BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI
APPEAL No. 33 of 2024 (SZ)

IN THE MATTER OF:

S.P. MUTHURAMAN
son of S. Ponnusamy,
Door No. 204, Railway Feeder Road,
Sankar Nagar Post,
Tirunelveli-627 357 ... Appellant

Vs.

1. The Union of India,
represented by the Secretary to Government,
Ministry of Environment, Forest & Climate Change,
Indira Paryavaran Bhawan,
Vayu Wing, 3d Floor, Aliganj,
Jorbagh Road, New Delhi-110003.

2. The Member Secretary,
Industry-III, -EAC,
Ministry of Environment, Forest & Climate Change,
Indira Paryavaran Bhawan,
Vayu Wing, 3rd Floor, Aliganj,
Jorbagh Road, New Delhi-110003.

3. The Member Secretary,
Tamil Nadu Pollution Control Board,
No. 76, Mount Road,
Guindy, Chennai-600 032.

4. The District Environment Engineer,
Krishnagiri District,
Office of the Tamil Nadu Pollution Control Board,
Plot No. 149/A, First Floor,
SIPCOT Industrial Estate Phase -1,
Dharga, Hosur-635 126,
Krishnagiri District.

5. M/s. Chemplast Sanmar Limited,
Represented by its President,
No. 44, Theertham Road,

Berigai, Suligunta Village,
Shoolagiri Taluk,
Krishnagiri District-635 105.

...Respondents

INDEX TO THE PAPER BOOK FILED BY THE 5th RESPONDENT – VOLUME III

S.No.	Date	Particulars	Annexure	Page No.
35.	26.08.2023	Final environmental impact and risk assessment report on the proposed 2nd expansion of the Berigai Unit, sent by the 5th Respondent to the 2nd Respondent	Annexure 28	679
36.	29.10.2024	Details of the Accredited EIA Consultant Organisations as mentioned in the website of The National Accreditation Board for Education and Training (NABET)	Annexure 29	1319
37.		Proof of Service		1320

Certified that the above documents are true copies of the originals

Dated at Chennai on this the 12th day of November, 2024

Counsel for the 5th Respondent

M/S. CHEMPLAST SANMAR LIMITED.

S.F NO.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3,10/1,2,3A, 3B,4,12/1A, 1B, 13/1, 14/1A,2A, SULIGUNTA VILLAGE, BERIGAI 635105. SHOOLAGIRI TALUK, KRISHNAGIRI DISTRICT, TAMIL NADU, INDIA.

FINAL ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT FOR PROPOSED EXPANSION OF SYNTHETIC ORGANIC CHEMICALS & PESTICIDE SPECIFIC INTERMEDIATES (FROM 1601.4 MT/ANNUM TO 20031.4 MT/ANNUM) MANUFACTURING IN EXISTING UNIT



CATEGORY : A [5(b) & 5(f)]
BASELINE STUDY PERIOD : JULY 2022 TO SEPTEMBER 2022
DETAILS OF TOR FOR INDUSTRY-III
PROPOSAL NO : IA/TN/IND3/406642/2022
TOR LETTER No.J-11011/104/2009-IA-II(I) ; DATED 10TH DECEMBER, 2022
DATE OF PUBLIC HEARING: 12th May 2023
TOTAL PLOT AREA: 16.64 Hectares
PROJECT COST: Rs. 2292.398 Crores
PROJECT NO.: 900048/2022
REPORT SUBMISSION:AUGUST 2023

PREPARED BY:

Aqua-Air Environmental Engineers Pvt. Ltd.®

NABET/QCI ACCREDITED EIA CONSULTANT:
NABET/EIA/2023/SA 0196 VALID UPTO APRIL 08, 2024
NABL ACCREDITED TESTING LABORATORY: TC – 7328
MOEF ACCREDITED TESTING LABORATORY:
15018/24/2019 – CPW VALID UPTO DECEMBER 3, 2023
GPCB RECOGNIZED SCHEDULE-II ENVIRONMENTAL AUDITOR VALID UPTO DECEMBER 31, 2024
ISO 45001: 2018 CERTIFIED COMPANY
ISO 9001: 2015 CERTIFIED COMPANY

NABL

QCI

FINAL ENVIRONMENTAL IMPACT & RISK ASSESSMENT REPORT

CLIENT	:	**M/S. CHEMPLAST SANMAR LIMITED.** **S.F NO.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3,10/1,2,3A, 3B,4,12/1A, 1B, 13/1, 14/1A,2A, SULIGUNTA VILLAGE, BERIGAI 635105. SHOOLAGIRI TALUK, KRISHNAGIRI DISTRICT, TAMIL NADU, INDIA.**
PROJECT TITLE	:	**PROPOSED EXPANSION SYNTHETIC ORGANIC CHEMICALS & PESTICIDE SPECIFIC INTERMEDIATES (FROM 1601.4 MT/ANNUM TO 20031.4 MT/ANNUM) MANUFACTURING IN EXISTING UNIT**
TOTAL PLOT AREA	:	**16.64 Hectares**
PROJECT COST	:	**Rs. 2292.398 Crores**
PROJECT NO.	:	**900048/2022**
CATEGORY	:	**A-5(b) & 5(f)**

Prepared By:

Aqua-Air Environmental Engineers P. Ltd.
403-404, Centre Point, Nr. Kadiwala School, Ring Road,
Surat – 395002

NABET/QCI ACCREDITED EIA CONSULTANT: NABET/EIA/2023/SA 0196
NABL ACCREDITED TESTING LABORATORY: TC – 7328
MOEF ACCREDITED TESTING LABORATORY: 15018/24/2019 – CPW
GPCB RECOGNIZED SCHEDULE-II ENVIRONMENTAL AUDITOR
ISO 9001: 2015 Certified Company
ISO 45001: 2018 Certified Company

NABET CERTIFICATE OF ACCREDITATION

QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

National Accreditation Board for Education and Training

Certificate of Accreditation

Aqua Air Environmental Engineers Pvt. Ltd.

403-404, Centre Point, Nr. Kadiwala School, Ring Road, Surat- 395002, Gujarat.

*The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals (opencast only)	1	1 (a) (i)	A
2	Onshore oil and gas exploration, development & production	2	1 (b)	A
3	Thermal power plants	4	1 (d)	A
4	Coal Washeries	6	2(a)	B
5	Mineral beneficiation 6	7	2 (b)	A
6	Metallurgical industries (ferrous Only)- both primary & secondary	8	3 (a)	A
7	Cement Plants	9	3(b)	B
8	Petroleum refining industry	10	4 (a)	A
9	Chlor- Alkali Industry	13	4 (d)	A
10	Soda ash Industry	14	4 (e)	A
11	Chemical fertilizers	16	5 (a)	A
12	Pesticides industry and pesticide specific intermediates	17	5 (b)	A
13	Petro-chemical complexes	18	5 (c)	A
14	Manmade fibers manufacturing	19	5 (d)	B
15	Petrochemical based processing	20	5 (e)	A
16	Synthetic organic chemicals industry	21	5 (f)	A
17	Distilleries	22	5 (g)	A
18	Integrated paint Industry	23	5 (h)	B
19	Pulp & paper industry excluding manufacturing of paper	24	5(i)	B
20	Sugar Industry	25	5 (j)	B
21	Oil & gas transportation pipeline	27	6 (a)	A
22	Air ports	29	7 (a)	A
23	Industrial estates/ parks/ complexes/areas	31	7(c)	A
24	Common hazardous waste treatment, storage and disposal facilities (TSDF)	32	7(d)	A
25	Bio-medical waste treatment facilities	32A	7 (da)	B
26	Ports, harbours, break waters and dredging	33	7(e)	A
27	Highways	34	7 (f)	A
28	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
29	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
30	Building and construction projects	38	8 (a)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated April 11, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/23/2768 dated May 29, 2023. The accreditation needs to be renewed before the expiry date by Aqua Air Environmental Engineers Pvt. Ltd., Surat following due process of assessment.

Sr. Director, NABET
Dated: May 29, 2023

Certificate No.
NABET/EIA/2023/SA 0196

Valid up to
Apr. 08, 2024

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

MoEF&CC CERTIFICATE FOR LABORATORY ACCREDITATION

F. No. Q-15018/04/2019-CPW
Government of India
Ministry of Environment, Forest and Climate Change
(CP Division)

Agni-233, Indira Paryavaran Bhavan,
Jor Bagh Road,
New Delhi – 110 003.
Dated, the 14th October, 2019

To

M/s ABC Techno Labs India Private Limited
ABC Tower No. 400, 13th Street , SIDCO
Industrial Estate North Phase, Ambattur
Chennai, TamilNadu-600098

Subject: -Recognition of M/s ABC Techno Labs India Private Limited, ABC Tower No. 400, 13th Street, SIDCO, Industrial Estate North Phase, Ambattur, Chennai, TamilNadu-600098, as Environmental Laboratory under the Environment (Protection) Act, 1986 – regarding.

Sir,

I am directed to refer to your application dated:04.02.2019 for renewal of recognition of your laboratory under Environment (Protection) Act, 1986. Based on the recommendations of the Expert Committee for Recognition of Environmental Laboratories in its 60th meeting held on 30.08.2019 and your acceptance of the revised terms and conditions at Annexure-III & IV of the Guidelines for recognition of Environmental Laboratories, this Ministry approves the renewal of recognition of M/s ABC Techno Labs India Private Limited, ABC Tower No. 400, 13th Street , SIDCO, Industrial Estate North Phase , Ambattur, Chennai, TamilNadu-600098, for five years, as shall be notified in the Gazette of India.

2. As sought in your aforementioned application, M/s ABC Techno Labs India Private Limited, Chennai may undertake the following tests:

i. **Physical Tests:** Conductivity, Colour, pH, Fixed & volatile solids, Total solids, Total dissolved solids, Total suspended solids, Turbidity, Temperature, Velocity & discharge measurement of industrial effluent stream, Flocculation test (Jar Test), Odour, Salinity, Settleable solids and Sludge volume index.

ii. **Inorganic (General & Non-metallic):** Acidity, Alkalinity, Ammoniacal nitrogen, Chloride, Chlorine residual, Dissolved oxygen, Fluoride, Total hardness, Total kjehldal nitrogen (TKN), Nitrite nitrogen, Nitrate nitrogen, Phosphate, Sulphate, Bromide, Carbon dioxide, Chlorine demand, Iodine, Sulphite, Silica, Cyanide and Sulphide.

iii. **Inorganic (Trace metals):** Boron, Cadmium, Calcium, Chromium Total, Chromium Hexavalent, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Potassium, Sodium, Sodium absorption ratio, Zinc, Arsenic, Aluminum, Beryllium, Barium, Lithium, Manganese, Selenium, Silver, Strontium, Tin, Antimony, Cobalt and Vanadium.

iv. **Organics (General) and Trace Organics:** Bio-chemical oxygen demand (BOD), Chemical oxygen demand (COD), Oil & grease, Phenol, Pesticide ((Organo-chlorine, Organo nitrogen-phosphorous), Total organic carbon, Surfactants, Tannin & lignin, Poly-Chlorinated biphenyl (PCB's) each, Polynuclear aromatic hydrocarbon (PAH), Organic Carbon (in Solid) and Carbon/Nitrogen ratio.

v. **Microbiological Tests:** Total Coliform, Faecal Coliform, Faecal streptococci, E. coli, Total Plate count and Enterococcus.

vi. **Toxicological Tests:** Bioassay method for evaluation of toxicity using fish, Bio-accumulation, bio magnification and bio-transformation studies, Measurement of toxicity using Daphnia or other organism.

vii. **Biological Tests:** Benthic organism identification and count, Planktonic identification count, Measurement of various diversity index, Chlorophyll and Primary productivity.

viii. **Hazardous Waste:** Preparation of Leachate (TCLP extract/water extract), Corrosivity, Ignibility (Flash Point), Reactivity, Toxicity and Measurement of heavy metals/ pesticides in the waste/ leachate

ix. **Soil/ Sludge/ Sediment and Solid Waste:** Boron, Cation Exchange Capacity (CEC), Electrical Conductivity, Nitrogen available, Organic carbon/ matter (chemical method), pH, Phosphorus

(available), Phosphate (ortho), Phosphate (total), Potassium, SAR in soil extract, Sodium, Soil moisture, TKN, Calorific value, Ammonia, Bicarbonate, Calcium, Calcium Carbonate, Chloride, Colour, Exchangeable Sodium Percentage, Heavy metal, Magnesium, Nitrate, Nitrite, PAH, Pesticide, Potash (available), Sulphate, Sulphur, TOC, Total water soluble salt and Water holding capacity.

x. **Ambient Air/ Fugitive Emissions:** Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Suspended particulate matter, Respirable suspended particulate matter (PM_{10}), Ammonia, Carbon monoxide, Chlorine, Fluoride, Lead, Ozone, Benzene Toluene Xylene, Polycyclic aromatic hydrocarbon (PAH), Benzoapyrine & others, Fine Particulate Matter $PM_{2.5}$ and Volatile Organics Compounds.

xi. **Stack Gases/ Source Emission:** Particulate matter, Sulphur dioxide, Velocity & flow, Carbon dioxide, Carbon Monoxide, Temperature, Oxygen, Oxides of nitrogen, Acid mist, Ammonia, Chlorine, Fluoride(Gaseous), Hydrochloric acid, Total Hydro Carbon, Hydrogen Sulphide.

xii. **Noise Level:** Noise level measurement (20 to 130 dba), Ambient Noise & Source-specific Noise .

xiii. **Meteorological:** Ambient temperature, Wind direction, Wind speed, Relative Humidity and Rainfall.

3. Further, the following analysts have been approved for recognition as Government Analysts.
   (i) Mr. S. Ravi
   (ii) Mr. K.G. Swaminathan
   (iii) Mr. A. Robson Chinnadurai

4. The laboratory shall compulsorily participate in the Analytical Quality Control (AQC) exercise conducted by the Central Pollution Control Board (CPCB) at least once a year to ascertain the capability of the laboratory and analyses carried out and shall submit quarterly progress reports to this Ministry.

5. Periodic surveillance of the recognized environmental laboratory will be undertaken by this Ministry/ CPCB to assess its proper functioning, systematic operation and reliability of data generated at the laboratory.

6. It is also mandatory for the laboratory to have requisite accreditations of the NABL/ ISO 9001 and OHSAS and its renewal as per accreditation rules. Permission in para 2 above is subject to such accreditations and renewal, as applicable.

7. The laboratory should compulsorily follow the accepted Terms & Conditions. In case of serious non-compliance of any of the Terms and Conditions, the laboratory may be black-listed for a minimum period of two years and civil/ criminal proceedings, as applicable, may be initiated for performing functions on behalf of the Government in an unauthorized manner.

Yours faithfully,

(Dr. Susan George K.)
Scientist 'D'
Tel. No. 011-24695327
Email: susan.george@nic.in

Copy to:

1. Member Secretary, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, New Delhi – 110032.
2. Member Secretary, Tamil Nadu Pollution Control Board (TNPCB), 76 Anna Salai, Guindy, Chennai-600032
3. Additional Principal Conservator of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (SEZ),1st and 2nd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai-34.
4. Director, IT Division, MoEF&CC, New Delhi-110003: for uploading on MoEF&CC website

NABL CERTIFICATE

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

ABC TECHNO LABS INDIA PRIVATE LIMITED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

ABC TOWER, NO 400, 13TH STREET, SIDCO INDUSTRIAL ESTATE-NORTH PHASE, AMBATTUR, CHENNAI, TAMIL NADU, INDIA

in the field of

TESTING

Certificate Number: TC-5770

Issue Date: 03/04/2022 **Valid Until:** 02/04/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : ABC Techno Labs India Private Limited

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

UNDERTAKING BY PROJECT PROPONENT

Chemplast Sanmar Limited
Sanmar Speciality Chemicals Divn.

44 Theertham Road Berigai 635 105
Shoolagiri Taluk Krishnagiri District Tamil Nadu India
Tel + 91 4344 253 005
www.sanmargroup.com
CIN U24230TN1985PLC011637

UNDERTAKING

We **M/s. Chemplast Sanmar Limited**, own this EIA report for proposed expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) manufacturing in existing unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

Thanking You,

Yours faithfully,

For Chemplast Sanmar Limited

G. Sankara Subramaniam
(President)

CHEMPLAST SANMAR LTD. BERIGAI 635 105

Responsible Care®

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA

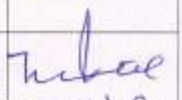
Proposed Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit AT S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India of M/s. Chemplast Sanmar Limited [Category – A, Sector-5(f) & 5(b) (As per the EIA Notification 2006 and its amendments)]

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA Co-ordinator

Name:	**Mr. Chetan Kabariya**
Signature and Date:	09/08/2023
Period of Involvement:	December 2022 to till Date
Contact Information:	**M/s. Aqua-Air Environmental Engineers. P. Ltd.** 403-404, Centre Point, Nr. Kadiwala School, Ring Road, Surat-395 002 (Guj.), India Phone (O): +91 (261) 2460854, 2461241 Website: www.aqua-air.co.in

FUNCTIONAL AREA EXPERTS

SR. NO.	FUNCTIONAL AREAS	NAME OF THE EXPERT/S	INVOLVEMENT (PERIOD AND TASK)	SIGNATURE AND DATE
1	AP	Mr. Henil Lankapati	**Period:** December 2022 to till Date **Task:** Selection of monitoring locations and parameters, Interpretation of Parameters; Evaluation of ambient air quality results; Impact identification and suggesting mitigation measures; Post Monitoring Plan, EMP Cost.	
2	WP	Mr. Navinchandra Patel	**Period:** December 2022 to till Date **Task:** Selection of monitoring locations and parameters; Evaluation of water quality results; Verifying the water balance of the project; Impact identification and suggesting mitigation measures.	
3	NV	Mr. Jatin Dalal	**Period:** December 2022 to till Date **Task:** Selecting monitoring location and parameters; identifying sources of noise generation and vibrations in the area.	
4	SHW	Mr. Jayeshkumar Patel	**Period:** December 2022 to till Date **Task:** Identifying details regarding solid wastes generation, storage, treatment & disposal; Impact identification and suggesting mitigation measures.	
5	RH	Mr. Dhaval Jhaveri	**Period:** December 2022 to till Date **Task:** Suggestion of mitigative and safety measures for hazards identified, prepare Scenario of the risk, Source of hazard; Review & Finalization of Risk Assessment, Detail HAZOP Study, Consequences of Risk Assessment	
6	AQ		**Period:** December 2022 to till Date **Task:** Collection of Meteorological Data, Run AERMOD to prepare site specific primary wind rose and GLC plots after verifying meteorological data from secondary sources; Air quality impact Predication, Calculation of output result, Assessment of Result, Impact	

			identification and suggesting mitigation measures.	
7	EB	Mr. Pritesh Patel	**Period:** December 2022 to till Date **Task:** Identification of sampling locations for terrestrial biodiversity on the basis of Land Use and Land cover map; Identification of impacts and suggesting mitigation measures, Identification of flora and fauna within study area, prepare conservation plan.	P. K. Patel 25/8/23
8	LU		**Period:** December 2022 to till Date **Task:** Preparation of toposheet and land use/land cover map from the satellite image. Identification of impacts and suggesting mitigation measures.	
9	HG	Mr. Bhavin Shah	**Period:** December 2022 to till Date **Task:** Identifying the ground water potential of the area, Interpretation of ground water analysis reports; Identification of impacts and suggesting mitigation measures.	25/8/23
10	GEO		**Period:** December 2022 to till Date **Task:** Preparing related maps and cross-sectional diagrams; Conduct survey and field study to gather geological data; Identification of impacts and suggesting mitigation measures.	
11	SE	Mrs. Shital Tamakuwala	**Period:** December 2022 to till Date **Task:** Identification of impact and suggesting Mitigative measures of project on community; preparation of CER plan in consultation with client.	14/8/2023
12	SC	Mrs. Archana Patel	**Period:** December 2022 to till Date **Task:** Selection of monitoring locations and parameters; Verification of analysis results based on secondary data; Identification of impacts and suggesting mitigation measures.	APatel 07/08/23.

TEAM MEMBERS AS FAE

SR. NO.	FUNCTIONAL AREAS	NAME OF THE EXPERT/S	INVOLVEMENT (PERIOD AND TASK)	SIGNATURE AND DATE
1	AP	Mr. Mitesh Patel	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for Selection of monitoring locations and parameters, Interpretation of Parameters; Evaluation of ambient air quality results; Impact identification and suggesting mitigation measures; Post Monitoring Plan, EMP Cost.	09.08.2023
2	NV	Mr. Jaykumar Patel	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for Selecting monitoring location and parameters; identifying sources of noise generation and vibrations in the area	09-08-2023
3	LU	Ms. Purva Patel	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for Preparation of topo sheets and land use/land cover map from the satellite image. Identification of impacts and suggesting mitigation measures	7/8/23
4	HG	Mr. Neel Patel	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for Identifying the ground water potential of the area, Interpretation of ground water analysis reports; Identification of impacts and suggesting mitigation measures.	07/08/2023

FUNCTIONAL AREA ASSOCIATES

SR. NO.	FUNCTIONAL AREAS	NAME OF THE EXPERT/S	INVOLVEMENT (PERIOD AND TASK)	SIGNATURE AND DATE
1	WP	Mr. Ghanshyam Dhola	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for selection of monitoring locations and parameters; Evaluation of water quality results; Verifying the water balance of the project; Impact identification and suggesting mitigation measures.	09/08/23
2	SE	Mr. Chirag Chauhan	**Period:** December 2022 to till Date **Task:** Worked under guidance/consultation of approved FAE for Identification of impact and suggesting mitigative measures of project on community; Details of Emission preparation of CER plan in consultation with client.	C. D. chauhan 09/08/23

Aqua-Air® Environmental Engineers Pvt. Ltd.
(Pollution Control Consultants & Engineers)
GPCB Recognized Schedule-II Environmental Auditor • ISO 45001 : 2018 Certified Company • ISO 9001:2015 Certified Company
NABET /QCI Accredited EIA Consultant • NABL Accredited Testing Laboratory • MOEFCC Approved Environmental Laboratory

Declaration by Head of the Organization

I, Jayeshkumar S. Patel hereby confirm that the above mentioned EIA Coordinator, Functional Area Experts, Functional Area Associates & team members were involved in preparation of draft EIA Report of **M/s. Chemplast Sanmar Limited** for Proposed expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Name of Consultant	Aqua Air Environmental Engineers Pvt. Ltd., Surat
Name of Concerned Person	Mr. Jayesh Patel
Designation	Chairman & Managing Director
Signature	15/3/2023
Contact Information	aquaair_surat@hotmail.com aqua_eia@yahoo.com

REG. OFFICE
403 & 404, Centre Point, Nr. Kadiwala School, Ring Road, Surat-395002, Gujarat, India.
T : +91 (261) 2460854 / 2461241 | E : aquaair_surat@hotmail.com | W : www.aqua-air.co.in

PLAGIARISM REPORT

Aqua-Air® Environmental Engineers Pvt. Ltd.
(Pollution Control Consultants & Engineers)
GPCB Recognized Schedule-II Environmental Auditor • ISO 45001 : 2018 Certified Company • ISO 9001:2015 Certified Company
NABET /QCI Accredited EIA Consultant • NABL Accredited Testing Laboratory • MOEFCC Approved Environmental Laboratory

Certificate of Plagiarism check

Title of EIA Report:	Proposed expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3,10/1,2,3A,3B,4,12 /1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India of **M/s. Chemplast Sanmar Limited**
Name of Accredited Organization:	M/s. Aqua Air Environmental Engineers Pvt. Ltd.
Unique Identification Number:	Project no. 900048/2022
Name of EIA Co-ordinator (EC):	Mr. Chetan Kabariya
Name of the Software:	Plagiarism Checker X 2021 Professional Edition
Date of Check:	19/08/2023
Time of Check:	1.00 PM

Declaration by the Head of the accredited consultant organization/ authorized person

I hereby certify that this EIA Report has been evaluated using online/In-house software viz., Plagiarism Checker X 2021 Professional Edition. The report produced has been analyzed by the system and based on it, I certify that the EIA report produced in accordance with good scientific practice.

Date and Sign of EIA Coordinator: 25/08/23

Name: Mr. Chetan Kabariya

Designation: Deputy Director (EIA/EC Department)

Date and Sign of Head of Accredited Organization: 25/8/2023

Name of the EIA consultant organization- M/s. Aqua Air Environmental Engineers Pvt. Ltd.

NABET Certificate No. NABET/EIA/2023/SA 0196 valid up to April 08, 2024

*Note – The ACO may use/take help of appropriate software to detect plagiarism of the EIA Report Content.

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No.J-11011/104/2009-IA-II(I)
Goverment of India
Minister of Enviroment,Forest and Climate Change
Impact Assessment Division
***

Indira Paryavaran Bhavan,
Vayu Wing,3rd Floor,Aliganj,
Jor Bagh Road,New Delhi-110003
10 Dec 2022

To,

M/s CHEMPLAST SANMAR LIMITED
9 Cathedral Road,
Karaikal-600086
Puducherry

Tel.No.44-28128500; Email:gss1@sanmargroup.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1) along with a Pre-feasibility Report. The details of the proposal are given below:

1. Proposal No.:	IA/TN/IND3/406642/2022
2. Name of the Proposal:	M/s. Chemplast Sanmar Limited
3. Category of the Proposal:	Industrial Projects - 3
4. Project/Activity applied for:	5(b) Pesticides industry and pesticide specific intermediates (excluding formulations) 5(f) Synthetic organic chemicals industry (dyes & dye intermediates; bulk
5. Date of submission for TOR:	03 Dec 2022

In this regard, under the provisions of the EIA Notification 2006 as amended, the Standard TOR for the purpose of preparing environment impact assessment report and environment management plan for obtaining prior environment clearance is prescribed with public consultation as follows:

ACTIVITY 5(b)- PESTICIDES INDUSTRY

SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR PESTICIDE INDUSTRIES

GENERIC CONDITIONS

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.

v. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.

vi. List of raw materials required and their source along with mode of transportation.

vii. Other chemicals and materials required with quantities and storage capacities

viii. Details of Emission, effluents, hazardous waste generation and their management.

ix. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

x. Details of boiler/gensets (including stacks/exhausts) and fuels to be used

x. Details of boiler/gensets (including stacks/exhausts) and fuels to be used

xi Process description along with major equipment's and machineries, process flow sheet (quantitative) from raw materials to products to be provided

xi. Hazard identification and details of proposed safety systems.

xii. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Integrated Regional Office of the Ministry of Environment, Forest and Climate Change as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental

clearances including Amendments shall be provided. In addition, copy of the latest CTO and status of compliance of Consent to Operate for the ongoing/existing operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A topo-sheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth download of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Land-use break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land. Documents related to conversion of land for Industrial purpose.

xiii. R&R details in respect of land in line with state Government policy

5. Forest, wildlife and CRZ related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Land-use map based on High resolution satellite imagery of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

vii. Recommendations and NOC from the concerned State/UT Coastal Zone Management Authority on CRZ angle

5) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

- AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Study should indicate minimum, maximum value of different parameters for the period (3 months) collected. Collected data should be supported by the reference data of either CPCB or SPCB. AAQ data & GLC of pollutants from stack emissions should suggest technology/ measures- Best Practiced Technology (BPT) indicating best achieved results.

ii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iii. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

iv. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
v. Ground water monitoring at minimum at 8 locations shall be included.
vi. Noise levels monitoring at 8 locations within the study area.
vii. Soil Characteristic as per CPCB guidelines.
viii. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
ix. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
x. Socio-economic status of the study area.

6) Environment Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
ii. Water Quality Modelling – in case of discharge in water body
iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules 1986.
v. Details of stack emission and action plan for control of emissions to meet standards.
vi. Measures for fugitive emission control
vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 2,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

7) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

8) Corporate Environment Policy

i. 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.

ii. Does the Environment 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.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

v. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

10) Corporate Environmental Responsibility (CER)

i. Adequate funds, as per the Ministry's OM/Guidelines, shall be earmarked towards the Corporate Environmental Responsibility based on Public Hearing issues/socio-economic issues and item-wise details along with time bound action plan shall be included (CER activities shall be related to environment). Socio-economic development activities need to be elaborated upon. For the projects where public hearing is not conducted, CER plan shall be provided based on socio-economic study of the area.

9) Additional studies/Measures to be considered

(i). Provide latest and ecofriendly technology for product manufacturing.

(ii). Emphasize on Green chemistry/Clean Manufacturing

(iii). Provide CAS No. of products along with product list.

(iv). Provide details of amount of carbon sequestered in their unit through greenbelt/other modes, in case of expansion project.

(v). Life structure and sustainability for carbon and water foot print.

(vi). Detailed pollution Load estimation.

(vii). Transportation of Hazardous substance, effluents etc shall be carriedout through authorized and GPS enable vehicles/Trucks only.

(viii). Category of Hazardous Wastes shall be mentioned in the EIA/EMP report and in presentation.

(ix). Details of greenhouse gases and emissions shall be provided.

(x). Greenbelt shall be developed in the first year of the project and wind breaks shall be erected.

(xi). Study area map shall be overlapped with all the associated features.

(xii). Emphasize on green fuels.

(xiii). The project from NCR shall not use Coal as fuel. Further, PP shall avoid use of Coal in the CPAs and elsewhere also if alternatives are available.

(xiv). Provide the Cost-Benefit analysis with respect to the environment due to the project.

(xv). Details of carbon foot prints and carbon sequestration study w.r.t. proposed project

needs to spelled out. Proposed mitigation measures also needs to be analyzed and submitted for further appraisal of the EAC

11) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

12) A tabular chart with index for point wise compliance of above TORs and its details needs to be submitted in the EIA/EMP Report.

SPECIFIC CONDITIONS

1. Commitment that no banned pesticides will be manufactured.
2. Details on solvents to be used, measures for solvent recovery and for emissions control.
3. Details of process emissions from the proposed unit and its arrangement to control.
4. Ambient air quality data should include VOC, other process-specific pollutants* like NH3*,chlorine*, HCl*, HBr*, H2S*,HF*, CS2etc.,(*-as applicable)
5. Work zone monitoring arrangements for hazardous chemicals.
6. Detailed effluent treatment scheme including segregation for units adopting 'Zero' liquid discharge.
7. Action plan for odour control to be submitted.
8. A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.
9. Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.
10. Material Safety Data Sheet for all the Chemicals are being used/will be used.
11. Authorization/Membership for the disposal of solid/hazardous waste in TSDF.
12. Details of incinerator if to be installed.
13. Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling & safety system to be incorporated.
14. Arrangements for ensuring health and safety of workers engaged in handling of toxic materials
15. Details of carbon foot prints and carbon sequestration study w.r.t. proposed project needs to spelled out. Proposed mitigation measures also needs to be analysed and submitted for further appraisal of the EAC.

ACTIVITY 5(f)- SYNTHETIC ORGANIC CHEMICALS INDUSTRY

STANDARD TERMS OF REFERENCE FOR EIA STUDIES FOR 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)

GENERIC CONDITIONS

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation
ii. Information about the project proponent
iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.
ii. Products with capacities for the proposed project.
iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
iv. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.
v. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.
vi. List of raw materials required and their source along with mode of transportation.
vii. Other chemicals and materials required with quantities and storage capacities
viii. Details of Emission, effluents, hazardous waste generation and their management.
ix. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
x. Details of boiler/gensets (including stacks/exhausts) and fuels to be used
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xi Process description along with major equipment's and machineries, process flow sheet (quantitative) from raw materials to products to be provided
xi. Hazard identification and details of proposed safety systems.
xii. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Integrated Regional Office of the Ministry of Environment, Forest and Climate Change as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, copy of the latest CTO and status of compliance of Consent to Operate for the ongoing/existing operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A topo-sheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth download of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Land-use break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood

Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land. Documents related to conversion of land for Industrial purpose.

xiii. R&R details in respect of land in line with state Government policy

5. Forest, wildlife and CRZ related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Land-use map based on High resolution satellite imagery of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

vii. Recommendations and NOC from the concerned State/UT Coastal Zone Management Authority on CRZ angle

5) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

- AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Study should indicate minimum, maximum value of different parameters for the period (3 months) collected. Collected data should be supported by the reference data of either CPCB or SPCB. AAQ data & GLC of pollutants from stack emissions should suggest technology/ measures- Best Practiced Technology (BPT) indicating best achieved results.

ii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

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iv. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

v. Ground water monitoring at minimum at 8 locations shall be included.

vi. Noise levels monitoring at 8 locations within the study area.

vii. Soil Characteristic as per CPCB guidelines.

viii. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

ix. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

x. Socio-economic status of the study area.

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i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality Modelling – in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules 1986.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 2,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

7) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

8) Corporate Environment Policy

i. 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.

ii. Does the Environment 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.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

v. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

10) Corporate Environmental Responsibility (CER)

i. Adequate funds, as per the Ministry's OM/Guidelines, shall be earmarked towards the Corporate Environmental Responsibility based on Public Hearing issues/socio-economic issues and item-wise details along with time bound action plan shall be included (CER activities shall be related to environment). Socio-economic development activities need to be elaborated upon. For the projects where public hearing is not conducted, CER plan shall be provided based on socio-economic study of the area.

9) Additional studies/Measures to be considered

(i). Provide latest and ecofriendly technology for product manufacturing.

(ii). Emphasize on Green chemistry/Clean Manufacturing

(iii). Provide CAS No. of products along with product list.

(iv). Provide details of amount of carbon sequestered in their unit through greenbelt/other modes, in case of expansion project.

(v). Life structure and sustainability for carbon and water foot print.

(vi). Detailed pollution Load estimation.

(vii). Transportation of Hazardous substance, effluents etc shall be carriedout through authorized and GPS enable vehicles/Trucks only.

(viii). Category of Hazardous Wastes shall be mentioned in the EIA/EMP report and in presentation.

(ix). Details of greenhouse gases and emissions shall be provided.

(x). Greenbelt shall be developed in the first year of the project and wind breaks shall be erected.

(xi). Study area map shall be overlapped with all the associated features.

(xii). Emphasize on green fuels.

(xiii). The project from NCR shall not use Coal as fuel. Further, PP shall avoid use of Coal in the CPAs and elsewhere also if alternatives are available.

(xiv). Provide the Cost-Benefit analysis with respect to the environment due to the project.

(xv). Details of carbon foot prints and carbon sequestration study w.r.t. proposed project needs to spelled out. Proposed mitigation measures also needs to be analyzed and submitted for further appraisal of the EAC

11) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

12) A tabular chart with index for point wise compliance of above TORs and its details needs to be submitted in the EIA/EMP Report.

SPECIFIC CONDITION

1. Details on solvents to be used, measures for solvent recovery and for emissions control.
2. Details of process emissions from the proposed unit and its arrangement to control.
3. Ambient air quality data should include VOC, other process-specific pollutants* like NH3*,chlorine*,HCl*,HBr*,H2S*,HF*,etc.,(*-as applicable)
4. Work zone monitoring arrangements for hazardous chemicals.
5. Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge.
6. Action plan for odour control to be submitted.
7. A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.
8. Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.
9. Action plan for utilization of MEE/dryers salts.
10. Material Safety Data Sheet for all the Chemicals are being used/will be used.
11. Authorization/Membership for the disposal of solid/hazardous waste in TSDF.
12. Details of incinerator if to be installed.
13. Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan

5(b): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR PESTICIDES INDUSTRY AND PESTICIDE SPECIFIC INTERMEDIATES (EXCLUDING FORMULATIONS) AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

SR. NO.	TERMS OF REFERENCES	COMPLIANCE
1.	**Executive Summary**	**Executive Summary** is referred as Chapter-11.
2.	**Introduction**	
	i. Details of the EIA Consultant including NABET accreditation	EIA Consultants, M/s. Aqua-Air Environmental Engineers Pvt. Ltd. has obtained NABET- QCI accreditation scheme of MoEFCC, New Delhi. NABET accreditation certificate no. NABET/EIA/2023/SA 0196 valid upto April 08, 2024. Please refer **Annexure-7**, (Page No. A-14).
	ii. Information about the project proponent	**M/s. Chemplast Sanmar Limited**, having eight Partners/Directors. The detail of project proponent is refer as Section 1.1.1. of Chapter 1 (Page No.2)
	iii. Importance and benefits of the project	**Importance and benefits of the project** • We have well equipped and established R&D to develop and scale up the new products from the group of Synthetic Organic chemicals and Pesticide intermediates. • We have both Technical and non-technical man power in existing facility and hence readily available to oversee the expansion and commissioning. • Existing Manufacturing facility is well equipped with advanced technologies and this project is just the expansion similar to existing facility. Following are the benefits which may occur due to proposed project; • Use of existing skills in the region for minor developments, required for the proposed project • Increased transportation and handling requirements, that could benefit the local economy • Increased taxes to the State and Central Governments, which would add to the public good

3.	**Project Description**	
	i. Cost of project and time of completion.	Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Time of completion =2 Year after getting EC and NOC.
	ii. Products with capacities for the proposed project.	**List of Products Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum)** is referred as Table 2.3, Section 2.6, and Chapter-2 in EIA Report (Page No. 46).
	iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	**Reference of earlier EC details is given below:** **Unit has obtained ECs with Past Productions** EC vide letter F.No.J-11011/104/2009-IA II (I) dated 29/04/2009. **Products with capacities** are referred as Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46). Company has adequate land area for expansion in existing area and it is given in Section 2.2, Chapter-2 in EIA Report (Page No. 15).
	iv. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications. v. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.	**Products with capacities** are referred as Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46).
	vi. List of raw materials required and their source along with mode of transportation.	**List of raw materials** required and their source along with mode of transportation is referred as Table-2.3, Section 2.8 and Chapter-2 in EIA Report (Page No. 53-72). Most of the Raw Materials will be purchased from Local Market. Some Raw Material are not available in Local Market, so it will be imported. Transportation of Raw Material is Primarily by Road/ Sea/Air.
	vii. Other chemicals and materials required with quantities and storage capacities	**Total nos. of 30 Other chemicals and materials** details with quantities, maximum storage and mode of storage are referred as Table 7.1, Chapter-7 in EIA Report (Page No. 335).
	viii. Details of Emission, effluents, hazardous waste	**Details of Effluent & its Management:**

	generation and their management.	➢ The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream. • Low COD stream: Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system. • High TDS Stream: Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility). • Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment. **Details of Emission & its Management:** • In existing, company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector & Adequate Stack will be provided to control of flue gas emission. In proposed expansion, company will use Furnace Oil and Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector, ESP & Adequate Stack will be provided to control of flue gas emission. The source of process gas emission will be from reactor vent. **Details of Hazardous Waste and Its Disposal Management:** • Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes, Used / Spent Oil, spent solvents will be disposed Disposal to TNPCB Authorized Recyclers (Recyclable). • Chemical sludge from waste water treatment, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for

<table>
<tr><td></td><td></td><td>reuse, Contaminated cotton rags or other cleaning materials, Spent Carbon or Filter medium disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
• Spent Carbon or Filter medium disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016.</td></tr>
<tr><td></td><td>ix. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)</td><td>Total Power Requirement
Power requirement will be 14000 KVA which will be taken from State Electricity Department.

Fuel Requirement:
<table>
<tr><th>Sl. No.</th><th>Type of Fuel</th><th>Existing (MT/day)</th><th>Proposed (MT/day)</th><th>Total (MT/day)</th></tr>
<tr><td>1</td><td>Furnace Oil</td><td>8</td><td>90</td><td>98</td></tr>
<tr><td>2</td><td>Briquettes</td><td>00</td><td>250</td><td>250</td></tr>
<tr><td>3</td><td>HSD</td><td>1.7</td><td>20.3</td><td>22</td></tr>
<tr><td>4</td><td>LPG</td><td>0.008</td><td>0.192</td><td>0.20</td></tr>
</table>
Requirement of Water:
Total Domestic Water: 100.0 KL/Day [Existing: 12.0 KL/Day + Proposed: 88.0 KL/Day]
Total Gardening Water: 30.5 KL/Day [Existing: 25.5 KL/Day + Proposed: 5 KL/Day]
Total Water Quantity: 1207.5 KL/Day [Existing: 207.5 KL/Day + Proposed: 1000 KL/Day]

Source of water: The Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/PWD available and remaining 1000 KLD applied to get from government water source.

Status of Approval: Unit has obtained CGWA letter wide letter no. 21-4(134)/SECR/CGWA/2009-3708 dated: 01/06/2012 for 207.5 KLD.

Water Balance Diagram is referred as Fig. 2.4,</td></tr>
</table>

		Section 2.10.3. in Chapter-2 in EIA Report (Page No. 135). **Man-power requirement:** Company will be appointed Approximately 1350 people [Existing: 350 people + proposed: 1000 people] local skilled and unskilled people based on qualification and requirement as per prevailing norms of state government.
	x. Details of boiler/gensets (including stacks/exhausts) and fuels to be used	Details of boiler is refer as Section 2.11.5 (Page No. 150-151). & fuels to be used is refer as Section 2.11.4. Chapter-2 in EIA Report (Page No. 149).
	xi. Process description along with major equipments and machineries, process flow sheet (quantities) from raw material to products to be provided	**Process description** along with major equipments and machineries, process flow sheet (quantities) from raw material to products is referred as Section 2.9, Chapter-2 in EIA Report (Page No. 73).
	xii. Hazard identification and details of proposed safety systems.	**Hazard Identification** major risk areas are as follows: • Bulk storage area for Raw Materials at ambient temperature and atmospheric pressure. • Process Plant involving pumping, transportation, reactors, distillation, heating, cooling, etc. • Bulk loading and unloading from storage tanks to road takers and vice versa. Safety precautions are referred as Section 7.4, Chapter-7 of EIA Assessment Report (Page No. 341)
	xii. Expansion/modernization proposals: a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances	This is an Expansion project. a. Unit has obtained EC from MOEF vide file No. J-11011/104/2009-IA-II(I) dated 29/04/2009. Certified EC Compliance Report from MoEFCC, Tamilnadu has been obtained vide file no. E.P.12.1/862/TN/1206 dated 8th December 2021 is attached in Annexures. Unit has obtained CTO & CTE. Renewal of **CTE** (Air) & (Water) vide no.: **2206241783392** dated: 03/06/2022 and Consent to establish for Expansion is valid up to **March 31, 2027.** **CTO for expansion** (Air) & (Water) vide no.:

	including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB shall be attached with the EIA-EMP report.	**2307153222383** dated: 18/08/2022 and Consent to establish for Expansion is valid up to **March 31, 2028.**
	b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	b. Unit has obtained EC from MOEF vide file No. J-11011/104/2009-IA-II(I) dated 29/04/2009. Certified EC Compliance Report from MoEFCC, Tamilnadu has been obtained vide file no. E.P.12.1/862/TN/1206 dated 8th December 2021 is attached in Annexures. Visit date: 6/12/2021 Unit has obtained CTO & CTE. Renewal of **CTE** (Air) & (Water) vide no.: **2206241783392** dated: 03/06/2022 and Consent to establish for Expansion is valid upto **March 31, 2027.** **CTO for expansion** (Air) & (Water) vide no.: **2307153222383** dated: 18/08/2022 and Consent to establish for Expansion is valid up to **March 31, 2028.**
4.	**Site Details**	
	i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	Location the project site: S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3,10/1,2,3A,3B, 4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India. Justification for selecting the site: ● Minor site clearance activities shall be carried out to clear shrubs and weed. ● The project site is located on level ground, which does not require any major land filling for area grading work. ● No sanctuaries or archeological sites are located in the vicinity of the area. ● No rehabilitation or resettlement of local

		people required. ● Site is very well connected by road and railway. ● Availability of Fuel, Power, TSDF, etc. within the estate. Proposed Expansion activities are carried out within Existing Premises and No additional investigations are required for the present proposal. Hence no alternative sites were examined.
	ii. A topo sheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)	A topo sheet of the study area is referred as Figure 3.13, Section 3.10, Chapter-3 in EIA Report (Page No.229).
	iii. Details w.r.t. option analysis for selection of site	Major factors involved in the selection of site are listed below: • Proposed Expansion activities are carried out within Existing Premises and No additional investigations are required for the present proposal. ● Minor site clearance activities shall be carried out to clear shrubs and weed. ● The project site is located on level ground, which does not require any major land filling for area grading work. ● No sanctuaries or archeological sites are located in the vicinity of the area. ● No rehabilitation or resettlement of local people required. ● Site is very well connected by road and railway. ● Availability of Fuel, Power, TSDF, etc. within the estate.
	iv. Co-ordinates (lat-long) of all four corners of the site.	**Co-ordinates (lat-long)** of all corners of the site. 12°48'21.69"N 77°59'2.03"E 12°48'18.20"N 77°59'14.32"E 12°48'17.79"N 77°59'19.40"E 12°48'14.08"N 77°59'18.40"E 12°48'10.76"N 77°59'18.31"E

		12°48'6.70"N 77°59'16.68"E 12°48'13.67"N 77°58'57.08"E
	v. Google map-Earth downloaded of the project site	**Google map-Earth** downloaded of the project site is referred as Figure – 2.2, Section- 2.3.1, Chapter-2 in EIA Report (Page No.35).
	vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	**Layout maps** are referred as Figure – 2.1, Section-2.2, Chapter-2 in EIA Report (Page No. 17).
	vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	Photographs of the proposed and existing (if applicable) plant site and greenbelt developed within the plant premises is referred as Section 2.3.1 and Chapter-2 in EIA Report (Page no. 36-38)
	viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc. shall be included. (not required for industrial area)	**Total land area of the Unit is 16.64 Hectares and break-up of total land of the project site** is referred as Table 1.3, Section 1.2.2, and Chapter-1 in EIA Report (Page No. 4).
	ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area	There is no factory around 10 km of the plant surrounding. Land use details of the study area is referred as Section 3.9, Chapter-3 in EIA Report (Page No. 237).
	x. Geological features and Geo-hydrological status of the study area shall be included.	**Geological features** is referred as Section 3.8.6 (Page No. 224) **and Geo-hydrological status** of the study area are referred as Section 3.8.4, Chapter-3 in EIA Report (Page No. 222).
	xi. Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)	**Drainage pattern** of the project is referred as Section 3.8.5, and Chapter-3 in EIA Report (Page No. 223).

	xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	Unit has already obtained acquisition of land. Land possession documents are attached as Section 2.2.1. , Chapter-2 in EIA Report(Page no. 20)
	xiii. R&R details in respect of land in line with state Government policy	The unit is located outside Notified Industrial Area. There is no habitation on the proposed expansion project activity area and it is inside the existing industry land. There shall not be displacement of any population in project area. The increasing industrial activity will boost the commercial and economical status of the locality up to some extent. Hence, R & R is not applicable to this project.
5.	**Forest and wildlife related issues (if applicable)**	
	i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden there on.	Forest and wildlife related issues are not applicable. As, no forest and no sanctuaries are located in 10 km radial of study area.

	v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area	Not applicable, As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	vii. Recommendations and NOC from the concerned State/UT Coastal Zone Management Authority on CRZ angle	Not applicable.
6.	**Environmental Status**	
	i. Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	**Determination of atmospheric inversion level** at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall is referred as Section 3.3, Chapter-3 in EIA Report (Page No. 176).
	• AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	Ambient Air Quality Monitoring (AAQM) was carried out at eleven locations during the study period. The conventional and project specific parameters such as Suspended Particulate Matter, RSPM-PM_{10}, RSPM-$PM_{2.5}$, SO_2, NOx, O_3, Pb, C_6H_6, BaP, As, Ni, CO & VOCs were monitored at site. AAQ data is referred in Table-3.10, Section-3.4, Chapter-3 in EIA Report. (Page No. 188-189).
	ii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	**Raw data of all AAQ measurement** for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 is referred as Table-3.10, Section-3.4, Chapter-3 in EIA Report. (Page No. 188-189).
	iii. Surface water quality of nearby River (100 m upstream and downstream of discharge point) and other surface drains at eight	11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. Surface water quality is referred in Table-3.13, Section-3.6.1, Chapter-3 in EIA Report. (Page

	locations as per CPCB/MoEF&CC guidelines.	No.196-199).
	iv. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.	No falls
	v. Ground water monitoring at minimum at 8 locations shall be included.	11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. Ground water monitoring is referred in Table-3.13, Section-3.6.1, Chapter-3 in EIA Report. (Page No.196-199).
	vi. Noise levels monitoring at 8 locations within the study area.	Noise levels monitoring for 11 location of Residential Area, along with project site is referred as Table No. 3.12, Section 3.5, Chapter-3 in EIA Report (Page No194-195).
	vii. Soil Characteristic as per CPCB guidelines.	**Soil Characteristic for 11 Location** is referred as Table No. 3.14, Section 3.7.1, Chapter-3 in EIA Report (Page No. 203-207).
	viii. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	Car/jeep/ van & four wheelers - 219 Nos. Bus/ coach -192 Nos. Heavy motor vehicle - 12 Nos. Trucks - 15 Nos. Motor cycle & scooter - 309 Nos. Three wheelers-10 Nos. Cycle-9 Nos. Farm vehicle (tractor/ combine harvester)-162 Nos. Detailed traffic study of the area is refer as Section 3.11, Chapter-3 in EIA report (Page no. 231-235)
	ix. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	**Flora** existing in the study area is referred as Section 3.12.5, Chapter-3 in EIA Report (Page No. 243-248) and **Fauna (terrestrial and aquatic)** existing in the study area is referred as Section 3.12.6, Chapter-3 in EIA Report (Page No. 248-253).
	x. Socio-economic status of the study area.	**Socio-economic** status of the study area is referred as Section 3.13, Chapter-3 in EIA Report (Page No. 254).
7.	**Impact and Environment Management Plan**	
	i. Assessment of ground level concentration of pollutants from	**Assessment of ground level concentration** of pollutants is referred as Table 4.2, Chapter-4 in

	the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	EIA Report (Page No. 290 to 298). Details of the model used and the input data used for modeling: 1) Conc. of all pollutants 2) Meteorological Data 3) Ram file, Sam File, Met File, Mixing Height 4) Village Co-Ordinates Predicted Ambient Air Quality is referred in Table-4.4, Section-4.2.2, Chapter-4 in EIA Report. (Page No.306). Details of the model used and the input data used for modeling also be provided in Section-4.2.2, Chapter-4 in EIA Report. (Page No.290-298). The air quality contours is referred in Figure-4.2, Chapter-4 in EIA Report. (Page No.299-303).
	ii. Water Quality modelling – in case of discharge in water body	Not Applicable, As No effluent is/will be discharged into any surface water body. Hence, Water Quality modeling is not required.
	iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	Impact of the transport of the raw materials and end products is referred in Section-4.8, Chapter-4 in EIA Report. (Page No. 316-317). Action plan for transportation of raw materials and products is referred in Section-10.13, Chapter-10 in EIA Report. (Page No. 502)
	iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules 1986.	➢ The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream. • Low COD stream: Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system. • High TDS Stream: Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated

		wastewater will be totally recycled and the soild waste generated will be disposed to TSDF (Common disposal Facility). • Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment. Detailed effluent treatment scheme including segregation of effluent streams of wastewater shall be treated in effluent treatment plant consist of MEE treatment is referred as section-2.10.4 & Section 2.10.5, Chapter-2 in EIA Report (Page No. 102 to 104).
	v. Details of stack emission and action plan for control of emissions to meet standards.	**Details of stack emission** • In existing, company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector & Adequate Stack will be provided to control of flue gas emission. In proposed expansion, company will use Furnace Oil/Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector, ESP / wet Scrubber & Adequate Stack will be provided to control of flue gas emission. • The source of process gas emission will be from reactor vent. Company has installed adequate Scrubber systems to control process gas emission. Details of stack emission is referred as Table 4.2, Section 4.2.2, Chapter-4 in EIA Report (Page No. 290-298) and action plan for control of emissions is referred as Section 2.11.6, Chapter-2 in EIA Report (Page No. 152-153).
	vi. Measures for fugitive emission control	**Measures for fugitive emission control**: • The Solvent used in the processes is handled in a closed loop and in process materials are stored in drums will be kept under structured roof. • Equipment where volatile solvents distilled is provided with reflux condensers and after

		coolers and the receivers are connected to the scrubber. • Pumps of compatible MOC with Single and Double Mechanical seals are used for handling corrosive and hazardous chemicals • Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by External lab • All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions. • Proper ventilation in storage area is ensured and all materials are stored in suitable packing to prevent contamination of air due to particulates & volatile emissions from storage area. • All the Flange joints of the pipe lines which carry solvents are covered with flange guards. • Adequate Dust Suppression System including Water Sprinkling System is installed for control of fugitive emission during loading of raw material and product. • Work place monitoring within plant, storage & other area and AAQM will be done as per 'Post project monitoring plan' as well as regulatory requirement as per factory act. • Properly designed method & practices of transportation, storage & handling of materials are established and maintained along with necessary facilities to reduce airborne particle of materials and VOCs.
	vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the	Details of hazardous waste generation and their disposal: **Details of Hazardous Waste and Its Disposal Management:** • Empty barrels/ containers/liners contaminated with hazardous chemicals

	concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.	/wastes, Used / Spent Oil, spent solvents will be disposed Disposal to TNPCB Authorized Recyclers (Recyclable). • Chemical sludge from waste water treatment, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Contaminated cotton rags or other cleaning materials, Spent Carbon or Filter medium disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016. • Spent Carbon or Filter medium disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016. Details of hazardous waste generation and their storage, utilization and management is referred as Table 2.5, Section 2.12.1, Chapter-2 in EIA Report (Page No. 153).
	viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	Fly ash (18250 MT/Annum) will be collected, stored, transported and sent for brick manufacturer or in cement industries.
	ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectors area) for green belt (3.33 %) within the plant premises. Name of species planted are as below 1. Neem 2. Silver Oak 3. Eucalyptus 4. Pongamia 5. Gulmohur 6. Spathodia 7. Ashoka 8. Banyan 9. Bamboo 10. Peapal
	x. Action plan for rainwater harvesting measures at plant site	Unit will harvest rainwater from the rooftop of the buildings. Rain water harvesting is under

<table>
<tr><td></td><td>shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.</td><td>process.
Rainwater harvesting is attached in Section 10.4.3.1 in Chapter 10 of EIA report (Page no. 488).</td></tr>
<tr><td></td><td>xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.</td><td>Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.</td></tr>
<tr><td></td><td>xii. Action plan for post-project environmental monitoring shall be submitted.</td><td>Post-project environmental monitoring is referred as Table 6.1, Section 6.3 Chapter-6 in EIA Report (Page No. 323).</td></tr>
<tr><td></td><td>xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.</td><td>Disaster Management Plan- On site &off Site Emergency Management Plan is referred as Section 7.10, Chapter-7 in EIA Report (Page No. 410).</td></tr>
<tr><td>8.</td><td>Occupational health</td><td></td></tr>
<tr><td></td><td>i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers</td><td>Company will allot Rs. 102 Lakh per annum for the occupational health & safety of all contract and casual workers.
<table>
<tr><th>One time investment for Occupational safety</th><th>In lakhs</th></tr>
<tr><td>Hydrant system, smoke detector & Sprinkler and Fire fighting devices</td><td>200</td></tr>
<tr><td>Process control, censor, interlock,guard and other instrumentation for safety</td><td>3000</td></tr>
<tr><td>Emergency shower, SCBA,ECC,gas detector</td><td>100</td></tr>
<tr><td>Total</td><td>3300</td></tr>
</table>
<table>
<tr><th>Annual plan for occupation Heath and safety</th><th>In lakhs/Annum</th></tr>
<tr><td>Employee periodical medical check-up</td><td>27</td></tr>
<tr><td>OHC operating cost</td><td>24</td></tr>
</table></td></tr>
</table>

		Ambulance	12
		Personal protective equipments	34
		Training and awareness	5
		Total	102
	ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.	Health Evaluation of Workers is referred as Section 7.12.6, Chapter-7 in EIA Report (Page No. 452). Workers are checked for physical fitness with special reference to the possible health hazards likely to be presented where he/she is being expected to work before being employed for that purpose. Tests carried out: 1)Physical test 2)General Examination like Temp., Pulse, Pressure, Haemoglobin/Total W.B.C/ Platelet/others 3)Microscopic Examination 4) Systematic Examination 5) Vision Testing 6) Blood Glucose analysis 7) Haemogram Profile
	iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,	**EMP for the Occupational Safety & Health hazards** so that such exposure can be kept within permissible exposure level (PEL)/Threshold Level value (TLV) so as to protect health of workers is referred as, Section 7.12.3, Chapter-7 in EIA Report (Page No. 450).
	iv. Annual report of health status of workers with special reference to Occupational Health and Safety	Annual report of health status of workers with special reference to Occupational Health and Safety is referred as Section 7.12.6 Chapter-7 in EIA Report (Page No. 453). There was not found any abnormality of any employees and workers. All employees and workers are found fit. Occupational health surveillance program is undertaken as regular exercise for all employees specifically for those engaged in handling substances. Medical records of each employee are maintained

		separately.
9.	**Corporate Environment Policy**	
	i. 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.	Environment Policy is referred in Section-6.4, Chapter – 6 in EIA Report(Page No.325).
	ii. Does the Environment 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.	Environment Policy is referred in Section-6.4, Chapter – 6 in EIA Report(Page No.325).
	iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.	Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions is referred in Figure-6.1, Section-6.5, Chapter-6 in EIA Report(Page No.327).
	iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report	An organogram to report of non-compliances / violations of environmental norms to the Board of Directors of the company. is referred in Section-6.6, Chapter-6 in EIA Report(Page No.328).
	v. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	Company will provide the sanitation facility only to the Labour force during construction as well as to the casual workers including truck drivers during operation phase.
11.	**Enterprise Social Commitment (ESC)**	
	i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development	CER @ 0.25 % of the additional project cost (i.e. 2000 Crore) and CSR will be carried out by the company in the surrounding villages. This fund will be administered by a local area development committee in accordance with the orders of the appropriate Government.

	activities need to be elaborated upon.	
12.	**Additional studies/Measures to be considered**	
	i. Provide latest and ecofriendly technology for product manufacturing.	Latest and ecofriendly technology for product manufacturing are as follows: 1. Usage of Non-fossil fuel source for boiler (Briquettes) 2. Adiabatic Cooling Towers instead of conventional type Cooling Towers 3. Low-Power Exercise Equipment -Energy efficient (IE3) motors 4. Variable Speed Drives (VSD). 5. LED Lighting 6. Monofluid Temperature Control 7. Steam Condensate Recovery System and Flash Steam Recovery System 8. Rainwater harvesting 9. Double Scrubbing system for all reactors 10. Scrubber for all open Reactor and Chemical storage Detailed Latest and ecofriendly technology for product manufacturing is refer as Section 2.5, Chapter-2 in EIA report (Page no. 42)
	ii. Emphasize on Green chemistry/Clean Manufacturing	Unit has emphasizing on green chemistry /clean manufacturing in following ways: **1. Scrubbing system** All reaction vessels vent is connected with vent scrubber with capacity of 2500 m3/hr is installed to control fugitive emission Emphasize on green chemistry/clean manufacturing **2. Double condenser for solvent recovery** For solvent recovery equipment connected with primary and secondary condensers with chilled water / brine. For filtration and drying well designed ANFD with condensers are available for minimizing solvent emission in environment. **3. Usage of Non-fossil fuel source for boiler (Briquettes)** replacing the Usage of furnace oil by non-fossil fuel source (Briquettes) for Boiler. Using fossil fuel would generate 2.8 to 3 T of CO2 emission per ton of fuel Usage of non-fossil fuel source (Briquettes) is increasing the Energy-efficiency and Reduction of

		greenhouse gas emissions **4. Adiabatic Cooling Towers instead of conventional type Cooling Towers** We are going with Adiabatic Cooling Towers, which is saving 75% of water consumption with compare to conventional type Cooling Towers.Adiabatic cooler uses wetted pads to pre-cool the ambient air entering the tower. This pre-cooled air is used to cool process water. This helps achieve a lower temperature than the ambient dry bulb temperature. **5. Low-Power Exercise Equipment -Energy efficient (IE3) motors** a. 93% efficiency as against 88% for conventional IE1 motors – 5% increase in efficiency – 1 GWh electrical energy accounts for releasing 790 tons of CO2[Source: as per CEA data, Govt. of India.] – Yearly reduction in CO2 emissions due to IE3 otors: 2 X 790 = 1580 tonnes **6. Variable Speed Drives (VSD)** – Selected IE3 motors are with VSD – 1 GWh electrical energy accounts for releasing 790 tons of CO2 [Source: as per CEA data, Govt. of India.] – Yearly reduction in CO2 emissions due to VSD: 0.3 X 790 = 237 tonnes **7. LED Lighting** We are going with 100% of LED lightings over the plant, it's better than other by, they are brighter, Require lesser energy to function and Last longer. – LED lamps consume 20% energy for heating – Metal halide lamps consume 75% energy – 1 GWh electrical energy accounts for releasing 790 tones of CO2 – Yearly reduction in CO2 emissions due to VSD : 0.3 X 790 = 237 tonnes **8. Monofluid Temperature Control** a. Precise temperature control in addition to reduction in lean waste generation **9. Steam Condensate Recovery System and Flash Steam Recovery System** – Condensate headers are routed to the receiver wherein pressure powered/

<table>
<tr><td></td><td></td><td>mechanical pump transfers the condensate to boiler feed water tank
– High pressure condensate from process will be diverted to a flash vessel to generate LP steam. Thermo compressor option will be validated based on LP pressure
10. Bio-degradable Goods
Company has to use Bio-degradable Goods (wood) for packing and palleting purpose instead of plastic</td></tr>
<tr><td></td><td>iii. Provide CAS No. of products along with product list.</td><td>Provide CAS No. of products along with product list is in Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46).</td></tr>
<tr><td></td><td>iv. Provide details of amount of carbon sequestered in their unit through greenbelt/other modes, in case of expansion project.</td><td>Calculation of CO2 sequestered per is referred as Section 10.14, Chapter-10 in EIA Report (Page no. 503-506)</td></tr>
<tr><td></td><td>v. Life structure and sustainability for carbon and water foot print.</td><td>Life structure and sustainability for carbon and water foot print is attached in Annexure-8 in EIA report.(Page no.A-15)</td></tr>
<tr><td></td><td>vi. Detailed pollution Load estimation.</td><td>For proposed project,
Worst case scenario for water consumption:
<table>
<tr><th>Sr. no.</th><th>Group</th><th>Product name</th><th>Water consumption (KL/Day)</th></tr>
<tr><td>1.</td><td>Group-1</td><td>COLCHICINE & THIOCOlCHICOSIDE</td><td>1.07</td></tr>
<tr><td>2.</td><td>Group-2</td><td>M-ANISIDINE</td><td>598.90</td></tr>
<tr><td></td><td colspan="2">Total Water consumption</td><td>599.98 KL/Day</td></tr>
</table>
Worst case scenario for waste water generation (Qualitative and Quantitative):
<table>
<tr><th>Sr. no.</th><th>Group</th><th>Product name</th><th>Waste water generation (KL/Day)</th></tr>
<tr><td>1.</td><td>Group-1</td><td>COLCHICINE & THIOCOlCHICOSIDE</td><td>1.18</td></tr>
<tr><td>2.</td><td>Group-2</td><td>M-ANISIDINE</td><td>598.90</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>Total Wastewater generation</td><td>600.09 KL/Day</td></tr>
</table>
</td></tr>
<tr><td></td><td>vii. Transportation of Hazardous substance, effluents etc shall be carried out through authorized and GPS enable vehicles/Trucks only.</td><td>All hazardous Goods vehicles/ trucks had been installed with GPS and the monitored by Nicer Globe.i.e as mentioned below
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Name of the chemicals</th><th rowspan="2">Type</th><th colspan="2">Location</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>1</td><td>Caustic Soda</td><td>Truck</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>2</td><td>Sodium Hypochlorite</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>3</td><td>Hydrogen</td><td>Truck</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>4</td><td>Hydrochloric acid</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>5</td><td>Sodium hydroxide</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
</table>
Other transport Safety initiative’s
– Journey Risk Management Study conducted for all major distribution routes by Chemplast Sanmar Ltd., Mettur
– Restriction driving hours between 11:00 PM – 05:00 AM for driver to manage the driver fatigue. Every 5 Hrs. / 2 Hrs. resting
– All drivers are trained and driver competency card was issued for all drivers.</td></tr>
<tr><td></td><td>viii. Category of Hazardous Wastes shall be mentioned in the EIA/EMP report and in presentation.</td><td>Category of Hazardous Wastes is referred as Table 2.5, Section 2.12.1, Chapter-2 in EIA Report (Page No. 153).</td></tr>
<tr><td></td><td>ix. Details of greenhouse gases and emissions shall be provided.</td><td>• Greenhouse gas is the property of absorbing infrared radiation (net heat energy) emitted from Earth’s surface and reradiating it back to Earth’s surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases. A number of processes influence greenhouse gas concentrations. Industrial activities increase atmospheric CO_2 levels primarily through the burning of fossil fuels.
• Greenhouse gas emissions from existing unit are Carbon dioxide (CO_2), PM, SO2, NO_2 & CO
• Company has planted trees which helps to reduce greenhouse gases through</td></tr>
</table>

		photosynthesis absorbing large quantities of CO_2 and producing oxygen.
	x. Greenbelt shall be developed in the first year of the project and wind breaks shall be erected.	Agreed, Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectors area) for green belt (3.33 %) Company has planted trees in a row or shrubs planted in such a manner as to provide shelter from the wind and to protect soil from erosion. The windbreaks are formed in North-West direction.
	xi. Study area map shall be overlapped with all the associated features.	The baseline parameters such as Land use / Land cover, Ecological status, Geology, Hydrology, Soil, Drainage Pattern and infrastructure establishment is studied within the 10 km aerial radius from the center where the site is located. A map depicting major land use/ land cover classes comprising lands under agriculture, allow land, open/degraded vegetation; lands falling under water bodies, scrub and lands under inhabitations is presented. The map also marks the area within 10 km of the project site as the area of interest. Area and distance calculations have been carried out using GIS software after geo-referencing the interpreted data with the help of Survey of India (SoI) topographical maps of the scale 1:50,000. Study area map overlapped with all the associated features are referred in Figure 3.13, Section 3.10, Chapter-3 in EIA Report (Page No.229).
	xii. Emphasize on green fuels.	As of now company is using FO & HSD. However, company will review the viability of other fuels.
	xiii. The project from NCR shall not use Coal as fuel. Further, PP shall avoid use of Coal in the CPAs and elsewhere also if alternatives are available.	Not Applicable, as unit is located in Berigai, Tamil Nadu.
	xiv. Provide the Cost-Benefit analysis with respect to the environment due to the project.	CER @ 0.25 % of the additional project cost (i.e. 2000 Crore) and CSR will be carried out by the company in the surrounding villages. This fund will be administered by a local area development

		committee in accordance with the orders of the appropriate Government.
	xv. Details of carbon foot prints and carbon sequestration study w.r.t. proposed project needs to spelled out. Proposed mitigation measures also needs to be analyzed and submitted for further appraisal of the EAC	Details of carbon foot prints and carbon sequestration as Section 10.14, Chapter-10 in EIA Report (Page no. 503-506)
11.	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	There is no any litigation pending against the project and/or any direction/order passed by any Court of Law against the project.
12.	'A tabular chart with index for point wise compliance of above TORs.	Complied

SPECIFIC TERMS OF REFERENCE

SR. NO.	TERMS OF REFERENCES	COMPLIANCE
1	Commitment that no banned pesticides will be manufactured.	**Undertaking** stating that no banned pesticides will be manufactured is referred as **Annexure-15,** (Page No. A-108).
2	Details on solvents to be used, measures for solvent recovery and for emissions control.	**Solvents such as** Toluene, TBA, MCB, MTBE, ODCB, Methanol & Benzene will be used**, measures for solvent recovery** is referred in Section-7.12, Chapter-7 in EIA Report (Page No. 499).
3	Details of process emissions from the proposed unit and its arrangement to control.	Process gas emissions from the proposed unit are SO_2, NO_2 & CO and **Measures for fugitive emission control are as following**: • The Solvent used in the processes is handled in a closed loop and in process materials are stored in drums will be kept under structured roof. • Equipment where volatile solvents distilled is provided with reflux condensers and after coolers and the receivers are connected to the scrubber. • Pumps of compatible MOC with Single and Double Mechanical seals are used for handling corrosive and hazardous chemicals • Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by External lab • All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions. • Proper ventilation in storage area is ensured and all materials are stored in suitable packing to prevent contamination of air due to particulates & volatile emissions from storage area. • All the Flange joints of the pipe lines which carry solvents are covered with flange

		guards. • Adequate Dust Suppression System including Water Sprinkling System is installed for control of fugitive emission during loading of raw material and product. • Work place monitoring within plant, storage & other area and AAQM will be done as per 'Post project monitoring plan' as well as regulatory requirement as per factory act. • Properly designed method & practices of transportation, storage & handling of materials are established and maintained along with necessary facilities to reduce airborne particle of materials and VOCs. Details of process emissions proposed scenario is referred as section - 2.11.1, Chapter-2 in EIA Report (Page No. 147).
4	Ambient air quality data should include VOC, other process- specific pollutants* like NH_3*,chlorine*, HCl*, HBr*, H_2S*, HF*, CS2 etc., (*- as applicable)	Ambient air samples were collected and analyzed for SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_X, O_3, Pb, CO, NH_3, C_6H_6, Benzo (a) Pyrene (BaP), Arsenic (As), Nickel (Ni) & VOCs for identification, prediction, evaluation and assessment of potential impact on ambient air environment. Ambient air quality data is referred in Table-3.10 Section-3.4, Chapter-3 in EIA Report (Page No.188).
5	Work zone monitoring arrangements for hazardous chemicals.	Work zone monitoring arrangements is referred in Table 6.1, Section 6.3 Chapter-6 in EIA Report (Page No. 323).
6	Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge.	Unit has full-fledged Effluent Treatment Plant to treat the wastewater with multiple effect evaporators (MEE),Biological conventional treatment and RO system. The water recovered is totally reused in the process plant itself. The domestic waste water is also treated in the STP. The cyanide bearing wastewater is chemically treated with Sodium hypochlorite solution and taken for evaporation in the MEE. No effluent is/will be discharged into any surface water body. **Hence, this unit is/will be total Zero Liquid Discharge unit.** Detailed effluent treatment scheme including

		segregation of effluent streams of wastewater shall be treated in effluent treatment plant consist of MEE treatment is referred as section-2.10.4 & Section 2.10.5, Chapter-2 in EIA Report (Page No. 102 to 104).
7	Action plan for odor control to be submitted.	Action plan for odour control measure are as follows: • All liquid raw materials charged into Reactors with pumps or under gravity through closed pipes. • Suction Hoods placed near the Man-holes & Charging funnels of Reactors & Filters so that chemical vapors and dust do not escape into the Plant & surroundings, when the man-hole covers are opened for inspection or charging of RM. • All storage tanks of low boiling chemicals provided with Conservation Vents. • Vent lines of Dosing vessels shall be connected back to the vents of storage tanks to prevent contaminated air release during material transfer. • All pumps handling hazardous chemicals provided with mechanical seals to prevent fugitive emission. • Wherever possible magnetic coupled pumps are used. • Any spillage from drums etc. absorbed with saw dust / soda ash and moped clean. • The contaminated absorbent are safely dispose off along with hazardous waste.
8	A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.	Unit has agreement with TNWML for co-processing of hazardous waste is referred as section-2.12.3 Chapter-2 in EIA Report (Page No.180)
9	Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.	Authorization/Membership for the disposal of **liquid effluent** in CETP is not applicable as this is zero liquid discharge unit and Unit has agreement with TNWML referred as Section-2.11.4, Chapter-2 in EIA Report (Page No.158).
10	Material Safety Data Sheet for all the Chemicals are being used/will	**Material Safety Data Sheet** for all the Chemicals is referred to **Annexure-15**, (Page No. A-98).

	be used.	
11	Authorization/Membership for the disposal of solid/hazardous waste in TSDF.	Unit has agreement with TNWML referred as Section-2.11.4, Chapter-2 in EIA Report (Page No.158).
12	Details of incinerator if to be installed.	Not Applicable, Unit will not install the incinerator for existing as well as Proposed scenario. Incinerable Waste will be disposed to M/s. TNWML
13	Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling & safety system to be incorporated.	Risk assessment for storage and handling of hazardous chemicals are referred as Section-7.3.4.3, Chapter-7 in EIA Report (Page No. 333) & Action plan for handling & safety system to be incorporated are referred as Section-7.4, Chapter-7 in EIA Report (Page No. 341)
14	Arrangements for ensuring health and safety of workers engaged in handling of toxic materials.	Arrangements for ensuring health and safety of workers engaged in handling of toxic materials is referred in Section-7.12.4, Chapter-7 in EIA Report (Page No. 451)
15	Details of carbon foot prints and carbon sequestration study w.r.t. proposed project needs to spelled out. Proposed mitigation measures also needs to be analysed and submitted for further appraisal of the EAC.	Details of carbon foot prints and carbon sequestration as Section 10.14, Chapter-10 in EIA Report (Page no. 503-506).

5(f): STANDARD TERMS OF REFERENCE FOR EIA STUDIES FOR 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)

SR. NO.	TERMS OF REFERENCES	COMPLIANCE
1.	**Executive Summary**	**Executive Summary** is referred as Chapter-11.
2.	**Introduction**	
	iii. Details of the EIA Consultant including NABET accreditation	EIA Consultants, M/s. Aqua-Air Environmental Engineers Pvt. Ltd. has obtained NABET- QCI accreditation scheme of MoEFCC, New Delhi. NABET accreditation certificate no. NABET/EIA/2023/SA 0196 valid upto April 08, 2024. Please refer **Annexure-7**, (Page No. A-14)
	ii. Information about the project proponent	**M/s. Chemplast Sanmar Limited**, having eight Partners/Directors. The detail of project proponent is refer as Section 1.1.1. of Chapter 1 (Page No.2)
	iii. Importance and benefits of the project	**Importance and benefits of the project** • We have well equipped and established R&D to develop and scale up the new products from the group of Synthetic Organic chemicals and Pesticide intermediates. • We have both Technical and non-technical man power in existing facility and hence readily available to oversee the expansion and commissioning. • Existing Manufacturing facility is well equipped with advanced technologies and this project is just the expansion similar to existing facility. Following are the benefits which may occur due to proposed project; • Use of existing skills in the region for minor developments, required for the proposed project • Increased transportation and handling requirements, that could benefit the local economy • Increased taxes to the State and Central Governments, which would add to the public

		good
3.	**Project Description**	
	ii. Cost of project and time of completion.	Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Time of completion =2 Year after getting EC and NOC.
	iv. Products with capacities for the proposed project.	**List of Products Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum)** is referred as Table 2.3, Section 2.6, and Chapter-2 in EIA Report (Page No. 46).
	xiii. f expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	**Reference of earlier EC details is given below:** **Unit has obtained ECs with Past Productions** EC vide letter F.No.J-11011/104/2009-IA II (I) dated 29/04/2009. **Products with capacities** are referred as Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46). Company has adequate land area for expansion in existing area and it is given in Section 2.2, Chapter-2 in EIA Report (Page No. 15).
	xiv. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications. xv. Details of existing products and production, if any, along with present product/production details in tabular format, to verify the compliance of the EIA Notifications.	**Products with capacities** are referred as Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46).
	xvi. ist of raw materials required and their source along with mode of transportation.	**List of raw materials** required and their source along with mode of transportation is referred as Table-2.3, Section 2.8 and Chapter-2 in EIA Report (Page No. 53-72). Most of the Raw Materials will be purchased from Local Market. Some Raw Material are not available in Local Market, so it will be imported. Transportation of Raw Material is Primarily by Road/ Sea/Air.
	xvii. Other chemicals and materials required with	**Total nos. of 30 Other chemicals and materials** details with quantities, maximum storage and

	quantities and storage capacities	mode of storage are referred as Table 7.1, Chapter-7 in EIA Report (Page No. 335).
	xviii. Details of Emission, effluents, hazardous waste generation and their management.	**Details of Effluent & its Management:** ➢ The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream. • Low COD stream: Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system. • High TDS Stream: Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility). • Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment. **Details of Emission & its Management:** • In existing, company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector & Adequate Stack will be provided to control of flue gas emission. In proposed expansion, company will use Furnace Oil and Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector, ESP & Adequate Stack will be provided to control of flue gas emission. The source of process gas emission will be from reactor vent. **Details of Hazardous Waste and Its Disposal Management:** • Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes, Used / Spent Oil, spent solvents will be disposed Disposal to TNPCB Authorized Recyclers (Recyclable).

<table>
<tr><td></td><td></td><td>

Chemical sludge from waste water treatment, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Contaminated cotton rags or other cleaning materials, Spent Carbon or Filter medium disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
Spent Carbon or Filter medium disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016.

</td></tr>
<tr><td></td><td>xix.
equirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)</td><td>
Total Power Requirement
Power requirement will be 14000 KVA which will be taken from State Electricity Department.

Fuel Requirement:
<table>
<tr><th>Sl. No.</th><th>Type of Fuel</th><th>Existing (MT/day)</th><th>Proposed (MT/day)</th><th>Total (MT/day)</th></tr>
<tr><td>1</td><td>Furnace Oil</td><td>8</td><td>90</td><td>98</td></tr>
<tr><td>2</td><td>Briquettes</td><td>00</td><td>250</td><td>250</td></tr>
<tr><td>3</td><td>HSD</td><td>1.7</td><td>20.3</td><td>22</td></tr>
<tr><td>4</td><td>LPG</td><td>0.008</td><td>0.192</td><td>0.20</td></tr>
</table>
Requirement of Water:
Total Domestic Water: 100.0 KL/Day [Existing: 12.0 KL/Day + Proposed: 88.0 KL/Day]
Total Gardening Water: 30.5 KL/Day [Existing: 25.5 KL/Day + Proposed: 5 KL/Day]
Total Water Quantity: 1207.5 KL/Day [Existing: 207.5 KL/Day + Proposed: 1000 KL/Day]

Source of water: The Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/PWD available and remaining 1000 KLD applied to get from government water source.

Status of Approval: Unit has obtained CGWA letter wide letter no. 21-4(134)/SECR/CGWA/2009-3708 dated:
</td></tr>
</table>

		01/06/2012 for 207.5 KLD. **Water Balance Diagram** is referred as Fig. 2.4, Section 2.10.3. in Chapter-2 in EIA Report (Page No. 135). **Man-power requirement:** Company will be appointed Approximately 1350 people [Existing: 350 people + proposed: 1000 people] local skilled and unskilled people based on qualification and requirement as per prevailing norms of state government.
	xx. etails of boiler/gensets (including stacks/exhausts) and fuels to be used	Details of boiler is refer as Section 2.11.5 (Page No. 150-151). & fuels to be used is refer as Section 2.11.4. Chapter-2 in EIA Report (Page No. 149).
	xxi. Process description along with major equipments and machineries, process flow sheet (quantities) from raw material to products to be provided	**Process description** along with major equipments and machineries, process flow sheet (quantities) from raw material to products is referred as Section 2.9, Chapter-2 in EIA Report (Page No. 73).
	xxii. Hazard identification and details of proposed safety systems.	**Hazard Identification** major risk areas are as follows: • Bulk storage area for Raw Materials at ambient temperature and atmospheric pressure. • Process Plant involving pumping, transportation, reactors, distillation, heating, cooling, etc. • Bulk loading and unloading from storage tanks to road takers and vice versa. Safety precautions are referred as Section 7.4, Chapter-7 of EIA Assessment Report (Page No. 341)
	xiii. xpansion/modernization proposals: c. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and	This is an Expansion project. c. Unit has obtained EC from MOEF vide file No.J-11011/104/2009-IA-II(I) dated 29/04/2009. Certified EC Compliance Report from MoEFCC, Tamilnadu has been obtained vide file no. E.P.12.1/862/TN/1206 dated 8th December 2021 is attached in Annexures. Unit has obtained CTO & CTE. Renewal of **CTE** (Air) & (Water) vide no.:

	Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB shall be attached with the EIA-EMP report.	**2206241783392** dated: 03/06/2022 and Consent to establish for Expansion is valid upto **March 31, 2027.** **CTO for expansion** (Air) & (Water) vide no.: **2307153222383** dated: 18/08/2022 and Consent to establish for Expansion is valid up to **March 31, 2028.**
	d. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	d. Unit has obtained EC from MOEF vide file No.J-11011/104/2009-IA-II(I) dated 29/04/2009. Certified EC Compliance Report from MoEFCC, Tamilnadu has been obtained vide file no. E.P.12.1/862/TN/1206 dated 8th December 2021 is attached in Annexures. Visit date: 6/12/2021 Unit has obtained CTO & CTE. Renewal of **CTE** (Air) & (Water) vide no.: **2206241783392** dated: 03/06/2022 and Consent to establish for Expansion is valid upto **March 31, 2027.** **CTO for expansion** (Air) & (Water) vide no.: **2307153222383** dated: 18/08/2022 and Consent to establish for Expansion is valid up to **March 31, 2028.**
4.	**Site Details**	
	i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	Location the project site: S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3,10/1,2,3A,3B, 4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India. Justification for selecting the site: ● Minor site clearance activities shall be carried out to clear shrubs and weed. ● The project site is located on level ground, which does not require any major land filling

		for area grading work. ● No sanctuaries or archeological sites are located in the vicinity of the area. ● No rehabilitation or resettlement of local people required. ● Site is very well connected by road and railway. ● Availability of Fuel, Power, TSDF, etc. within the estate. Proposed Expansion activities are carried out within Existing Premises and No additional investigations are required for the present proposal. Hence no alternative sites were examined.
	ii. A topo sheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)	A topo sheet of the study area is referred as Figure 3.13, Section 3.10, Chapter-3 in EIA Report (Page No.229).
	iii. Details w.r.t. option analysis for selection of site	Major factors involved in the selection of site are listed below: • Proposed Expansion activities are carried out within Existing Premises and No additional investigations are required for the present proposal. ● Minor site clearance activities shall be carried out to clear shrubs and weed. ● The project site is located on level ground, which does not require any major land filling for area grading work. ● No sanctuaries or archeological sites are located in the vicinity of the area. ● No rehabilitation or resettlement of local people required. ● Site is very well connected by road and railway. ● Availability of Fuel, Power, TSDF, etc. within the estate.
	iv. Co-ordinates (lat-long) of all	**Co-ordinates (lat-long)** of all corners of the site.

	four corners of the site.	12°48'21.69"N 77°59'2.03"E 12°48'18.20"N 77°59'14.32"E 12°48'17.79"N 77°59'19.40"E 12°48'14.08"N 77°59'18.40"E 12°48'10.76"N 77°59'18.31"E 12°48'6.70"N 77°59'16.68"E 12°48'13.67"N 77°58'57.08"E
	v. Google map-Earth downloaded of the project site	**Google map-Earth** downloaded of the project site is referred as Figure – 2.2, Section- 2.3.1, Chapter-2 in EIA Report (Page No.35).
	vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	**Layout maps** are referred as Figure – 2.1, Section-2.2, Chapter-2 in EIA Report (Page No. 17).
	vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	Photographs of the proposed and existing (if applicable) plant site and greenbelt developed within the plant premises is referred as Section 2.3.1 and Chapter-2 in EIA Report (Page no. 36-38)
	viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc. shall be included. (not required for industrial area)	**Total land area of the Unit is 16.64 Hectares and break-up of total land of the project site** is referred as Table 1.3, Section 1.2.2, and Chapter-1 in EIA Report (Page No. 4).
	ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area	There is no factory around 10 km of the plant surrounding. Land use details of the study area is referred as Section 3.9, Chapter-3 in EIA Report (Page No. 237).
	x. Geological features and Geo-hydrological status of the study area shall be included.	**Geological features** is referred as Section 3.8.6 (Page No. 224) **and Geo-hydrological status** of the study area are referred as Section 3.8.4, Chapter-3 in EIA Report (Page No. 222).
	xi. Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency	**Drainage pattern** of the project is referred as Section 3.8.5, and Chapter-3 in EIA Report (Page No. 223).

	based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)	
	xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	Unit has already obtained acquisition of land. Land possession documents are attached as Section 2.2.1. , Chapter-2 in EIA Report(Page no. 20)
	xiii. R&R details in respect of land in line with state Government policy	The unit is located outside Notified Industrial Area. There is no habitation on the proposed expansion project activity area and it is inside the existing industry land. There shall not be displacement of any population in project area. The increasing industrial activity will boost the commercial and economical status of the locality up to some extent. Hence, R & R is not applicable to this project.
5.	**Forest and wildlife related issues (if applicable)**	
	viii. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	ix. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	x. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	xi. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief	Forest and wildlife related issues are not applicable. As, no forest and no sanctuaries are located in 10 km radial of study area.

	Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden there on.	
	xii. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area	Not applicable, As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	xiii. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife	Forest and wildlife related issues are not applicable. As, no forest and no wildlife sanctuaries are located in 10 km radial of study area.
	xiv. Recommendations and NOC from the concerned State/UT Coastal Zone Management Authority on CRZ angle	Not applicable.
5.	**Environmental Status**	
	i. Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	**Determination of atmospheric inversion level** at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall is referred as Section 3.3, Chapter-3 in EIA Report (Page No. 176).
	• AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	Ambient Air Quality Monitoring (AAQM) was carried out at eleven locations during the study period. The conventional and project specific parameters such as Suspended Particulate Matter, RSPM-PM_{10}, RSPM-$PM_{2.5}$, SO_2, NOx, O_3, Pb, C_6H_6, BaP, As, Ni, CO & VOCs were monitored at site. AAQ data is referred in Table-3.10, Section-3.4, Chapter-3 in EIA Report. (Page No. 188-189).
	ii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min., max., average and 98% values for each	**Raw data of all AAQ measurement** for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 is referred as Table-3.10, Section-3.4, Chapter-3 in EIA Report. (Page No. 188-189).

	of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	
	iii. Surface water quality of nearby River (100 m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.	11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. Surface water quality is referred in Table-3.13, Section-3.6.1, Chapter-3 in EIA Report. (Page No.196-199).
	iv. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.	No falls
	v. Ground water monitoring at minimum at 8 locations shall be included.	11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. Ground water monitoring is referred in Table-3.13, Section-3.6.1, Chapter-3 in EIA Report. (Page No.196-199).
	vi. Noise levels monitoring at 8 locations within the study area.	Noise levels monitoring for 11 location of Residential Area, along with project site is referred as Table No. 3.12, Section 3.5, Chapter-3 in EIA Report (Page No194-195).
	vii. Soil Characteristic as per CPCB guidelines.	**Soil Characteristic for 11 Location** is referred as Table No. 3.14, Section 3.7.1, Chapter-3 in EIA Report (Page No. 203-207).
	viii. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	Car/jeep/ van & four wheelers - 219 Nos. Bus/ coach -192 Nos. Heavy motor vehicle - 12 Nos. Trucks - 15 Nos. Motor cycle & scooter - 309 Nos. Three wheelers-10 Nos. Cycle-9 Nos. Farm vehicle (tractor/ combine harvester)-162 Nos. Detailed traffic study of the area is refer as Section 3.11, Chapter-3 in EIA report (Page no. 231-235)
	ix. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	**Flora** existing in the study area is referred as Section 3.12.5, Chapter-3 in EIA Report (Page No. 243-248) and **Fauna (terrestrial and aquatic)** existing in the study area is referred as Section 3.12.6, Chapter-3 in EIA Report (Page No. 248-253).

	x. Socio-economic status of the study area.	**Socio-economic** status of the study area is referred as Section 3.13, Chapter-3 in EIA Report (Page No. 254).
6.	**Impact and Environment Management Plan**	
	i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	**Assessment of ground level concentration** of pollutants is referred as Table 4.2, Chapter-4 in EIA Report (Page No. 290 to 298). Details of the model used and the input data used for modeling: 5) Conc. of all pollutants 6) Meteorological Data 7) Ram file, Sam File, Met File, Mixing Height 8) Village Co-Ordinates Predicted Ambient Air Quality is referred in Table-4.4, Section-4.2.2, Chapter-4 in EIA Report. (Page No.306). Details of the model used and the input data used for modeling also be provided in Section-4.2.2, Chapter-4 in EIA Report. (Page No.290-298). The air quality contours is referred in Figure-4.2, Chapter-4 in EIA Report. (Page No.299-303).
	ii. Water Quality modelling – in case of discharge in water body	Not Applicable, As No effluent is/will be discharged into any surface water body. Hence, Water Quality modeling is not required.
	iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	Impact of the transport of the raw materials and end products is referred in Section-4.8, Chapter-4 in EIA Report. (Page No. 316-317). Action plan for transportation of raw materials and products is referred in Section-10.13, Chapter-10 in EIA Report. (Page No. 502)
	iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards	➢ The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream. • Low COD stream: Low COD effluent (105 KL/Day) will be treated through the

	of discharge under E(P) Rules 1986.	conventional wastewater treatment system and the pass through RO system. • High TDS Stream: Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the soild waste generated will be disposed to TSDF (Common disposal Facility). • Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment. Detailed effluent treatment scheme including segregation of effluent streams of wastewater shall be treated in effluent treatment plant consist of MEE treatment is referred as section-2.10.4 & Section 2.10.5, Chapter-2 in EIA Report (Page No. 102 to 104).
	v. Details of stack emission and action plan for control of emissions to meet standards.	**Details of stack emission** • In existing, company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector & Adequate Stack will be provided to control of flue gas emission. In proposed expansion, company will use Furnace Oil/Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector, ESP / wet Scrubber & Adequate Stack will be provided to control of flue gas emission. • The source of process gas emission will be from reactor vent. Company has installed adequate Scrubber systems to control process gas emission. Details of stack emission is referred as Table 4.2, Section 4.2.2, Chapter-4 in EIA Report (Page No. 290-298) and action plan for control of emissions is referred as Section 2.11.6, Chapter-2 in EIA Report (Page No. 152-153).
	vi. Measures for fugitive emission control	**Measures for fugitive emission control**:

		• The Solvent used in the processes is handled in a closed loop and in process materials are stored in drums will be kept under structured roof. • Equipment where volatile solvents distilled is provided with reflux condensers and after coolers and the receivers are connected to the scrubber. • Pumps of compatible MOC with Single and Double Mechanical seals are used for handling corrosive and hazardous chemicals • Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by External lab • All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions. • Proper ventilation in storage area is ensured and all materials are stored in suitable packing to prevent contamination of air due to particulates & volatile emissions from storage area. • All the Flange joints of the pipe lines which carry solvents are covered with flange guards. • Adequate Dust Suppression System including Water Sprinkling System is installed for control of fugitive emission during loading of raw material and product. • Work place monitoring within plant, storage & other area and AAQM will be done as per 'Post project monitoring plan' as well as regulatory requirement as per factory act. • Properly designed method & practices of transportation, storage & handling of materials are established and maintained along with necessary facilities to reduce

		airborne particle of materials and VOCs.
	vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.	Details of hazardous waste generation and their disposal: **Details of Hazardous Waste and Its Disposal Management:** • Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes, Used / Spent Oil, spent solvents will be disposed Disposal to TNPCB Authorized Recyclers (Recyclable). • Chemical sludge from waste water treatment, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Contaminated cotton rags or other cleaning materials, Spent Carbon or Filter medium disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016. • Spent Carbon or Filter medium disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016. Details of hazardous waste generation and their storage, utilization and management is referred as Table 2.5, Section 2.12.1, Chapter-2 in EIA Report (Page No. 153).
	viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	Fly ash (18250 MT/Annum) will be collected, stored, transported and sent for brick manufacturer or in cement industries.
	ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectors area) for green belt (3.33 %) within the plant premises. Name of species planted are as below 1. Neem 2. Silver Oak 3. Eucalyptus 4. Pongamia 5. Gulmohur

<table>
<tr><td></td><td></td><td>6. Spathodia
7. Ashoka
8. Banyan
9. Bamboo
10. Peapal</td></tr>
<tr><td></td><td>x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.</td><td>Unit will harvest rainwater from the rooftop of the buildings. Rain water harvesting is under process.
Rainwater harvesting is attached in Section 10.4.3.1 in Chapter 10 of EIA report (Page no. 488).</td></tr>
<tr><td></td><td>xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.</td><td>Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.</td></tr>
<tr><td></td><td>xii. Action plan for post-project environmental monitoring shall be submitted.</td><td>Post-project environmental monitoring is referred as Table 6.1, Section 6.3 Chapter-6 in EIA Report (Page No. 323).</td></tr>
<tr><td></td><td>xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.</td><td>Disaster Management Plan- On site &off Site Emergency Management Plan is referred as Section 7.10, Chapter-7 in EIA Report (Page No. 410).</td></tr>
<tr><td>7.</td><td>Occupational health</td><td></td></tr>
<tr><td></td><td>i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers</td><td>Company will allot Rs. 102 Lakh per annum for the occupational health & safety of all contract and casual workers.
<table>
<tr><th>One time investment for Occupational safety</th><th>In lakhs</th></tr>
<tr><td>Hydrant system, smoke detector & Sprinkler and Fire fighting devices</td><td>200</td></tr>
<tr><td>Process control, censor, interlock,guard and other instrumentation for safety</td><td>3000</td></tr>
<tr><td>Emergency shower, SCBA,ECC,gas detector</td><td>100</td></tr>
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<tr><td></td><td></td><td>
<table>
<tr><td>Total</td><td>3300</td></tr>
</table>
<table>
<tr><th>Annual plan for occupation Heath and safety</th><th>In lakhs/Annum</th></tr>
<tr><td>Employee periodical medical check-up</td><td>27</td></tr>
<tr><td>OHC operating cost</td><td>24</td></tr>
<tr><td>Ambulance</td><td>12</td></tr>
<tr><td>Personal protective equipments</td><td>34</td></tr>
<tr><td>Training and awareness</td><td>5</td></tr>
<tr><td>Total</td><td>102</td></tr>
</table>
</td></tr>
<tr><td></td><td>ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.</td><td>Health Evaluation of Workers is referred as Section 7.12.6, Chapter-7 in EIA Report (Page No. 452).
Workers are checked for physical fitness with special reference to the possible health hazards likely to be presented where he/she is being expected to work before being employed for that purpose.
Tests carried out:
1)Physical test
2)General Examination like Temp., Pulse, Pressure, Haemoglobin/Total W.B.C/ Platelet/others
3)Microscopic Examination
4) Systematic Examination
5) Vision Testing
6) Blood Glucose analysis
7) Haemogram Profile</td></tr>
<tr><td></td><td>iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,</td><td>EMP for the Occupational Safety & Health hazards so that such exposure can be kept within permissible exposure level (PEL)/Threshold Level value (TLV) so as to protect health of workers is referred as, Section 7.12.3, Chapter-7 in EIA Report (Page No. 450).</td></tr>
<tr><td></td><td>iv. Annual report of health status of workers with special reference to Occupational Health and Safety</td><td>Annual report of health status of workers with special reference to Occupational Health and Safety is referred as Section 7.12.6 Chapter-7 in</td></tr>
</table>

		EIA Report (Page No. 453). There was not found any abnormality of any employees and workers. All employees and workers are found fit. Occupational health surveillance program is undertaken as regular exercise for all employees specifically for those engaged in handling substances. Medical records of each employee are maintained separately.
8.	**Corporate Environment Policy**	
	i. 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.	Environment Policy is referred in Section-6.4, Chapter – 6 in EIA Report(Page No.325).
	ii. Does the Environment 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.	Environment Policy is referred in Section-6.4, Chapter – 6 in EIA Report(Page No.325).
	iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.	Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions is referred in Figure-6.1, Section-6.5, Chapter-6 in EIA Report(Page No.327).
	iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report	An organogram to report of non-compliances / violations of environmental norms to the Board of Directors of the company. is referred in Section-6.6, Chapter-6 in EIA Report(Page No.328).
	v. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	Company will provide the sanitation facility only to the Labour force during construction as well as to the casual workers including truck drivers during operation phase.
10.	**Enterprise Social Commitment**	

	(ESC)	
	i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.	CER @ 0.25 % of the additional project cost (i.e. 2000 Crore) and CSR will be carried out by the company in the surrounding villages. This fund will be administered by a local area development committee in accordance with the orders of the appropriate Government.
9.	**Additional studies/Measures to be considered**	
	vi. Provide latest and ecofriendly technology for product manufacturing.	Latest and ecofriendly technology for product manufacturing are as follows: 11. Usage of Non-fossil fuel source for boiler (Briquettes) 12. Adiabatic Cooling Towers instead of conventional type Cooling Towers 13. Low-Power Exercise Equipment -Energy efficient (IE3) motors 14. Variable Speed Drives (VSD). 15. LED Lighting 16. Monofluid Temperature Control 17. Steam Condensate Recovery System and Flash Steam Recovery System 18. Rainwater harvesting 19. Double Scrubbing system for all reactors 20. Scrubber for all open Reactor and Chemical storage Detailed Latest and ecofriendly technology for product manufacturing is refer as Section 2.5, Chapter-2 in EIA report (Page no. 42)
	xvii. Emphasize on Green chemistry/Clean Manufacturing	Unit has emphasizing on green chemistry /clean manufacturing in following ways: **11. Scrubbing system** All reaction vessels vent is connected with vent scrubber with capacity of 2500 m3/hr is installed to control fugitive emission Emphasize on green chemistry/clean manufacturing **12. Double condenser for solvent recovery** For solvent recovery equipment connected with primary and secondary condensers with chilled water / brine. For filtration and drying well designed ANFD with condensers are available for minimizing solvent

		emission in environment. **13. Usage of Non-fossil fuel source for boiler (Briquettes)** replacing the Usage of furnace oil by non-fossil fuel source (Briquettes) for Boiler. Using fossil fuel would generate 2.8 to 3 T of CO_2 emission per ton of fuel Usage of non-fossil fuel source (Briquettes) is increasing the Energy-efficiency and Reduction of greenhouse gas emissions **14. Adiabatic Cooling Towers instead of conventional type Cooling Towers** We are going with Adiabatic Cooling Towers, which is saving 75% of water consumption with compare to conventional type Cooling Towers.Adiabatic cooler uses wetted pads to pre-cool the ambient air entering the tower. This pre-cooled air is used to cool process water. This helps achieve a lower temperature than the ambient dry bulb temperature. **15. Low-Power Exercise Equipment -Energy efficient (IE3) motors** a. 93% efficiency as against 88% for conventional IE1 motors – 5% increase in efficiency – 1 GWh electrical energy accounts for releasing 790 tons of CO_2[Source: as per CEA data, Govt. of India.] – Yearly reduction in CO_2 emissions due to IE3 otors: 2 X 790 = 1580 tonnes **16. Variable Speed Drives (VSD)** – Selected IE3 motors are with VSD – 1 GWh electrical energy accounts for releasing 790 tons of CO_2 [Source: as per CEA data, Govt. of India.] – Yearly reduction in CO_2 emissions due to VSD: 0.3 X 790 = 237 tonnes **17. LED Lighting** We are going with 100% of LED lightings over the plant, it's better than other by, they are brighter, Require lesser energy to function and Last longer. – LED lamps consume 20% energy for heating – Metal halide lamps consume 75% energy – 1 GWh electrical energy accounts for releasing 790 tones of CO_2

<table>
<tr><td></td><td></td><td>
– Yearly reduction in CO2 emissions due to VSD : 0.3 X 790 = 237 tonnes
18. Monofluid Temperature Control
a. Precise temperature control in addition to reduction in lean waste generation
19. Steam Condensate Recovery System and Flash Steam Recovery System
– Condensate headers are routed to the receiver wherein pressure powered/ mechanical pump transfers the condensate to boiler feed water tank
– High pressure condensate from process will be diverted to a flash vessel to generate LP steam. Thermo compressor option will be validated based on LP pressure
20. Bio-degradable Goods
Company has to use Bio-degradable Goods (wood) for packing and palleting purpose instead of plastic
</td></tr>
<tr><td></td><td>viii. Provide CAS No. of products along with product list.</td><td>Provide CAS No. of products along with product list is in Table 2.2, Section 2.7, and Chapter-2 in EIA Report (Page No. 46).</td></tr>
<tr><td></td><td>xix. Provide details of amount of carbon sequestered in their unit through greenbelt/other modes, in case of expansion project.</td><td>Calculation of CO2 sequestered per is referred as Section 10.14, Chapter-10 in EIA Report (Page no. 503-506)</td></tr>
<tr><td></td><td>xx. Life structure and sustainability for carbon and water foot print.</td><td>Life structure and sustainability for carbon and water foot print is attached in Annexure-8 in EIA report.(Page no.A-15)</td></tr>
<tr><td></td><td>xxi. Detailed pollution Load estimation.</td><td>For proposed project,
Worst case scenario for water consumption:
<table>
<tr><th>Sr. no.</th><th>Group</th><th>Product name</th><th>Water consumption (KL/Day)</th></tr>
<tr><td>1.</td><td>Group-1</td><td>COLCHICINE & THIOCOlCHICOSIDE</td><td>1.07</td></tr>
<tr><td>2.</td><td>Group-2</td><td>M-ANISIDINE</td><td>598.90</td></tr>
<tr><td></td><td colspan="2">Total Water consumption</td><td>599.98 KL/Day</td></tr>
</table>
Worst case scenario for waste water generation (Qualitative and Quantitative):</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Sr. no.</th><th>Group</th><th>Product name</th><th>Waste water generation (KL/Day)</th></tr>
<tr><td>1.</td><td>Group-1</td><td>COLCHICINE & THIOCOlCHICOSIDE</td><td>1.18</td></tr>
<tr><td>2.</td><td>Group-2</td><td>M-ANISIDINE</td><td>598.90</td></tr>
<tr><td></td><td colspan="2">Total Wastewater generation</td><td>600.09 KL/Day</td></tr>
</table>
</td></tr>
<tr><td></td><td>xxii. Transportation of Hazardous substance, effluents etc shall be carried out through authorized and GPS enable vehicles/Trucks only.</td><td>
All hazardous Goods vehicles/ trucks had been installed with GPS and the monitored by Nicer Globe.i.e as mentioned below
<table>
<tr><th rowspan="2">S. No</th><th rowspan="2">Name of the chemicals</th><th rowspan="2">Type</th><th colspan="2">Location</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>1</td><td>Caustic Soda</td><td>Truck</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>2</td><td>Sodium Hypochlorite</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>3</td><td>Hydrogen</td><td>Truck</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>4</td><td>Hydrochloric acid</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
<tr><td>5</td><td>Sodium hydroxide</td><td>Tanker</td><td>Mettur, TN</td><td>Berigai, TN</td></tr>
</table>
Other transport Safety initiative’s

Journey Risk Management Study conducted for all major distribution routes by Chemplast Sanmar Ltd., Mettur
Restriction driving hours between 11:00 PM – 05:00 AM for driver to manage the driver fatigue. Every 5 Hrs. / 2 Hrs. resting
All drivers are trained and driver competency card was issued for all drivers.

</td></tr>
<tr><td></td><td>xiii. Category of Hazardous Wastes shall be mentioned in the EIA/EMP report and in presentation.</td><td>Category of Hazardous Wastes is referred as Table 2.5, Section 2.12.1, Chapter-2 in EIA Report (Page No. 153).</td></tr>
<tr><td></td><td>xiv. Details of greenhouse gases and emissions shall be provided.</td><td>

Greenhouse gas is the property of absorbing infrared radiation (net heat energy) emitted from Earth’s surface and reradiating it back to Earth’s surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the

</td></tr>
</table>

		most important greenhouse gases. A number of processes influence greenhouse gas concentrations. Industrial activities increase atmospheric CO_2 levels primarily through the burning of fossil fuels. • Greenhouse gas emissions from existing unit are Carbon dioxide (CO_2), PM, SO2, NO_2 & CO • Company has planted trees which helps to reduce greenhouse gases through photosynthesis absorbing large quantities of CO_2 and producing oxygen.
	xxv. Greenbelt shall be developed in the first year of the project and wind breaks shall be erected.	Agreed, Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectors area) for green belt (3.33 %) Company has planted trees in a row or shrubs planted in such a manner as to provide shelter from the wind and to protect soil from erosion. The windbreaks are formed in North-West direction.
	xvi. Study area map shall be overlapped with all the associated features.	The baseline parameters such as Land use / Land cover, Ecological status, Geology, Hydrology, Soil, Drainage Pattern and infrastructure establishment is studied within the 10 km aerial radius from the center where the site is located. A map depicting major land use/ land cover classes comprising lands under agriculture, allow land, open/degraded vegetation; lands falling under water bodies, scrub and lands under inhabitations is presented. The map also marks the area within 10 km of the project site as the area of interest. Area and distance calculations have been carried out using GIS software after geo-referencing the interpreted data with the help of Survey of India (SoI) topographical maps of the scale 1:50,000. Study area map overlapped with all the associated features are referred in Figure 3.13, Section 3.10, Chapter-3 in EIA Report (Page No.229).
	xvii. Emphasize on green fuels.	As of now company is using FO & HSD. However, company will review the viability of other fuels.

	viii. The project from NCR shall not use Coal as fuel. Further, PP shall avoid use of Coal in the CPAs and elsewhere also if alternatives are available.	Not Applicable, as unit is located in Berigai, Tamil Nadu.
	xix. Provide the Cost-Benefit analysis with respect to the environment due to the project.	CER @ 0.25 % of the additional project cost (i.e. 2000 Crore) and CSR will be carried out by the company in the surrounding villages. This fund will be administered by a local area development committee in accordance with the orders of the appropriate Government.
	xxx. Details of carbon foot prints and carbon sequestration study w.r.t. proposed project needs to spelled out. Proposed mitigation measures also needs to be analyzed and submitted for further appraisal of the EAC	Details of carbon foot prints and carbon sequestration as Section 10.14, Chapter-10 in EIA Report (Page no. 503-506)
11.	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	There is no any litigation pending against the project and/or any direction/order passed by any Court of Law against the project.
12.	'A tabular chart with index for point wise compliance of above TORs.	Complied

SPECIFIC CONDITION

SR. NO.	TERMS OF REFERENCES	COMPLIANCE
1	Details on solvents to be used, measures for solvent recovery and for emissions control.	**Solvents such as** Toluene, TBA, MCB, MTBE, ODCB, Methanol & Benzene will be used**, measures for solvent recovery** is referred in Section-7.12, Chapter-7 in EIA Report (Page No. 499).
2	Details of process emissions from the proposed unit and its arrangement to control.	Process gas emissions from the proposed unit are SO_2, NO_2 & CO and **Measures for fugitive emission control are as following**: • The Solvent used in the processes is handled

		in a closed loop and in process materials are stored in drums will be kept under structured roof. • Equipment where volatile solvents distilled is provided with reflux condensers and after coolers and the receivers are connected to the scrubber. • Pumps of compatible MOC with Single and Double Mechanical seals are used for handling corrosive and hazardous chemicals • Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by External lab • All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions. • Proper ventilation in storage area is ensured and all materials are stored in suitable packing to prevent contamination of air due to particulates & volatile emissions from storage area. • All the Flange joints of the pipe lines which carry solvents are covered with flange guards. • Adequate Dust Suppression System including Water Sprinkling System is installed for control of fugitive emission during loading of raw material and product. • Work place monitoring within plant, storage & other area and AAQM will be done as per 'Post project monitoring plan' as well as regulatory requirement as per factory act. • Properly designed method & practices of transportation, storage & handling of materials are established and maintained along with necessary facilities to reduce airborne particle of materials and VOCs.

		Details of process emissions proposed scenario is referred as section - 2.11.1, Chapter-2 in EIA Report (Page No. 147).
3	Ambient air quality data should include VOC, other process- specific pollutants* like NH_3*,chlorine*, HCl*, HBr*, H_2S*, HF*, CS2 etc., (*- as applicable)	Ambient air samples were collected and analyzed for SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_x, O_3, Pb, CO, NH_3, C_6H_6, Benzo (a) Pyrene (BaP), Arsenic (As), Nickel (Ni) & VOCs for identification, prediction, evaluation and assessment of potential impact on ambient air environment. Ambient air quality data is referred in Table-3.10 Section-3.4, Chapter-3 in EIA Report (Page No.188).
4	Work zone monitoring arrangements for hazardous chemicals.	Work zone monitoring arrangements is referred in Table 6.1, Section 6.3 Chapter-6 in EIA Report (Page No. 323).
5	Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge.	Unit has full-fledged Effluent Treatment Plant to treat the wastewater with multiple effect evaporators (MEE),Biological conventional treatment and RO system. The water recovered is totally reused in the process plant itself. The domestic waste water is also treated in the STP. The cyanide bearing wastewater is chemically treated with Sodium hypochlorite solution and taken for evaporation in the MEE. No effluent is/will be discharged into any surface water body. **Hence, this unit is/will be total Zero Liquid Discharge unit.** Detailed effluent treatment scheme including segregation of effluent streams of wastewater shall be treated in effluent treatment plant consist of MEE treatment is referred as section-2.10.4 & Section 2.10.5, Chapter-2 in EIA Report (Page No. 102 to 104).
6	Action plan for odor control to be submitted.	Action plan for odour control measure are as follows: • All liquid raw materials charged into Reactors with pumps or under gravity through closed pipes. • Suction Hoods placed near the Man-holes & Charging funnels of Reactors & Filters so that chemical vapors and dust do not escape into the Plant & surroundings, when the man-hole covers are opened for inspection or charging of RM. • All storage tanks of low boiling chemicals

		provided with Conservation Vents. • Vent lines of Dosing vessels shall be connected back to the vents of storage tanks to prevent contaminated air release during material transfer. • All pumps handling hazardous chemicals provided with mechanical seals to prevent fugitive emission. • Wherever possible magnetic coupled pumps are used. • Any spillage from drums etc. absorbed with saw dust / soda ash and moped clean. The contaminated absorbent are safely dispose off along with hazardous waste.
7	A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous waste generated.	Unit has agreement with TNWML for co-processing of hazardous waste is referred as section-2.12.3 Chapter-2 in EIA Report (Page No.180)
8	Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.	Authorization/Membership for the disposal of **liquid effluent** in CETP is not applicable as this is zero liquid discharge unit and Unit has agreement with TNWML referred as Section-2.11.4, Chapter-2 in EIA Report (Page No.158).
9	Action plan for utilization of MEE/dryers salts.	MEE salt will be collected, Store, Transport and disposed at TNWML.
10	Material Safety Data Sheet for all the Chemicals are being used/will be used.	**Material Safety Data Sheet** for all the Chemicals is referred to **Annexure-14**, (Page No. A-98).
11	Authorization/Membership for the disposal of solid/hazardous waste in TSDF.	Unit has agreement with TNWML referred as Section-2.11.4, Chapter-2 in EIA Report (Page No.158).
12	Details of incinerator if to be installed.	Not Applicable, Unit will not install the incinerator for existing as well as Proposed scenario. Incinerable Waste will be disposed to M/s. TNWML
13	Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling & safety system to be incorporated.	Risk assessment for storage and handling of hazardous chemicals are referred as Section-7.3.4.3, Chapter-7 in EIA Report (Page No. 333) & Action plan for handling & safety system to be incorporated are referred as Section-7.4, Chapter-7 in EIA Report (Page No. 341)

EXECUTIVE SUMMARY

1.0 INTRODUCTION

M/s. Chemplast Sanmar Limited is proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

2.0 PROJECT DESCRIPTION

- M/s. Chemplast Sanmar Limited is located outside Industrial estate, as per EIA Notification 2006, For Category 5(f) project "Located outside the notified industrial area/ estate" falls under category A.
- Company has proposed for the Pesticide Industrial Product [Sector-17; 5(b)]. As per EIA Notification 2006, For Category 5(b) Pesticides industry and pesticide specific intermediates - "All units producing technical grade Pesticides" falls under category A.
- Also, Inter-state boundary is there within 10 Kms from the existing project site (i.e., Karnataka state boundary at 0.89 km from the project site), as per EIA Notification 2006, general condition "(iv) inter-State boundaries and international boundaries." falls under category A.
- Hence, we have applied in category A [5(b) & 5(f)] Environmental Clearance at MoEF & CC, New Delhi.
- Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (32 %) area is covered as greenbelt. No additional land needs to be acquired for the proposed expansion project.
- The TNPCB has conducted the Public Hearing/public consultation, as per the provisions of EIA notification, 2006. Public consultation for this project was conducted on 12th May 2023. The public hearing was attended by 134 nos. of Person from local resident, company executives, experts, and representatives of company management.
- The main issues raised during the public hearing were focused on local employment, CSR, and CER activities, as well as other technical issues, and in response, the project proponent said that they would try to assist as much as they can base on local need.

2.1 WATER REQUIREMENT, WASTE WATER GENERATION AND TREATMENT

- Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/PWD available and remaining 1000 KLD applied to get from government water source.
- The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream.

- **Low COD stream:** Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system.
- **High TDS Stream:** Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility).
- Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.
- No effluent is/will be discharged into any surface water body. Hence, this unit is/will be total Zero Liquid Discharge unit.

2.2 AIR POLLUTION SOURCE AND ITS MITIGATION MEASURES

- Company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. There are 9 nos. of flue gas emissions in existing unit. APCM like Mechanical Dust collector & adequate stack will be install to control the flue gas emission.
- After expansion, 9 nos. of flue gas emissions will be added. After proposed expansion, company will use Furnace Oil/Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Company will use Briquettes, Furnace Oil & HSD as a fuel in additional Boiler, TFH & D.G. Set. APCM like Mechanical Dust collector, ESP and adequate stack will be install to control the flue gas emission.
- 16 nos. of process gas emission in existing unit and 25 no. of process gas emission will be added after expansion. so, after total expansion, there will be 41 nos. of process gas emission. Company has installed Wet Alkali Scrubber & Wet scrubber with stack to control the process gas emission and will continue the same after proposed expansion.

2.3 HAZARDOUS WASTE GENERATION AND ITS MANAGEMENT

- 10 nos. of hazardous wastes will be generated after proposed expansion, the quantity of hazardous waste will increase after proposed expansion. Company will dispose the hazardous waste as per the Hazardous & other Wastes management & Transboundry movement rules, 2016.
- Empty barrels/ containers/liners contaminated with hazardous chemicals/wastes; Used/Spent Oil Decontamination & Spent catalyst sent to TNPCB Authorized Recyclers (Recyclable).
- Chemical sludge from waste water treatment, spent solvents, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Contaminated cotton rags or other cleaning materials will be disposed at common TSDF.
- Spent Carbon or Filter medium, Process wastes or residues will be disposal to Co-processor by following protocol of Hazardous Waste Rule – 2016.
- There will be 01 no. of non-hazardous waste (i.e., Fly Ash), which will be disposed as per Fly ash notification rule.

2.4 GREEN BELT

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (32 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectors area) for green belt (3.33 %) within the plant premises.

2.5 POWER REQUIREMENTS & FUEL REQUIREMENT

Power Requirement

Total Power Requirement is 14000 KVA from State Electricity Department & 13470 KVA-DG Set will be kept for emergency power back up.

Fuel Requirement

Sl. No.	Type of Fuel	Existing (MT/day)	Proposed (MT/day)	Total (MT/day)
1	Furnace Oil	8	90	98
2	Briquettes	00	250	250
3	HSD	1.7	20.3	22
4	LPG	0.008	0.192	0.20

3.0 DESCRIPTION OF THE ENVIRONMENT

BASELINE ENVIRONMENTAL STATUS

The baseline environmental quality has been assessed in the Pre-Monsoon season of July, 2022 to September, 2022 in a study area of 10 km radial distance from the project site. The ambient air quality monitoring was carried out in accordance with National Ambient Air Quality Standards (NAAQS) of CPCB. Ambient Air Quality Monitoring (AAQM), Noise level monitoring, ground water monitoring and Soil monitoring was carried out at eleven locations during the study period. The baseline data involves collection of Samples of ground water, surface water and soil, monitoring of ambient air quality, noise levels, ecological status, and meteorological parameters. The analytical results show that the values are within the prescribed limits for air quality. The ground water quality is observed to be within the limits for potable purpose when compared to the prescribed standards of IS: 10500 – 2012.

4.0 IDENTIFICATION AND QUANTIFICATION OF IMPACTS

The impact assessment report has identified various sources of pollution and quantified the pollution loads due to the expansion. It has also identified the technologies to be adopted for the mitigation and control of the same. The sources of pollution are air emissions from utilities and process; liquid effluents from process, utilities, and domestic sources; solid wastes from process, treatment systems and utilities; and noise pollution from utilities, and process equipment.

5.0 ALTERNATIVES SITE AND TECHNOLOGY

Land of the existing site is classified for the industry usage. Expansion will be carried out within existing premises, so alternative site analysis has not considered this project.

6.0 ENVIRONMENT MONITORING PLAN

Environmental monitoring for water, air, noise and solid waste quality shall be conducted periodically either by proponent or third party. The frequency of monitoring and the quality parameters shall be as suggested by the TNPCB, Tamil Nadu and MoEFCC, New Delhi.

7.0 SAFETY MEASURES

Following Safety measures are implemented to prevent hazards caused by this project.

- Protective equipment such as gloves, gumboots, goggles, helmets, uniforms, etc. are provided to the staff as required as well as mandatory.
- Firefighting equipments are provided. Fire extinguishers such as foam, powder, carbon dioxide are used.
- Each appliance and safety equipment are installed only after inspection and verification of its capabilities. As well as calibration of each are done periodically and its record is maintained.
- The company is using self-breathing apparatus as required.
- Attention paid to each stage of the training and process from time to time to warn each staff member of the dangers and arrange mock drill for this.
- Only authorized persons are allowed to enter the company's plant.

Medical facilities and services

- Periodic Medical Check-up (Every Six months) of all employees.
- First aid kits are available with essential medicines.
- The medical officer comes periodically for checkup.

8.0 SOCIAL DEVELOPMENT ACTIVITIES

- As per OM no. 22-65/2017 on dated 01/05/2018 regarding “Corporate Environment Responsibility” (CER), Brownfield projects must contribute 0.25% of the Additional Capital Investment, Hence, the company will contribute Rs. 5.0 Crore as funds for CER activities.
- The company has carried out socio-economic development activities in the surrounding villages and shall be continued after proposed expansion.

9.0 CAPITAL AND RECURRING COST EARMARKED FOR ENVIRONMENTAL PROTECTION MEASURES

Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.

10.0 ENVIRONMENT MANAGEMENT PLAN

The Environment Management plan is meant for mitigation/ management of the adverse impacts and the strengthening positive impacts during proposed expansion project.

CHAPTER – 1

INTRODUCTION

1.1 BACKGROUND

Chemplast Sanmar is over fifty years old and is a part of the SHL Chemicals Group, which in turn is a constituent of the Sanmar Group, one among the oldest and most prominent corporate groups in South India. It is a major manufacturer of Speciality Chemicals such as Specialty Paste PVC resin and Custom Manufactured Chemicals for agro-chemical, pharmaceutical and fine chemicals sector. The company also produces other chemicals such as Caustic Soda, Chlorochemicals, Hydrogen Peroxide, Refrigerant gas and Industrial Salt. The manufacturing facilities are located at Mettur, Berigai and Vedaranyam in Tamil Nadu and Karaikal in the Union Territory of Puducherry.

Chemplast Sanmar Limited, is a leading supplier of intermediates for global Agrochemical, Pharmaceutical and Fine Chemical innovators. These intermediates involve complex multi-step synthesis using unique chemistries.

The manufacturing facility is located at Berigai, Tamil Nadu.

Organic Chemicals

- Custom manufacturing of organic intermediates supplying into Pharmaceutical, Agrochemical and other fine chemical applications.
- Exclusive custom development and manufacturing of key intermediates
- Organic synthesis building blocks with capacity ranging from 100 kgs to 100's of MTPA

Phyto Chemicals

- Manufactures Active Pharmaceutical Ingredients (API) extracted from locally available biomass.
- Phyto Chemical APIs are sold globally to the Pharmaceutical industry.

M/s. Chemplast Sanmar Limited, Proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

1.1.1 PROMOTERS AND THEIR BACK GROUND

List of directors as on 16th October 2021

Sr. no.	Names with address of the Directors of the company	Designation	Nationality	Age
1.	Mr. Vijay Sankar No.194 T T K Road Alwarpet, Chennai - 600 018 DIN: 00007875	Chairman	Indian	49 Years
2.	Mr. Ramkumar Shankar G 10, B Block, Jains Sagarika Apartments Satyadev Avenue, MRC Nagar, Chennai 600 028 DIN: 00018391	Managing Director	Indian	55 Years
3.	Mr. Amarnath Ananthanarayanan 2nd C Green EDGE Old No. 12, New No. 21 Masilamani Road, Royapettah, Chennai 600 014 DIN: 02928105	Director	Indian	51 Years
4.	Mr. Aditya Jain F-63 Radhe Mohan Drive Gadaipur Bund Road Mehrauli, New Delhi-100 074 DIN: 00835144	Director	Indian	60 Years
5.	Mr. Chandran Ratnaswami 177 Mckee Avenue, Ontario M2N4C6, Toronto, Canada - M2N4C6 DIN:00109215	Director	Canadian	73 Years
6.	Mr. Sanjay Vijay Bhandarkar 33 Moonreach Apartment, 11th Floor, Prabha Nagar Tata Press Lane, Prabhadevi, Mumbai 400 025 DIN: 01260274	Director	Indian	54 Years
7.	Mr. Prasad Raghava Menon 264/A Road No 12, MLA Colony Khariatabad, Banjara Hills Hyderabad-500 034 DIN: 00005078	Director	Indian	76 Years
8.	Ms. Lakshmi Vijayakumar 25 Ranjit Road Kotturpuram Chennai 600 085 DIN: 09115998	Director	Indian	67 Years

1.1.2 REGULATORY PROVISION

For proposed expansion project; following assumptions have been considered:

1) The reason of applying in category A [5(b) & 5(f)] Environmental Clearance at MoEF & CC, New Delhi.
   - Chemplast Sanmar Limited has proposed for the Pesticide Industrial Product [Sector-17; 5(b)],
   - Unit is located outside Industrial estate, &
   - Inter-state boundary was there within 10 Kms from the existing project site (i.e. Karnataka state boundary at 0.89 km from the project site)
2) Capacity of Plant Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in existing unit.
3) Consent to Establish/Consent to operate for proposed expansion project from TNPCB, Tamil Nadu.
4) Total working days in a year 365
5) Raw material storage facility for 30 days
6) Finished product storage for 15 days
7) Solvent Storage facility for 30 days
8) Factory Act License
9) Public Liability Insurance
10) The Motor Vehicles Act
11) The Bureau of Indian Standards Act
12) The Petroleum Act 1934 & The Petroleum Rules 2002.
13) Poisons act, 1919
14) Hazardous Waste management rule,2016
15) Manufacturing, storage and import of hazardous chemical rules 2016
16) Chemical Weapons Convention 1997

1.1.3 JUSTIFICATION OF PROJECT

Chemplast Sanmar Limited, is a leading supplier of intermediates for global Agrochemical, Pharmaceutical and Fine Chemical innovators. These intermediates involve complex multi-step synthesis using unique chemistries.

The manufacturing facility is located at Berigai, Tamil Nadu.

1.2 PROJECT DETAILS

1.2.1 TOTAL PROJECT COST

Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.

TABLE 1.1

BREAK UP OF PROJECT COST

Sr. No.	Particulars	Existing Amount (Rs. In Crore)	Proposed Amount (Rs. In Crore)	Total Proposed Amount (Rs. In Crore)
1	Land	5.915	-	5.915
2	Building and site development	81.446	374	455.446
3	Plant and machinery	186.555	1526	1712.555
4	Total Capital cost Environment protection measures (includes cost of ETP, Tree Plantation, Evaporator System and Rain Water Harvesting etc.)	18.482	100	118.482
	Total Cost of Project	**292.398**	**2000**	**2292.398**
5	Recurring Cost of Environment protection measures (includes cost of ETP, Tree Plantation, Evaporator System etc.)			86.65 Crores/Annum

1.2.2 PLOT AREA

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises.

1.2.3 EXACT DETAILS ABOUT INFRASTRUCTURAL FACILITIES, PLANT MACHINERIES, ETC. REQUIRED FOR THE PROPOSED PROJECT

TABLE 1.2

LIST OF MACHINERIES AND EQUIPMENTS

S. No	Equipment Description	Unit	Existing		Proposed		Total proposed	
			No	Capacity	No	Capacity	No	Capacity
1	Air compressor	CFM	7	2100	5	4000	12	6100
2	Agitated Nutsche Filter	KL	10	63	10	100	20	163
3	Autoclave	KL	8	62	5	50	13	112
4	Boiler	T/Hr	1	9	4	100	5	109
5	Chilled brine compressor	TR	6	583	10	1400	16	1983
6	Chilled water compressor	TR	6	1160	10	2600	16	3760

7	Cooling tower	TR	17	3800	10	5000	27	8800
8	DG set	KVA	6	3470	5	10000	11	13470
9	Distillation column	KL	8	80	10	100	18	180
10	FBD	KL	2	1	0	0	2	1
11	Mixing vessel	KL	31	200	100	1000	131	1200
12	Multiple Effect Evaporator	KLD	2	220	2	780	4	1000
13	N2 Compressor	Nm3/Hr	3	350	5	1250	8	1600
14	RCVD	KL	2	6	3	15	5	21
15	Reactor	KL	52	520	100	1200	152	1720
16	RO plant (Process)	m3/Hr	3	47	2	50	5	97
17	RO plant (ETP)	m3/Hr	3	17	2	50	5	67
18	RPVD	KL	5	29	10	100	15	129
19	Scrubber	m3/Hr	16	53860	25	87500	41	141360
20	STP plant	KLD	1	25	1	100	2	125
21	Thermic Fluid Heater	Kcal/Hr	2	2	2	4	4	6

TABLE 1.4

SALIENT FEATURES OF THE PROJECT

<table>
<tr><th>Sr. No.</th><th>Salient Features</th><th>Details</th></tr>
<tr><td>1</td><td>Location of project

Co-ordinates</td><td>S.F No. 5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India
12°48'21.69"N 77°59'2.03"E
12°48'18.20"N 77°59'14.32"E
12°48'17.79"N 77°59'19.40"E
12°48'14.08"N 77°59'18.40"E
12°48'10.76"N 77°59'18.31"E
12°48'6.70"N 77°59'16.68"E
12°48'13.67"N 77°58'57.08"E</td></tr>
<tr><td>2</td><td>Status of Land acquisition</td><td>Land is already acquired</td></tr>
<tr><td>3</td><td>Land area of project site</td><td>16.64 Hectares</td></tr>
<tr><td>4</td><td>Fuel to be used</td><td>
<table>
<tr><th>Sl. No.</th><th>Type of Fuel</th><th>Existing (MT/day)</th><th>Proposed (MT/day)</th><th>Total (MT/day)</th></tr>
<tr><td>1</td><td>Furnace Oil</td><td>8</td><td>90</td><td>98</td></tr>
<tr><td>2</td><td>Briquettes</td><td>00</td><td>250</td><td>250</td></tr>
<tr><td>3</td><td>HSD</td><td>1.7</td><td>20.3</td><td>22</td></tr>
<tr><td>4</td><td>LPG</td><td>0.008</td><td>0.192</td><td>0.20</td></tr>
</table>
(Note: In proposed expansion, initially company will install Briquettes Boiler-25 TPH. On continuation of the expansion phases, company will install either Briquettes / FO boiler based on the Briquettes resource availability)</td></tr>
<tr><td>5</td><td>Source of Water</td><td>Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA available and remaining 1000 KLD applied to get from government water source.</td></tr>
<tr><td>6</td><td>Total Water Quantity</td><td>Total Water Quantity: 1207.5 KL/Day [Existing: 207.5 KL/Day + Proposed: 1000 KL/Day]
○ Process water consumption: 600 KL/Day [Existing: 48 KL/Day + Proposed: 552 KL/Day]
○ Washing water: 75 KL/Day [Existing: 10 KL/Day +</td></tr>
</table>

		Proposed: 65 KL/Day] ○ Boiler & Cooling water: 402 KL/Day [Existing: 112 KL/Day + Proposed: 290 KL/Day] Total Domestic Water: 100.0 KL/Day [Existing: 12.0 KL/Day + Proposed: 88.0 KL/Day] Total Gardening Water: 30.5 KL/Day [Existing: 25.5 KL/Day + Proposed: 5 KL/Day]
7	Quantity of industrial effluent generation and domestic wastewater generation	Total Industrial Wastewater: 705 KL/Day [Existing: 68.0 KL/Day + Proposed: 637 KL/Day] ○ Process waste water generation: 600 KL/Day [Existing: 48 KL/Day + Proposed: 552 KL/Day] ○ Washing waste water generation: 75 KL/Day [Existing: 10 KL/Day + Proposed: 65 KL/Day] ○ Boiler & Cooling waste water generation: 30 KL/Day [Existing: 10 KL/Day + Proposed: 20 KL/Day] Total Domestic Wastewater generation: 100.0 KL/Day [Existing: 12.0 KL/Day + Proposed: 88.0 KL/Day]
8	Treatment of effluent	ETP, RO & MEE
9	Disposal of treated effluent	The total wastewater generation will be 705 KL/Day and will be segregated into two stream High COD Stream & Low COD stream. • **Low COD stream:** Low COD effluent will be treated through the conventional wastewater treatment system and the pass through RO system. • **High TDS Stream:** Neutralized concentrate effluent and rejects from RO will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility). • Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.
10	Details of process emissions	• Company is using Furnace Oil in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector & Adequate Stack will be provided to control of flue gas emission. • After proposed expansion, company will use Furnace Oil/Briquettes in Steam Boiler & HSD in Thermic Fluid Heater and DG Set. Mechanical Dust collector, ESP with water scrubber & Adequate Stack will be provided to control of flue gas emission. • The source of process gas emission will be from reactor vent.

<table>
<tr><td rowspan="2">11</td><td>Hazardous waste generation</td><td>There are 10 categories of hazardous wastes disposed as per Hazardous & other Wastes management & Transboundry movement rules, 2016.
Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes, Used / Spent Oil, Chemical sludge from waste water treatment, Spent solvents, Distillation residues, Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Spent catalyst, Contaminated cotton rags or other cleaning materials, Spent Carbon or Filter medium, Process wastes or residues</td></tr>
<tr><td>Non- Hazardous waste generation</td><td>There is a generation of non hazardous waste (i.e. Fly Ash) disposed as per Fly ash notification rule</td></tr>
<tr><td>12</td><td>Disposal of hazardous waste</td><td>Company will generate, collect, Store & dispose to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016.</td></tr>
<tr><td>13</td><td>Power requirement & source</td><td>Source - State Electricity Department, Tamil Nadu
Power required
<table>
<tr><th>Sr. No.</th><th>Description</th><th>Existing Requirement (KVA)</th><th>Proposed Requirement (KVA)</th><th>Total Requirement (KVA)</th></tr>
<tr><td>1</td><td>State Electricity Department</td><td>2000</td><td>12000</td><td>14000</td></tr>
<tr><td>2</td><td>D.G. Set</td><td>3470 (600x4) (750x1) (320x1)</td><td>10000 (5 x 2000 kVA)</td><td>13470</td></tr>
</table>
Note:
1. Proposed power requirement approval to get from Tamil Nadu Electricity Board (TNEB)
2. DG Set will be kept for emergency power back up.</td></tr>
<tr><td>14</td><td>Names & distance of National parks, Wildlife sanctuaries, Reserve Forests etc. Located within 10 Km from the plant boundary</td><td>There are no National parks, Wildlife sanctuaries, and Reserve Forests etc. located within 15 km from the plant boundary.</td></tr>
</table>

15	Any litigation/Court case pertaining to the project:	No litigation/Court case pertaining to the industry.
16	Total Cost of the Project: Rs. (Crores)	Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore].
17	Nearest Town	22 Kms Hosur
18	Nearest Railway station	25 Kms Hosur Railway station
19	Nearest Airport	53 Kms Bengaluru International Airport

1.3 PURPOSE OF EIA

The EIA study is carried out to assess the pollution potential and evaluate the adequacy and efficiency of proposed Pollution Control & Environmental Management System.

Environmental Impact Assessment (EIA) is the process of evaluating likely environmental impacts, both positive and negative, of proposed expansion project by taking into account natural, social and economic aspects. It also comprises of suggesting mitigation measures, for the possible negative impacts, before implementation of the project.

The purpose of the EIA study is identifying existing environmental condition in the study area, predicting and assessing environmental impacts due to the proposed expansion project and suggesting measures to mitigate the adverse impacts and to delineate a comprehensive environment management plan along with recommendations and suggestions. The different activities that are likely to take place in the proposed expansion project have been identified and mitigation measures have been proposed.

This report is prepared based on Generic Structure of EIA Document' given in Appendix III and IIIA to EIA Notification dated 14th September 2006.

1.4 OBJECTIVES OF EIA

Detailed EIA/EMP report has been prepared in line with approved ToR issued by MOEFFCC, New Delhi and as per generic structure as per the guideline provided by MoEF & CC. The EIA/EMP report includes collection of baseline data with respect to major environmental components, viz. Air, Noise, Water, Land, Biological and Socio-economic components for one season.

1.5 METHODOLOGIES FOR EIA

Taking into consideration proposed expansion project activities and guidelines, an area of 10 km radius from the center of the project has been selected and is designated as the study area for the purpose of EIA studies.

1.5.1 BASE LINE CONDITION

The samples of ambient air, ground and surface water and soil are collected and analyzed as per the standard methods for establishing the baseline data and to determine the impact of proposed activity on the same.

1.5.2 AMBIENT AIR ENVIRONMENT

The air environment around the plant was studied by setting up eleven locations within the study area of 10 km radius from the project site and collection and monitoring the site specific meteorological data, viz. wind speed, wind direction, humidity, rainfall and ambient temperature was carried out. Design of network for ambient air quality monitoring locations is based on guidelines provided by CPCB. The ambient air samples were collected and analyzed for SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_2, O_3, Pb, CO, NH_3, C_6H_6, Benzo (a) Pyrene (BaP), Arsenic (As), & Nickel (Ni), for identification, prediction, evaluation and assessment of potential impact on ambient air environment.

1.5.3 GROUND AND SURFACE WATER ENVIRONMENT

The water required for domestic and industrial use is being made available from the CGWA & State government Water Authority. Hence, to assess the physico-chemical quality of the water, a number of water samples were collected and analyzed for pollution parameters viz., pH, Temperature, TDS, Turbidity, BOD, COD, TSS, DO, fluorides, Chlorides, Sulphates, Nitrates, Ammonical Nitrogen, Total Hardness, Total Alkalinity, Oil & Grease, Calcium, Mg, Ni, T-Cr+3, Cu, Hg, As, Mn, Pb, Fe, Zn, Cd and Microbiological Parameter.

1.5.4 NOISE ENVIRONMENT

Noise pollution survey was conducted in the study zone. The anticipated noise sources were industrial activities, which are likely to be increased due to proposed activity. Noise levels were also recorded in surrounding villages for evaluating general scenario of the study area. Hourly equivalent sound levels (Leq) were also recorded for calculating Day and Night noise levels in the surrounding villages.

1.5.5 SOIL ENVIRONMENT

Soil sampling and analysis was carried out to assess physico-chemical characteristics of the soils and delineate existing cropping pattern, existing land use and topography, within the study area.

1.5.6 BIOLOGICAL ENVIRONMENT

Keeping in view, the importance of biological component of total environment due to the proposed expansion project, biological characterization of terrestrial and aquatic environments, changes in species diversity of flora and fauna in terrestrial as well as aquatic systems were studied for impact analysis due to proposed expansion project activity, if any.

1.5.7 SOCIO-ECONOMIC ENVIRONMENT

Demographic and related socio-economic data was collected from census handbook to assess socio-economic status of the study area. Assessment of impact on significant historical, cultural, and archeological sites/places in the area and economic and employment benefit arisen out from the project is given special attention.

1.5.8 IDENTIFICATION OF POLLUTION SOURCE

Detailed study of manufacturing process for proposed expansion scenario is carried out along with input and output of materials, water and wastewater as well as infrastructure facilities available.

1.5.9 EVALUATION OF POLLUTION CONTROL AND ENVIRONMENTAL MANAGEMENT SYSTEM

The qualitative and quantitative analysis of various pollution sources as well as evaluation of pollution control system is carried out.

1.5.10 EVALUATION OF IMPACT

A comprehensive evaluation of environmental impact with reference to proposed expansion activities is carried out.

1.5.11 PREPARATION OF ENVIRONMENTAL MANAGEMENT PLAN

A comprehensive Environmental Management Plan has been prepared covering all the aspects of pollution prevention measures, Air and Water Pollution Control measures, Hazardous Waste Management, Environmental Surveillance and Environmental Management Plan.

The present report is an EIA conducted during Pre Monsoon Season, 2022 (1st July, 2022 to 30th September, 2022). The baseline environmental conditions have been established through field monitoring and literature survey.

1.6 STRUCTURE OF REPORT

The objective of the EIA study is preparation of Environment Impact Assessment (EIA) report based on the guidelines of the Ministry of Environment, Forests & Climate Change (MoEFCC), CPCB and TNPCB. It incorporates the following.

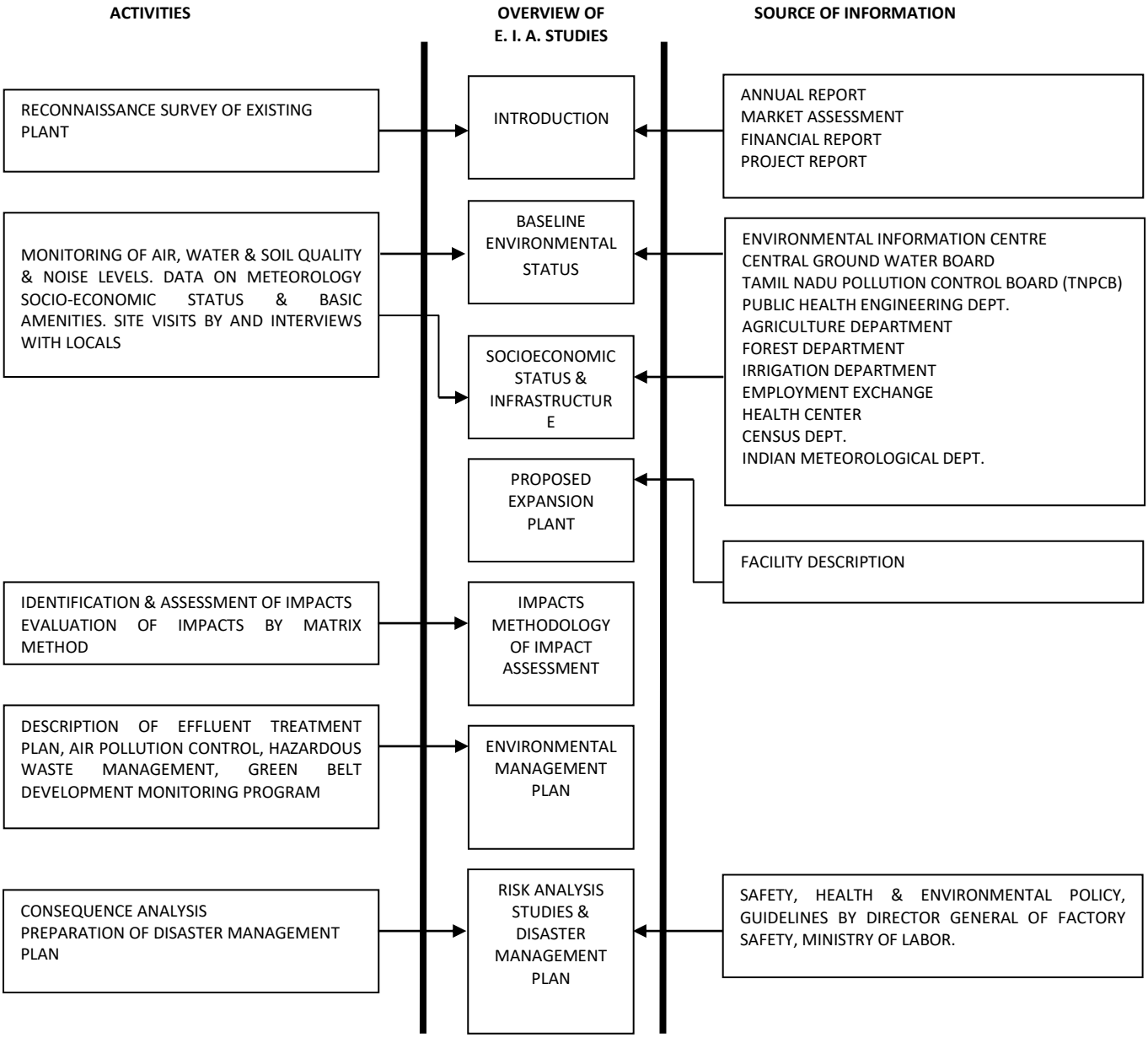
- **Chapter 1** is an Introduction to the Industry and its premises. It also expresses the basic objectives and methodologies for EIA studies and work to be covered under each Environmental component.
- **Chapter 2** presents Project Description and Infrastructural facilities including all industrial and environmental aspects of M/s. Chemplast Sanmar Limited, as well as

manufacturing process details. This chapter also gives information about raw material storage and handling, water and wastewater quantitative details, air pollution and control system, Hazardous Waste generation, storage facility and disposal and utilities for proposed plant capacity. It also provides information about proposed Environmental Management Facilities available at the project site.

- **Chapter 3** covers Description of the environment including meteorological details, Identification of baseline status of Environmental components of the surrounding area covering air, water and land environment. Also presents a study of land use pattern, Biological Environment & Socio-Economic Environment giving details about District Krishnagiri, Taluka Shoolagiri and the study area in terms of land use pattern, biological environment, and socio-economic environment.
- **Chapter 4** deals with Anticipated Environmental Impacts & Mitigation Measures, which provides quantification of significant impacts of the proposed activities of plant on various environmental components. Evaluation of the proposed pollution control facilities has been presented.
- **Chapter 5** describes Analysis of Alternatives (Technology & Site) considered with respect to Technology & Site.
- **Chapter 6** deals with Environmental Monitoring Program
- **Chapter 7** describes Additional studies w.r.t Risk assessment and Disaster Management Plan that shall be adopted by the company, Public consultation, R&R action plan.
- **Chapter 8** describes Project Benefits
- **Chapter 9** deals with Environmental Cost Benefit Analysis
- **Chapter 10** describes Environment Management Plan (EMP) to be adopted for mitigation of anticipated adverse impacts if any and to ensure acceptable impacts.
- **Chapter 11** describes Executive Summary & Conclusion of the Project.
- **Chapter 12** describes Disclosure of Consultants Engaged.

FIGURE - 1.1

ACTIVITIES, SOURCES OF INFORMATION AND CONTENTS OF EIA REPORT



CHAPTER – 2
PROJECT DESCRIPTION

2.1 BACKGROUND

Chemplast Sanmar is over fifty years old and is a part of the SHL Chemicals Group, which in turn is a constituent of the Sanmar Group, one among the oldest and most prominent corporate groups in South India. It is a major manufacturer of Speciality Chemicals such as Specialty Paste PVC resin and Custom Manufactured Chemicals for agro-chemical, pharmaceutical and fine chemicals sector. The company also produces other chemicals such as Caustic Soda, Chlorochemicals, Hydrogen Peroxide, Refrigerant gas and Industrial Salt. The manufacturing facilities are located at Mettur, Berigai and Vedaranyam in Tamil Nadu and Karaikal in the Union Territory of Puducherry.

Chemplast Sanmar Limited, is a leading supplier of intermediates for global Agrochemical, Pharmaceutical and Fine Chemical innovators. These intermediates involve complex multi-step synthesis using unique chemistries.

The manufacturing facility is located at Berigai, Tamil Nadu.

M/s. Chemplast Sanmar Limited, Proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

2.2 LAND REQUIREMENT FOR THE PROJECT INCLUDING ITS BREAK UP FOR VARIOUS PURPOSES, ITS AVAILABILITY

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises.

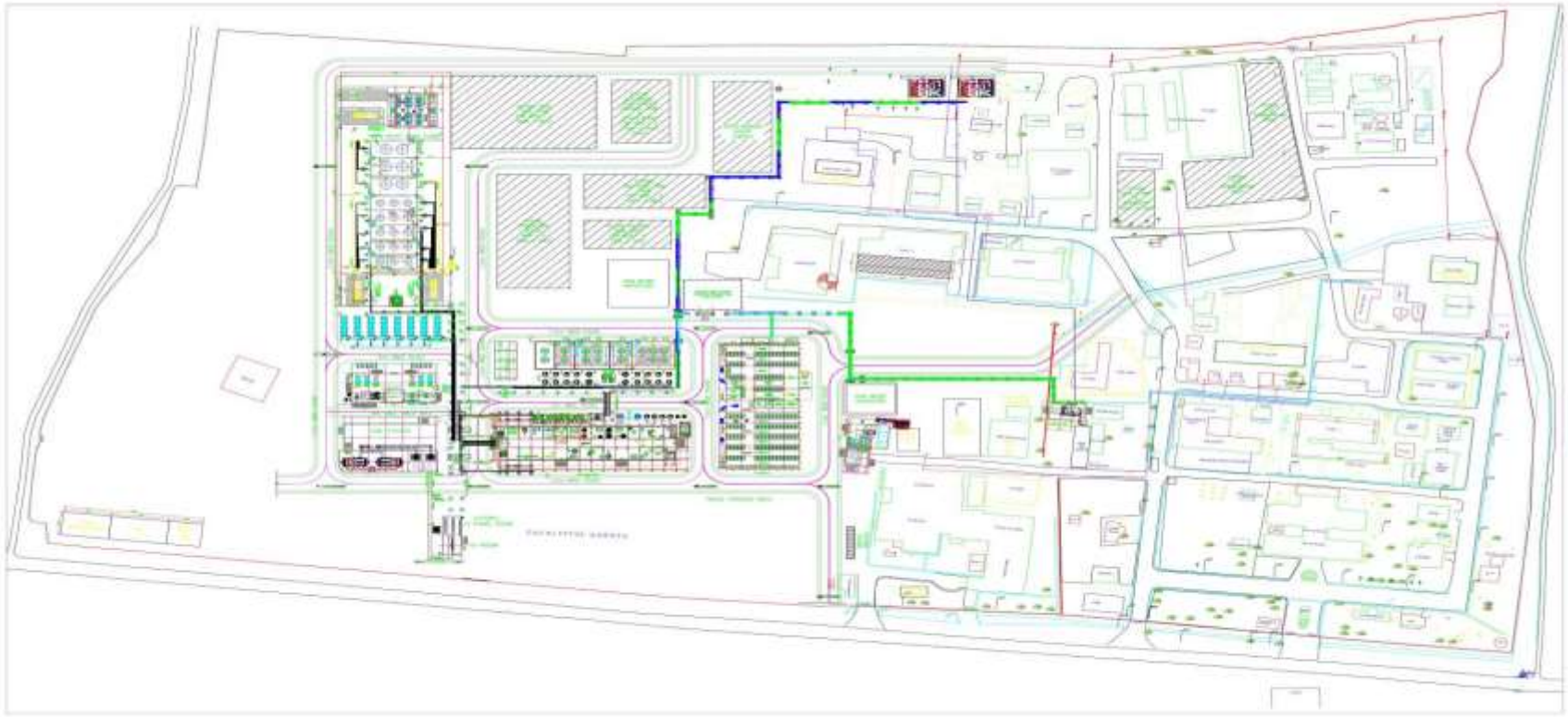
BREAK UP OF DIFFERENT LAND USE OF FACTORY

Sr. No.	land use	Area (sq. mt.)		
		Existing	Proposed	Total
1	Production Plants	33467	23201	56668
2	Parking	40	1160	1200
3	Security Building	20	280	300
4	Effluent Treatment plant	4800	625	5425
5	Utility	460	525	985

6	Raw Material and Finished Products Storage	611	2002	2613
8	Tank Farm Area	6325	4575	10900
9	Green Belt	53400	5400	58800
10	Road	8577	7632	16209
11	Solid waste storage / disposal area	1700	6600	8300
12	Vacant area	57000	-52000	5000
	Total	**166400**	**0**	**166400**

FIGURE – 2.1

LAYOUT OF THE PLANT



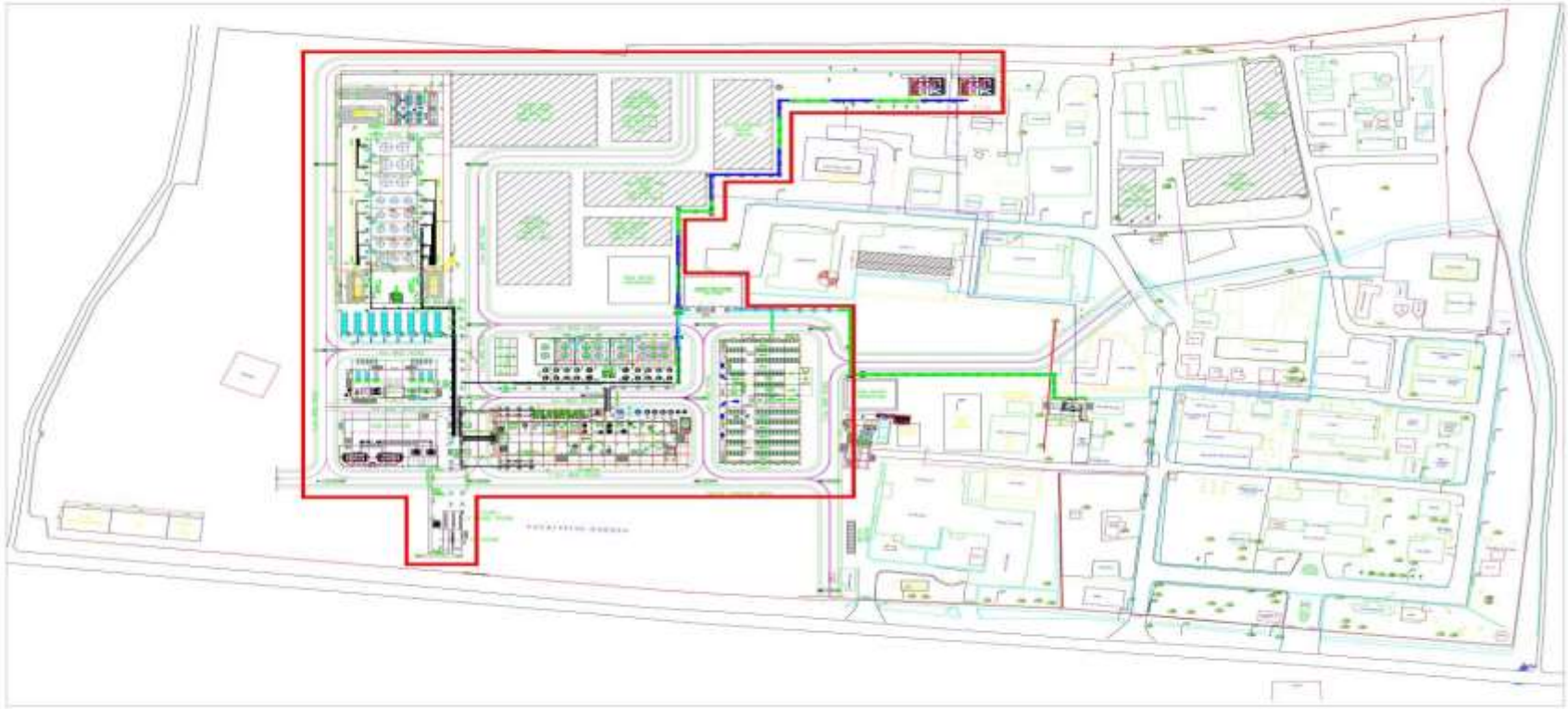
794

GREENBELT WITHIN PLANT PREMISES



Green Belt area

PROPOSED PROJECT AREA



2.2.1 LAND POSSESSION DOCUMENTS. COPY OF NA ORDER SHOWING PERMISSION TO USE THE PROJECT LAND FOR INDUSTRIAL PURPOSE.



9-19 Chemicals & Plastics Ltd

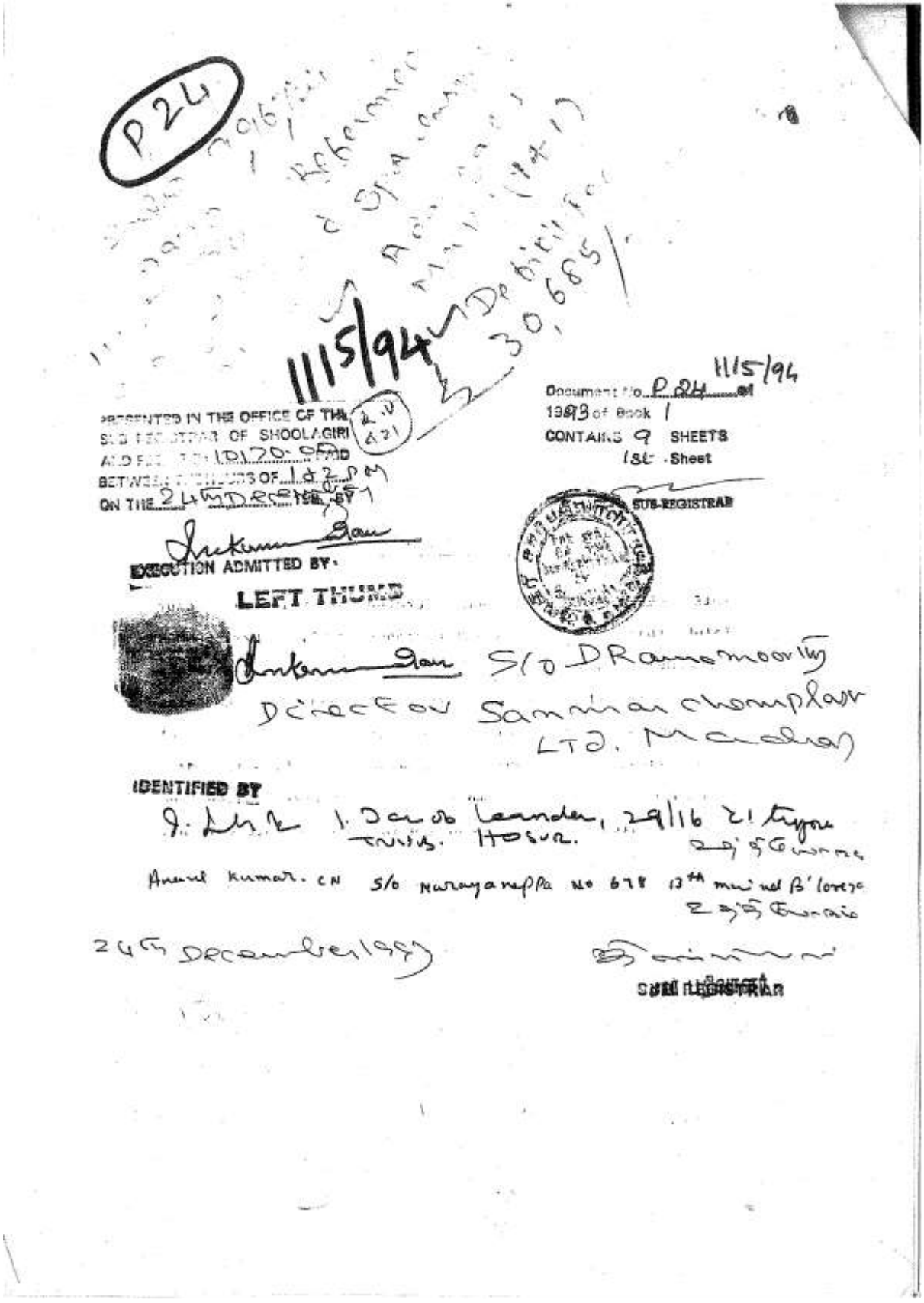
14-1-93

SALE DEED FOR Rs.9,96,734/-

THIS DEED OF ABSOLUTE SALE executed at Sulagiri, Hosur Taluk, this the 24th day of December, 1993, by M/s. SANMAR CHEMPLAST LIMITED (formerly known as Vinyl Investments (Alpha) Limited), a Company incorporated under the Companies Act and having its Registered Office at No.8, Cathedral Road, Madras-600 086, duly represented by its Director, Mr R Sukumaran, son of D Ramamoorthy, hereinafter called the "VENDOR" which term shall mean and include the said Company,

For SANMAR CHEMPLAST LIMITED

DIRECTOR



P24

1115/94

Document No. P 24 of 1115/94
1993 of Book 1
CONTAINS 9 SHEETS
1st Sheet

PRESENTED IN THE OFFICE OF THE
SUB REGISTRAR OF SHOOLAGIRI
AND FEE Rs. 10120.00 PAID
BETWEEN THE HOURS OF 1 & 2 PM
ON THE 24th DECEMBER, 93

SUB-REGISTRAR

EXECUTION ADMITTED BY:

LEFT THUMB

S/o D Ramamoorthy
Director of Sanmar Chemplast
LTD. Madras

IDENTIFIED BY

1. Dasa Leander, 29/16 21 Tigra
ENVIS. HOSUR.

Anand Kumar. CN S/o Narayanappa No 678 13th main rd B'lore-20

24th December 1993

SUB REGISTRAR

its successors-in-title and assigns; TO AND IN FAVOUR OF M/s. CHEMICALS AND PLASTICS INDIA LIMITED, a Company incorporated under the Companies Act and having its Registered Office at No.8, Cathedral Road, Madras-600 086, and represented herein by its Power of Attorney, Mr P Vasudevan, son of .V. Pattabhiraman, hereinafter called the "PURCHASER" which term shall mean and include the said Company, its successors-in-title and assigns; WITNESSETH:

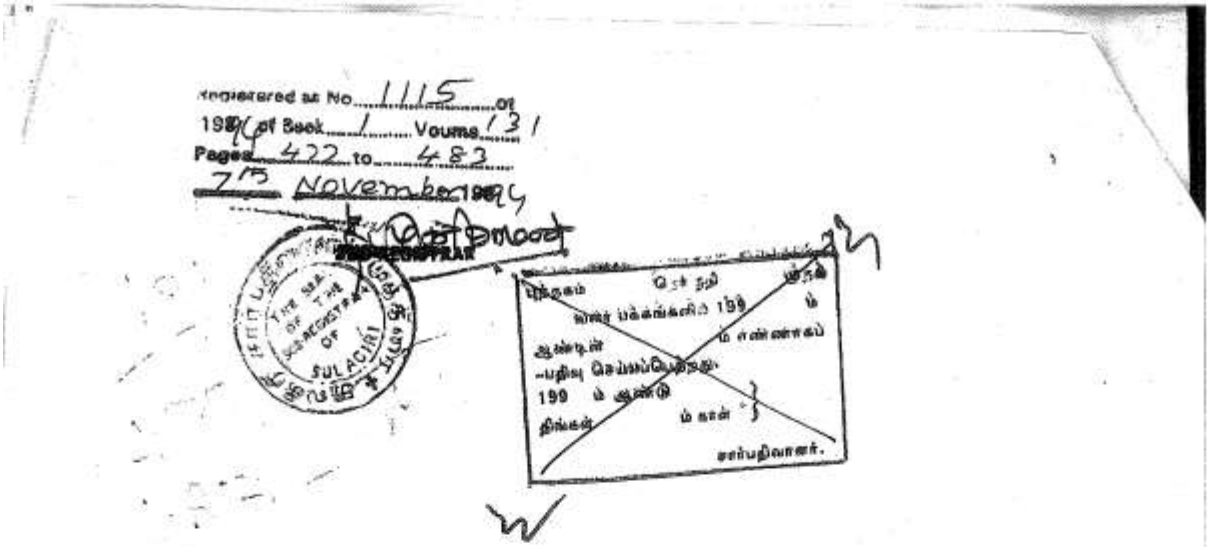
WHEREAS the Vendor herein purchased Punja Lands situated in No.44, Suligunta Village, Hosur Taluk, Dharmapuri District, measuring a total extent of 17.66 Acres under various sale deeds as per details given below and the said sale deeds were registered in the Office of the Sub-Registrar, Shoolagiri:

Sl. No.	Survey No.	Extent A. Cent	Sale Deed Dated	Regn. No. of the Sale Deed
1.	13/1	2.80	28.3.1990	196/1990
2.	12/1B	1.20	28.3.1990	202/1990
3.	7/1	2.60		
	8/1	0.03		
	8/2B	1.09	28.3.1990	203/1990
4.	12/1A	1.25	28.3.1990	204/1990
5.	8/1	1.72		
	9/2	0.40	28.3.1990	209/1990
6.	10/3B	1.40	4.10.1990	682/1990
7.	10/4	2.73	4.10.1990	683/1990
8.	8/2A	0.96	4.10.1990	684/1990
9.	10/3A	1.48	5.10.1990	692/1990
	TOTAL	17.66		

WHEREAS out of the aforesaid lands, the Vendor herein sold an extent of 32 cents out of 2.60 acres comprised in Survey

For SANMAR CHEMPLAST LIMITED

DIRECTOR



Registered as No 1115 of
1994 of Book 1 Volume 131
Pages 422 to 483
7th November 1994

SUB-REGISTRAR

THE SEAL OF THE SUB-REGISTRAR OF SULAGIRI

Note: Two copies have been registered along with this document

1115/94

CONTAINS 9 SHEETS
Final Sheet

SUB-REGISTRAR

-3-

No.7/1 and another extent of 1.80 Acres out of 2.80 acres comprised in Survey No.13/1 in No.44, Suligunta Village, totally measuring an extent of 2.12 Acres, to M/s. Drachem Speciality Chemicals Limited under the Sale Deed dated 28.8.1991 which was registered as Document No.720 of 1991 in the Office of the Sub-Registrar, Shoolagiri;

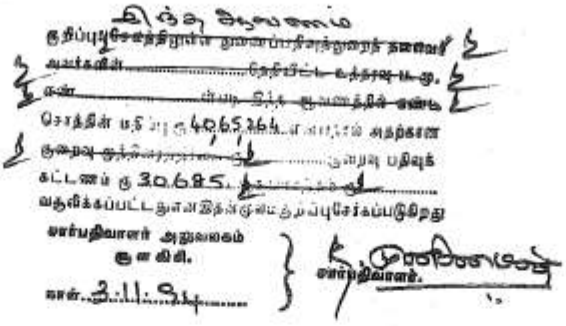
WHEREAS after the aforesaid sale, the Vendor herein owned the remaining lands measuring a total extent of 15.54 Acres or thereabouts;

WHEREAS Mr Khader Sahib and Mrs. Rabia Be requested the Vendor to provide 3.75 Mtrs. wide and 372 Mtrs. long passage to have an access for the land owned by them behind the lands owned by the Vendor herein and they had offered to give in exchange their lands to the Vendor herein and the Vendor had acceded to the said request;

WHEREAS the aforesaid Mr Khader Sahib and Mrs. Rabia Be and the Vendor herein executed a Deed of Exchange on 24.12.1993 and the same was registered in the Office of the Sub-Registrar, Shoolagiri. Under the said Deed of Exchange the Vendor has transferred a total extent of 35.49 cents of land situated in No.44, Suligunta Village to Mr Khader Sahib and Mrs. Rabia Be for using the said land as pathway and the said Mr. Khader Sahib and Mrs. Rabia Be, in exchange, transferred their land comprised in Survey No.9/1 situated in No.44, Suligunta Village, measuring an extent of 35.44 cents or thereabouts in favour of the Vendor herein;

For SANMAR CHEMPLAST LIMITED

DIRECTOR



Document No. 1115/94
1993 of Book 1
CONTAINS 9 SHEETS
3rd Sheet
SUB-REGISTRAR



-4-

WHEREAS after the execution of the aforesaid Deed of Exchange, the Vendor herein is in absolute possession and sole enjoyment of the remaining lands measuring a total extent of 15 Acres and 53.95 Cents or thereabouts, which is more fully described in the Schedule hereunder and which is hereinafter referred to as "Schedule Property", as its absolute owner;

WHEREAS the Vendor offered to sell the Schedule Property to the Purchaser herein for a price of Rs.9,96,734/-(Rupees Nine lacs ninetysix thousand seven hundred and thirtyfour only) , (the Vendor herein is the wholly owned subsidiary of the Purchaser herein) and the Purchaser herein agreed to purchase the Schedule Property for the said price, without any encumbrance whatsoever;

WHEREAS the Vendor has authorised and empowered its Director, Mr R Sukumaran, to execute this sale deed in favour of the Purchaser;

NOW THIS DEED OF ABSOLUTE SALE WITNESSETH AS FOLLOWS:

That in pursuance of the aforesaid agreement and in consideration of the sum of Rs.9,96,734/- (Rupees Nine lacs ninetysix thousand seven hundred and thirtyfour only) already paid by the Purchaser to the Vendor herein, the receipt of which sum the Vendor doth hereby acknowledge and release the Purchaser from any further payments, the Vendor doth hereby sell, transfer and assign unto the Purchaser by way of this Deed of Absolute Sale of that Punja Lands of a

For SANMAR CHEMPLAST LIMITED

DIRECTOR

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total extent of 15 Acres and 53.95 Cents or thereabouts, which is more fully described in the Schedule hereunder, together with all hedges, ridges, ditches, ways, waters, waterways and water courses, and all the easements, privileges, advantages, and appurtenances whatsoever appertaining thereto and all the estate, right, title and interest of the Vendor in and upon the said piece and parcel of lands and every part thereof TO HAVE AND TO HOLD the same unto the Purchaser absolutely and forever free from all encumbrances.

The Vendor hereby assures the Purchaser that the Vendor is absolutely entitled to the Schedule Property hereby conveyed and have full powers to convey the same and that it has not done knowingly suffered any act or thing whereby the Schedule Property hereby conveyed is encumbered or charged in any manner. The Vendor doth hereby declare and assure the Purchaser that the Property described in the Schedule hereby conveyed is not subject to any encumbrance, charge or lien or mortgage or agreement for sale or lispendens or the subject matter of any pending proceedings or litigation or acquisition by State or Central Government or attachment in or by any Court or any Municipal Panchayat or Revenue or other authority.

The Vendor further covenants with the Purchaser that the Purchaser shall and may at all times hereinafter peaceably and quietly possess and enjoy the property described in the Schedule hereunder without any lawful eviction,

For SANMAR CHEMPLAST LIMITED

DIRECTOR

interruption, claim or demand whatsoever from or by the Vendor or any one claiming from, under or in trust for the Vendor and the Vendor shall indemnify and save harmless the Purchaser from injury of any kind on account of any such claim or demand or defect in title or encumbrance over or in relation to the said property described in the Schedule hereunder.

The Vendor hereby undertakes and assures the Purchaser that in case the Purchaser is deprived of the whole or any portion of the property described in the Schedule by reasons of the action in law or any defect in title found in the title of the Vendor or any encumbrance or charge, on the same coming to light, the Vendor shall repay the whole of the sale price or any part of it as shall be proportionate to the portion of the property described in the Schedule so affected.

AND THE VENDOR shall and will from time to time and at all times hereinafter at the request and cost of the Purchaser execute and register and cause to be done or executed and registered all such acts, deeds and things whatsoever for further and more perfectly assuring the said property described in the Schedule unto the Purchaser in the manner aforesaid as shall and may reasonably required.

The Vendor hereby declares that the Vendor shall pay or has paid all taxes, rates, levies, charges, public returns and assessments payable to the Government or any authority in

For SANMAR CHEMPLAST LIMITED

DIRECTOR

respect of the said land hereby conveyed upto the date of registration of this deed and should any taxes, rates, levies, charges, public returns and assessments be found to be due the Vendor undertakes to properly discharge the same.

The Vendor has this day delivered full and complete possession of the Schedule Property to the Purchaser herein. The Vendor has also delivered to the Purchaser all the original documents of title.

SCHEDULE OF PROPERTY

All that piece and parcel of Punja Lands situated in No.44, Suligunta Village, Hosur Taluk, Dharmapuri District, measuring a total extent of 15 Acres and 53.95 cents or thereabouts, comprised in

Survey No.		Extent A. Cent
12 (i.e., 12/1A and 12/1B)	..	2. 44.31
8 (i.e., 8/1, 8/2B & 8/2A)	..	3. 74.45
9/2	..	0. 39.53
7/1	..	2. 28
13/1	..	1. 00
10/3B	..	1. 37.72
10/4	..	2. 67.23
10/3A	..	1. 27.27
9/1	..	0. 35.44
	TOTAL	15. 53.95

and bounded on the

North by : Survey Nos. 2, 9 and 4

East by : Lands belonging to Drachem Speciality Chemicals Limited

For SANMAR CHEMPLAST LIMITED

DIRECTOR

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West by : Survey No.1

South by : Berikai Theertham Road

and situated within the Registration District of Dharmapuri and Sub-Registration District of Shoolagiri.

The Present market value of the Property is Rs.9,96,734/-

IN WITNESS WHEREOF the Vendor has signed, sealed and executed on the day, month and year first above written.

The Common Seal of Sanmar Chemplast Limited has been affixed hereto purusant to a Resolution passed by the Board of Directors of the Company at its meeting held on 5th November, 1993, in the presence of Mr R Sukumaran, Director, and Mr P Vasudevan, Authorised Signatory.

For SANMAR CHEMPLAST LIMITED,

R Sukumaran
Director

P Vasudevan
Authorised Signatory

VENDOR

Witnesses:

1. [illegible] 1. JACOB LEONARD, 2a/16 Village, 24th St. Bryden Road Hosur

2. Anand Kumar. C N
No 618 12th main Road
I Block 5 Stage
west of Chord Road
B. Lore 79

Drafted by:
(S.SUBRAMANIAN)
B.A (Hons). B.L.
ADVOCATE
51 Bheemasena Gardens
Royapettah II Street,
MYLAPORE, MADRAS - 600 004.

-9-

FORM UNDER RULE 3(1) OF THE TAMILNADU STAMP PREVENTION OF UNDERVALUATION OF INSTRUMENT ACT

S. No.	Village	Survey No.	Extent Acre & Cent	Nature of Property	Executants estimate of Market Value
1.	Suligunta	12 (ie, 12/1A and 12/1B)	2. 44.31	Punja	1,75,000=00
2.	"	8 (i.e., 8/1, 8/2B & 8/2A)	3. 74.45	Punja	2,05000=00
3.		9/2	0. 39.53	Punja	30,000=00
4.	"	7/1	2. 28	Punja	1,75,000=00
5.	"	13/1	1. 00	Punja	1,00,000=00
6.	"	10/3B	1. 37.72	Punja	61,734=00
7.	"	10/4	2. 67.23	Punja	1,75,000=00
8.	"	10/3A	1. 27.27	Punja	70,000=00
9.	"	9/1	0. 35.44	Punja	5000=00
		TOTAL	15. 53.95		996734=00

For SANMAR CHEMPLAST LIMITED

DIRECTOR

Signature of the Executant

Recd on 29/03/10
by Post

அனுப்புநர்

திரு.சொ.ஜீவானந்தம், டி.சி.இ.,
நகர் ஊரமைப்பு துணை இயக்குநர்(பொ),
தருமபுரி மண்டலம்,
83, பிடமனேரி ரோடு,
அப்பாவு நகர்,
தருமபுரி - 636 703.

பெறுநர்

ஆணையாளர்,
சூளகிரி ஊராட்சி ஒன்றியம்,
சூளகிரி,
கிருஷ்ணகிரி மாவட்டம்.

ந.க.எண்.143/2010/தம், நாள்.23.03.2010

ஐயா,

பொருள். நிறுவனம் - நகர் ஊரமைப்பு துணை இயக்குநர் அலுவலகம், தருமபுரி மண்டலம் - கிருஷ்ணகிரி மாவட்டம் - ஒசூர் வட்டம் - சூளகிரி ஊராட்சி ஒன்றியம் - சூலிகுண்டா கிராமம் - ச.எண்கள்.5, 7/1,2,3ஏ,3பி, 8/1,2ஏ,2பி,9/1,2,3, 10/1பா,2பா,3ஏ,3பி,4, 12/1ஏ,1பி, 13/1, 14/1ஏ,2ஏ - இடத்தில் அமையவுள்ள கூடுதல் உத்தேச நிறுவன கட்டிட வரைபடங்களுக்கு ஒப்புதல் வழங்குதல் - குறித்து.

பார்வை. 1) ஆணையாளர், சூளகிரி ஊராட்சி ஒன்றியம் கடிதம் ந.க.எண்.885/2009/அ2, நாள் 16.2.2010.
2) மனுதாரர் நன்னிலை வரி, உள்கட்டமைப்பு மற்றும் அடிப்படை வசதி கட்டணம் செலுத்திய விபரம் பெறப்பட்ட நாள் 19.3.2010.

பார்வை (1)ல் கண்ட தங்கள் கடிதத்துடன் பெறப்பட்ட உத்தேச நிறுவன வரைபடங்கள் பரிசீலிக்கப்பட்டு கீழ்கண்டவாறு உத்தரவு வழங்கப்படுகிறது.

1994 ஆம் ஆண்டு ஊராட்சி சட்டத்தில் 160-வது பிரிவின்படி தொழிற்சாலைக் கட்டிடங்களை முறைப்படுத்துவதற்கான பிறப்பிக்கப்பட்ட விதி 8(எ)ன்படி கிருஷ்ணகிரி மாவட்டம் மற்றும் ஒசூர் வட்டம், சூளகிரி ஊராட்சி ஒன்றியம், சூலிகுண்டா கிராமம், ச.எண்கள்.5, 7/1,2,3ஏ,3பி, 8/1,2ஏ,2பி,9/1,2,3, 10/1பா,2பா,3ஏ,3பி,4, 12/1ஏ,1பி, 13/1, 14/1ஏ,2ஏ-ல் அமையும் மனைக்கு ம.வ./ந.ஊ.து.இ(தம)எண். 13/2010 என எண்ணிடப்பட்டு மனை ஒப்புதலும் அம்மனையில் அமையும 2193 H.P. கூடுதல் பரித்திறன் கொண்ட கூடுதல் உத்தேச நிறுவன கட்டிட வரைபடங்களுக்கு தொ.வ.ப./ந.ஊ.து.இ. (தம) எண். 10 அ முதல் ஊ வரை /2010 என எண்ணிடப்பட்டு கீழ்கண்ட நிபந்தனையுடன் ஒப்புதல் அளிக்கப்பட்டு இத்துடன் இணைத்து அனுப்பப்படுகிறது.

நிபந்தனை

ஒப்புதல் அளிக்கப்படும் வரைபடத்தில் இத்துறையின் முன் அனுமதியின்றி மாற்றங்கள் ஏதும் செய்யலாகாது.

23/3/10

நகர் ஊரமைப்பு துணை இயக்குநர்(பொ),
தருமபுரி மண்டலம், தருமபுரி.

23/3/2010

இணைப்பு
வரைபடங்கள் - 2 தொகுப்பு

நகல்
தி/ள சன்மார் ஸ்பெஷாலிட்டி கெமிக்கல்ஸ் லிட்.,
எண். 44 தீர்த்தம் ரோடு,
பேரிகை - 635 105.
ஒசூர் வட்டம்,
கிருஷ்ணகிரி மாவட்டம்.

From

Mr. S. Jeevanandham, D.C.E.,
Assistant Director
District Town and Country Planning Office,
83, Pidamaneri Road,
Appavu Nagar,
Dharmapuri – 636 703

To

The commissioner,
Shoolagiri Panchayat Union, Shoolagiri, Krishnagiri District.

N.K.No.143/2010/T

Dated 23.03.2010

Sir,

Subject:

Company - Office of the Deputy Director of Urban Development, Dharmapuri Zone - Krishnagiri District - Hosur Circle - Shoolagiri Panchayat Union - Shoolagonda village S.Nos.5, 7/1,2,3A,3B, 8/1,2A,2B,9/1, 2,3, 10/1PA, 2PA, 3A, 3B, 4, 12/1A, 1B, 13/1, 14/1A, 2A - Approving additional proposed institutional building plans to be located at the site - Regarding.

Reference: 1) Shoolagiri Panchayat Union letter No.885/2009/A2, dated 16.2.2010.

2) The date of receipt of details of payment of gratuity tax, infrastructure and basic facility fee by the petitioner is 19.3.2010.

The proposed company drawings received along with their letter given in reference (1) are considered and orders are issued as follows.

Pursuant to Rule 8(a) issued for regularization of industrial buildings under Section 160 of the Panchayat Act, 1994, Krishnagiri District and Hosur Circle, Choolagiri Panchayat Union, Chulikunda Village, S.Nos.5,7/1,2,3A,3B, 8/ 1, 2A, 2B, 9/1, 2, 3, 10/1PA, 2PA, 3A, 3B, 4, 12/1A, B, 13/1, 14/1A, 2A land was approved by District Town and Country Planning Office (Dharmapuri) Letter. No. 13/2010 and for additional proposed institutional building plans of 2193 HP capacity located in the said building by was approved by department of Deputy Director of Urban Development, Dharmapuri Zone letter No. 10 A to F of 2010 numbered and approved subject to the following conditions are attached hereto.

Note: No changes shall be made in the drawings to be approved without the prior approval of the department.

Deputy Director (i/c)
District Town and Country Planning,
Dharmapuri

Encl:
Maps -2 sets.
Copy To:
Deputy Director of Urban Development (P.O.), Dharmapuri Zone, Dharmapuri.
Mr. Sanmar Specialty Chemicals Ltd,
No. 44 Theertham Road,Hosur Circle,
Parikai 635105.
Krishnagiri District.

2.3 PROJECT SETTING

M/s. Chemplast Sanmar Limited, **Berigai,** Tamil Nadu is located at longitude 77°59'9.12"E and latitude 12°48'14.27"N. Detailed Layout map of the plant is shown in Figure – 2.2.

Land area of project is 16.64 ha. and this land is developed and used as a non agricultural activity. The buildings are designed considering seismic zone II. The land is plain terrain – no scope of landslide.

There is no protected area, important or sensitive species within 15 kms from the proposed project boundary. Hosur City is about 22 kms away and has a population of about 4.95 lakh.

2.3.1 PROJECT SITE AND PLANT LAYOUT

LOCATION (MAP SHOWING GENERAL LOCATION, SPECIFIC LOCATION AND PROJECT BOUNDARY & PROJECT SITE LAYOUT) WITH COORDINATES.

FIGURE - 2.2

LOCATION OF THE PROJECT SITE

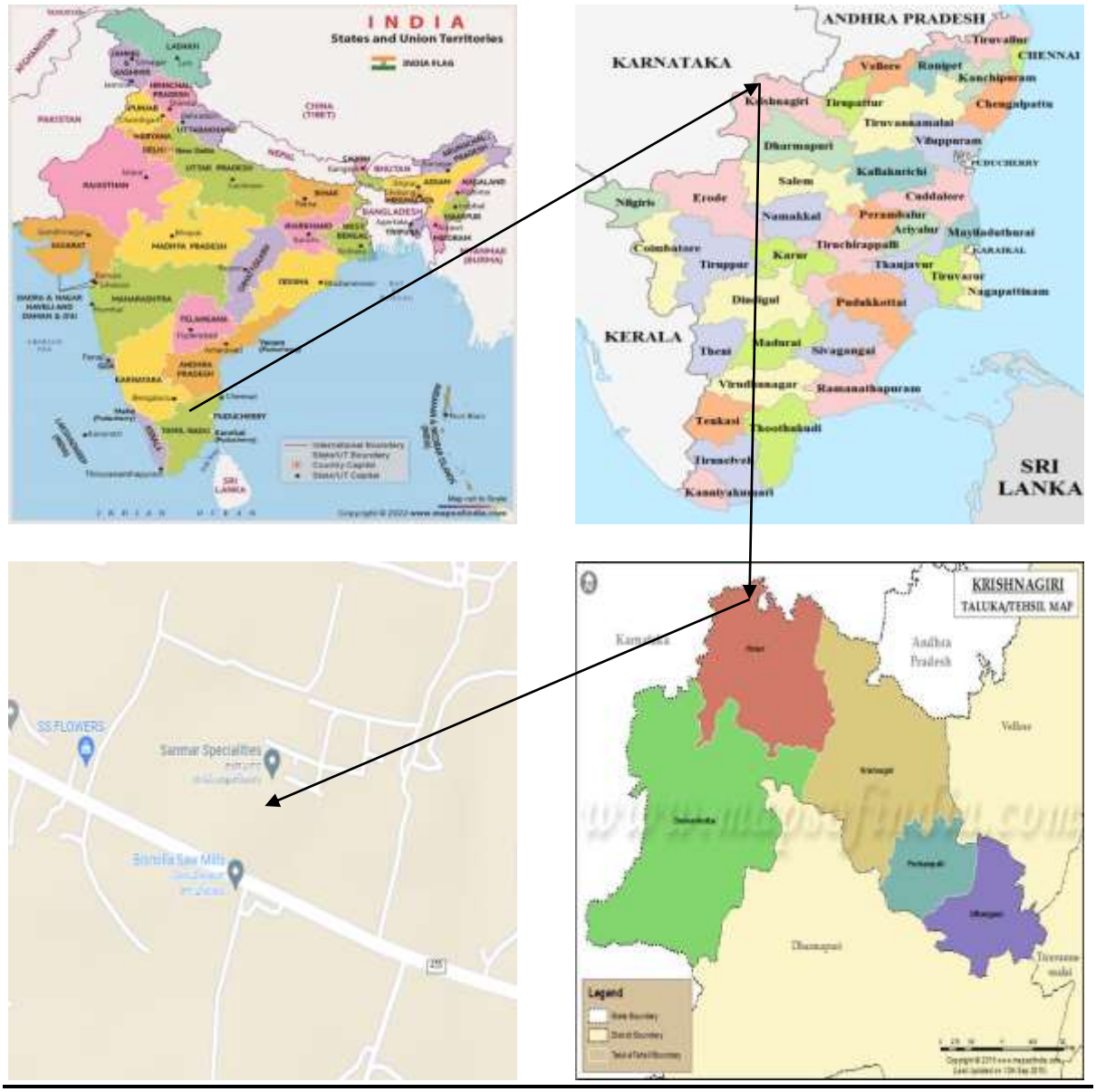


FIGURE - 2.2 (CONT.)

PROJECT SITE ON GOOGLE EARTH





PHOTOGRAPHS OF THE EXISTING PLANT SITE



Process Building



Power and Utilities area



Admin



ETP and STP

PHOTOGRAPHS OF GREENBELT DEVELOPED WITHIN PREMISES:









2.4 LOCATION OF THE PROJECT SITE AND NEAREST HABITATS WITH DISTANCES FROM THE PROJECT SITE TO BE DEMARCATED ON A TOPOSHEET (1: 50000 SCALE).

The Land Use Land Cover study has been carried out for Chemplast Sanmar is located at Berigai, Krishnagiri District, Tamilnadu State, India.

The mapping of Land use Land Cover has been carried out with help of Bhuvan Data and Google Earth Imagery using QGIS Software and verified by reconnaissance survey.

The 10 Km Aerial buffer area was identified in with the help of Lat-Lon using Google Earth Pro. The same area is than identified from Bhuvan database and the both the layers were super imposed using Geo Reference technique in QGIS. Based on Visual interpretation the Land use classes were identified and the same was verified with the help of field survey. The area calculation was also done for each land use classes occurring in that region.

The area of industrial settlements are there in this study area along with it human settlements forms the key infrastructure in this region. As the area is having mainly industrial development the transportation facilities by Road network is quite well developed and it is well connected with villages all over in the study area. Almost every villages in this region is well connected with metalled road network. Apart from road network development the railway also present in the study area.

2.4.1 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE

The distance of railways and National and State highways are presented in Table 2.1 below.

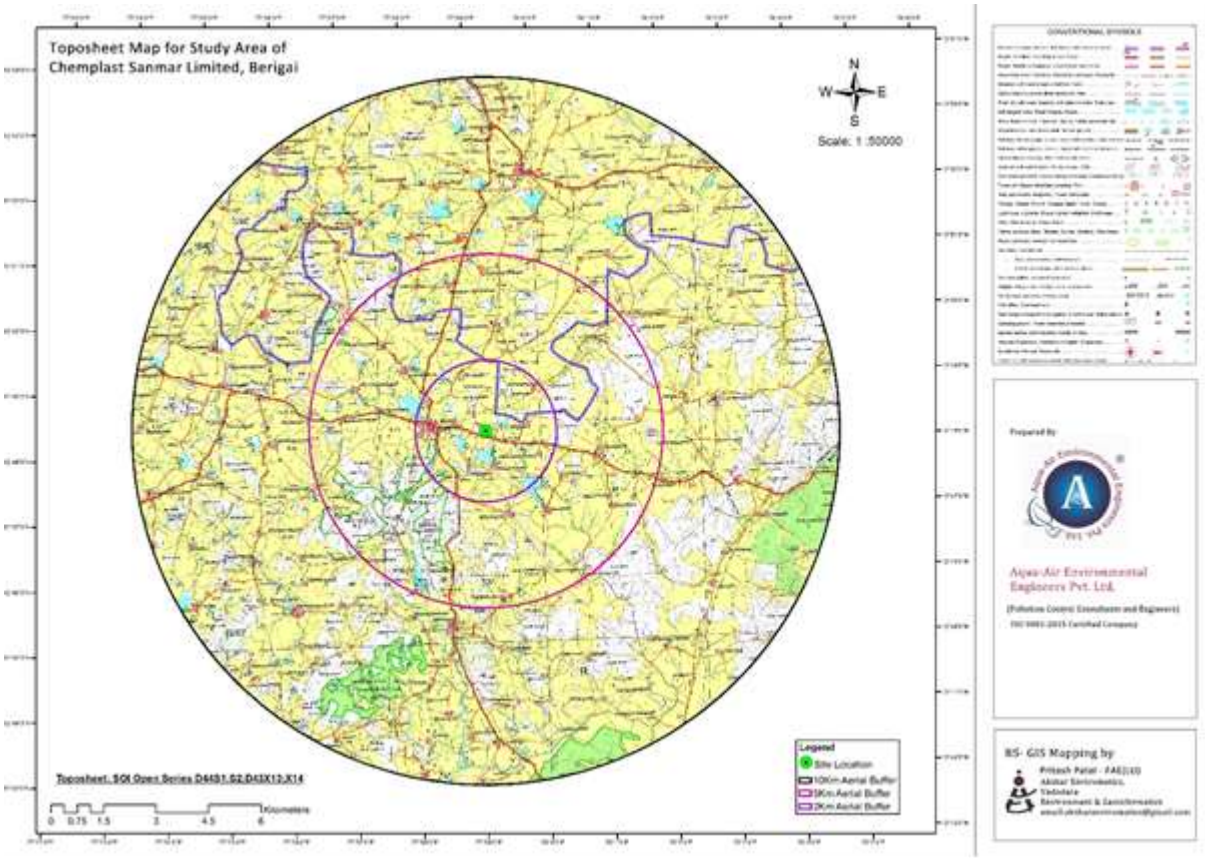
TABLE 2.1

DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE

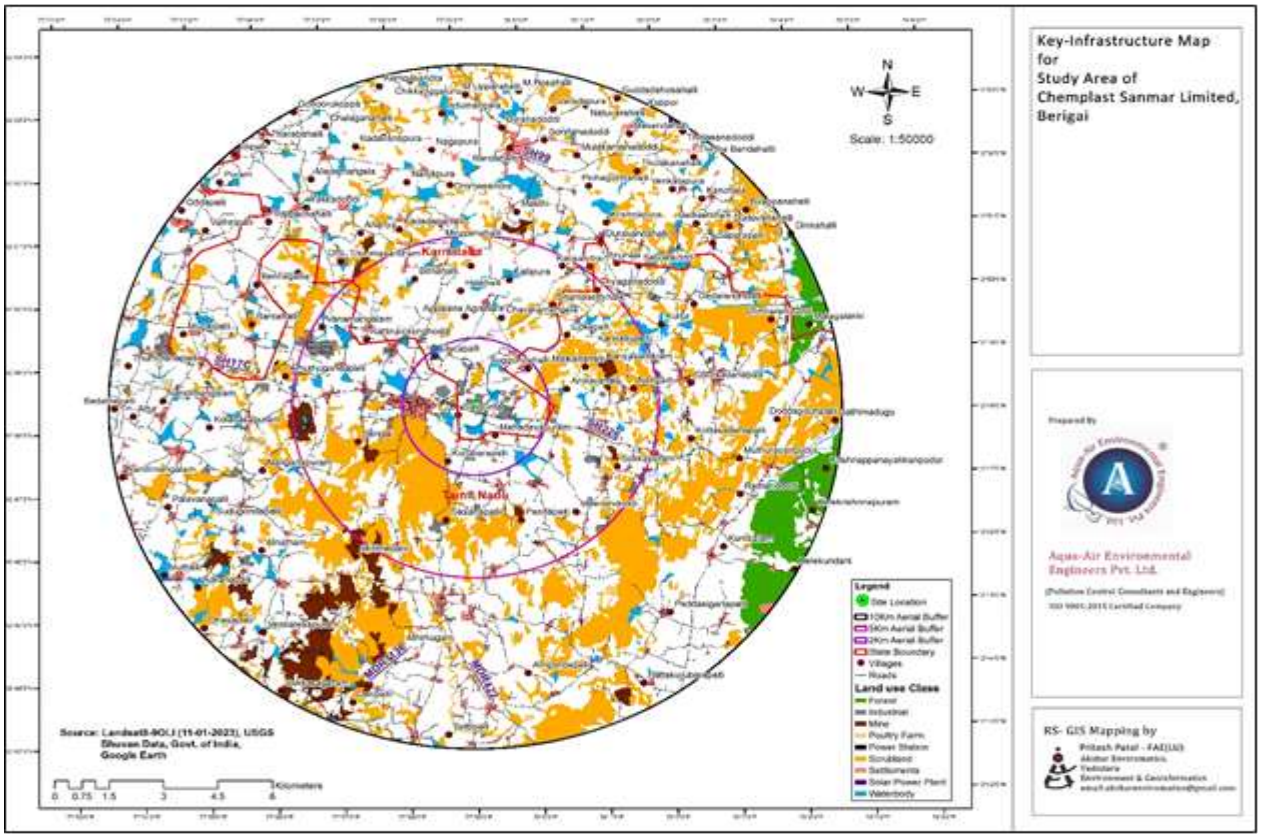
Sr. No.	Nearest Infrastructure Feature	Distance from Project Area
1	Hosur Railway Station	20.28 km South - West
2	National Highway NH-44	14.50 km South - West
3	State Highway SH-17C	7.56 km North-West
4	Hosur town	22 km South - West
5	Krishnagiri District Head quarter	40 km South - East
6	Bengaluru International Airport	52.41 Km North-West
7	Ponnaiayr River	11.35 km South-West

FIGURE – 2.3

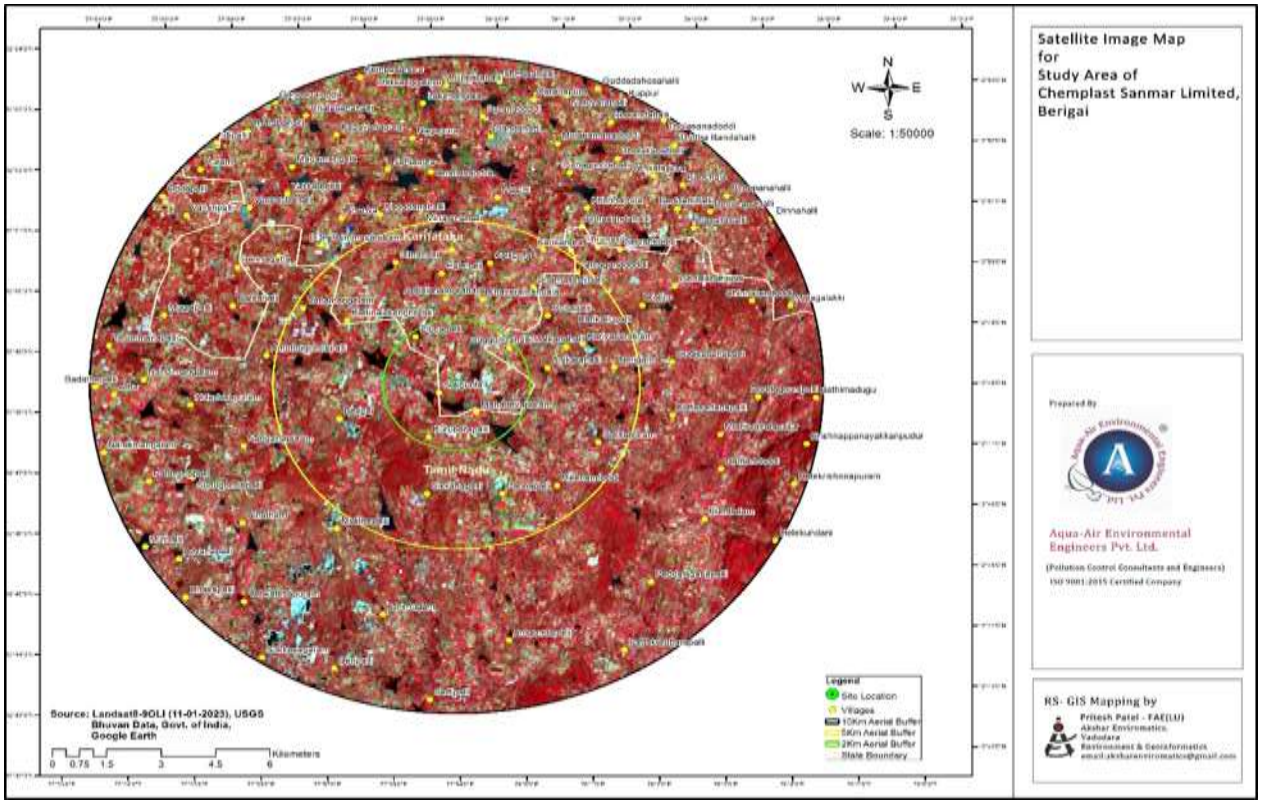
TOPOSHEET



KEY INFRASTRUCTURE



SATELLITE IMAGERY



2.5 TECHNICAL DETAILS OF THE PLANT/S ALONG WITH DETAILS ON BEST AVAILABLE TECHNOLOGIES (BAT), PROPOSED TECHNOLOGY AND REASONS FOR SELECTING THE SAME.

The plant capabilities include the following:

- Glass lined and Stainless steel reactors
- Glass and Stainless Steel Distillation Columns with Structured and Random Packing
- High Pressure Hydrogenation reactors
- Supporting process equipment typically suited for the manufacture of speciality chemicals involving complicated multi-stage synthesis

Utilities

- Stand-by power generation facility
- Brine chilling facilities
- Thermic fluid heating system
- Boiler and compressed air systems
- Chilled water facility

Eco-Friendly Technology for product manufacturing

1. **Usage of Non-fossil fuel source for boiler (Briquettes)**

- replacing the Usage of furnace oil by non-fossil fuel source (Briquettes) for Boiler. Using fossil fuel would generate 2.8 to 3 T of CO2 emission per ton of fuel
- Usage of non-fossil fuel source (Briquettes) is increasing the Energy-efficiency and Reduction of greenhouse gas emissions

2. **Adiabatic Cooling Towers instead of conventional type Cooling Towers**
   We are going with Adiabatic Cooling Towers, which is saving 75% of water consumption with compare to conventional type Cooling Towers. Adiabatic cooler uses wetted pads to pre-cool the ambient air entering the tower. This pre-cooled air is used to cool process water. This helps achieve a lower temperature than the ambient dry bulb temperature.
3. **Low-Power Exercise Equipment -Energy efficient (IE3) motors**

- 93% efficiency as against 88% for conventional IE1 motors
- 5% increase in efficiency

Estimated Power Demand (kW)	Energy consumption/year (GWh)		Energy Saving (GWh)
	88% Efficiency	93% Efficiency	
2000	17	15	2

- 1 GWh electrical energy accounts for releasing 715 tons of CO2 [Source: as per CEA data, Govt. of India.]
- Yearly reduction in CO2 emissions due to IE3 motors: 2 X 715 = 1430 tonnes

4. Variable Speed Drives (VSD)

– Selected IE3 motors are with VSD

Estimated Power Demand (kW)	Energy consumption/year (GWh)		Energy Saving (GWh)
	Without VSD	With VSD	
1565	11	9	2

- 1 GWh electrical energy accounts for releasing 715 tons of CO2 [Source: as per CEA data, Govt. of India.]
- Yearly reduction in CO2 emissions due to VSD: 2 X 715 = 1430 tonnes

5. LED Lighting

Company is going with 100% of LED lightings over the plant, it's better than other by, they are brighter, Require lesser energy to function and Last longer.

– LED lamps consume 20% energy for heating
– Metal halide lamps consume 75% energy

Estimated Power Demand (kW)	Energy consumption/year (GWh)		Energy Saving (GWh)
	Metal halide lamps	LED	
25	0.6	0.3	0.3

- 1 GWh electrical energy accounts for releasing 715 tones of CO2 [Source: as per CEA data, Govt. of India.]
- Yearly reduction in CO2 emissions due to VSD : 0.3 X 715 = 214.5 tonnes

6. Monofluid Temperature Control

- Precise temperature control in addition to reduction in lean waste generation
- By considering cooling water changeover in one 16KL reactor, one 10KL reactor and one final product dryer (three products at a time)

Cooling water drained per day per product	2845	L/day
Cooling water drained per day for all three products	8535	L/day
Cooling water sent to ETP per month as lean waste	85350	L/month

Total reduction of Cooling water as lean waste with MFS per year	1024	KL/year

7. Steam Condensate Recovery System and Flash Steam Recovery System

- Condensate headers are routed to the receiver wherein pressure powered/ mechanical pump transfers the condensate to boiler feed water tank
- High pressure condensate from process will be diverted to a flash vessel to generate LP steam. Thermo compressor option will be validated based on LP pressure

Steam condensate recovery metrics	Qty	Units	Remarks
Condensate available	5600	Kg/hr	80% out of 7000 kg/hr
Total Sensible Heat available	718.24	Mcal/Hr	2.84 MMBTU
Fuel equivalent/Hr	83.6	Kg of FO	13.2 % of boiler fuel consumption/hr
Co2 emission reduction per Annum	2081	MT of CO2	8000 Hrs of operation
Total flash steam available @3.5 bar as LP steam	498	Kg/hr	8% of condensate qty

8. Rainwater harvesting

- Up to 80 % of rainwater goes into underground

9. Double Stage Scrubbing system for all reactors

Double stage scrubbing system for all reactors for reduce the emission from the stack and Reduction of polluting substances and greenhouse gas emissions

10. Scrubber for all open Reactor and Chemical storage

All reactor vent and bulk storage tank vent will be connected with wet scrubbing system for reduce polluting substance to atmosphere.

2.6 PHASE WISE PROJECT IMPLEMENTATION SCHEDULE WITH BAR CHART AND TIME FRAME, IN TERMS OF SITE DEVELOPMENT, INFRASTRUCTURE PROVISION, EMS IMPLEMENTATION ETC.

All activities related to proposed project shall be started soon after getting Environmental Clearance. CTO and CTE will be obtained from the Tamil Nadu State Pollution Control Board.

PROJECT BAR CHART

Schedule																																						
Year	2022						2023												2024												2025			
Activity	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Environment clearance from MoEF																																		
Finalizing of engineering contractor																																		
Basic Engineering																																		
Detailed engineering and placing of order for long lead items																																		
Progressive detailed engineering																																		
Obtaining CTE from local PCB																																		
Site preparation																																		
Construction to mechanical completion																																		
Obtaining CTO from TNPCB																																		
Commissioning																																		
Commercial production																																		

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2.7 CHEMICAL NAME OF EACH PROPOSED PRODUCT TO BE MANUFACTURED. (PROVIDE CAS NUMBER OF ALL THE PRODUCTS & RAW MATERIALS).

TABLE 2.2

LIST OF PRODUCTS WITH PRODUCTION CAPACITY

S.No	PROPOSED PRODUCTS LIST FOR EC	CAS No.	LD50	As per Existing CTE (MTPA)	Additional (MTPA)	Total Proposed (MTPA)	Category
A	**PHYTO CHEMICALS**						
1	COLCHICINE	64-86-8	5.87 mg/kg	1.4	0	1.4	5(f)
2	THIOCOlCHICOSIDE	602-41-5	300 mg/kg				5(f)
B	**ORGANIC CHEMICALS**						
3	2-(1-CYLCOCHEXENY)LETHYLAMINE (CHEA)	3399-73-3	2.5 mg/kg	1600	18400	20000	5(f)
4	3-[1,3,3-TRIS-(2-CARBOXY-ETHYL)-2-OXO-CYCLOHEXYL]-PROPIONIC ACID (T4C)	5107-67-5	36 mg/kg				5(f)
5	SUBSTITUTED ARYL ALKYL AMINE	3625-06-7	1540 mg/kg				5(f)

6	2-AMINO-2-PHENYLBUTYRIC ACID SODIUM SALT /METHYL 2-(N,N-DIMETHYLAMINO)-2-PHENYLBUTYRATE (TR1600/TR1400)	94133-84-3 /39068-93-4	36 mg/kg				5(f)
7	4-CHOLO-BUTYL VERATRATE	69788-75-6	1540 mg/kg				5(f)
8	4-(2-AMINOETHYL)-2-METHOXYPHENOL (AE PHENOL)	554-52-9	5000 mg/kg				5(f)
9	METHYL-2 PHENOXY ISOBUTYRATE	103-60-6	5000 mg/kg				5(f)
10	(4R)- 2- OXOOXAZOLIDINE -4- CARBOXYLIC ACID (COX)	83841-00-3	5000 mg/kg				5(f)
11	4-t BUTYLPHENYLACETONITRILE	3288-99-1	236 mg/kg				5(f)
12	1-BROMO-3,5-DICHLOROBENZENE (DCBB)	19752-55-7	1070 mg/kg				5(f)
13	4-CHLORO-2-NITRO BENZOIC ACID	6280-88-2	71 mg/kg				5(f)
14	4-BROMO PHENYL PROPANOL (BPP)	25574-11-2	1020 mg/kg				5(f)

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15	2-CHLORO-5-CHLOROMETHYL-1,3-THIAZOLE (CCMT)	105827-91-6	1020 mg/kg				5(f)
16	TETRACHLORO BUTYRIC ACID (TCBA)	97055-35-1	2940 mg/kg				5(f)
17	IONOPHOR	133338-85-9	88 mg/kg				5(f)
18	4-BROMO-2-FLUORO HYDROXY BIPHENYL (BFB)	41604-19-7	1540 mg/kg				5(f)
19	PARA METHYL PHENCYL CHLORIDE (PMPC)	2196-99-8	8750 mg/kg				5(f)
20	SODIUM 4-(2,4-DICHLOR M-TOLUOYL)-1,3-DI METHYL -5-PYRAZOLATE (MY710Na)	172343-40-7	8750 mg/kg				5(f)
21	2-TRIFLUOROMETHYL BENZENE SULFONAMIDE (TBSA)	1869-24-5	180 mg/kg				5(f)
22	METHYL CARBAZATE	6294-89-9	5000 mg/kg				5(f)
23	TETRALONE IMINE	79560-20-6	810 mg/kg				5(f)
24	4-[2(4-CHLORO-2,6-DIMETHYLPHENYL)ACETTY L]METHYLAMINO]-1-METHOXY-N-PHENYLPIPERIDIN-4-CARBOXAMIDE (DIAMIDE)	1644459-63-1	5000 mg/kg				5(f)

25	3(2,2,2-TRIFLUOROETOXY)2-PYRIDINE SULFONAMIDE SODIUM SALT (SULFONAMIDE)	227605-94-9	5000 mg/kg				5(f)
26	5-CHLORO-8-HYDROXY-QUINOLINE (CHQ)	130-16-5	5000 mg/kg				5(f)
27	PHENYLGUANIDINE CARBONATE (PGC)	14018-90-7	1000 mg/kg				5(f)
28	FE (III) ACETYL ACETANOATE	14024-18-1	1872 mg/kg				5(f)
29	MANGANESE(II)HEXACYANOMANGANATE(II)SODIUM SALT (ANODE)	Not available	1020 mg/kg				5(f)
30	IRON(II)MANGANESE(II) HEXACYANOFERRATE(II) SODIUM SALT TETRADECAHYDRATE (CATHODE)	Not available	1020 mg/kg				5(f)
31	1-CHLORO-3-NITROBENZENE	121-73-3	1000 mg/kg	0			5(f)
32	2,4,6- TRICHLORO ANILINE	634-93-5	1000 mg/kg				5(f)
33	PIVALOYL CHLORIDE	3282-30-2	5000 mg/kg				5(f)
34	5-CHLORO VALEROYL CHLORIDE	1575-61-7	1000 mg/kg				5(f)

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35	4-FLUORO PHENYL ACETIC ACID	405-50-5	5000 mg/kg				5(f)
36	4-BROMO FLUOROBENZENE	460-00-4	2700 mg/kg				5(f)
37	3-FLUOROTOLUENE	352-70-5	7000 mg /kg				5(f)
38	4-FLUOROTOLUENE	352-32-9	7000 mg /kg				5(f)
39	ORTHO NITRO ANISOLE	91-23-6	2000 mg/kg				5(f)
40	PARA NITRO ANISOLE	100-17-4	2300 mg/kg				5(f)
41	O-CHLORO P-NITRO TOLUENE	121-86-8	1400 mg/kg				5(f)
42	3-AMINO- 4- METHYL BENZOIC ACID METHYL ESTER	40872-87-5	1700 mg/kg				5(f)
43	3-AMINO 4-METHYL BENZOIC ACID ISOPROPYL ESTER	21447-47-2	2000 mg/kg				5(f)
44	5-AMINO-2-METHYL BENZENE SULPHONIC ACID PHENYL ESTER	1089339-15-0	1400 mg/kg				5(f)
45	(3-AMINOPHENYL) BENZENESULFONATE	26408-93-5	1400 mg/kg				5(f)
46	4 -AMINO BENZOIC ACID METHYL ESTER	619-45-4	1700 mg/kg				5(f)

47	2-FLUOROANISOLE	321-21-8	3700 mg/kg				5(f)
48	4-FLUOROANISOLE	459-60-9	3700 mg/kg				5(f)
49	2-PHENOXYETHYLAMINE	1758-46-9	800 mg/kg				5(f)
50	SPIROPIDION (TINIVION)	1229023-00-0	1000 mg/kg				5(b)
51	4-AMINO BENZAMIDE	2835-68-9	1500 mg/kg				5(f)
52	P-TOLUIDINE	106-49-0	1400 mg/kg				5(f)
53	M-ANISIDINE	536-90-3	1400 mg/kg				5(f)
54	4-CHLORO,2 AMINO PHENOL (4-CAP)	95-85-2	1400 mg/kg				5(f)
55	HYDROXY ESTER (HES)	27513-35-5	1400 mg/kg				5(f)
56	PARA CHLORO PHENYL GLYCINE (PCPG)	6212-33-5	1400 mg/kg				5(f)
57	DICHLOROFLUOROBROMO BENZENE (DCFBB)	17318-08-0	1400 mg/kg				5(f)
58	4-ACETYL-2-METHYL BENZOIC ACID (AMBA)	55860-35-0	1400 mg/kg				5(f)
C	**R&D PRODUCTS**						
	R&D and Pilot scale Products	--	--	00	30	30	--
	Total			**1601.4**	**18430**	**20031.4**	

D	BY-PRODUCTS						
1	Dil. Hydrochloric Acid	--	--	1050	12090	13140	--
2	Dil. Sulphuric Acid	--	--	750	8630	9380	--
3	Dil. Acetic acid	--	--	00	22000	22000	--
4	Potassium salt	--	--	00	11400	11400	--

2.8 DETAILS ON RAW MATERIALS, SOURCE AND STORAGE WITHIN THE PREMISES.

TABLE 2.3

LIST OF RAW MATERIAL

S. No.	Proposed products list for EC	Raw material	CAS	TPA	Mode of Transport	Distance from project site (Km)	Type of Linkage
A	**PHYTO CHEMICALS**						
1	COLCHICINE	Caustic Soda	1310-73-2	1.134	Road	157	Local
		Hyflo	68855-54-9	1.778	Road	1060	Local
		Sodium Chloride	7440-23-5	1.638	Road	1060	Local
		Acetic acid	64-19-7	0.196	Road	1060	Local
		Activated carbon	7440-44-0	0.224	Road	60	Local
		Chloroform	67-66-3	10.64	Road	157	Local
		DNS	609-99-4	11.97	Road	1060	Local
		Ethyl acetate	141-78-6	5.67	Road	60	Local
		Hexane	110-54-3	1.778	Road	1060	Local
		Methanol	67-56-1	15.12	Road	1060	Local
2	THIOCOlCHICOSIDE	Caustic Soda	1310-73-2	3.5	Road	157	Local
		Calcium carbonate	471-34-1	2.52	Road	160	Local
		Hyflo	68855-54-9	1.08	Road	1060	Local

		Sodium Carbonate	497-19-8	2.31	Road	1060	Local
		Sodium Chloride	7440-23-5	9.11	Road	1060	Local
		Sodium methyl mercaptide	5188-7-8	1.92	Road	1060	Local
		Sodium Hypochlorite	7681-52-9	16.91	Road	407	Local
		Acetic acid	64-19-7	2.13	Road	1060	Local
		Activated Carbon	7440-44-0.	0.62	Road	60	Local
		Chloroform	67-66-3	65.8	Road	157	Local
		DNS	609-99-4	42.7	Road	1060	Local
		Ethyl acetate	141-78-6	3.36	Road	60	Local
		G.S. Seed	NA	377.86	Road	50	Local
		Hexane	110-54-3	4.72	Road	1060	Local
		Isopropyl alcohol	67-63-0	7.49	Road	60	Local
		Methanol	67-56-1	16.56	Road	1060	Local
B	ORGANIC CHEMICALS						
3	2-(1-CYLCOCHEXENY)LETHYLAMINE (CHEA)	Cyano Acetic acid	99 372-09-8	20520	Sea/Air	8597	Import
		Cyclohexanone	108-94-1	26000	Road	60	Local
		Hydrogen	1333-74-0	1300	Road	157	Local
		Ammonium acetate	631-61-8	140	Road	60	Local
		Toluene	108-88-3	120	Road	60	Local
		Ammonium gas	7664-41-7	1300	Road	30	Local

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		Raney cobalt	7440-48-4	60	Road	1060	Local
4	3-[1,3,3-TRIS-(2-CARBOXY-ETHYL)-2-OXO-CYCLOHEXYL]-PROPIONIC ACID (T4C)	TBA	75-65-0	9900	Road	1060	Local
		Acrylonitrile	107-13-1	19000	Road	1060	Local
		Potassium Hydroxide	1310-58-3	1000	Road	1060	Local
		Cyclohexanone	108-94-1	7800	Road	1060	Local
		Caustic soda	1310-73-2	7500	Road	157	Local
		Hydrochloric acid	7647-01-0	20000	Road	157	Local
		Hyflo+ Activated carbon	7440-44-0.	400	Road	1060	Local
5	SUBSTITUTED ARYL ALKYL AMINE	4-Methoxy phenyl acetone	122-84-9	18220	Road	1060	Local
		Mono Ethyl amine	75-04-7	13340	Road	1060	Local
		Hydrogen	1333-74-0	300	Road	157	Local
		Pd/c	7440-05-3	40	Air	1792	Local
6	2-AMINO-2-PHENYLBUTYRIC ACID SODIUM SALT /METHYL 2-(N,N-DIMETHYLAMINO)-2-PHENYLBUTYRATE (TR1600/TR1400)	Toluene	108-88-3	16880	Road	60	Local
		DMS	77-78-1	13600	Road	60	Local
		Methanol	67-56-1	4000	Road	1060	Local
		Ammonium carbonate	506-87-6	23600	Road	60	Local
		Sodium hydroxide	1310-73-2	33200	Road	157	Local
		Formic acid	64-18-6	16000	Road	60	Local
		Formaldehyde	50-00-0	19800	Road	60	Local
		Propiophenone	93-55-0	14800	Road	1060	Local
		Sodium cyanide	143-33-9	5020	Road	1346	Local

7	4-CHOLO-BUTYL VERATRATE	3,4-Dimethoxy Benzoic acid	93-07-2	21000	Road	1060	Local
		Thionyl chloride	98 7719-09-7	17600	Road	1060	Local
		EDC	25952-53-8	21000	Road	60	Local
		Tetrahydrofuran	109-99-9	11000	Road	60	Local
		Zinc chloride	7646-85-7	1000	Road	60	Local
		Sodium bicarbonate	144-55-8	3400	Road	60	Local
		Toluene	108-88-3	12600	Road	60	Local
8	4-(2-AMINOETHYL)-2-METHOXYPHENOL (AE PHENOL)	Vanilin	121-33-5	21200	Sea	8192	Import
		Sodium cyanide	143-33-9	9600	Road	1346	Local
		Sulphuric acid	7664-93-9	19600	Road	280	Local
		MTBE	1634-04-4	21200	Road	813	Local
		Chloro acetic acid	79-11-8	400	Road	60	Local
		Methanol	67-56-1	21600	Road	1060	Local
		Palladium carbon	7440-05-3	400	Road	1792	Local
		Sodium hydroxide	1310-73-2	10600	Road	157	Local
		Hydrogen	1333-74-0	800	Road	157	Local
9	METHYL-2 PHENOXY ISOBUTYRATE	Phenol	108-95-2	16800	Road	1060	Local
		Sodium methoxide	108-95-2	10200	Road	1060	Local
		Toluene	108-88-3	17600	Road	60	Local
		Methyl -2-Bromo iso utyrate	547-63-7	23400	Road	1060	Local
		Caustic soda	1310-73-2	2800	Road	157	Local

10	(4R)- 2-OXOOXAZOLIDINE - 4- CARBOXYLIC ACID (COX)	D-serine	312-84-5	16020	Sea	8100	Import
		Dimethyl carbonate	616-38-6	13780	Road	1060	Local
		Potassium methoxide 32 % in Methanol	865-33-8	10680	Road	1060	Local
		Hydrochloric acid	7647-01-0	5560	Road	157	Local
		MIBK	108-10-1	7260	Road	1060	Local
		Acetone	67-64-1	22200	Road	1060	Local
11	4-t BUTYLPHENYLACETONITRILE	4-tert butylbenzaldehyde	97 939-97-9	18800	Road	1660	Local
		Hydrogen	1333-74-0	200	Road	157	Local
		Hydrochloric Acid	7647-01-0	4200	Road	157	Local
		Sodium cyanide	143-33-9	5600	Road	1660	Local
12	1-BROMO-3,5-DICHLOROBENZENE (DCBB)	3,5 Dichloroaniline	626-43-7	14400	Road	1660	Local
		Hydrobromicacid	7647-01-0	14400	Road	1060	Local
		Sodium nitrite	7632-00-0	6200	Road	1451	Local
13	4-CHLORO-2-NITRO BENZOIC ACID	4-Chloro-2-Nitro toluene	89-59-8	15200	Road	1660	Local
		Potasium permanganate	7722-64-7	28400	Road	1060	Local
14	4-BROMO PHENYL PROPANOL (BPP)	4-Bromo benzyl bromide	589-15-1	15200	Sea/Air	8597	Import
		Diethyl malonate	105-53-3	9800	Road	1207	Local
		Sodium methoxide	124-41-4	3200	Road	1060	Local
		Benzene	71-43-2	2000	Road	1060	Local

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		potassium Hyodroxide	1310-58-3	4200	Road	1060	Local
		Hydrochloric acid	7647-01-0	22600	Road	157	Local
		Bromo phenyl propionic acid	1643-30-7	15600	Sea	8597	Import
		Thionyl chloride	7719-09-7	28000	Road	1660	Local
		Methanol	67-56-1	14000	Road	1060	Local
15	2-CHLORO-5-CHLOROMETHYL-1,3-THIAZOLE (CCMT)	2,3-Dichloro propane	78-88-6	16600	Sea	8597	Import
		Sodium Thiocyanate	540-72-7	12200	Sea	8597	Import
		Sulfuryl chloride	7791-25-5	36000	Road	1660	Local
16	TETRACHLORO BUTYRIC ACID (TCBA)	Carbon tetra chloride	56-23-5	13600	Road	157	Local
		Acetonitrile	75-05-8	4800	Road	1060	Local
17	IONOPHOR	Dicyclohexyl amine	101-83-7	14000	Road	1060	Local
		Chloro acetyl chloride	98 79-04-9	8800	Road	1660	Local
18	4-BROMO-2-FLUORO HYDROXY BIPHENYL (BFB)	4-bromo-2- Fluoro Biphenyl	41604-19-7	17200	Road	8597	Local
		Acetylchlorite	75-36-5	5400	Road	1060	Local
		Bromine	7726-95-6	2000	Road	1060	Local
		Nitro benzene	98-95-3	2000	Road	1660	Local
		Hydrogen peroxide	7722-84-1	22200	Road	157	Local
		Sodium Hydroxide	1310-73-2	5400	Road	157	Local
19	PARA METHYL	Toluene	108-88-3	11000	Road	60	Local

	PHENCYL CHLORIDE (PMPC)	Chloro acetyl chloride	98 79-04-9	13400	Road	1660	Local
20	SODIUM 4-(2,4-DICHLOR M-TOLUOYL)-1,3-DI METHYL -5-PYRAZOLATE (MY710Na)	2,6-Dichloro toluene	99 118-69-4	10000	Road	1660	Local
		Carbon tetrachloride	99 56-23-5	9600	Road	157	Local
		1,3-Dimethyl pyrazolone	2749-59-9	7000	Sea	8597	Import
		Sodium carbonate	497-19-8	6600	Road	39	Local
21	2-TRIFLUOROMETHYL BENZENE SULFONAMIDE (TBSA)	2-Aminobenzotrifluoride	88-17-5	13200	Road	1030	Local
		Sodium nitrite	7632-00-0	11200	Road	1451	Local
		Thionyl chloride	98 7719-09-7	9800	Road	1660	Local
		Sodium Meta bi sulphite	7681-57-4	2000	Road	60	Local
		HCl	7647-01-0	58200	Road	157	Local
		Ammonia solution	1336-21-6	21400	Road	30	Local
22	METHYL CARBAZATE	Dimethyl carbonate	616-38-6	20000	Road	60	Local
		Hydrazine hydrate	7803-57-8	11200	Road	60	Local
23	TETRALONE IMINE	1-Naphthol	90-15-3	10000	Sea/Air	8597	Import
		1,2-dichloro benzene	95-50-1	10000	Sea/Air	8597	Import
24	4-[2(4-CHLORO-2,6-DIMETHYLPHENYL)	MTA HCl	593-56-6	11200	Sea/Air	8597	Import
		Methyl acrylate	96-33-3	15800	Sea/Air	8597	Import

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	ACETTYL]METHYLAMINO]-1-METHOXY-N-PHENYLPIPERIDIN-4-CARBOXAMIDE (DIAMIDE)	CDPAA	76811-97-7	10800	Sea/Air	8597	Import
		Phenyl isonitrile	931-54-4	7600	Sea/Air	8597	Import
		Methyl amine	74-89-5	4200	Road	1060	Local
		Dimethylaniline	75-21-8	4000	Road	60	Local
		Chlorobenzene	108-90-7	6000	Sea/Air	8597	Import
		Sodium bromide	7647-15-6	2000	Sea/Air	8597	Import
		Magnesium	7439-95-4	6000	Road	606	Local
		Ethylene oxide	75-21-8	3000	Road	1060	Local
		4-Acetamido TEMPO catalyst	14691-89-5	200	Sea/Air	8597	Import
		Psuedocumene	95-63-6	400	Road	1008	Local
		MTAAC	79-20-9	4400	Road	1060	Local
25	3(2,2,2-TRIFLUOROETOXY) 2-PYRIDINE SULFONAMIDE SODIUM SALT (SULFONAMIDE)	Trifluoroethanol	75-89-8	11200	Sea/Air	8597	Import
		Methanesulfonyl chloride	124-63-0	12800	Sea/Air	8597	Import
		Triethylamine	121-44-8	11400	Road	1060	Local
		Furfurylomine	617-89-0	14800	Road	1060	Local
		n-Butanol	71-36-3	2000	Road	1060	Local
		Chlorine gas	7782-50-5	15800	Road	157	Local
		Sodium hydroxide	1310-73-2	35000	Road	157	Local
		Sodium Hypo chloride	7681-52-9	11600	Road	157	Local
		Hydrochloric acid	7647-01-0	25600	Road	157	Local

		Ethyl ester (TFEMS)	533-23-3	16800	Sea/Air	8597	Import
		Isopropyl mercaptan	75-33-2	6000	Road	1060	Local
		n-Heptane	142-82-5	2000	Road	1060	Local
		pottasium hydroxide	1310-58-3	4400	Road	60	Local
		Ammonia	1336-21-6	1200	Road	30	Local
26	5-CHLORO-8-HYDROXY-QUINOLINE (CHQ)	4 Chloro 2-amino phenol	95-85-2	16000	Road	1660	Local
		Glycerol	56-81-5	10200	Road	1060	Local
		Sulphuric acid	7664-93-9	41020	Road	280	Local
		Sodium hydroxide	1310-73-2	4400	Road	157	Local
		Acetone	67-64-1	20000	Road	1660	Local
27	PHENYLGUANIDINE CARBONATE (PGC)	Aniline	62-53-3	10600	Road	1660	Local
		Hydrochloric Acid	7647-01-0	4200	Road	157	Local
		30% Cyanamide soln	420-04-2	4800	Sea/Air	8597	Import
		Sodium carbonate	497-19-8	6000	Road	39	Local
28	FE (III) ACETYL ACETANOATE	Acetylacetone	123-54-6	17000	Road	60	Local
		Iron III chloride	7705-08-0	9200	Road	1660	Local
		Ammonium hydroxe soln	1336-21-6	2000	Road	30	Local
29	MANGANESE(II)HEXACYANOMANGANATE(II)SODIUM SALT (ANODE)	Manganese acetate tetra hydrate	6156-78-1	13000	Road	1060	Local
		Sodium cyanide	143-33-9	9400	Road	1660	Local
30	IRON(II)MANGANESE(II)	Iron sulfate hydrate	13463-43-9	13400	Road	1660	Local

	HEXACYANOFERRATE(II) SODIUM SALT TETRADECAHYDRATE (CATHODE)	Sodium Ferro cyanide decahydrate	14434-22-1	4200	Road	1660	Local
		Manganese sulfate monohydrate	10034-96-5	2800	Road	60	Local
		Sodium sulfate	7757-82-6	2200	Road	60	Local
31	1-CHLORO-3-NITROBENZENE	Nitro benzene	98-95-3	15600	Road	1660	Local
		Chlorine	7782-50-5	9000	Road	157	Local
		Sodium hydroxide	1310-73-2	5000	Road	157	Local
32	2,4,6- TRICHLORO ANILINE	Aniline	62-53-3	9480	Road	1660	Local
		Chlorine	7782-50-5	21640	Road	157	Local
		Sodium hydroxide	1310-73-2	12220	Road	157	Local
33	PIVALOYL CHLORIDE	Thionyl chloride	98 7719-09-7	19720	Road	1660	Local
		Pivalic Acid	75-98-9	16920	Road	1060	Local
		Sodium hydroxide	1310-73-2	6600	Road	157	Local
34	5-CHLORO VALEROYL CHLORIDE	Aluminium chloride powder	7446-70-0	14000	Road	1660	Local
		Valeroyl chloride	638-29-9	13600	Sea/Air	8597	Import
		Solvent (MCB)	108-90-7	13600	Road	60	Local
35	4-FLUORO PHENYL ACETIC ACID	Para fluorobenzaldehyde	459-57-4	16000	Sea/Air	8597	Import
		H2 gas	1333-74-0	200	Road	157	Local
		Phosphorus tribromide	7789-60-8	11800	Sea/Air	8597	Import
		Soda ash	497-19-8	5000	Road	39	Local

		Sodium cyanide	143-33-9	6400	Road	1660	Local
		Sodium hydroxide	1310-73-2	5200	Road	157	Local
		Sulfuric acid	7664-93-9	6400	Road	280	Local
36	4-BROMO FLUOROBENZENE	FluoroBenzene	462-06-6	10980	Sea/Air	8597	Import
		Bromine	7726-95-6	18260	Road	1060	Local
		Sodium hydroxide	1310-73-2	4580	Road	157	Local
37	3-FLUOROTOLUENE	m-Toluidine	108-44-1	19460	Sea/Air	8597	Import
		HF	7664-39-3	3620	Road	269	Local
		Solid NaNO2	7632-00-0	12520	Road	1660	Local
		Hydrochloric acid	1310-73-2	6620	Road	157	Local
38	4-FLUOROTOLUENE	P-Toluidine	106-49-0	19460	Sea/Air	8597	Import
		HF	7664-39-3	3620	Road	269	Local
		Solid NaNO2	7632-00-0	12520	Road	1660	Local
		Hydrochloric acid	1310-73-2	6620	Road	157	Local
39	ORTHO NITRO ANISOLE	ONCB	88-73-3	20600	Road	1660	Local
		Methanol	67-56-1	4180	Road	1060	Local
		Caustic Flakes	1310-73-2	16480	Road	157	Local
40	PARA NITRO ANISOLE	PNCB	100-00-5	20600	Road	1660	Local
		Methanol	67-56-1	4180	Road	1060	Local
		Caustic Flakes	1310-73-2	16480	Road	157	Local
41	O-CHLORO P-NITRO TOLUENE	P-Nitro Toluene	99-99-0	15980	Road	1660	Local
		Chlorine gas	7782-50-5	8260	Road	157	Local
		Sodium hydroxide	1310-73-2	4640	Road	157	Local

		Methanol	67-56-1	20000	Road	1060	Local
42	3-AMINO- 4-METHYL BENZOIC ACID METHYL ESTER	3- Nitro -4- Methyl Benzoic Acid	618-95-1	19140	Sea/Air	8597	Import
		Methanol	67-56-1	6360	Road	1060	Local
		Iron Powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	220	Road	157	Local
43	3-AMINO 4-METHYL BENZOIC ACID ISOPROPYL ESTER	3- Nitro -4- Methyl Benzoic Acid	618-95-1	19140	Sea/Air	8597	Import
		Iso Propyl Alcohol	67-63-0	6360	Road	60	Local
		Iron Powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	220	Road	157	Local
44	5-AMINO-2-METHYL BENZENE SULPHONIC ACID PHENYL ESTER	2- Methyl -5- Nitro Benzene Sulphonyl Chloride	1694-92-4	17000	Sea/Air	8597	Import
		Phenol	108-95-2	6780	Road	1060	Local
		Sodium Hydroxide	1310-73-2	14140	Road	157	Local
		Iron Powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	140	Road	157	Local
		Sulphuric acid	7664-93-9	13800	Road	280	Local
45	(3-AMINOPHENYL) BENZENESULFONATE	3- Nitro Phenol	554-84-7	11340	Road	1660	Local
		Benzene Sulfonic Acid	98-11-3	14400	Road	1660	Local
		Sodium Hydroxide	1310-73-2	14520	Road	157	Local
		Iron Powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	160	Road	157	Local

841

		Sulfuric acid	7664-93-9	13800	Road	280	Local
46	4 -AMINO BENZOIC ACID METHYL ESTER	4 - Nitro Benzoic Acid	98 62-23-7	23020	Road	1660	Local
		Methanol	67-56-1	4420	Road	1060	Local
		Sulfuric Acid	7664-93-9	29744	Road	280	Local
		Iron Powder	1310-73-2	20	Road	1660	Local
		Solvent - ODCB	497-19-8	28000	Road	1660	Local
		Sodium Hydroxide	1310-73-2	24244	Road	157	Local
47	2-FLUOROANISOLE	2-Bromo Fluoro Benzene	95-50-1	27760	Sea/Air	8597	Import
		Sodium Methoxide	124-41-4	8560	Road	1060	Local
48	4-FLUOROANISOLE	4-Bromo Fluoro Benzene	460-00-4	27760	Sea/Air	8597	Import
		Sodium Methoxide	124-41-4	8560	Road	1060	Local
49	2-PHENOXYETHYLAMINE	Acetonitrile	75-05-8	5980	Road	1060	Local
		Ethanolamine	141-43-5	8920	Road	1060	Local
		Phenol	108-95-2	13740	Road	1060	Local
		NaOH	1310-73-2	5880	Road	157	Local
		Methanol	67-56-1	20000	Road	1060	Local
50	SPIROPIDION (TINIVION)	Diamide	10465-78-8	27400	Sea/Air	8597	Import
		NMP (N-Methyl pyrolidine)	872-50-4	31600	Sea/Air	8597	Import
		Potassium hydroxide 85 %	872-50-4	4400	Road	60	Local
		DDOL (1-Dodecanol)	112-53-8	47000	Sea/Air	8597	Import

842

		MCH (Methylcyclohexane)	108-87-2	4800	Sea/Air	8597	Import
		ECF (Ethyl chloroformate)	541-41-3	8200	Road	1660	Local
		Caustic lye 25%	1310-73-2	4000	Road	157	Local
		32% Hcl	7647-01-0	1200	Road	157	Local
		Sodium chloride 25 %	7647-14-5	12400	Road	1660	Local
		BHT (Butylated hydroxytoluene) (d : 1.048)	128-37-0	20	Sea/Air	8597	Import
		Me-THF (2-Methyltetrahydrofuran) (d: 0.854)	96-47-9	37200	Sea/Air	8597	Import
		MCH-2 (Methylcyclohexane) (d : 0.77)	108-87-2	42600	Sea/Air	8597	Import
51	4-AMINO BENZAMIDE	4-Nitro benzamide	2835-68-9	25140	Sea/Air	8597	Import
		Iron powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	300	Road	157	Local
52	P-TOLUIDINE	P-Nitro Toluene	99-99-0	26600	Road	1660	Local
		Iron powder	7439-89-6	20	Road	1660	Local
		Hydrogen	1333-74-0	400	Road	157	Local
53	M-ANISIDINE	M-Aminophenol	591-27-5	17723	Road	1660	Local
		Acetic Anhydride	108-24-7	18710	Road	1660	Local

		Potassium Carbonate	77-78-1	25282	Road	1660	Local
		Dimethyl Sulphate	584-08-7	23116	Road	1660	Local
		Hydrochloric acid	67-64-1	6689	Road	157	Local
		Sodium Hydroxide	1310-73-2	7340	Road	157	Local
		Ethylene DiChloride	7647-01-0	13760	Road	157	Local
54	4-CHLORO,2 AMINO PHENOL (4-CAP)	Aromatic substituted/ unsubstituted halides	--	20600	Sea/Air	8597	Import
		Nitric acid	7697-37-2	25000	Road	334	Local
		Sulfuric acid	7664-93-9	24000	Road	280	Local
		Sodium Hydroxide flakes	1310-73-2	22000	Road	157	Local
		Fe powder	7439-89-6	2000	Road	1660	Local
		Con. HCl	7647-01-0	20000	Road	157	Local
		Methylene dichloride	75-09-2	48700	Road	157	Local
55	Hydroxy Ester (HES)	Aliphatic diester	79-20-9	30000	Sea/Air	8597	Import
		Sodium ethoxide	141-52-6	10400	Road	639	Local
		Ethanol	64-17-5	35000	Road	334	Local
		Ethyl acetate	141-78-6	14400	Road	1060	Local
		Xylene	95-47-6	50000	Road	1060	Local
		Sulfuric acid	7664-93-9	20000	Road	280	Local
		Butyl acetate	123-86-4	42400	Road	1060	Local

		Caustic lye (48%)	1310-73-2	50000	Road	157	Local
56	Dichloro Fluoro Bromo Benzene (DCFBB)	Aromatic substituted nitrohalides	1694-92-4	34000	Sea/Air	8597	Import
		Nitric acid	7697-37-2	37000	Road	334	Local
		Sulfuric acid	7664-93-9	38000	Road	280	Local
		Ferric Chloride	7705-08-0	43200	Road	1660	Local
		Chlorine gas	7782-50-5	12000	Road	157	Local
		Potassium Fluoride	7789-23-3	16000	Road	1060	Local
		Tetrabutyl Ammonium Bromide	1643-19-2	4000	Road	1060	Local
		NMP	872-50-4	80000	Sea/Air	8597	Import
		Raney Nickel	7440-02-0	2000	Road	1060	Local
		HBr in Water (48%)	10035-10-6	20000	Road	1060	Local
		Hydrogen peroxide (50%)	7722-84-1	12000	Road	157	Local
		Copper(I)oxide	1317-39-1	3000	Road	1060	Local
		Sodium nitrite	7632-00-0	24000	Road	1451	Local
		Isopropyl alcohol	67-63-0	100000	Road	1060	Local
		Caustic lye (48%)	1310-73-2	38000	Road	157	Local
57	Para chloro phenyl glycine (PCPG)	4-Chlorobenzaldehyde	97 104-88-1	15140	Road	1060	Local
		Sodium cyanide	143-33-9	5280	Road	1346	Local

		Ammonium bicarbonate	1066-33-7	8522	Road	1060	Local
		Methanol	67-56-1	20000	Road	1060	Local
		Sodium hydroxide	1310-73-2	4310	Road	157	Local
		Sulphuric acid	7664-93-9	10560	Road	280	Local
58	AMBA: 4-Acetyl-2-Methyl Benzoic Acid	2-Fluorotoluene	95-52-3	12200	Road	1060	Local
		Acetyl chloride	98 79-04-9	8800	Road	1660	Local
		Sodium Cyanide	1310-73-2	5400	Road	1346	Local
		MIBK	108-10-1	40000	Road	1060	Local
		Sodium hydroxide	1310-73-2	4400	Road	157	Local
		Hydrochloric acid	1310-73-2	4000	Road	157	Local

2.9 MANUFACTURING PROCESS, CHEMICAL REACTION AND MASS BALANCE OF EACH PRODUCTS

i) PHYTO CHEMICALS

1) COLCHICINE AND THIOCOLCHICOSIDE

Solvent extraction of Gloriosa superba seed followed by removal of solvent (concentration) by distillation will give the plant seed concentrate, which mainly contains Colchicine and Colchicoside. These two components were then separated by selective solvent extraction. Crude Colchicoside was converted by a synthetic reaction to Thiocolchicoside using Sodium methylmercaptide as reagent.

Colchicine Chloroform Concentrate ⟶ $C_{22}H_{25}NO_6$ 399.44.

Material Balance

1.Product: Colchicine			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Caustic Soda	0.810	Product	1.000
Hyflo	1.270	Solvent recovery	5.100
Sodium Chloride	1.170	Spent solvent (Mixed Solvent)	1.250
Acetic acid	0.140	Effluent Streams	308.220
Activated carbon	0.160		
Chloroform	7.600		
DNS	8.550		
Ethyl acetate	4.050		
Hexane	1.270		
Methanol	10.800		
Water	279.750		
Total Input	315.570	Total Output	315.570

Material Balance

2) Product: Thiocolchicoside

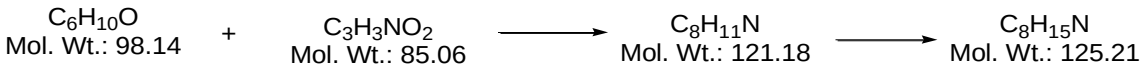
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Caustic Soda	2.500	Product	1.000

Calcium carbonate	1.800	Solvent recovery	90.405
Hyflo	0.770	Spent solvent (Mixed Solvent)	10.046
Sodium Carbonate	1.650	Solid waste	269.059
Sodium Chloride	6.510	Effluent Streams	308.230
Sodium methyl mercaptide	1.370		
Sodium Hypochlorite	12.080		
Acetic acid	1.520		
Activated Carbon	0.440		
Chloroform	47.000		
DNS	30.500		
Ethyl acetate	2.400		
G.S. Seed	269.900		
Hexane	3.370		
Isopropyl alcohol	5.350		
Methanol	11.830		
Water	279.750		
Total Input	678.740	Total Output	678.740

3) Organic Chemicals

3) CHEA

Cyclohexanone is condensed with cyanoacetic acid to get Cyclohexenylacetonitrile, which is then hydrogenated to get Cylcochexenylethylamine. The product is purified by fractional distillation.



Material Balance

3.Product: CHEA			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Cyano Acetic acid	1.026	Product	1.000
Cyclohexanone	1.300	Solvent recovery	0.004
Hydrogen	0.065	Solid waste	0.966
Ammonium acetate	0.007	Effluent Streams	1.000
Toluene	0.006	Distillation residues	0.002
Ammonium gas	0.065		
Raney cobalt	0.003		
Water	0.500		
Total Input	2.972	Total Output	2.972

4) T4C

Cyclohexanone is condensed with acrylonitrile in the presence of potassium hydroxide using tert. butyl alcohol as solvent. The resulting tetra cyano compound is hydrolysed with sodium hydroxide. The product T4C is isolated by acidification of the reaction mixture.

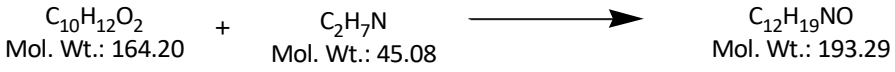


Material Balance

4.Product: T4C			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
TBA	0.495	Product	1.000
Acrylonitrile	0.950	Solvent recovery	0.347
Potassium Hydroxide	0.050	Spent solvent (TBA)	0.149
Cyclohexanone	0.390	Solid waste	1.764
Caustic soda	0.375	Effluent Streams	1.820
Hydrochloric acid	1.000	Spent Hyflo	0.100
Hyflo+ Activated carbon	0.020	Spent Carbon	0.100
Water	2.000		
Total Input	5.280	Total Output	5.280

5) SUBSTITUTED ALKYL ARYL AMINE

4-MPA is reacts with Mono Ethyl amine abd followed by reductive ammonisation using ethylamine and 5%palladium on carbon to give Substituted Alkyl Aryl amine

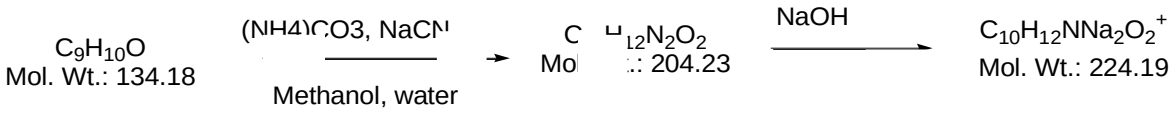


Material Balance

5.Product: Substituted Alkyl Aryl amine			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Methoxy phenyl acetone	0.911	Product	1.000
Mono Ethyl amine	0.667	Solvent recovery	0.197
Hydrogen	0.015	Spent solvent (Mono Ethyl amine)	0.200
Pd/c (Catalyst)	0.002	Effluent Streams	0.198
Total Input	1.595	Total Output	1.595

6) TR-1600/TR-1400:

Toluene reacts with DMS is presence of Ammonium carbonate and Sodium cyanide followed Methylation reaction to give **TR-1600**

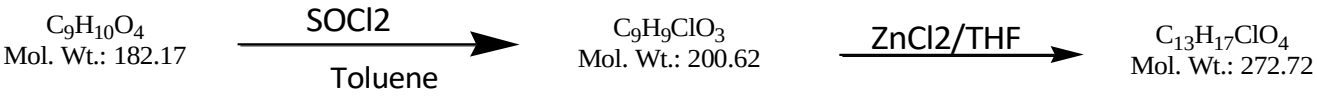


Material Balance

6. Product: TR 1600/TR 1400			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Toluene	0.844	Product	1.000
DMS	0.680	Spent solvent (Methanol)	0.197
Methanol	0.200	Contaminated aromatic, aliphatic or naphthenic solvents may or may not fit for reuse (Toluene)	0.003
Ammonium carbonate	1.180	Solid waste	1.645
Sodium hydroxide	1.660	Effluent Streams	8.500
Formic acid	0.800		
Formaldehyde	0.990		
Propiophenone	0.740		
Sodium cyanide	0.251		
Water	4.000		
Total Input	11.345	Total Output	11.345

7) 4-CHLORO-BUTYL VERATRATE

Condensation of 3,4-Dimethoxybenzoic acid with Tetrahydrofuran in the presence of zinc chloride gives 4-Chlorobutyl veratrate.

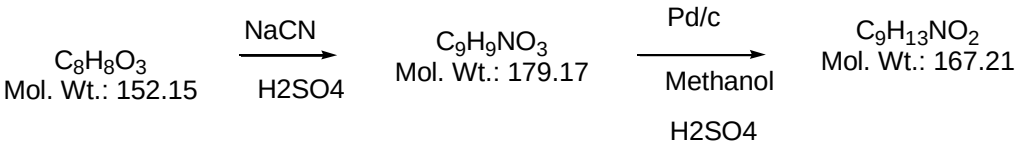


Material Balance

7.Product: : 4-Chloro-butyl veratrate			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
3,4-Dimethoxy Benzoic acid	1.050	Product	1.000
Thionyl chloride	0.880	Solvent recovery	1.080
EDC	1.050	Spent solvent (Mixed solvent)	0.600
Tetrahydrofuran	0.550	Solid waste	1.700
Zinc chloride	0.050	Effluent Streams	5.000
Sodium bi carbonate	0.170		
Toluene	0.630		
Water	5.000		
Total Input	9.380	Total Output	9.380

8) AE PHENOL

Vanillin reacts with sodium cyanide to give cyanohydrin and followed by reduction to give Substituted amino ethyl phenol.



Material Balance

8.Product: AE PHENOL			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Vanilin	1.060	Product	1.000
Sodium cyanide	0.480	Solvent recovery	1.520
Sulphuric acid	0.980	Spent solvent (Methanol)	0.620
MTBE	1.060	Solid waste	2.110
Chloro acetic acid	0.020	Effluent Streams	10.500
Methanol	1.080	Spent Catalyst	0.00200
Palladium carbon (Catalyst)	0.020	Recovered catalyst	0.01800
Sodium hydroxide	0.530		
Hydrogen	0.040		
Water	10.500		
Total Input	15.770	Total Output	15.770

9) Methyl 2 phenoxy isobutyrate:

Phenol reacts with methyl 2 –bromo isobutyrate followed phenol and sodium methoxide reaction to give Methyl 2 phenoxy isobutyrate

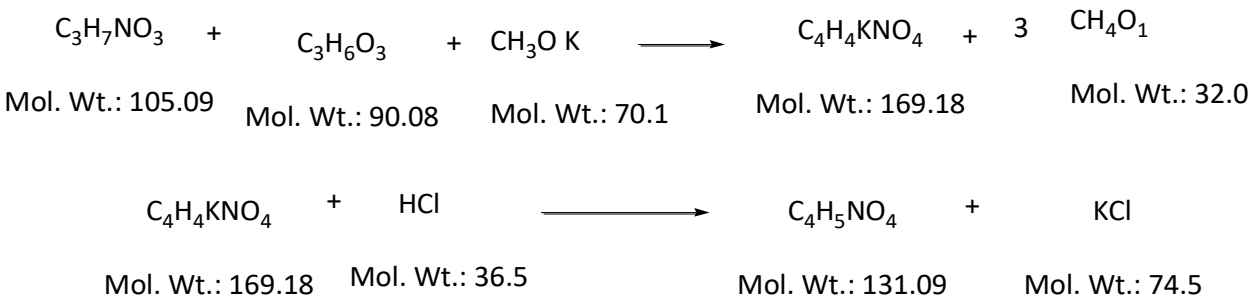
C_6H_6O (Mol. Wt.: 94.11) + $C_5H_9BrO_2$ (Mol. Wt.: 181.03) $\xrightarrow[\text{Toluene}]{\text{NaOMe}}$ $C_{11}H_{14}O_3$ (Mol. Wt.: 194.23)

Material Balance

9.Product: Methyl 2 phenoxy isobutyrate			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Phenol	0.840	Product	1.000
Sodium methoxide	0.510	Solvent recovery	0.660
Toluene	0.880	Spent solvent (Toluene)	0.216
Methyl -2-Bromo iso utyrate	1.170	Contaminated aromatic, aliphatic or naphthenic solvents may or may not fit for reuse (Toluene)	0.004
Caustic soda	0.140	Solid waste	0.360
Water	3.500	Effluent Streams	4.800
Total Input	7.040	Total Output	7.040

10) (4R)-2-OXOOXAZOLIDINE-4-CARBOXYLIC ACID (COX)

D-Serine reacts with DMC in presence of potassium methoxide to give Potassium salt and followed with addition of MIBK and reaction with HCl to give COX.

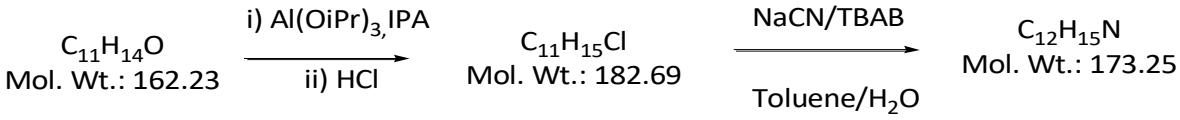


Material Balance

10.Product: 4-R-2-Oxaoxazolidine-4-Carboxylic Acid (COX)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
D-serine	0.801	Product	1.000
DMC	0.689	Solvent recovery	2.207
Potassium methoxide	0.534	Solid waste	0.568
Hydrochloric acid	0.278		
MIBK	0.363		
Acetone	1.110		
Total Input	3.775	Total Output	3.775

11) 4-t-BUTYLPHENYL ACETONITRILE (CP)

t-Butyl benzaldehyde via reduction followed by cyanation methodology to give 4-(t-Butyl phenyl acetonitrile

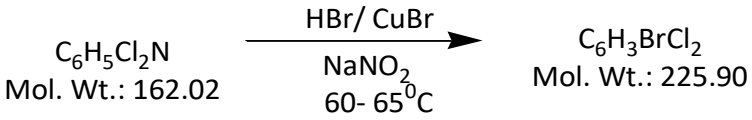


Material Balance

11.Product: 4-Tert Butylphenyl Acetonitrile			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-tert butylbenzaldehyde	0.940	Product	1.000
Hydrogen	0.010	Solid waste	0.580
Hydrochloric Acid	0.210	Effluent Streams	0.960
Sodium cyanide	0.280		
Water	1.100		
Total Input	2.540	Total Output	2.540

12) 1-BROMO 3-5 DICHLOROBENZENE (DCBB)

Bromination of 3,5-dichloroaniline using hydrogen bromide in presence of cupric bromide to give 1-bromo-3,5-dichlorobenzene

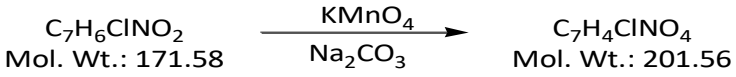


Material Balance

12.Product: DCBB-(1 Bromo 3-5 Dichlorobenzene)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
3,5 Dichloroaniline	0.720	Product	1.000
Hydrobromicacid	0.720	Solid waste	0.550
Sodium nitrite	0.310	Effluent Streams	0.160
Water	0.080	Gaseous Emission (Nitrogen)	0.120
Total Input	1.830	Total Output	1.830

13) 4-CHLORO 2-NITROBENZOIC ACID

Oxidation of 4-chloro-2-nitro toluene to give 4-chloro-2-nitro benzoic acid

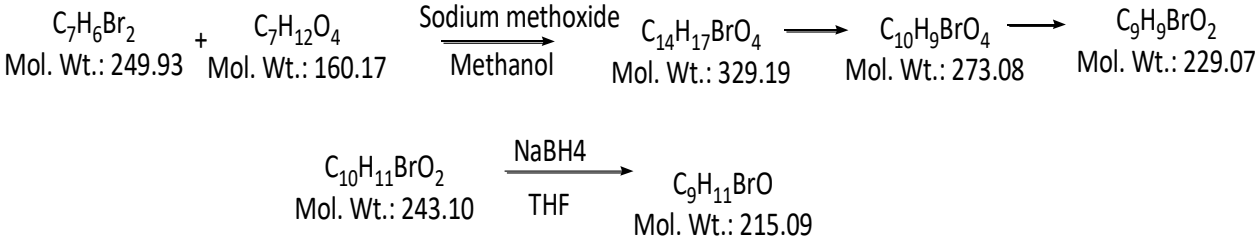


Material Balance

13.Product: 4-Chloro-2-Nitro Benzoic Acid			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Chloro-2-Nitro toluene	0.760	Product	1.000
Potasium permanganate	1.420	Solid waste	1.180
water	1.060	Effluent Streams	1.060
Total Input	3.240	Total Output	3.240

14) 2-(4-BROMO PHENYL) PROPANOL (BPP)

Dehydrohalogenation reaction of 4-Bromo benzylbromide and diester followed by hydrolysis and reduction using sodium bromohydride gives BPP.

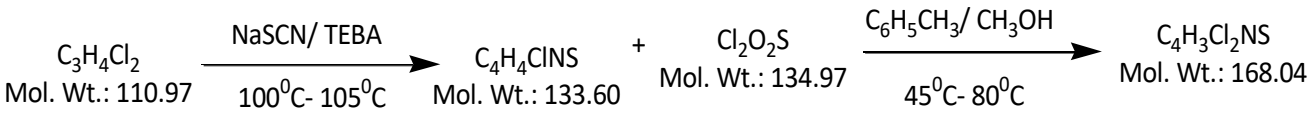


Material Balance

14.Product: 2-(4-Bromo Phenyl) Propanol			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Bromo benzyl bromide	0.760	Product	1.000
Diethyl malonate	0.490	Solvent recovery	1.680
Sodium methoxide	0.160	Solid waste	1.660
Water	2.520	Effluent Streams	3.700
Benzene	0.100	Gaseous Emission (CO2)	0.190
potassium Hyodroxide	0.210	Distillation residues	0.020
Hydrochloric acid	1.130		
Bromo phenyl propionic acid	0.780		
Thionyl chloride	1.400		
Methanol	0.700		
Total Input	8.250	Total Output	8.250

15) 2-CHLORO-5-CHLOROMETHYL -1,3, THIAZOLE (CCMT)

2,3-Dichloropropene react with sodium thiocyanate /TEBA to give 2-Chloroallyl isothiocyante, which was treated with sulfuryl chloride to yield 2-Chloro-5-chloromethyl 1,3-thiazole.

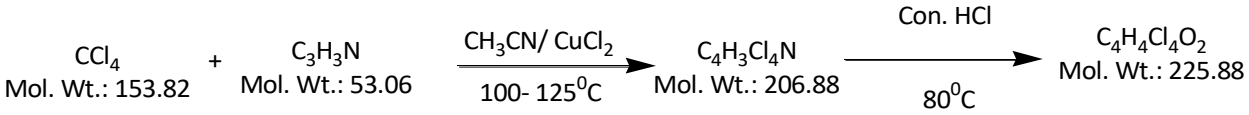


Material Balance

15.Product: 2-Chloro-5-Chloro Methyl -1,3, Thiazole(CCMT)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2,3-Dichloro propane	0.830	Product	1.000
Sodium Thiocyanate	0.610	Solid waste	1.400
Water	1.400	Effluent Streams	2.240
Sulfuryl chloride	1.800		
Total Input	4.640	Total Output	4.640

16) TETRACHLORO BUTYRIC ACID (TCBA)

Carbon tetrachloride reacts with acrylonitrile in the presence of acetonitrile/cupric chloride to give tetrachlorobutyro nitrile followed acid hydrolysis to form Tetrachlorobutyric acid.

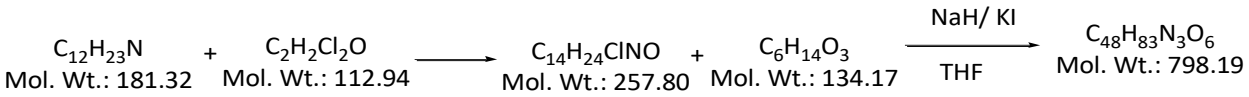


Material Balance

16.Product: Tetra Chloro Butyric acid (TCBA)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Carbon tetra chloride	0.680	Product	1.000
Acetonitrile	0.240	Solid waste	0.080
water	1.160	Effluent Streams	1.000
Total Input	2.080	Total Output	2.080

17) IONOPHOR

Dicyclohexylamine react with chloroacetyl chloride to give 2-chlorodicyclohexylacetamide followed by reaction with triol in the presence sodium hydride and KI to give the ionophor.

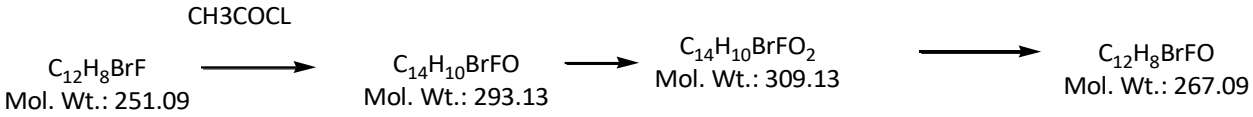


Material Balance

17.Product: Ionophor			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Dicyclohexyl amine	0.700	Product	1.00
Chloro acetyl chloride	0.440	Solid waste	0.11
Water	1.070	Effluent Streams	1.10
Total Input	2.210	Total Output	2.210

18) 4- BROMO-2-FLUORO HYDROXY BIPHENYL (BFB)

Acetylation of 4-bromo-2-fluoro-biphenyl followed by oxidation and hydrolysis gives 4-bromo-2-fluoro-biphenyl-4-ol.

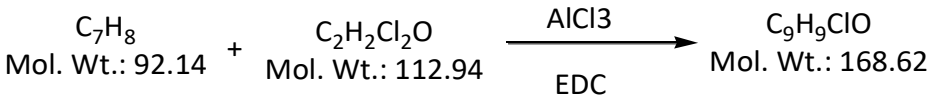


Material Balance

18.Product: 4- Bromo-2-Fluoro Hydroxy Biphenyl (BFB)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-bromo-2- Fluoro Biphenyl	0.860	Product	1.000
Acetylchlorite	0.270	Solid waste	1.360
Water	2.550	Effluent Streams	2.900
Bromine	0.100		
Nitro benzene	0.100		
Hydrogen peroxide	1.110		
Sodium Hydroxide	0.270		
Total Input	5.260	Total Output	5.260

19) PARA-METHYL PHENCYL CHLORIDE (PMPC)

Acetylation reaction between toluene and chlorocetyl chloride gives PMPC.

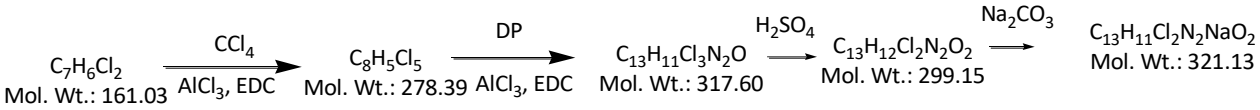


Material Balance

19.Product: TP-Methyl Phencyl Chloride (PMPC)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Toluene	0.550	Product	1.000
Chloro acetyl chloride	0.670	Spent Solvent (Toluene)	0.217
Water	1.100	Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse (Toluene)	0.002
		Effluent Streams	1.101
Total Input	2.320	Total Output	2.320

20) SODIUM 4(2-DICHLOROM-TOLYL)-1,3-DIMETHYL-5-PYRAZOLATE (MY710Na)

Reaction with 2,3-diichloro toluene and 1,3-Dimethyl-5-Pyrozolone in the presence of AlCl3 and CCl4, followed by insitu reaction with sulphuric acid and sodium carbonate to give MY710Na.

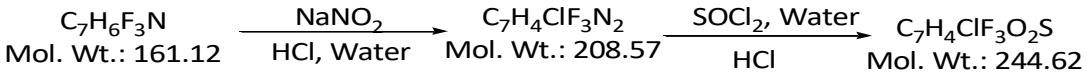


Material Balance

20.Product: (Sodium-4-(2,4dichloro-toluoyl)-5-pyrazolate) MY710Na			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2,6-Dichloro toluene	0.500	Product	1.000
Carbon tetrachloride	0.480	Solid waste	0.660
1,3-Dimethyl pyrazolone	0.350	Effluent Streams	1.060
Sodium carbonate	0.330		
water	1.060		
Total Input	2.720	Total Output	2.720

21) 2-TRIFLUROMETHYL BENZENE SULFONAMIDE (TBSA)

2-Aminobenzotrifluoride reacts with sodium nitrite/HCl mixture to form Diazonium salt, which was treated with thionyl chloride to give sulphonyl chloride derivative. This was further reacted with ammonia solution to give TBSA.

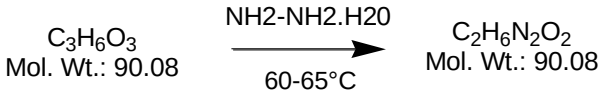


Material Balance

21.Product: 2-Trifluromethyl benzene sulfonamide(TBSA)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2-Aminobenzotrifluoride	0.660	Product	1.000
Sodium nitrite	0.560	Solid waste	0.300
Thionyl chloride	0.490	Effluent Streams	8.343
Sodium Meta bi sulphite	0.100	Gaseous Emission (Nitrogen)	0.090
HCl	2.910	BY-Product (Dil. Hcl)	0.657
Water	4.600		
Ammonia solution	1.070		
Total Input	10.390	Total Output	10.390

22) METHYL CARBAZATE

Dimethyl carbonate reacts with hydrazine hydrate - 80% solution to give Methyl carbazate.

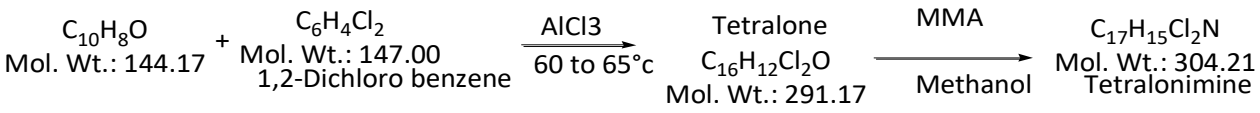


Material Balance

22.Product: Methyl Carbazate			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Dimethyl carbonate	1.000	Product	1.000
Hydrazine hydrate	0.560	Solid waste	0.360
Water	0.200	Effluent Streams	0.400
Total Input	1.760	Total Output	1.760

23) TETRALONE IMINE

1-Naphthol react with 1,2-dichloro benzene in the presence of aluminium chloride to gave tetralone compound. This was followed by reacted withmethoxy methyl amine to yield tetralone imine in good excellent yield.

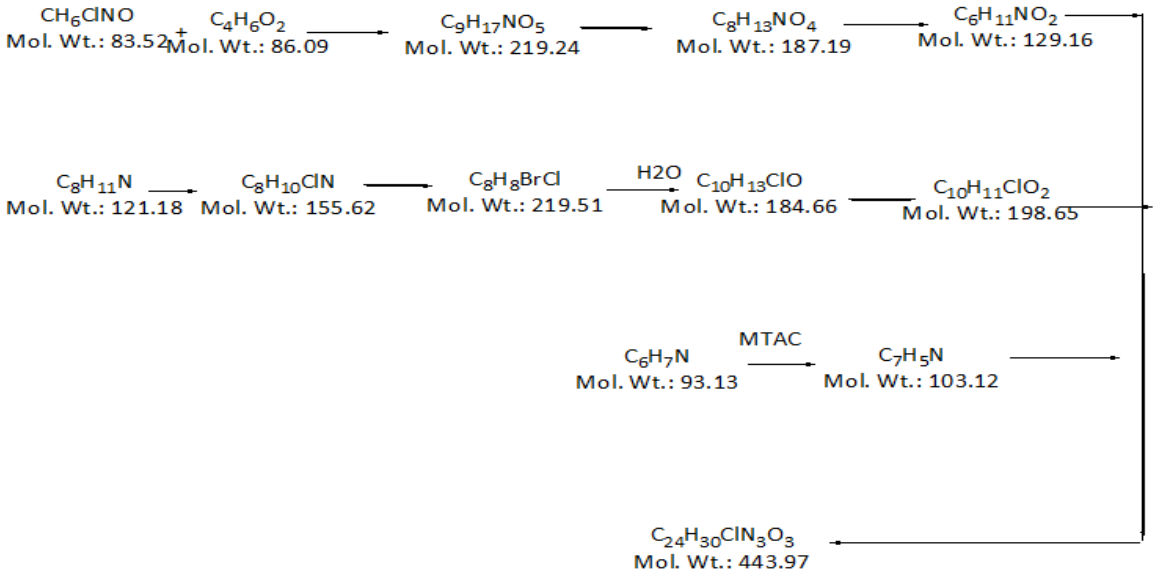


Material Balance

23. Product: Tetralone Imine			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
1-Naphthol	0.50	Product	1.000
1,2-dichloro benzene	0.50	Effluent Streams	1.000
Water	1.00		
Total Input	2.000	Total Output	2.000

24) DIAMIDE

MTA hydrochloride reacts with Methyl acrylate and followed by chlorination & Bromination to give Diamide.

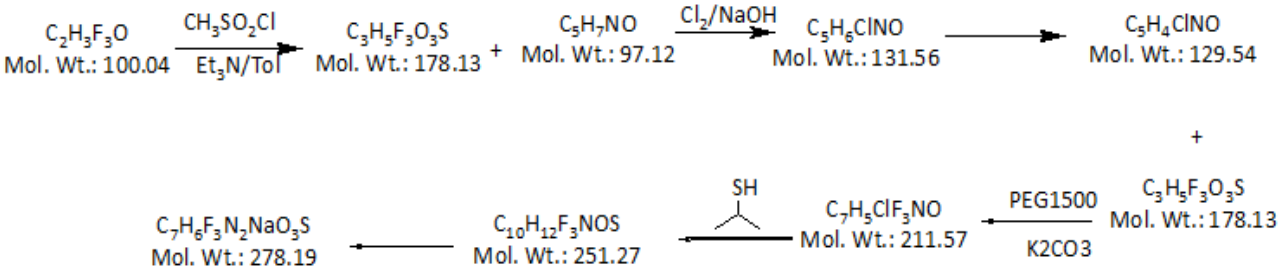


Material Balance

24. Product: Diamide			
Material balance Per kg output of product			
Input		**Output**	
RM	Input qty in Kg	Output	output qty in Kg
MTA HCl	0.56	Product	1
Methyl acrylate	0.79	Solid waste	1.25
Water	3.47	Effluent Streams	5.00
CDPAA	0.54		
Phenyl isonitrile	0.38		
Methyl amine	0.21		
Dimethylaniline	0.20		
Chlorobenzene	0.30		
Sodium bromide	0.10		
Magnesium	0.30		
Ethylene oxide	0.15		
4-Acetamido TEMPO catalyst	0.01		
Psuedocumene	0.02		
MTAAC	0.22		
Total Input	**7.25**	**Total Output**	**7.25**

25)SULFONAMIDE

TFE reacts with Methane sulfonyl chloride and followed by Chlorination & then Hydrolysis to give Sulphonamide.

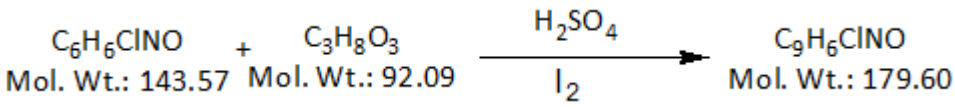


Material Balance

25.Product: Sulfonamide			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
TFE	0.560	Product	1.000
Methane sulfonyl chloride	0.640	Solvent recovery	6.200
TEA	0.570	Solid waste	1.800
Water	3.010	Effluent Streams	2.540
Furfurylomine	0.740		
n-Butanol	0.100		
Chlorine gas	0.790		
Sodium hydroxide	1.750		
Sodium Hypo chloride	0.580		
Hydrochloric acid	1.280		
Ethyl ester (TFEMS)	0.840		
IPM	0.300		
n-Heptane	0.100		
KOH	0.220		
Ammonia	0.060		
Total Input	**11.540**	**Total Output**	**11.540**

26) CHLORO-8 -HYDROXY QUINOLINE (CHQ)

Reaction of substituted aniline with glycerol in presence of sulfuric acid produces chloro hydroxyquinoline.

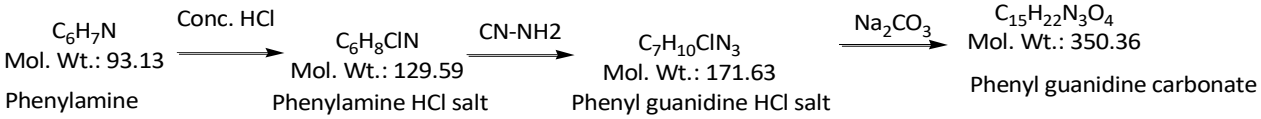


Material Balance

26.Product: 5 Chloro-8 -Hydroxy Quinoline (CHQ)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4 CAP	0.800	Product	1.000
Glycerol	0.510	Solvent recovery	0.800
Sulphuric acid	2.051	Solid waste	0.781
Sodium hydroxide	0.220	Effluent Streams	10.331
Toluene	1.000	Distillation residue	0.200
Water	9.000	By-Product (Dil. Sulphuric acid)	0.469
Total Input	**13.581**	**Total Output**	**13.581**

27) PHENYLGUANIDINE CARBONATE (PGC)

Aniline in presence of Concentrated Hydrochloric acid reacts with Hydrogen Cyanamide - 30% solution to give Phenyl guanidine carbonate.

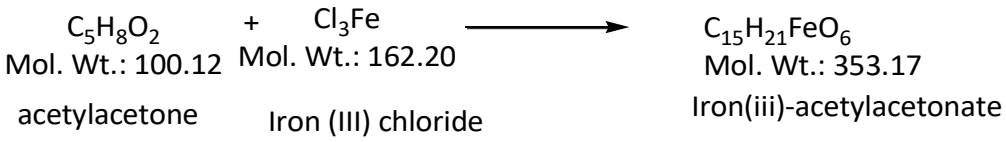


Material Balance

27. Product: Phenyl Guanidine Carbonate (PGC)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Aniline	0.530	Product	1.000
Hydrochloric Acid	0.210	Solid waste	0.330
30% Cyanamide soln	0.240	Effluent Streams	2.000
Sodium carbonate	0.300		
water	2.050		
Total Input	**3.330**	**Total Output**	**3.330**

28) Fe(III) ACETYL ACETONATE

Reaction between acetylacetone and Iron(III)chloride in the presence of ammonia to give the complex Iron(III)acetylacetone.

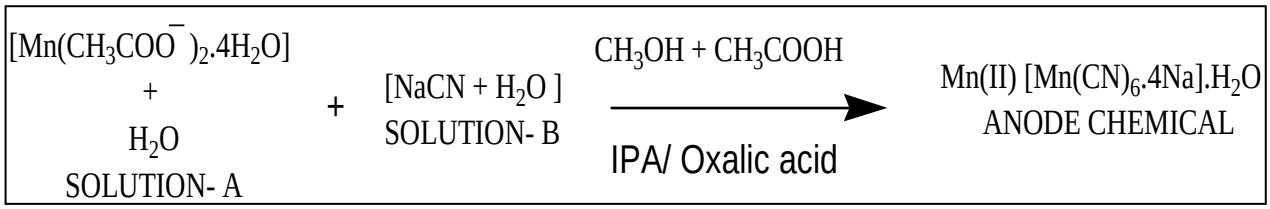


Material Balance

28.Product: Fe(III) Acetyl Acetanoate			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Acetylacetone	0.850	Product	1.000
Iron III chloride	0.460	Solid waste	0.420
Ammonium hydroxe soln	0.100	Effluent Streams	1.040
Water	1.050		
Total Input	2.460	Total Output	2.460

29) ANODE

Manganese acetate Tetra hydrate reacted with sodium cyanide in the presence of oxalic acid to give anode.



Material Balance

29.Product: : Anode			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Manganese acetate tetrahydrate	0.650	Product	1.000
Sodium cyanide	0.470	Solid waste	0.120
Water	0.240	Effluent Streams	0.240
Total Input	1.360	Total Output	1.360

30) CATHODE

Iron reacts with sodium hexacyanoferrate mixture to give Cathode.

$$[Fe\text{-}MnSO_4]\ \text{SOLUTION- A} + [Na/KFe(CN)_6]\ \text{SOLUTION- B} \xrightarrow[\text{MAIN REACTOR}]{Na_2SO_4 + H_2O} [Fe(II)Mn(II)Fe(CN)_6.4Na].10H_2O\ \text{CATHODE CHEMICAL}$$

Material Balance

30.Product: : Cathode			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Iron sulfate hydrate	0.670	Product	1.000
Sodium ferrocyanide decahydrate	0.210	Solid waste	0.540
Manganese sulfate monohydrate	0.140	Effluent Streams	0.430
Sodium sulfate	0.110		
Water	0.840		
Total Input	1.970	Total Output	1.970

31. 1-Chloro-3-Nitrobenzene

Nitro benzene reacts with Chlorine gas in presence of Catalyst to give crude 1-Chloro-3-nitrobenzene. The crude product is purified by Fractional vacuum distillation.

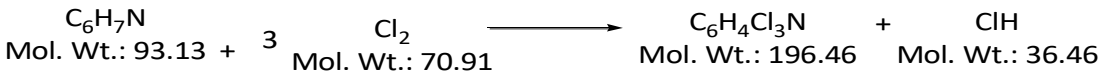
$C_6H_5NO_2$ (Mol. Wt.: 123.11) + Cl_2 (Mol. Wt.: 70.91) ⟶ $C_6H_4ClNO_2$ (Mol. Wt.: 157.55) + ClH (Mol. Wt.: 36.46)

Material Balance

31. 1-Chloro-3-Nitrobenzene			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Nitro benzene	0.780	Product	1.000
Chlorine	0.450	Solid waste	0.360
Sodium hydroxide	0.250	Effluent Streams	9.920
Process Water	9.800		
Total Input	11.280	Total Output	11.280

32. 2,4,6-trichloro aniline

Aniline is reacts with HCl to produce aniline hydrochloride. The aniline hydrochloride reacts with gaseous form of chlorine to form 2,4,6-trichloroaniline.

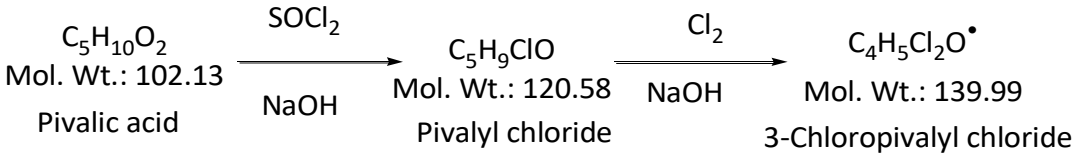


Material Balance

32. 2,4,6- Trichloro Aniline			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Aniline	0.474	Product	1.000
Chlorine	1.082	Effluent Stream	9.775
Sodium hydroxide	0.611	Solid waste	0.892
Process Water	9.500		
Total Input	11.667	Total Output	11.667

33. Pivaloyl Chloride

Pivalic acid reacts with thionyl chloride to give Pivaloyl chloride. The crude product is purified by Fractional vacuum distillation.

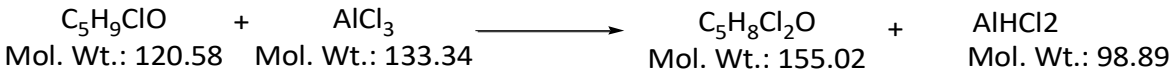


Material Balance

33. Pivaloyl Chloride			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Thionyl chloride	0.986	Product	1.000
Pivalic Acid	0.846	Effluent Stream	9.649
Sodium hydroxide	0.330	Gaseous Emission	0.530
Process water	9.500	Solid waste	0.483
Total Input	11.662	Total Output	11.662

34. 5-Chloro Valeroyl Chloride

Valeroyl chloride reacts with aluminum chloride in presence of monocholoro benzene give 5-chloro valeroyl chloride. The crude product is purified by Fractional vacuum distillation.



Material Balance

34. 5-Chloro Valeroyl Chloride			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Aluminium chloride powder	0.700	Product	1.000
Valeroyl chloride	0.680	Effluent Stream	9.420
Solvent (MCB)	0.680	Solvent Recovery	0.680
DM Water	9.040		
Total Input	11.100	Total Output	11.100

35. 4-FLUORO PHENYL ACETIC ACID

4-Fluorobenzaldehyde reacts with Ra-Ni in presence of hydrogen gas to give 4-Fluorobenzyl alcohol, which was reacted with PBr3 to give bromo derivative. The bromo derivative reacts with sodium cyanide gave cyano compound. Finally, cyano compound hydrolyzed with sodium hydroxide to give 4-Fluorophenyl aceticacid.



Material Balance

35. 4-FLUORO PHENYL ACETIC ACID			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Para fluorobenzaldehyde	0.800	Product	1.000
H2 gas	0.010	Effluent Stream	10.650
Phosphorus tribromide	0.590		
Soda ash	0.250		
Sodium cyanide	0.320		
Water	9.100		
Sodium hydroxide	0.260		
sulfuric acid	0.320		
Total Input	11.650	Total Output	11.650

36. 4-BROMO FLUOROBENZENE

Fluorobenzene reacts with bromine in presence of Fe catalyst to give 4-Bromo Fluorobenzene. The crude product is purified by Fractional vacuum distillation.

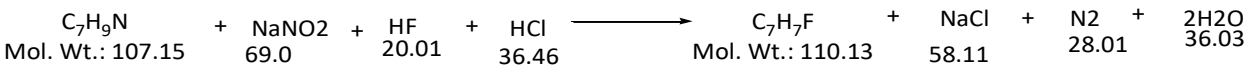
$$\underset{\text{Mol. Wt.: 96.10}}{C_6H_5F} + \underset{159.81}{Br2} \longrightarrow \underset{\text{Mol. Wt.: 175.00}}{C_6H_4BrF} + \underset{80.91}{HBr}$$

Material Balance

36. 4-BROMO FLUOROBENZENE			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
FluoroBenzene	0.549	Product	1.000
Bromine	0.913	Effluent Stream	0.103
Sodium Hydroxide	0.229	Solid waste	0.588
Total Input	1.691	Total Output	1.691

37. 3-Fluorotoluene

m-Toluidine reacts with sodium nitrite in presence of HF to give 3-Fluorobenzene.
The crude product is purified by Fractional vacuum distillation.

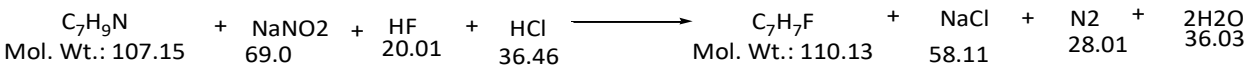


Material Balance

37. 3-Fluorotoluene			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
m-Toluidine	0.973	Product	1.000
HF	0.181	Effluent Stream	10.027
Solid NaNO2	0.626	Solid waste	0.530
Hydrochloric acid	0.331	Gaseous Emission	0.254
Process Water	9.700		
Total Input	11.811	Total Output	11.811

38. 4-Fluorotoluene

P-Toluidine reacts with sodium nitrite in presence of HF to give 4-Fluorobenzene.
The crude product is purified by Fractional vacuum distillation.



Material Balance

38. 4-Fluorotoluene			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
P-Toluidine	0.973	Product	1.000
HF	0.181	Effluent Stream	10.027
Solid NaNO2	0.626	Solid waste	0.530
Hydrochloric acid	0.331	Gaseous Emission	0.254
Process Water	9.700		
Total Input	11.811	Total Output	11.811

39. O-NITRO ANISOLE

O-Nitro chloro benzene reacts with sodium hydroxide in presence of methanol to give o-Nitro anisole. The crude product is purified by Fractional vacuum distillation.

$C_6H_4ClNO_2$ (Mol. Wt.: 157.55) + NaOH (40.0) + CH_3OH (32.0) ⟶ $C_7H_7NO_3$ (Mol. Wt.: 153.14) + NaCl (58.44) + H_2O (18.0)

Material Balance

39. Ortho Nitro Anisole			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
ONCB	1.030	Product	1.000
Methanol	0.209	Effluent Stream	10.268
Caustic Flakes	0.824	Solid waste	1.385
Process Water	9.900		
Sulphuric acid	0.690		
Total Input	12.653	Total Output	12.653

40. p-NITRO ANISOLE

p-Nitro chlorobenzene reacts with sodium hydroxide in presence of methanol gave p-Nitroanisole. The crude product is purified by Fractional vacuum distillation.

$C_6H_4ClNO_2$ (Mol. Wt.: 157.55) + NaOH (40.0) + CH_3OH (32.0) ⟶ $C_7H_7NO_3$ (Mol. Wt.: 153.14) + NaCl (58.44) + H_2O (18.0)

Material Balance

40. Para Nitro Anisole			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
PNCB	1.030	Product	1.000
Methanol	0.209	Effluent Stream	10.268
Caustic Flakes	0.824	Solid waste	1.385
Process Water	9.900		
Sulphuric acid	0.690		
Total Input	12.653	Total Output	12.653

41. O-CHLORO P-NITRO TOLUENE

p-Nitro toluene reacts with chlorine gas to give o-chloro nitro toluene. The crude product is purified by Fractional vacuum distillation.

$$\underset{\text{Mol. Wt.: 137.14}}{C_7H_7NO_2} + \underset{70.91}{Cl2} \longrightarrow \underset{\text{Mol. Wt.: 171.58}}{C_7H_6ClNO_2} + \underset{36.40}{HCl}$$

Material Balance

41. O-Chloro P-Nitro toluene			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
P-Nitro Toluene	0.799	Product	1.000
Chlorine gas	0.413	Effluent Stream	9.705
Sodium Hydroxide	0.232	Solid waste	0.339
Process Water	9.600	Solvent recovery	0.820
Methanol	1.000	Distillation residue	0.180
Total Input	12.044	Total Output	12.044

42. 3-AMINO 4- METHYL BENZOIC ACID METHYL ESTER

3-Nitro-4-methyl Benzoic Acid is reacted with Methanol in presence of Sulfuric Acid to form 3-Nitro -4-Methyl Benzoic Acid Methyl Ester. 3- Nitro -4- Methyl Benzoic Acid Methyl Ester undergoes reduction by Acetic Acid and Iron power to form 3- Amino -4- Methyl Benzoic Acid Methyl Ester.

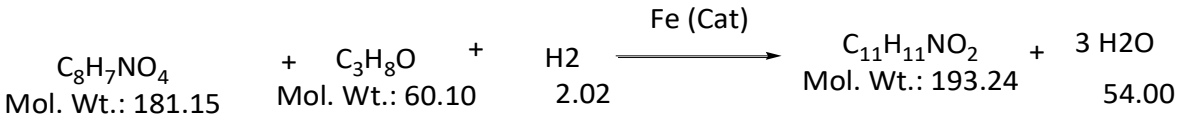
$$\underset{\text{Mol. Wt.: 181.15}}{C_8H_7NO_4} + \underset{32.04}{CH_3OH} + \underset{2.02}{H_2} \xrightarrow{\text{Fe (Cat)}} \underset{\text{Mol. Wt.: 165.19}}{C_9H_{11}NO_2} + \underset{54.00}{3\ H_2O}$$

Material Balance

42. 3-Amino 4-Methyl Benzoic Acid Methyl Ester			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
3- Nitro -4- Methyl Benzoic Acid	0.957	Product	1.000
Methanol	0.318	Effluent Stream	9.887
Iron Powder	0.001		
Hydrogen	0.011		
Water	9.600		
Total Input	10.887	Total Output	10.887

43. 3-AMINO 4- METHYL BENZOIC ACID ISOPROPYL ESTER

3-Nitro-4-methyl Benzoic Acid is reacted with isopropanol in presence of Iron powder to form 3-amino -4-Methyl Benzoic Acid Isopropyl Ester.

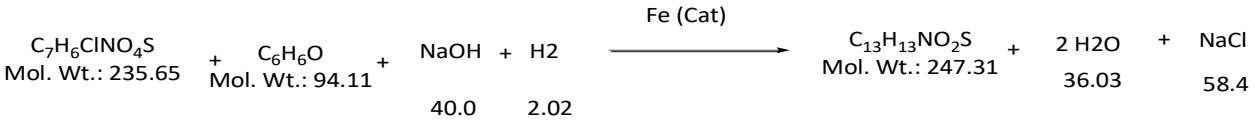


Material Balance

43. 3-Amino 4-Methyl Benzoic Acid Isopropyl Ester			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
3- Nitro -4- Methyl Benzoic Acid	0.957	Product	1.000
Iso Propyl Alcohol	0.318	Effluent Stream	9.487
Iron Powder	0.001		
Hydrogen	0.011		
Water	9.200		
Total Input	10.487	Total Output	10.487

44. 5-Amino-2-Methyl Benzene Sulphonic Acid Phenyl Ester

2- Methyl 5- Nitro Benzene Sulphonyl Chloride is reacted with Phenol in presence of Sodium Hydroxide to form 2- Methyl -5 Nitro Benzene Sulphonic Acid Phenyl Ester. Methyl -5 Nitro Benzene Sulphonic Acid Phenyl Ester undergoes reduction by Iron power to form 5- Amino - 2- Methyl Benzene Sulphonic Acid Phenyl Ester. The crude product is purified by Fractional vacuum distillation.

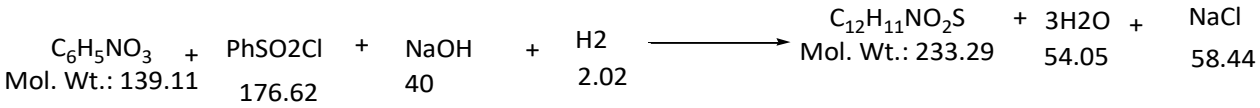


Material Balance

44. 5-Amino-2-Methyl Benzene Sulphonic Acid Phenyl Ester			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2- Methyl -5- Nitro Benzene Sulphonyl Chloride	0.850	Product	1.000
Phenol	0.339	Effluent Stream	10.483
Sodium Hydroxide	0.707	Solid waste	1.211
Iron Powder	0.001		
Hydrogen	0.007		
Water	10.100		
Sulphuric acid	0.690		
Total Input	12.694	Total Output	12.694

45. (3-AMINOPHENYL) BENZENESULFONATE

3-Nitro Phenol is reacted with Benzene Sulphonyl Chloride in presence of Sodium Hydroxide as well as Solvent - ODCB to form Benzene Sulphonic Acid -3- Nitro Phenyl Ester. Benzene Sulphonic Acid -3- Nitro Phenyl Ester undergoes reduction by Iron Power to form Benzene Sulphonic Acid -3- Amino Phenyl Ester.

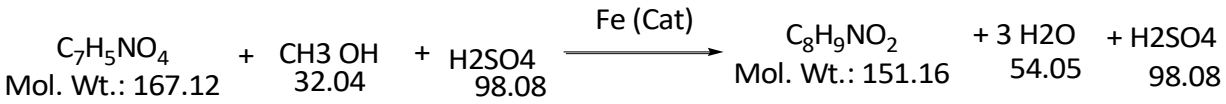


Material Balance

45. (3-Aminophenyl) benzenesulfonate			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
3- Nitro Phenol	0.567	Product	1.000
Benzene Sulfonyl chloride	0.720	Effluent Stream	10.674
Sodium Hydroxide	0.726	Solid waste	1.238
Iron Powder	0.001		
Hydrogen	0.008		
Water	10.200		
Sulphuric acid	0.690		
Total Input	12.912	Total Output	12.912

46) 4 -Amino Benzoic Acid Methyl Ester

4 - Nitro Benzoic Acid and methanol in presence of sulphuric acid and iron powder gives 4 - Amino Benzoic Acid Methyl Ester

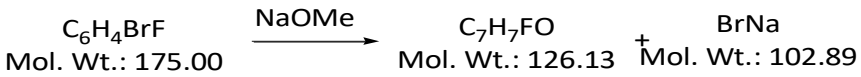


Material Balance

46. 4 -Amino Benzoic Acid Methyl Ester			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4 - Nitro Benzoic Acid	1.151	Product	1.000
Methanol	0.221	Effluent Stream	10.929
Sulfuric Acid	1.487	Solid waste	2.156
Iron Powder	0.001	Solvent Recovery	1.400
Solvent - ODCB	1.400		
Sodium Hydroxide	1.212		
Water	10.012		
Total Input	15.485	Total Output	15.485

47) 2-FLUOROANISOLE

4-Flurobromobeznene presence of Catalyst gives 2-Fluoroanisole. The final product purified from high vacuum distillation.

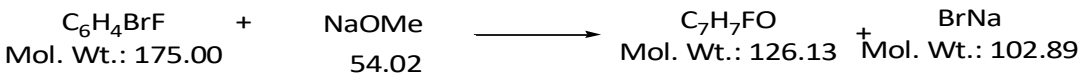


Material Balance

47. 2-FLUOROANISOLE			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2-Bromo Fluoro Benzene	1.388	Product	1.000
Sodium Methoxide	0.428	Solid waste	0.816
Total Input	1.816	Total Output	1.816

48) 4-FLUOROANISOLE

4-Flurobromobeznene presence of Catalyst to give 4-Fluoroanisole. The final product purified from high vacuum distillation.



Material Balance

48. 4-FLUOROANISOLE			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Bromo Fluoro Benzene	1.388	Product	1.000
Sodium Methoxide	0.428	Solid waste	0.816
Total Input	1.816	Total Output	1.816

49) 2-Phenoxyethylamine

Ethnolamine with acetonitrile presence of Catalyst and than reaction with phenol and followed by hydrolysis to give 2-Phenoxyethylamine

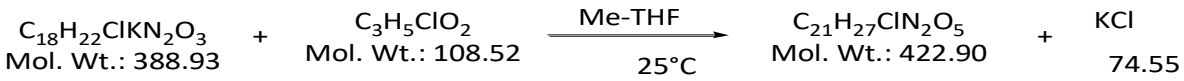


Material Balance

49. 2-Phenoxyethylamine			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Acetonitrile	0.299	Product	1.000
Ethanolamine	0.446	Solid waste	0.596
Phenol	0.687	Effluent Stream	10.230
Sodium hydroxide	0.294	Solvent recovery	0.820
Water	10.100	Distillation residue	0.180
Methanol	1.000		
Total Input	12.826	Total Output	12.826

50) Spiropidion (TINIVION)

Diamide reacts with KOH and NMP in presence of Catalyst and followed by addition of ECF and Me-THF to give Spiropidion (TINIVION).

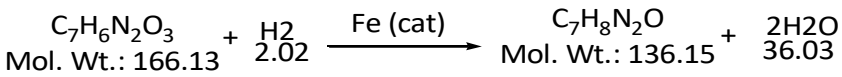


Material Balance

50 . Spiropidion (TINIVION).			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Diamide	1.370	Product	1.000
NMP	1.580	Solid waste	0.600
Potassium hydroxide 85 %	0.220	Solvent recovery	7.000
DDOL (1-Dodecanol)	2.350	Effluent Stream	7.561
MCH	0.240		
ECF	0.410		
Caustic lye 25%	0.200		
HCl	0.060		
Sodium chloride 25 %	0.620		
BHT	0.001		
Me-THF	1.860		
MCH-2	2.130		
Process water	5.120		
Total Input	**16.161**	**Total Output**	**16.161**

51) 4-Amino Benzamide:

4-Nitro Benzamide presence of Catalyst gives 4-Amino Benzamide . The final product purified from high vacuum distillation.



Material Balance

51. 4-Amino Benzamide			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Nitro benzamide	1.257	Product	1.000
Iron powder	0.001	Effluent stream	10.273
Hydrogen	0.015		
Water	10.000		
Total Input	11.273	Total Output	11.273

52) P-Toludine :

P-Nitrophenol presence of Catalyst is gives p-Toludine. The final product purified from high vacuum distillation.

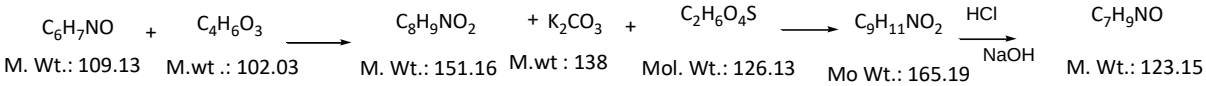
$$\underset{\text{Mol. Wt.: 137.14}}{C_7H_7NO_2} + \underset{2.02}{H2} \xrightarrow{\text{Fe (cat)}} \underset{\text{Mol. Wt.: 107.15}}{C_7H_9N} + \underset{36.03}{2H2O}$$

Material Balance

52. P-Toluidine			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
P-Nitro Toluene	1.330	Product	1.000
Iron powder	0.001	Effluent stream	1.350
Hydrogen	0.020	Spent catalyst	0.001
Water	1.000		
Total Input	2.351	Total Output	2.351

53) M-Anisidine

M-Anisidine prepared from m-Aminophenol and Dimethyl sulphate as a reagent and Acetone as a solvent. The final product purified from high vacuum distillation.

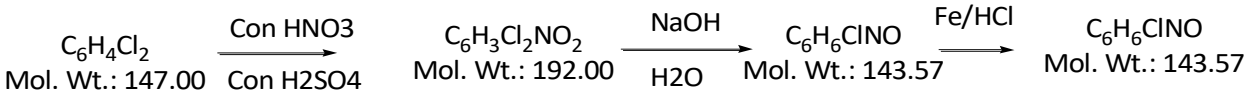


Material Balance

53.M-ANISIDINE			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
M-Aminophenol	0.886	M-Anisidine	1.000
Acetic Anhydride	0.935	Solid waste	2.128
Potassium Carbonate	1.264	Acetic acid	1.100
Dimethyl Sulphate	1.156	CO2	0.404
Hydrochloric acid	0.334	Effluent stream	10.930
Sodium Hydroxide	0.367	Spent Solvent (EDC)	0.999
Ethylene DiChloride	0.688		
Water	10.930		
Total Input	**16.561**	Total Output	**16.561**

54) 4-CHLORO,2 AMINO PHENOL (4-CAP)

1,4-Dichlorobenzene reacts with Nitration and basic hydrolysis followed hydrogenation using Fe/HCl to gives 4-CAP

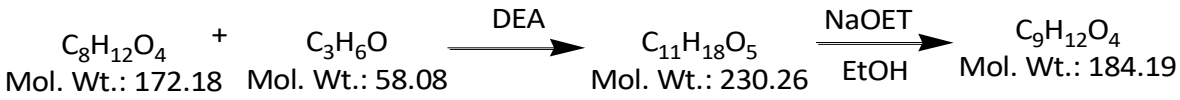


Material balance

54.4-CHLORO,2 AMINO PHENOL (4-CAP)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Aromatic substituted/ unsubstituted halides	1.030	Product	1.000
Nitric acid	1.250	Effluent stream	6.253
Sulfuric acid	1.200	Solid waste	1.230
Sodium Hydroxide flakes	1.100	solvent recovery	2.435
Fe powder	0.100		
Hydrochloric acid	1.000		
Methylene dichloride	2.435		
Process water	2.803		
Total Input	10.918	Total Output	10.918

55) Hydroxy Ester (HES)

Diethyl maleate reacts with Acetone and followed by addition of Sodium ethoxide to give hydroxy ester.

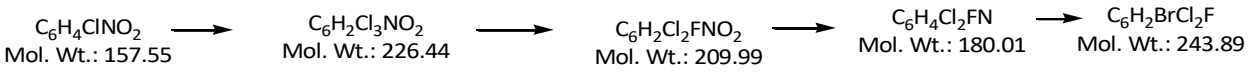


Material balance

55.Hydroxy Ester (HES)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
Diethyl maleate	1.500	Product	1.000
Sodium ethoxide	0.520	Effluent stream	7.160
Ethanol	1.750	solid waste	1.450
Ethyl acetate	0.720	solvent recovery	5.000
Xylene	2.500	Contaminated aromatic, aliphatic or naphthenic solvents may or may not fit for reuse (Xylene)	0.500
Sulfuric acid	1.000		
Process water	2.500		
Acetone	2.120		
Caustic lye	2.500		
Total Input	**15.110**	**Total Output**	**15.110**

56) Dichloro Fluoro Bromo Benzene (DCFBB)

Chlorination of Dichloro nitro Aniline and followed by Fluorination, reduction and bromination gives DCFBB.

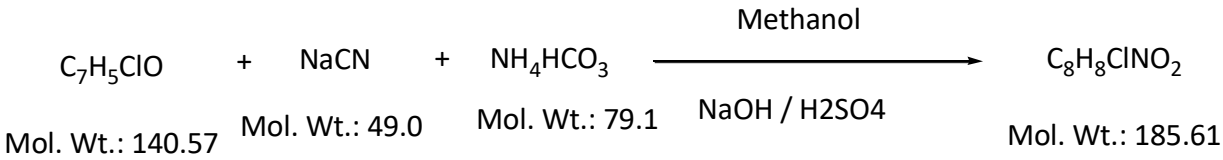


Material balance

56.Dichloro Fluoro Bromo Benzene (DCFBB)			
Material balance Per kg output of product			
Input	Input qty In Kg	Output	Out put in Kg
Dichloronitro benzene	1.700	Product	1.000
Nitric acid	1.850	Effluent stream	10.560
Sulfuric acid	1.900	solid waste	2.000
Ferric Chloride	2.160	solvent recovery	12.500
Chlorine gas	0.600		
Potassium Fluoride	0.800		
Tetra butyl Ammonium Bromide	0.200		
NMP	4.000		
Raney Nickel	0.100		
HBr in Water (48%)	1.000		
Hydrogen peroxide (50%)	0.600		
Copper(I)oxide	0.150		
Sodium nitrite	1.200		
Isopropyl alcohol	5.000		
Process water	2.900		
Caustic lye (48%)	1.900		
Total Input	**26.060**	**Total Output**	**26.060**

57) Para chloro phenyl glycine (PCPG)

Para chlorobenzaldehyde react with Sodium cyanide and presence of Ammonium bi carbonate and methanol to give PCPG

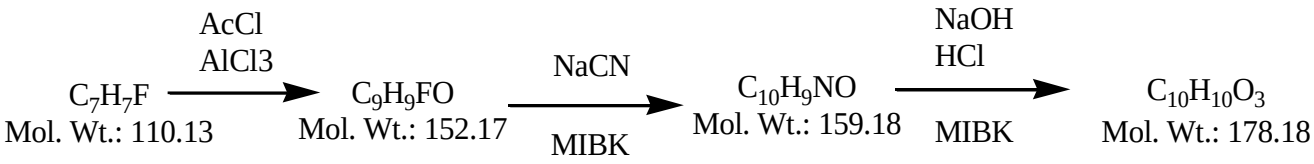


Material balance

57. Para chloro phenyl glycine (PCPG)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
4-Chlorobenzaldehyde	0.757	Product	1.000
Sodium cyanide	0.264	Solid waste	0.765
Ammonium bicarbonate	0.426	Effluent stream	1.426
Methanol	1.000	Solvent Recovery	1.000
water	1.000		
Sodium hydroxide	0.216		
Sulphuric acid	0.528		
Total Input	4.191	Total Output	4.191

58. 4-Acetyl-2-Methyl Benzoic Acid (AMBA)

2-Flurotoluene reacts with acetyl chloride to give acetylated product and hydrolysis to give 4-Acetyl-2-Methyl Benzoic Acid (AMBA)



Material balance

58. 4-Acetyl-2-Methyl Benzoic Acid (AMBA)			
Material balance Per kg output of product			
Input	Input qty in Kg	Output	Out put in Kg
2-Fluorotoluene	0.610	Product	1.000
Acetyl chloride	0.440	Solvent recovery	1.900
Sodium Cyanide	0.270	Process wastes or residues	1.500
MIBK	2.000	Effluent stream	3.340
Sodium hydroxide	0.220		
Hydrochloric acid	0.200		
Water	4.000		
Total Input	**7.740**	Total Output	**7.740**

2.10 WATER REQUIREMENT, WASTEWATER GENERATION AND MANAGEMENT

2.10.1 ASSESSMENT OF SOURCE OF THE WATER SUPPLY WITH ADEQUACY OF THE SAME TO MEET WITH THE REQUIREMENTS FOR THE PROJECT. PERMISSION OBTAINED FROM THE CONCERN AUTHORITY FOR SUPPLY OF RAW WATER.

The Total water requirement will be 1207.5 KL/Day. Out of that 207.5 KL/Day ground water for which NOC from CGWA/WRD available and remaining 1000 KL/Day applied to get from government water source.

Central Ground Water Authority
Ministry of Water Resources
Government of India

No. 21-4(134)/SECR/CGWA/2009-3708 Dated- 01 JUN 2012

To,

M/s Sanmer Speciality Chemicals Ltd.,
44, Theertham road Berigai-635105
Hosur Taluk, Krishnagiri District
Tamil Nadu

Sub: Renewal of Ground Water clearance in respect of M/s Sanmer Speciality Chemicals Ltd., for their organic chemicals & phytochemicals manufacturing industry located at Village Suligunta, Block Suligiri, Taluk Hosur, District Krishnagiri, Tamil Nadu - reg.

Sir,

It has been decided by the Central Ground Water Authority that NOC would be issued only once and renewal is stopped/ discontinued. There would be random site inspection of selected industries by CGWA, and in case the industry is found to be a defaulter in adhering to the laid down terms and conditions, the NOC is to be cancelled.

However, to neutralize the adverse impact of ground water withdrawal that may arise on a long term basis, the industry is advised to undertake the following measures:

1. Ground Water withdrawal shall not exceed the quantity of **207.5 m^3/day**.
2. All abstraction structures to be kept fitted with water meter by the industry and monitoring of ground water abstraction to be continued accordingly on regular basis, at least once in a month. The data may be submitted on a yearly basis to the Regional Director, Central Ground Water Board, South Eastern Coastal Region, Chennai for perusal and records.
3. The industry should continue to implement artificial recharge measures/rain water harvesting measures for augmenting the ground water resources of the area.
4. The industry shall ensure proper conservation measures, recycling and reuse of waste water after adequate treatment.
5. The industry shall continue to monitor the ambient ground water regime of the area through piezometers and submit the data on a yearly basis to the Regional Director, Central Ground Water Board, South Eastern Coastal Region, Chennai for perusal and records.

Yours faithfully,

Regional Director

Copy for information to the:

1. Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai-600032, Tamil Nadu with a request to ensure that Rain Water Harvesting and Artificial Recharge methods are being implemented by the firm and quantity of withdrawal is not exceeding **207.5 m^3/day.**
2. Regional Director, Central Ground Water Board, South Eastern Coastal Region, Chennai. This has reference to your letter No. T/8/46-847 dated 7.5.2012.
3. TS to Chairman, Central Ground Water Board, NH-IV, Faridabad.

Regional Director

West Block-2, Wing-3, Ground Floor, R. K. Puram, Sector-1, New Delhi-110066
Tel: (011) 26175377, 26175379, 26175373; Fax (011) 26175369 e-mail: tsmsmi-cgwb@nic.in, web site: http://cgwb.gov.in

2.10.2 WATER AND WASTEWATER

- The Total water requirement will be 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/WRD available and remaining 1000 KLD applied to get from government water source.
- The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream.
  - **Low COD stream:** Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system.
  - **High TDS Stream:** Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the soild waste generated will be disposed to TSDF (Common disposal Facility).
  - Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.

TABLE 2.4

WATER CONSUMPTION & WASTE WATER GENERATION

Water Consumption

Category	Existing KL/day	Proposed (Additional) KL/day	Total after Expansion KL/day	Remarks
(A) Domestic	12	88	100	
(B) Gardening	25.5	5	30.5	
(C) Industrial				
Process	48	552	600	
Washing	10	65	75	
Boiler	112	290	402	
Cooling				
Total (A+B+C)	**207.5**	**1000**	**1207.5**	

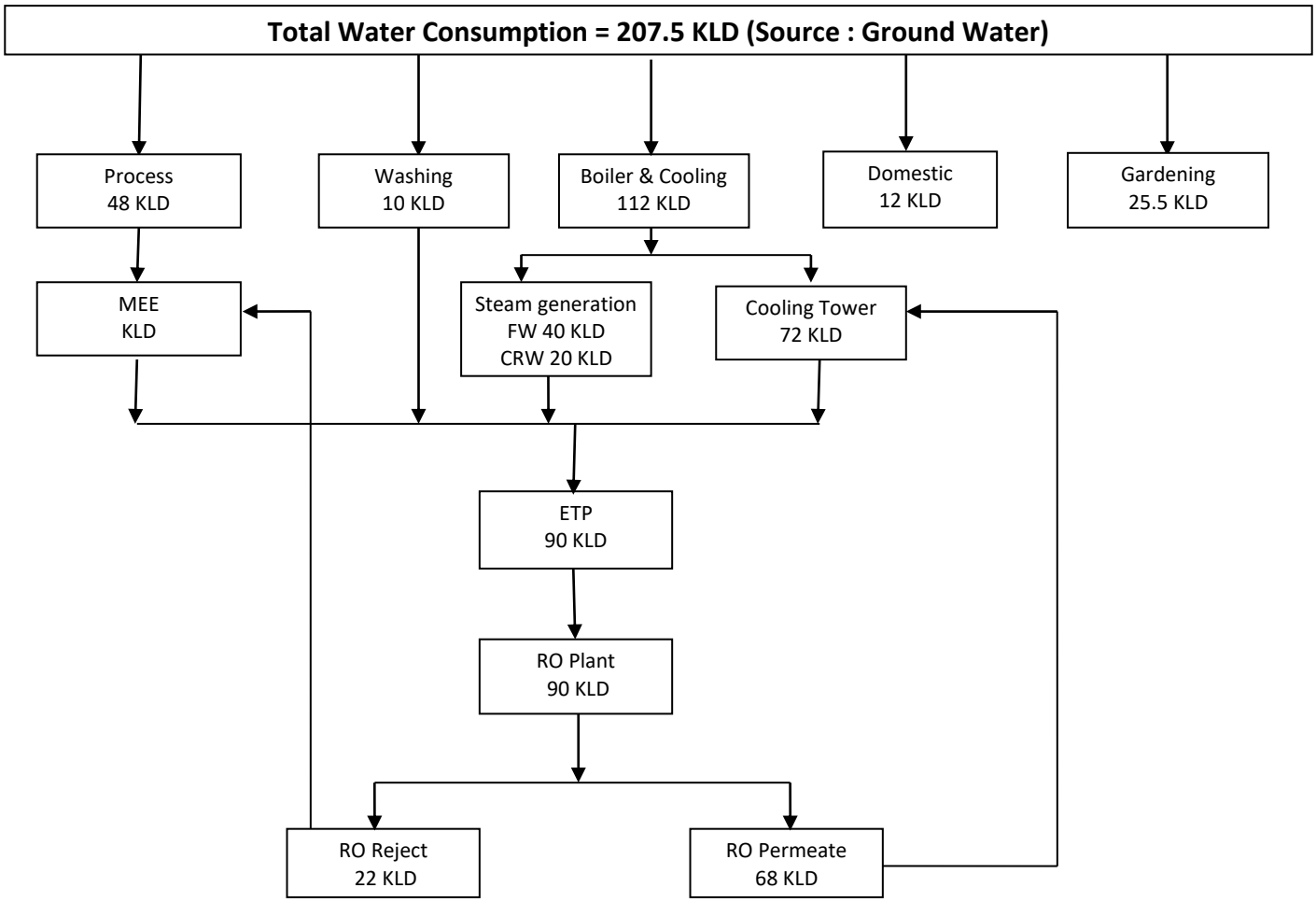
Note: For R&D products and pilot plant water requirement will be 0.1 KL/day. And that will be taken from the 1207.5 KL/Day.

Wastewater generation

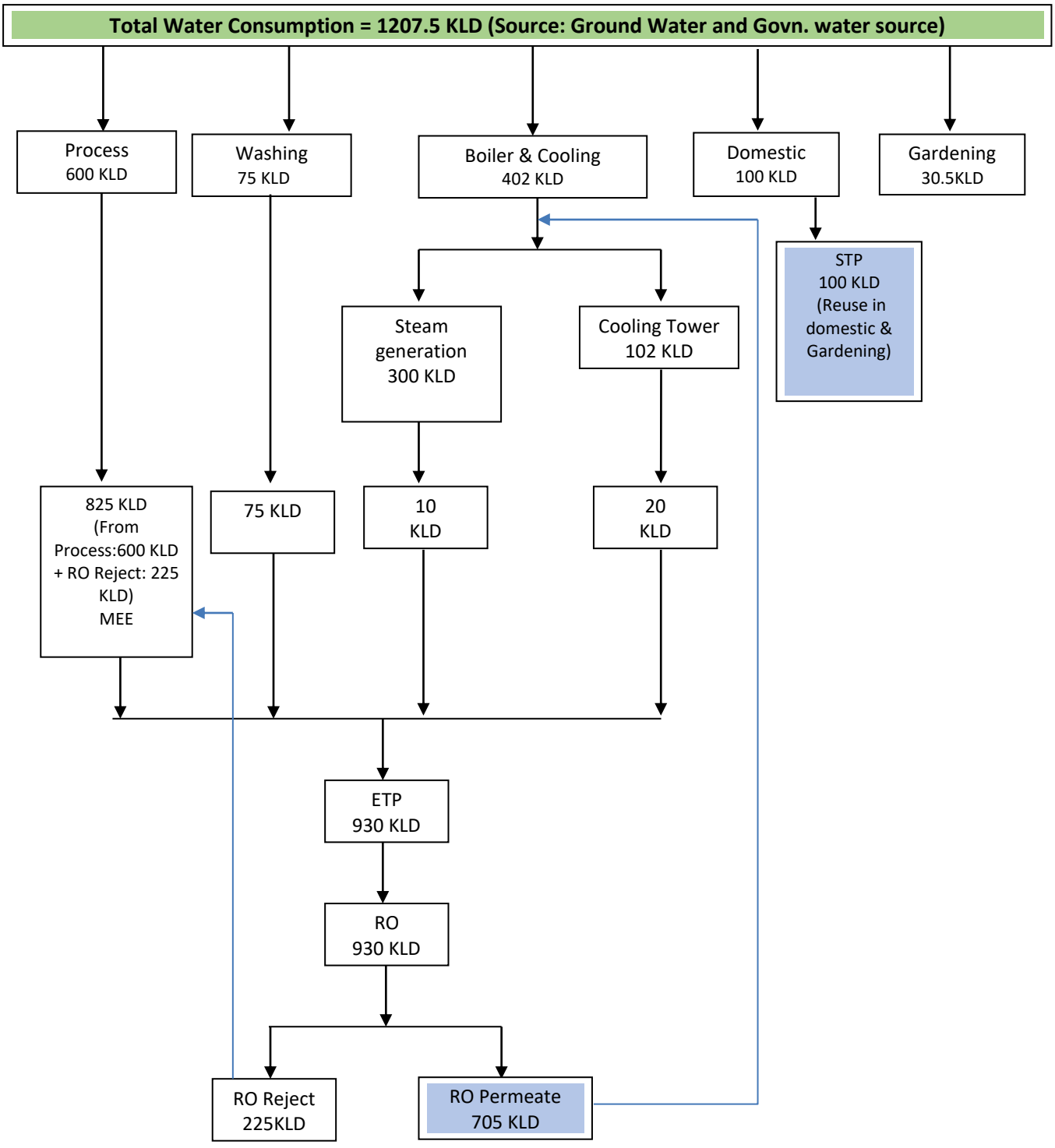
Category	Existing KL/Day	Proposed (Additional) KL/day	Total after Expansion KL/day	Remarks
A) Domestic	12	88	100	Forwarded to STP. Treated water reused in gardening after treatment.
B) Industrial				
Process	48	552	600	Treated in MEE and send to ETP followed by RO
Washing	10	65	75	Treated in ETP followed by RO.
Boiler	10	20	30	
Cooling				
Total Industrial waste water	**68**	**637**	**705**	

Note: For R&D products and pilot plant wastewater generation will be 0.1 KL/day.

Water Balance (As per Existing CTE):



WATER BALANCE DIAGRAM (TOTAL PROPOSED):



Note: Fresh Water: 1207.5 KLD + Reuse water: 805 KLD

2.10.3 SEGREGATION OF WASTE STREAMS, CHARACTERIZATION AND QUALITY WITH SPECIFIC TREATMENT AND DISPOSAL OF EACH STREAM

Segregation of waste streams:

Industrial effluent will be segregated into High COD and Low COD effluent streams.

- **Low COD stream:** Low COD effluent will be treated through the conventional wastewater treatment system and the pass through RO system.
- **High TDS Stream:** Neutralized concentrate effluent and rejects from RO will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility).
- Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.

Product wise Wastewater Characteristics

S. No	PROPOSED PRODUCTS LIST FOR EC	TDS in ppm	TSS in ppm	COD in ppm	BOD in ppm
A					
1	COLCHICINE	1000	1000	5137	1543
2	THIOCOlCHICOSIDE	872916	1000	5958	1789
B					
3	2-(1-CYLCOCHEXENY)LETHYLAMINE (CHEA)	966000	1000	38257	11489
4	3-[1,3,3-TRIS-(2-CARBOXY-ETHYL)-2-OXO-CYCLOHEXYL]-PROPIONIC ACID (T4C)	969231	1000	5290	1589
5	SUBSTITUTED ARYL ALKYL AMINE	5000	1000	26622	7995
6	2-AMINO-2-PHENYLBUTYRIC ACID SODIUM SALT /METHYL 2-(N,N-DIMETHYLAMINO)-2-PHENYLBUTYRATE (TR1600/TR1400)	193529	1000	8905	2674
7	4-CHOLO-BUTYL VERATRATE	340000	1000	7596	2281
8	4-(2-AMINOETHYL)-2-METHOXYPHENOL (AE PHENOL)	200952	1000	38850	11667
9	METHYL-2 PHENOXY ISOBUTYRATE	75000	1000	45833	13764
10	(4R)- 2- OXOOXAZOLIDINE -4- CARBOXYLIC ACID (COX)	5000	1000	5475	1644
11	4-t BUTYLPHENYLACETONITRILE	604167	1000	32069	9630
12	1-BROMO-3,5-DICHLOROBENZENE (DCBB)	3437500	1000	4226	1269
13	4-CHLORO-2-NITRO BENZOIC ACID	1113208	1000	16617	4990
14	4-BROMO PHENYL PROPANOL (BPP)	448649	1000	20572	6178
15	2-CHLORO-5-CHLOROMETHYL-1,3-THIAZOLE (CCMT)	625000	1000	18119	5441
16	TETRACHLORO BUTYRIC ACID (TCBA)	80000	1000	2524	758
17	IONOPHOR	100000	1000	1595	479
18	4-BROMO-2-FLUORO HYDROXY BIPHENYL (BFB)	468966	1000	5031	1511

19	PARA METHYL PHENCYL CHLORIDE (PMPC)	5000	1000	800	240
20	SODIUM 4-(2,4-DICHLOR M-TOLUOYL)-1,3-DI METHYL -5-PYRAZOLATE (MY710Na)	622642	1000	19495	5854
21	2-TRIFLUOROMETHYL BENZENE SULFONAMIDE (TBSA)	35958	1000	7867	2362
22	METHYL CARBAZATE	900000	1000	3944	1184
23	TETRALONE IMINE	5000	1000	3461	1039
24	4-[2(4-CHLORO-2,6-DIMETHYLPHENYL)ACETTYL]METHYLAMINO]-1-METHOXY-N-PHENYLPIPERIDIN-4-CARBOXAMIDE (DIAMIDE)	224000	1000	9009	2705
25	3(2,2,2-TRIFLUOROETOXY)2-PYRIDINE SULFONAMIDE SODIUM SALT (SULFONAMIDE)	708661	1000	4554	1368
26	5-CHLORO-8-HYDROXY-QUINOLINE (CHQ)	75598	1000	36939	11093
27	PHENYLGUANIDINE CARBONATE (PGC)	165000	1000	2407	723
28	FE (III) ACETYL ACETANOATE	403846	1000	2194	659
29	MANGANESE(II)HEXACYANOMANGANATE(II)SODIUM SALT (ANODE)	500000	1000	223	67
30	IRON(II)MANGANESE(II) HEXACYANOFERRATE(II) SODIUM SALT TETRADECAHYDRATE (CATHODE)	1255814	1000	269	81
31	1-CHLORO-3-NITROBENZENE	5000	1000	11000	3303
32	2,4,6- TRICHLORO ANILINE	91253	1000	9000	2703
33	PIVALOYL CHLORIDE	50057	1000	13000	3904
34	5-CHLORO VALEROYL CHLORIDE	5000	1000	52000	15616
35	4-FLUORO PHENYL ACETIC ACID	5000	1000	9500	2853
36	4-BROMO FLUOROBENZENE	5000	1000	8800	2643
37	3-FLUOROTOLUENE	52857	1000	11000	3303
38	4-FLUOROTOLUENE	52857	1000	11000	3303
39	ORTHO NITRO ANISOLE	134885	1000	56000	16817
40	PARA NITRO ANISOLE	134885	1000	51000	15315
41	O-CHLORO P-NITRO TOLUENE	34930	1000	58000	17417
42	3-AMINO- 4- -METHYL BENZOIC ACID METHYL ESTER	5000	1000	53000	15916
43	3-AMINO 4-METHYL BENZOIC ACID ISOPROPYL ESTER	5000	1000	61000	18318
44	5-AMINO-2-METHYL BENZENE SULPHONIC ACID PHENYL ESTER	115520	1000	59000	17718
45	(3-AMINOPHENYL) BENZENESULFONATE	115983	1000	55000	16517
46	4 -AMINO BENZOIC ACID METHYL ESTER	197281	1000	57000	17117
47	2-FLUOROANISOLE	5000	1000	7000	2102
48	4-FLUOROANISOLE	5000	1000	7000	2102
49	2-PHENOXYETHYLAMINE	58260	1000	65000	19520

50	SPIROPIDION (TINIVION)	79355	1000	14000	4204
51	4-AMINO BENZAMIDE	5000	1000	61000	18318
52	P-TOLUIDINE	5000	1000	12000	3604
53	M-ANISIDINE	194694	1000	54000	16216
54	4-CHLORO,2 AMINO PHENOL (4-CAP)	196706	1000	57000	17117
55	Hydroxy Ester (HES)	202514	1000	53000	15916
56	Dichloro Fluoro Bromo Benzene (DCFBB)	189394	1000	51000	15315
57	Para chloro phenyl glycine (PCPG)	536616	1000	58000	17417
58	AMBA: 4-Acetyl-2-Methyl Benzoic Acid	449102	1000	58000	17417

2.10.4 DETAILS OF ETP INCLUDING DIMENSIONS OF EACH UNIT ALONG WITH SCHEMATIC FLOW DIAGRAM.

Multiple Effect Evaporator Plant:

Suspended Solid Separation process:

Concentrated effluent transferred to the flash mixer neutralized with HCl. A polymer is dosed in the flash mixer and PAC is dosed in the Flocculator where suspended particles to help settle, the overflow from the flash mixer flows to the Clarifier. The overflow of the Clarifier feed to Stripper column.

STRIPPING COLUMN:

The TSS Outlet is feed into the stripping column through a triple pre heaters and a Heat exchanger where the low boiling solvent are stripped out

MEE PLANT:

The Stripper bottom liquid is feed into the Multiple Effect Evaporator **MEE** (Triple Effect Evaporator) where the Condensate is feed to Biological system for further treatment and Concentrate is feed into **ATFD (Agitated thin film dryer)**

ATFD:

The product from the MEE Plant is feed to the AGITATED THIN FILM DRYER where the concentrate water is dried to a solid powder which is disposing as per TNPCB norms.

Biological Treatment Plant (ETP):

Bar Screen

The raw effluent from the incoming line is received at the bar screen to separate the large debris and fine particles.

Equalization Tank

The overflow from bar screen chamber flows into the equalization tank which serves to attenuate variation in the effluent flow rate and characteristics. The feed to the downstream processes shall be uniform. Flow equalization will dampen and absorb flow rate variations so a near constant flow rate is achieved.

The Equalization tank will be provided with air diffusion system to keep the collected effluent under constant mixing, prevent any suspended solids from settling to the bottom of the tank.
The dimension of the Equalization tank is 3.0m * 5.0m * 3.0m X 2 nos and the volume is 90 m3.

Flash Mixer

The effluent from the equalization tank is pumped to flash mixer where effluent water containing turbid and suspended particles can be coagulated by dosing coagulant. Dosage rate of coagulant varies depending upon inlet turbidity & total suspended solids in feed water. The dosing tank is designed to hold solution required for 20 hours of operation. The dosing tank is connected to the pumps (1W + 1S), positive displacement type diaphragm pumps in PP construction.
After coagulant dosing, the pH of feed water may reduce. For effective coagulation, pH of water is required to be raised for which auto dosing system is provided.
The dimension of the flash mixer is 1.0 m * 1.0 m * 1.5m (LD-1.2m + FB-0.3m) and the volume is 0.25 m3.

Flocculator

The overflow from the flash mixer flows to a flocculator, a polymer is dosed in the flocculator to bridge the coagulated floc and produce a dense sludge to settle easily in the tube deck clarifier.

Tube Deck Clarifier

The heavy floc particles settle down to the bottom conical portion of the tube deck clarifier due to gravity. The settled sludge at the bottom will be discharged at regular intervals to the sludge holding tank. The overflow from the tube deck clarifier flows by gravity to the buffer tank.

Up Flow Anaerobic Sludge Blanket (UASB) Reactor

The UASB feed pump is provided to transfer effluent from buffer tank to the UASB reactor.
UASB uses an anaerobic process while forming a blanket of granular sludge which suspends in the tank. Influent wastewater is distributed at the bottom of the reactor and travels in an up-flow mode through the sludge blanket. During this, the combined organics are processed and degraded by the anaerobic microorganisms.
After the UASB process, the overflow is passed into the aeration tank to carry out the activated sludge process.

Secondary Biological Treatment

The overflow from the UASB flows by gravity to the downstream two stage aeration process, here the incoming effluent is continuously aerated, and it will be treated biologically with the help of the microorganisms for the removal of BOD, COD and other Organic pollutants. In this aerobic process, the effluent is subjected to extended aeration

type activated sludge process for biodegradation of organic impurities in the presence of re-circulated biomass. Air blowers & diffused aeration system will be used for aeration.
Post aeration, the effluent will be further clarified using a secondary clarifier. The clarifier will have a slow speed agitator for inducing the flocculation reaction and ensure large floc formation. The heavy floc particles settle down to the bottom conical portion due to gravity. The settled sludge at the bottom will be discharged at regular intervals to the sludge handling system using sludge transfer pumps. The overflow from the clarifier flows by gravity to the clear water tank.

Mechanical Dewatering System (Filter Press)
The sludge generated from Tube deck clarifier & secondary clarifier is drained into the Sludge holding tank. The collected sludge is pumped to the filter press for dewatering the sludge. The polyelectrolyte is added to the sludge handling system. Dewatering is a physical (mechanical) unit operation used to reduce the moisture content of sludge. The filtrate from filter press is taken to drain pit. Sludge generated from filter press is suitably disposed.

Disinfection
Liquid chlorine solution is dosed in the clear water tank for disinfection. Chlorination is the most common type of disinfection used worldwide. This is due to its effectiveness in providing a good pathogen kill with the relative simplicity in operation and maintenance. Clarified effluent from the secondary clarifier will be disinfected by dosing Sodium hypochlorite solution. Sodium hypochlorite solution will be prepared in the solution preparation tank and dosed by diaphragm type electronic dosing pump

Pressure Sand Filter & Activated Carbon Filter
Effluent from clear water tank is pumped to PSF followed by ACF to remove suspended solids, turbidity etc.
The arrested solids/turbidity in the PSF is removed by back washing. Solids are entrapped when raw water is passed in downward direction through the sand bed. This unit is charged with a uniform grade of filtering sand, which is supported on different grades of under-bed materials. The Pressure Sand Filter is made of MSFRP vertical vessel. It is fitted with top inlet distributor and header - lateral type of bottom collecting system.
Externally this unit is fitted with frontal pipe work and control valves. The unit is isolated for backwash, when the pressure drop across the bed exceeds the specified limit (0.8 Kg/cm^2) or quality of filtered water deteriorates, whichever is earlier. PSF backwash is done by using PSF filtrate collected into the filter back wash sump. Backwash generated from PSF is routed to drain pit.

Advanced Membrane Technology (Ultra Filtration)
The ultra-filtration membranes are used to remove the following impurities from the feed water

- Fine Colloidal particles
- Large Organic compounds
- Colloidal Silica

- Bacteria and Virus

The membranes act as an absolute barrier filtration to remove the impurities.
The Ultra-filtration membrane individual module consists of multiple fine fibers with 0.2 mm internal diameter. The membrane fibers are made of PES / PVDF to suit the filtration applications. The filtration cycle is from out to in, the feed water passes from outside of the fibers to the inside during filtration.
Typical operation cycle for the UF will be,

- Filtration – useful water is produced
- Air scouring
- Backwash
- Soaking
- Flush / Rinse.
- Chemical Enhanced backwash at prefixed intervals.

Backwashing
Dedicated backwash pumps connected to a backwash water source will be provided as part of the equipment. The backwash water requirement will be taken from a dedicated tank or common UF filtrate storage tank. A suitable acidic/alkaline cleaner dosing and chlorine dosing system will be provided to dose chemicals as required during backwashing of the Ultra-filtration membranes. The dosing sequence will be controlled by the PLC and will be done by means of metering pumps to ensure accurate and optimum dosing.
The backwash water from the UF will be led back to the drain pit.

Reverse Osmosis: Stage -1
Reverse Osmosis is the third & final stage of treatment for removal of dissolved salts; two pass Reverse Osmosis system is provided. UF permeate is pumped by the cartridge filter feed pumps, to the cartridge filters. The capacity of the pump is such that they will pump the required quantity of UF permeates to RO skid. The system consists of following equipment in series.

pH Correction
Feed pH correction is done to ensure all sparingly soluble salts are kept within their solubility levels at the reject end of the RO. Acid is dosed to adjust pH and ensure the reject water saturation index is maintained below 2.0.
Feed pH correction can by automate based on the feed water pH online monitoring to ensure the feed pH remains within the desired band levels.
When pH correction is done using acid, CO_2 is generated from the reaction with the alkalinity present in the water, the dissolved CO_2 passes through the membranes, a degasser is provided to in the RO permeate to remove the CO_2 generated.

Anti scalant Dosing System

To achieve higher recovery from the RO membranes it is necessary to hold the sparingly soluble salts in the water at super saturation levels, this is achieved by addition of chelating agents that prevent precipitation of the sparingly solution ions like Ca, Mg and silica. Type and quantity of antiscalant used is based on the feed water chemistry. At the design stage software simulation are generated, this however will have to be established during the plant commissioning.

Micron Cartridge System

A cartridge type 5 / 10 micron-rating filter is provided after chemical dosing to act as a guard filter. The cartridges will be non-fiber shedding in nature. This filter serves to trap any particulate matter generated due to chemical dosing. It ensures clean water is always fed to the RO units.

High Pressure Pump

An online high-pressure booster pumps is used to pressurize the RO feed to the desired pressure to achieve the desired recovery. Multistage centrifugal booster pumps are offered for this service. The base level of these pumps is offered with CI casing and SS wetted parts. Full stainless pumps are also offered based on the feed water salinity levels.

Reverse Osmosis Block

The RO block contains the membranes housed in the FRP housings. The housing is fitted in a compact skid frame with the feed, permeate and Reject piping. The housings are arranged in such a manner that the hydraulic flows across all the housing are uniform and the off take of permeate from each membrane is uniform.

Each stage is designed for a uniform of take of permeate to maintain the required cross flow and the reject flows. This will ensure that fouling and scaling do not take place on the membrane surface. The membranes used are the latest generation spiral wound thin film composite membranes. For specific applications fouling resistant membranes will be used, however this will be decided based on the nature of the feed water.

Hardness Removal System

The pre-treatment section is designed to precipitate / coagulate and flocculate the following from the feed water,

- Total Suspended solids
- Total Hardness (Partially)

Chemical Coagulation

The process involves dosing of coagulant to precipitate the dissolved salts in the first stage, the following chemicals are dosed in the flash mixer to induce the precipitation.

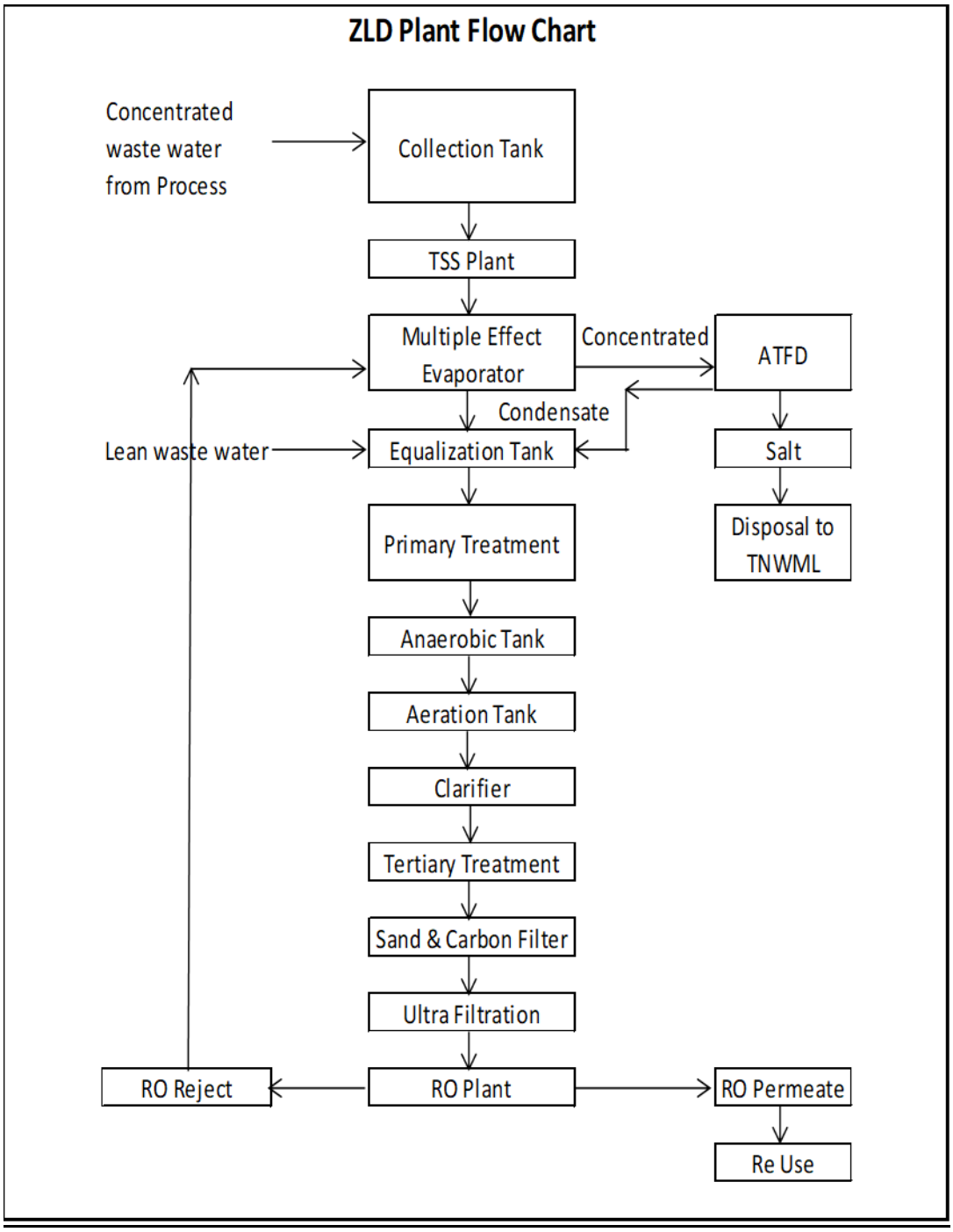
- Lime Solution for precipitation of carbonate-based hardness.
- Soda ash solution to provide bicarbonate alkalinity for non-carbonate hardness precipitation.
- Ferric Chloride solution to enhance the floc formation.

The overflow from the flocculator flows by gravity to the secondary tube deck Clarifier. In the tube deck clarifier, the incoming water flows upward through the tube Pac media and heavy floc particles settle down to the bottom conical portion of the tube settler due to gravity. At regular intervals, the settled sludge at the bottom will be discharged to sludge holding tank. The clear water overflows by gravity to the RO-2 feed tank.

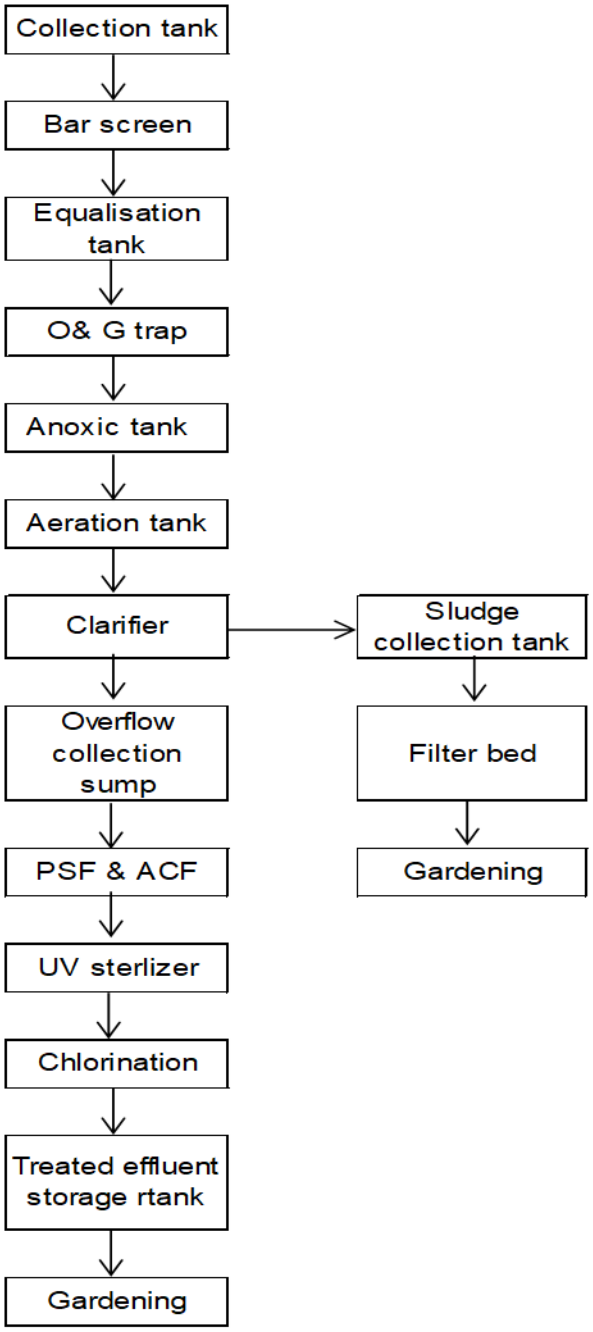
Treatment units Value

Sl.No.	Treatment units	Existing (KLD)	Proposed (KLD)	Total (KLD)
1	Biological Treatment system	100	1100	1200
2	Ultra filtration system	100	1100	1200
3	Reverse Osmosis Plant	100	1100	1200
4	Multiple Effect Evaporator	220	930	1000

Process Flow Diagram: -



STP Flow Chart



2.10.5 EFFLUENT TREATMENT SCHEME INCLUDING SEGREGATION OF EFFLUENT STREAMS FOR UNITS ADOPTING 'ZERO' LIQUID DISCHARGE.

Unit has full-fledged Effluent Treatment Plant to treat the wastewater with multiple effect evaporators (MEE),Biological conventional treatment and RO system. The water recovered is totally reused in the process plant itself. The domestic waste water is also treated in the STP. The cyanide bearing wastewater is chemically treated with Sodium hypochlorite solution and taken for evaporation in the MEE. No effluent is/will be discharged into any surface water body. **Hence, this unit is/will be total Zero Liquid Discharge unit.**

2.10.6 PLANS FOR MANAGEMENT, COLLECTION AND DISPOSAL OF WASTE STREAMS TO BE GENERATED FROM SPILLAGE, LEAKAGES, VESSEL WASHING, USED CONTAINER WASHING ETC. MEASURES PROPOSED FOR PREVENTING EFFLUENT DISCHARGE DURING UNFORESEEN CIRCUMSTANCES.

- All major chemical handling is done through closed system.
- All reaction vessels are connected to scrubber system.
- Smoke & fire detection system installed at ware house.
- Spillage of any chemical will be avoided to the maximum extent by closed circuit system i.e. day tanks are provided with an overflow line having bigger diameter than that of inlet of the pipe diameter. Standard operating procedures are available to handle spillage and leakage.

2.11 AIR POLLUTION AND CONTROL SYSTEM

2.11.1 DETAILS OF PROCESS VENT

Sr. no.	Source of emission	Type of emission	Stack/Vent Height (meter)	APCM
EXISTING				
1	Scrubber at Plant - I	SO_X,NO_X,CO	6.1	Wet Alkali Scrubber,Stack
2	Scrubber at Plant -II	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
3	Scrubber at Plant - II	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
4	Scrubber at Plant - II	SO_X,NO_X,CO	15	Wet Alkali Scrubber,Stack
5	Absorber at Plant - I	SO_X,NO_X,CO	4	Wet Alkali Scrubber,Stack
6	Scrubber at R & D plant	SO_X,NO_X,CO	12	Wet Alkali Scrubber,Stack
7	Phyto Plant Scrubber(Process)	SO_X,NO_X,CO	19	Wet Alkali Scrubber,Stack
8	Scrubber at Plant - II	SO_X,NO_X,CO	15	Wet Alkali Scrubber,Stack
9	Scrubber at Pilot Plant	SO_X,NO_X,CO	6.1	Wet Alkali Scrubber,Stack
10	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
11	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
12	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
13	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
14	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
15	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
16	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
PROPOSED				
17	Scrubber -1	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
18	Scrubber -2	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
19	Scrubber -3	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
20	Scrubber -4	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
21	Scrubber -5	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
22	Scrubber -6	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
23	Scrubber -7	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
24	Scrubber -8	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
25	Scrubber -9	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
26	Scrubber -10	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
27	Scrubber -11	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
28	Scrubber -12	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
29	Scrubber -13	SO_X,NO_X,CO	17	Wet scrubber with stack
30	Scrubber -14	SO_X,NO_X,CO	17	Wet scrubber with stack
31	Scrubber -15	SO_X,NO_X,CO	17	Wet scrubber with stack
32	Scrubber -16	SO_X,NO_X,CO	17	Wet scrubber with stack
33	Scrubber -17	SO_X,NO_X,CO	17	Wet scrubber with stack
34	Scrubber -18	SO_X,NO_X,CO	17	Wet scrubber with stack

35	Scrubber -19	SO_X,NO_X,CO	17	Wet scrubber with stack
36	Scrubber -20	SO_X,NO_X,CO	17	Wet scrubber with stack
37	Scrubber -21	SO_X,NO_X,CO	17	Wet scrubber with stack
38	Scrubber -22	SO_X,NO_X,CO	17	Wet scrubber with stack
39	Scrubber -23	SO_X,NO_X,CO	17	Wet scrubber with stack
40	Scrubber -24	SO_X,NO_X,CO	17	Wet scrubber with stack
41	Scrubber -25	SO_X,NO_X,CO	17	Wet scrubber with stack

2.11.2 DETAILS OF THE UTILITIES REQUIRED.

Various utilities required for proper functioning of manufacturing plants. These utilities include steam boiler, cooling plant, Cooling tower, Chilling tower, Air compressor, High Vacuum System, etc.

2.11.3 TYPE AND QUANTITY OF FUEL TO BE USED FOR EACH UTILITY.

Power Requirement:

Sr. No.	Description	Existing Requirement (KVA)	Proposed Requirement (KVA)	Total Requirement (KVA)
1	State Electricity Department	2000	12000	14000
2	D.G. Set	3470 (600x4)KVA (750x1)KVA (320x1)KVA	10000 (5 x 2000 kVA)	13470

Note: DG Set will be kept for emergency power back up.

Fuel Requirement:

Sl. No.	Type of Fuel	Existing (MT/day)	Proposed (MT/day)	Total (MT/day)
1	Furnace Oil	8	90	98
2	Briquettes	00	250	250
3	HSD	1.7	20.3	22
4	LPG	0.008	0.192	0.20

2.11.4 FLUE GAS EMISSION RATE EMISSION FROM EACH UTILITY

FLUE GAS EMISSIONS

SR. no.	Source of emission With Capacity	Stack Height (meter)	Name of the fuel	Quantity of Fuel MT/hr & MT/Day	Type of emissions i.e. Air Pollutants	APCM
EXISTING						
1	Boiler-1 (9 TPH)	40	Furnace Oil	8 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector ,Stack
2	D.G set (600 KVA	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
3	D.G set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
4	D.G set (750 KVA)	12	HSD	90lit/Hr	SOX,NOX,SPM,CO	Stack
5	DG (320 KVA)	9.8	HSD	40 lit/Hr	SOX,NOX,SPM,CO	Stack
6	D.G Set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
7	D.G Set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
8	Thermic Fluid Heater 1 Lakh Kcal/Hr	9	HSD	20 lit/hr	SOX,NOX,SPM,CO	Stack
9	Thermic Fluid Heater 1 Lakh Kcal/Hr	9	HSD	20 lit/hr	SOX,NOX,SPM,CO	Stack
PROPOSED						
10	Boiler-1 (25 TPH)	40	Briquettes	125 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack & ESP with water scrubber
11	Boiler-1 (25 TPH)	40	Briquettes	125 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack & ESP with water scrubber
12	Boiler-1 (25 TPH)	40	Furnace Oil	45 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack

13	Boiler-1 (25 TPH)	40	Furnace Oil	45 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack
14	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
15	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
16	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
17	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
18	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
19	Thermic Fluid Heater 2 Lakh Kcal/Hr	9	HSD	40 lit/hr	SOX,NOX,SPM,CO	Stack
20	Thermic Fluid Heater 2 Lakh Kcal/Hr	9	HSD	40 lit/hr	SOX,NOX,SPM,CO	Stack

(Note: In proposed expansion, initially company will install Briquettes Boiler-25 TPH. On continuation of the expansion phases, company will install either Briquettes / FO boiler based on the Briquettes resource availability)

2.11.5 LIST THE PROJECT SPECIFIC SOURCES OF FUGITIVE EMISSION ALONG WITH ITS QUANTIFICATION AND PROPOSED MEASURES TO CONTROL IT.

The emissions are normally defined as emissions to the atmosphere resulting from leaking piping sources and equipment such as valves, flanges, pump seals, connections, and compressor seals open end lines and pressure relief valves. The emissions are not visually observed but can be measured in relatively low concentration at each area of source.

Fugitive emissions are expected to be generated during construction and operation stages of the proposed project. During construction stage, main source of fugitive emission is dust which is expected mainly due to movement of vehicles carrying construction material and vehicles used for construction. During operation stage, leakage through valves, pumps, emission from open drum containing chemicals, open feeding; storage tanks, etc. are the major sources of fugitive emissions of organic chemicals and VOCs. Adequate dust collector is installed for control of fugitive emission during loading of raw material and product. Condensers are provided to trap VOC. All the Flange joints of the pipe lines which carry solvents are covered with flange guards. All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions. VOC detectors are installed at various places to identify any fugitive emissions. A regular preventive maintenance schedule is in place to replace or rectify all gaskets and joints etc as a part of ISO systems to ensure no fugitive emissions takes place.

The fugitive emissions control measures:

- The Solvent used in the processes is handled in a closed loop and in process materials are stored in drums will be kept under structured roof.
- Equipment where volatile solvents distilled is provided with reflux condensers and after coolers and the receivers are connected to the scrubber.
- Pumps of compatible MOC with Single and Double Mechanical seals are used for handling corrosive and hazardous chemicals
- Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by External lab
- All the rotating equipment like pumps are installed with Mechanical Seals to arrest any sort of emissions.
- Proper ventilation in storage area is ensured and all materials are stored in suitable packing to prevent contamination of air due to particulates & volatile emissions from storage area.

- All the Flange joints of the pipe lines which carry solvents are covered with flange guards.
- Adequate Dust Suppression System including Water Sprinkling System is installed for control of fugitive emission during loading of raw material and product.
- Work place monitoring within plant, storage & other area and AAQM will be done as per 'Post project monitoring plan' as well as regulatory requirement as per factory act.
- Properly designed method & practices of transportation, storage & handling of materials are established and maintained along with necessary facilities to reduce airborne particle of materials and VOCs.

2.11.6 PROVISION OF CEMS (CONTINUOUS EMISSION MONITORING SYSTEM).

- Continuous online Monitoring System for Gaseous Emission as well as Effluent are installed.
- Parameters required to be monitored in the stack emissions using Continuous Emission Monitoring system, are industry specific and are specified below: - PM, SO2, & HCN
- For online continuous monitoring of effluent, the unit installed web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises.

2.12 HAZARDOUS WASTE GENERATION AND MANAGEMENT

2.12.1 MANAGEMENT PLAN FOR HAZARDOUS/SOLID WASTE INCLUDING STORAGE, HANDLING, UTILIZATION AND SAFE DISPOSAL AS PER THE HAZARDOUS AND OTHER WASTES (MANAGEMENT AND TRANSBOUNDARY MOVEMENT) RULES 2016. CPCB GUIDELINES IN RESPECT OF SPECIFIC TREATMENT, SUCH AS SOLAR EVAPORATION, INCINERATION, ETC., NEED TO BE FOLLOWED.

TABLE 2.5

DETAILS OF HAZARDOUS WASTE AND ITS DISPOSAL

Sr. No	Name of Waste	Source of Generation	Cat No.	Existing Quantity (MT/Year)	Total Proposed Quantity (MT/Year)	Disposal Method

1.	Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes	Storage & handling of Raw Materials	Sch-I/ 33.1	40	500	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
2.	Used / Spent Oil	Equipment & Machineries	Sch-I/ 5.1	10	200	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
3.	Chemical sludge from waste water treatment	In-house ETP & MEE	Sch-I/ 35.3	2500	43000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
4.	Spent solvents	Process	Sch-I/ 28.6	350	20000	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
5.	Distillation residues	Process	Sch-I/20.3	20	4000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
6.	Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse		Sch-I/20.1	6	10000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016
7.	Spent catalyst	Process	Sch-I/28.2	1	40	Collection, Storage, Transportation for Regeneration, Recovery and Reuse. (Recyclable)

8.	Contaminated cotton rags or other cleaning materials		Sch-I/ 33.2	2	40	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
9.	Spent Carbon or Filter medium	Process	Sch-I/ 36.2	NA	4000	Collection, Storage, Transportation & disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016.
10.	Process residue and wastes	Process	Sch-I/ 28.1	NA	30000	Collection, Storage, Transportation & disposal to Co-processor by following protocol of Hazardous Waste Rule – 2016.
Non Hazardous waste						
11.	Fly Ash	Utility	--	--	18250	Collection, Storage, Transportation and sent for brick manufacturer and/or in cement industries.

2.12.2 METHODOLOGY OF DE-CONTAMINATION AND DISPOSAL OF DISCARDED CONTAINERS AND ITS RECORD KEEPING.

Decontamination & Disposal of Discarded Containers: The proper disposal of empty chemical containers is more important for hazardous chemicals as it can contain residual amounts of chemicals. There can be no more than 1 inch of material left in the container not more than 3% by weight of the containers capacity. In an effort to ensure that this residue is handled properly and to be able to recycle or properly dispose of these containers, the following procedure is to be followed. The below guidelines are useful for non-hazardous chemicals also.

Rinse Procedure: An empty chemical container that contains hazardous chemicals (liquid or solid), must be rinsed 3 times with water (or appropriate rinsing agent) before being discarded. The first rinse is collected as chemical waste, it can be put into any waste container of compatible chemicals, the second & third rinses then go down to drain. If the chemical is on the list of acutely hazardous waste, then all three rinses are collected. They are placed into an operating fume hood overnight without the cap to allow the vapors to disperse. After the containers are rinsed, they are discarded appropriately as described

below. All caps are let off of the discarded containers. Containers are labeled with "Empty" labels and the chemical name is crossed or blacked out prior to being discarded. Caps are discarded to regular trash.

Reuse /Recycle/ Disposal of cleaned containers:

- All chemicals must follow the above rinse except the volatile Solvents & before being discarded in any form.
- Metal containers or any plastic containers, plastic tubing or plastic beakers that do not meet the recycling criteria can be discarded into regular trash.
- Glass containers, glass tubing that do not meet the recycling criteria are to be placed into trash can for disposal.
- Plastic & glass containers that meet the recycling criteria must be placed in appropriate recycling containers.
- Empty compressed gas cylinders are returned to vendor.

2.12.3 MANAGEMENT OF BY-PRODUCTS WHICH FALL UNDER THE PURVIEW OF THE HAZARDOUS AND OTHER WASTES (MANAGEMENT AND TRANSBOUNDARY MOVEMENT) RULES 2016 AS PER THE SAID RULES AND NECESSARY PERMISSIONS FROM THE CONCERN AUTHORITY.

- Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse, Distillation residues, Chemical sludge from waste water treatment, Contaminated cotton rags or other cleaning materials will be disposed at TNWML.
- Spent solvent will be disposed to TNPCB Authorized Recycler (M/s. Pentakcoat Resins).
- Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes will be sent to TNPCB Authorized Recycler (M/s. Keerthiga Chemicals)
- Spent oil will be sent to TNPCB Authorized Recycler (M/s. Sri Balaji Enterprises)

2.12.4 MEMBERSHIP OF COMMON ENVIRONMENTAL INFRASTRUCTURE LIKE TSDF, COMMON INCINERATION FACILITY (CHWIF), MEE, SPRAY DRYER ETC.

IWMA - Membership certificate



Caring for the Environment
IWMA

Industrial Waste Management Association

Regd. No. 256 / 2002

'Crown Court', 2nd Floor, 128, Cathedral Road, Chennai - 600 086.

SANMAR SPECIALITY CHEMICALS LIMITED

This is to certify that .....

..... located at 44, THEERTHAM ROAD, SULIGUNTA VILLAGE, BERIGAI - 635 103.

..... is a member of the Industrial Waste Management Association. The membership no. is 488

Date : 15.09.09

Chairman

Agreement with Tamilnadu Waste Management Limited

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भारतीय गैर न्यायिक
एक सौ रुपये Rs. 100
ONE HUNDRED RUPEES
₹. 100
भारत INDIA
INDIA NON JUDICIAL

தமிழ்நாடு तमिलनाडु TAMILNADU BZ 897290

Rs. 100/-
Sl. No.
Date : 23/9/2020

Chemplast Sanmar Ltd
Benigai

Parimala

N.B. PARIMALA,
Stamp Vendor

SERVICE AGREEMENT

This Service Agreement is made at 15th day of January 2021 BY AND BETWEEN

M/s Chemplast Sanmar Limited -Sanmar Speciality Chemicals Divison having its registered office at No.9 Cathedral Road, Chennai -600 086 and having production units at No.44, Theerham Road, Suligunta Village, Berigai Post, Shoolagiri Taluk, Krishnagiri District -635105 Tamil Nadu represented by its Dr.Krishnakumar Rangachari on behalf of its Occupier hereinafter referred as "Generator" which expression shall unless repugnant to the subject or context include its successors and assigns):

AND

TAMILNADU WASTE MANAGEMENT LIMITED, company registered under the Companies Act, 1956 and having its registered office Ramky Grandiose, 12th & 13th floor, Ramky Tower's complex, Gachibowli, Hyderabad – 500 032, represented by its AUTHORISED SIGNATORY (herein after called ("TNWML") of the FIRST PART (which expression include their successors and assigns, unless such inclusion is inconsistent with the context of meaning thereof)

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TAMILNADU WASTE MANAGEMENT LTD

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Hereinafter in this Agreement Generator and Operator shall collectively be referred to as 'Parties' and individually as 'Party'.

WHEREAS;

A. Generator Sanmar Speciality Chemicals engaged in manufacturing of Speciality Chemicals and Generating Hazardous waste at plant located in Sriperumbudur.

B. Operator is engaged in the business of Waste Management and presently operating 'Integrated Common Hazardous Waste Treatment Storage Disposal Facility' at Plot No.5-15, 28-33, Sipcot Industrial complex, Gummidipoondi, Thiruvallur District had been established as per the TNPCB's Consent to Establish Order AND WHEREAS the GENERATORS desire to get their Hazardous WASTE (herein after referred as WASTE) being generated at their premises collected, treated, stored and disposed of by utilizing the services of the TNWML.

C. WHEREAS Generator has approached Operator for availing its services for collection, transport, treatment, storage and disposal of the Hazardous Waste generated during the process of manufacturing of its product and the same has been accepted by Operator on the terms and conditions set out in this Agreement read with the provisions of Hazardous Rules and supervision of SPCB.

NOWTHEREFORE in consideration of the above-mentioned premises and the mutual promises contained herein, the Generator and Operator have agreed to enter into this Agreement under the terms and conditions set forth hereinafter.

1. **DEFINITIONS AND INTERPRETATION**

1.1 Definitions: In this Agreement, including in the recitals hereof, the following words, expressions and abbreviations shall have the following meanings, unless the context otherwise requires:

a. "Agreement" means this agreement including all attachments, annexure or Schedules annexed thereto.
b. "CPCB" means Central Pollution Control Board.
c. "Rules" means Hazardous & Other Wastes (Management & Handling) Rules, 2016 as amended from time to time.
d. "MoEF" means Ministry of Environment & Forests.
e. "SPCB" means State Pollution Control Board, Tamilnadu o in the state in which the TSDF operated by Operator is situated.
f. "TSDF" means the Integrated Common Hazardous Waste Treatment Storage Disposal facility by name "TAMILNADU WASTE MANAGEMENT LIMITED" (TNWML) operated by the Operator and located at Plot No.5-15, 28-33, SIPCOT Industrial complex, Gummidipoondi, Thiruvallur District PIN-601

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March, 2018 under Section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974, under Section 21 of Air (Prevention and Control of Pollution) Act, 1981 and Hazardous Waste Authorization No. 4498, dated 2nd January 2015, under the Provisions of Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016

g. "Waste" means Hazardous waste generated at the premises of the Generator.

1.2 Interpretation : In this Agreement, unless the subject or context otherwise requires:

a. Reference to the singular number shall include references to the plural number and vice-versa;
b. References to a "person" shall include references to natural persons, partnership firms, companies, bodies corporate and associations, whether incorporated or not or any other organization or entity including any governmental or political sub-division, ministry, department or agency thereof;
c. References to recitals, clauses and annexure are to recitals, clauses and schedules to this Agreement;
d. Any reference herein to a statutory provision shall include such provision, as is in force for the time being and as from time to time, amended or re-enacted in so far as such amendment or re-enactment is capable of applying to any transactions covered by this Agreement.
e. Clause headings used herein are only for ease of reference and shall not affect the interpretation of this Agreement.

1.3 The Recitals & Annexure shall form an integral part of this Agreement.

1.4 All capitalized terms used in this agreement which have not been specifically defined in this Agreement shall, unless inconsistent with the context have the meanings assigned to them under the Authorization Agreement.

1.5 The GENERATOR shall be member of Industrial Waste Management Association (herein after referred to as IWMA) and enter into an agreement with TNWML and the agreement is nontransferable.

2 SCOPE OF SERVICES

2.1 The scope of services to be provided by Operator under this Agreement shall be collection, transportation, treatment, storage and disposal of Waste generated at its TSDF Facility.

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2.2 It is agreed between the Parties that Operator shall provide the above services to the Generator through Tamilnadu Waste Management Ltd (TNWML), a TSDF operated by Operator

2.3 Operator shall dispose the Waste as per the mandate of the SPCB read with the provisions of Hazardous Rules.

2.4 Operator also agrees to accept even non-hazardous wastes from the Generator provided that the concerned SPCB issues 'no objection'.

3 GENERAL CONDITIONS

3.1 The Generator shall provide to Operator, a sample of the Waste and inform the entire process details which leads to generation of such Waste, for the purpose of determining the Waste characteristics and to decide parameters for comprehensive analysis, as well as its final pathway of treatment, storage and disposal of the Waste.

3.2 Operator shall carry on the comprehensive analysis of the Waste in its laboratory at the cost of the Generator, as per the parameters identified in the Annexure. The comprehensive analysis report shall be used by Operator to determine the disposal pathway based on the waste characteristics & as per MoEF, CPCB and the SPCB rules and guidelines issued from time to time. The disposal pathway shall be mutually agreed between the Generator & Operator and shall form basis for disposal/ user charges. The comprehensive analysis report is valid for two (2) years. Any change in the process, product mix or raw material which generates the Waste needs to be informed to Operator in advance of such proposed change by the Generator.

3.3 Upon receipt of information from the Generator, Operator shall plan and schedule for collection of the Waste from the Generator and the safety during transportation is the collective responsibility of the Generator and the transporter.

3.4 The Generator shall provide the details of Waste to Operator as mentioned below:

i) Complete details of the Waste and its characteristics regarding presence of explosive / ignitable / corrosive / toxic / odorous compounds in the manifest provided to the transporter for safe transportation and disposal.

ii) Safety information in 'Form 08', 'waste transportation manifest' in 'Form 09', 'TREM Card' in 'Form 09' for every Waste type as per Hazardous Rules.

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3.5 Operator shall analyze the Waste received through finger print analysis as per the parameters identified at Annexure as prescribed by the concerned SPCB.

3.6 In the event there are any differences in the analysis results of comprehensive analysis and finger print analysis, the Generator may either accept the results of Operator or send their samples to a mutually agreed third party analysis at their own cost. Any discrepancy in relation thereto shall be informed to the SPCB.
Any deviation in waste characteristics, if found at the time of receiving the waste by finger print analysis, charges will be worked out based on FPA and the same will be communicated to the generator for their clearance for which Generator should agree to dispose.

3.7 The Generator shall provide a fresh comprehensive analysis report when there is a change in the waste characteristics, manufacturing processes, changes in product mix or any other changer in the process of generation of the Waste.

3.8 Generator shall be liable for any loss or damage whether directly or indirectly arising there from and/or caused during transportation, handling, treatment & disposal due to any false information or withholding of information by the Generator.

3.9 The Generator shall provide an advance declaration before the first day of April every yearregarding the assuring quantity of Waste they would be sending to the Operator till end of the financial year i.e. till March 31st and declare Waste quantities on annual / monthly basis as per Rules in the declaration format provided in the Annexure so as to enable the operator to equip for TSDF operations.

3.10 Operator agrees to provide its specially designed containers available at its TSDF to the Generator, provided the Generator pays the container maintenance charges to Operator as per Annexure.

3.11 The Waste supplied by the Generator shall not contain any kind of nuclear / radio active or any other prohibited material. A certificate or confirmation from Generator shall be submitted to Operator for any such suspicious consignments.

3.12 The Generator shall pay a fixed amount to Operator as minimum monthly service commitment charges every month for the purpose of utilization of Operator's services. This amount shall be adjusted against every month user Charges for a calendar period of one year. In the event, for whatsoever

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reason, the Generator is unable to utilize the facility services for a particular month / period, the Generator shall forfeit the amount that is unutilized in that calendar year. The charges are mentioned under the attached Annexure.

3.13 In case the generator is unable to send the assured quantity of waste, as per their declaration the actual waste quantity will be charged as per the rate agreed and the difference between the assured quantity and actual quantity received, the charges shall be at the rate of 15% of the rate per M.T.

3.14 An interest free adjustable security deposit shall be paid by the Generator to the Operator. The security deposit shall be adjustable against user charges in the event either party decides to terminate this Agreement. No financial charges are applicable on such security deposit. This security deposit shall be reviewed every year depending on the Waste committed by Generator and the actual received at the ISDF. The security deposit detail is mentioned under the attached Annexure

4 USER CHARGES & TERMS OF PAYMENT

4.1 The Generator shall pay monthly user charges to Operator for its services as per the slab agreed, which is based upon the declaration given by the Generator as per Annexure. In addition, the Generator shall also be liable for payment of applicable taxes, levies, ESCROW Charges etc., if any, on the user charges.

4.2 The user charges are subjected to be revised on the basis of Government of India wholesale price index and also in every event of escalation of fuel costs, power tariff, change in disposal technologies and/or method, wage hike and others. Any revision shall be done as per guidelines arising out of discussion between TNWML and TWMA.

4.3 The monthly bill will be sent to the Waste Generators on or before 5th of every succeeding month and the bill amount shall be paid within 15 days of receipt of bill.

4.4 Any objection and/or clarification on the waste disposal invoices and monthly bills submitted by Operator to Generator shall be communicated to Operator within seven (7) working days from the date of the invoices. In case of non-receipt of any clarification or objection it shall be deemed that the invoices are acceptable and shall fall due for payment as per clause 4.3 of this Agreement.

4.5 In case of delayed payments Generator shall be liable to pay interest at the rate of [illegible] month on the outstanding amount during the default period

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are acceptable and shall fall due for payment as per clause 4.3 of this Agreement.

4.5 In case of delayed payments Generator shall be liable to pay interest at the rate of 1.5 % per month on the outstanding amount during the default period (As per clause 4.3). In the event of any bill amount along with interest is due for more than three (3) months, Operator reserves the right to refuse to extend its services to Generator and even to terminate this Agreement with immediate effect upon giving a prior written notice of fifteen (15) days.

5 TERM OF AGREEMENT

This Agreement shall be valid for a period of five years effective from 15.01.2021 and subject to early termination by either party in accordance with this Agreement.

6 FORCE MAJEURE

Notwithstanding anything else contained herein, neither Party hereto shall be liable for damages or to have this agreement terminated for any delay or default in the performance of such Party hereunder if such delay or default in performance derives from conditions beyond the reasonable control of such Party, including but not limited to, acts of God, strikes, fires, floods, extreme drought, shortage of supply, riots, work stoppages, embargoes, governmental actions or damage to the plant or facility or any cause unavoidable or beyond the control of either party including any arbitrary ruling by the Government prohibiting the handling of the Waste or continuing domestic or international problems such as wars or insurrections including any change of law. The Parties shall have right to terminate this Agreement upon giving a prior written notice to the other Party if the Force Majeure event continues for more than ninety (90) days.

7 INDEMNITY

Generator do hereby indemnify, keep indemnified and hold harmless the Operator, its representatives, nominees and officers (including without limitation, reimbursement of any loss suffered by Operator and / or its officers, directors, employees, agents or affiliates and their legal costs), awards, damages, losses and / or expenses, either pecuniary or non-pecuniary in nature, arising directly or indirectly, whether during collection or transportation or treatment or storage or disposal, as a result of:

a) The Waste supplied by or collected from Generator in case of any mismatch of waste from TREM Card or finger prints; and any non-

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c) Any violation or non-compliance by Generator of the provisions of Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2016, Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 including any modifications, amendments made thereto and any new acts and rules legislated and promulgated governing the activity under this Agreement during the term of this Agreement or any extension thereof.

8 EVENTS OF DEFAULT

The following shall constitute Generator's events of default:

a. If the Generator fails and/or refuses to pay their bills and/or dues for the user charges payable under this Agreement.
b. If the Waste supplied by the Generator contains any radioactive, Explosives or any other / all prohibited material.
c. If the Generator commits gross violation of the terms of this Agreement.

9 TERMINATION

The Operator shall have the right to terminate this Agreement with immediate effect upon expiry of thirty (30) days from the date of the written notice upon occurrence of Generator's event of default unless the same have been rectified with thirty (30) days from the date of the notice.

Either party shall have the right to terminate this Agreement in the event of violation of any of the terms and conditions as agreed upon in this agreement or otherwise, upon giving thirty (30) days written notice to the other party..

10 ENTIRE AGREEMEENT

This Agreement shall be deemed to represent the entire Agreement between the parties hereto regarding the subject matter hereof and shall supersede, cancel and replace any and all prior agreements or arrangements, if any, in this behalf, by and between the parties hereto.

11 RELATIONSHIP OF THE PARTIES

Nothing contained herein shall be deemed to constitute a partnership, joint venture or agency by and between the parties hereto.

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12 VARIATIONS

This Agreement may be modified or amended only by writing, duly executed by or on behalf of the parties hereto.

13 INVALIDITY

In the event that any provisions of this Agreement is held to be illegal, invalid or unenforceable under any present or future laws of the Republic of India such provisions alone shall be deemed terminable and the remaining parts & provisions of this Agreement shall remain in full force & effect.

14 NOTICES

14.1 Any notice, request, demand or other communication given or made under or in connection with the matters contemplated by this Agreement shall be in writing and shall be delivered personally or sent by registered post acknowledgement due or by facsimile or by courier:

In case of Generator to:
Attn: Mr.Yogeeswara Basappa Gowda (Vice President-Operations)
Chemplast Sanmar Limited -Sanmar Speciality Chemicals Division
No.44, Theertham Road, Suligunta Village, Berigai Post
Shoolagiri Taluk, Krishnagiri District -635105
Tamil Nadu

In case of Operator to:
Attn: Project Head,
Tamilnadu Waste Management Limited
Plot No : 5-15 & 28-33 , EPIP SIPCOT Industrial Estate
Gummidipoondi – 601201, Thiruvallur Dist., Tamil Nadu

and shall be deemed to have been duly given or made as follows:

(a) If personally delivered, upon delivery at the address of the relevant Party;
(b) If sent by registered post-acknowledgement due seven (7) days after the posting;
(c) If sent by facsimile upon successful transmission report.

14.2 A Party may notify the other Party of a change to its name, relevant addressee or address number for the purposes of Clause 13.1 as provided herein.

CHEMPLAST SANMAR

TAMILNADU WASTE MANAGEMENT LTD

ANNEXURE - E

15 SURVIVAL

Not withstanding any contained in this Agreement, the provisions of clause 4, 7 and 8 of this Agreement shall survive for five (5) years after termination or completion of term of this Agreement whichever is later.

16 DISPUTE RESOLUTION

In the event of any dispute, controversy, difference, disagreement or claim arising out of or in connection with or in relation to this Agreement, including any questions as to its existence, validity, interpretation, implementation or termination, the Parties hereto shall endeavor to resolve the same in an amicable manner in consonance with the intention of this Agreement. If however, after lapse of fifteen (15) days there from, the Parties are unable or otherwise fail to resolve such dispute, controversy, difference, disagreement or claim, through discussion or amicable settlement as above, then said dispute, controversy, difference, disagreement or claim shall be refered to and finally settled through arbitration by sole arbitrator as per the rules of Arbitration and Conciliation Act, 1996 as amended from time to time. The award of arbitration shall be final and binding. The seat of arbitration shall be at Hyderabad and the arbitration proceedings and all documentation shall be in English language. No party shall make public the contents of arbitration without the prior written consent of the other party. The arbitration proceedings shall be concluded within in six (6) months from the date of reference of dispute to arbitration by a party to this Agreement.

CHEMPLAST SANMAR LTD.

TAMIL NADU WASTE MANAGEMENT LTD.

ANNEXURE - E

17 GOVERNING LAW & JURISDICTION

This Agreement shall be governed in accordance with the laws of India. Operator and the Generator mutually agree that the courts of competent jurisdiction at Chennai shall have the exclusive jurisdiction over all the disputes arising out of this Agreement. Notwithstanding anything contained in this Agreement no party shall be refrained from approaching the courts of competent jurisdiction at Hyderabad for seeking any injunction or interim reliefs.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement on the day, month and year first above written.

For Chemplast Sanmar Ltd
Sanmar Speciality Chemicals Division

Name:Dr.Krishnakumar Rangachari

Designation: Executive Director

For Tamilnadu Waste Management Ltd

Name: M.Chinna Reddy

Designation: Project Incharge

In the presence of

Name: Yogeeswara Basappa Gowda
Designation: Sr.Vice President-Operations

Name: S. Shanmuni
Designation:

Chemplast Sanmar Ltd.
Sanmar Speciality Chemicals Division
84, Theertham Road, Manjakuppam-605 105
Shoolagiri Taluk, Krishnagiri District
Tamil Nadu. India.
Tel+91 4344 253005

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ANNEXURE - E

ANNEXURE

Common Hazardous Waste Treatment Storage & Disposal Facility

1) MEMBERSHIP DEPOSIT

The GENERATOR shall be member of Industrial Waste Management Association (herein after referred to as IWMA) and enter into an agreement with TNWML and the agreement is nontransferable.

SECURITY DEPOSIT *

The Security Deposit payable by the generator shall be determined as per the below matrix or minimum Rs.10,000/- :

$$\frac{\text{Annual Assured Qty}}{12} \times 1.5 \times \text{Disposal Chargers Per MT.}$$

* Note: This deposit is adjustable only against waste disposal charges in the event. members desire to withdraw membership.

2) USER CHARGES

The Generator shall pay the following applicable User Charges based on the Waste Types.

a) Direct Landfill Charges: Per MT

Direct Disposal into Landfill:Rs.1622

b) Stabilization Charges: Per MT

Cost of Direct Land Filling +Bulking Factor+ Cost of Stabilization Reagents + Rs.300.00 per MT for re-handling expenses.

Note: Bulking factor: This will be the percentage of the quantum of stabilizing materials to be added to the waste to make it fit for land filling as per CPCB norms.

c) Incineration Charges: A minimum of Rs.18750/-per MT per MT or KL (also depends on Material Density)

CHEMPLAST SANMAR LTD.

TAMILNADU WASTE MANAGEMENT LTD.

ANNEXURE - E

The cost of incinerating wastes per MT or per KL is subjective to the confirmation of the waste characteristics to the design parameters of the incinerator at the TSDF viz. Calorific Value, Chlorides, Sulphates, Nitrates, Bulk Density and the risks associated with the waste.

Weighment of TNWML will be considered for billing.

d) TRANSPORTATION CHARGES

a) Waste Transport Charges:

Freight Distance / Vehicle capacity	Up to 50 Kms	>51 Kms - <100 Kms	100 Kms - <200 Kms	200 Kms - <400 Kms	>400 Kms
Up to 10 MT	Rs.5.50	Rs.5.40	Rs.5.35	Rs.5.30	Rs. 5.25
> 10 MT	Rs.5.40	Rs.5.35	Rs.5.30	Rs. 5.25	Rs. 5.20

Minimum 90 % of Container capacity or Truck shall be charged for transportation in case of lower quantity

b) Truck Detention Charges:

Maximum time of Three hours is allowed for the truck to be detained at the Generator premises from the time of reporting at their Security Gate. In the event this period is exceeded then Rs. 500/- per hour shall be charged as detention charges.
Return of truck without waste loading in case after planning and scheduling of a truck for the generator, if the waste generator decides not to send any waste and wishes to send the empty truck to TNWML, the generator shall pay the transportation charges at actual "TO & FRO" distance at 90% loading capacity of truck.

4] CONTAINER MAINTENANCE CHARGES

[Applicable when containerized truck Services are utilized]

The Generator has to pay the following charges as mentioned below towards the services of the Container, if opted for by the Generator.

a) Container Hire Charge: The charges are: -

- 5.0 MT Hook loaders — Rs.2,50,000/- per Container
- 10.0 MT Hook Loaders — Rs.4,25,000/- per Container
- 15.0 MT Hook Loaders — Rs.5,50,000/- per Container
- 25.0 MT Hook Loaders — Rs. 8,10,000/- per Container

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ANNEXURE - E

DECLARATION

We the Chemplast Sanmar Limited -Sanmar Speciality Chemicals Division hereby declare that based on our industry production and our annual projections we shall be disposing the following Hazardous Waste types to TNWML. (Add sheets could be used for multiple waste types)

S. No	Category No	Waste Type	Disposal Method	Accumulated Quantity (MT)	Annual Generation (MT)
1.	20.1	Contaminated aromatic, aliphatic or napthenic solvents may or may not be fit for reuse	Incineration	-	6
2.	20.3	Distillation residues	Incineration	4.5	20
3	35.3	Chemical sludge from waste water treatment	Common Landfill	12	2500
4	33.2	Contaminated Cotton rags or Other cleaning materials	Incineration	0.2	2

- Avg. monthly generation of Hazardous Waste is expected as follows.

1. Avg. _____ MT per month of _____ type of Hazardous waste
2. Avg. _____ MT per month of _____ type of Hazardous waste
3. Avg. _____ MT per month of _____ type of Hazardous waste

FOR Chemplast Sanmar Limited
Sanmar Speciality Chemicals Division

R. Krishna Kumar

Authorized Signatory
The Generator

In the presence of

Name: Yogeeswara Basappa Gowda Sign:
Company/Occupation: Chemplast Sanmar Limited-Sanmar Speciality Chemicals Division
Designation: Sr.Vice President -Operations

Name: R Jayakumar Sign:
Company/Occupation: Chemplast Sanmar Limited -Sanmar Speciality Chemicals Division
Designation: Sr.Manager -Environment

Chemplast Sanmar Ltd.
Sanmar Speciality Chemicals Division
44, Theertham Road, Berigai-635 105
Shoolagiri Taluk, Krishnagiri District
Tamil Nadu. India.
Tel: 91 4344 253005

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TAMIL NADU WASTE MANAGEMENT LTD

2.13 NOISE LEVEL AND CONTROL SYSTEM

All measures are taken to maintain noise level within premises.

- Noise level is monitored once in month for day and night in 7 locations within the factory premises. All the values are within the stipulated level.
- Acoustic enclosure on D.G. set, engineering control at high noise level areas like compressors.
- Wherever feasible; proper oiling, lubrication and maintenance of equipment.
- Safety equipment are provided at noisy area.
- Development of greenbelt within premises and around plot boundary.

2.14 SUMMARY

M/s. Chemplast Sanmar Limited, Proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

The reason of applying in category A [5(b) & 5(f)] Environmental Clearance at MoEF & CC, New Delhi are as follows: (1) Chemplast Sanmar Limited has proposed for the Pesticide Industrial Product [Sector-17; 5(b)], (2) Unit is located outside Industrial estate, & (3) Inter-state boundary was there within 10 Kms from the existing project site (i.e. Karnataka state boundary at 0.89 km from the project site).

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises. Total Requirement is 14000 KVA from State Electricity Department (13470 KVA-DG Set will be kept for emergency power back up). The Total water requirement will be 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA available and remaining 1000 KLD applied to get from government water source. The total wastewater generation will be 705 KL/Day and will be segregated into two stream High COD Stream & Low COD stream. Solid/ hazardous wastes will be disposed as per Hazardous waste rules, 2016. Approximately 1350 people [Existing: 350 people + proposed: 1000 people] will be employed to local skilled and unskilled people based on qualification and requirement and preference will be given to local person for fulfilment of the manpower requirement.

CHAPTER – 3
DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

The baseline status of environmental quality in the vicinity of project site serves as the basis for identification, prediction and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment, viz. air, noise, water, and land and socio-economic. The baseline environmental quality has been assessed in the Pre Monsoon season of 1st July, 2022 to 30th September, 2022 in a study area of 10 km radial distance from the project site.

The environmental setting is considered to establish the baseline conditions which are described with respect to following:

- Land environment
- Land Use Pattern
- Water Environment
- Air Environment
- Meteorology
- Noise Environment
- Ecology
- Topography
- Demography and Socio-economic Environment

3.2 METHODOLOGY

Following the guidelines of MoEFCC, the baseline environmental study was conducted. The details of the study period, frequency of sampling & method of environmental sampling & analysis are shown below in succeeding paragraphs under respective titles.

3.2.1 STUDY PERIOD & FREQUENCY OF SAMPLING

The period of study determined was 1st July, 2022 to 30th September, 2022. The frequency of various environmental sampling & analysis was determined following the guidelines provided by MoEF in online EIA Manual. The details of frequency of environmental sampling considered for the study are illustrated in Table – 3.1.

TABLE 3.1

FREQUENCY OF ENVIRONMENTAL MONITORING

Attributes	**Sampling**	
	Locations	**Frequency**
A. Air Environment		
Meteorological	Project Site	1 hourly continuous for Study Period
Ambient Air Quality	11 locations in the study area (10 km radius from project site)	24 Hourly Basis Twice a week for three Month
B. Noise	11 Locations within the study area (10 Km radius from project site)	Once during Study Period
C. Water		
Ground Water	Grab samples from 11 Locations from Study Area (10 km radius from project site)	Once during Study Period
Surface Water	Grab samples from 2 Locations (10 km radius from project site)	Once during Study Period
D. Soil Quality	Soil samples from 10 locations within study area	Once during Study Period
E. Land Use & Land Cover	Study area (10 km from Project Site)	Once during Study Period
F. Ecological Data	Study area (10 km from Project Site)	Once during Study Period
G. Socioeconomic Data	Study area (10 km from Project Site)	Once during Study Period

3.2.2 METHOD OF ENVIRONMENTAL SAMPLING & ANALYSIS

The method adopted for environmental sampling & analysis is illustrated in following Table - 3.2

TABLE 3.2

METHOD OF ENVIRONMENTAL SAMPLING & ANALYSIS

Attributes	METHOD	
	Sampling / Preservation	**Analysis**
A. Air Environment **1) Micro meteorological data** **2) Ambient Air Quality**	Mechanical/automatic 1) Spectrum weather station & IMD 2) 2.5 Micron dust samplers & RSPM samplers having the facility to collect the gaseous samples	----- IS 5182 & CPCB
B. Noise	Instrument : Noise level meter	Method: IS: 9989-1981 (Reaff: 2020) Assessment of Noise with Respect to Community Response
C. Water & Waste Water **1) Ground Water** **2) Surface Water**	Methods of sampling and test (physical and chemical) for water and wastewater Part 1 – Sampling IS 3025 : Part 1 : 1987 & Methods of sampling and microbiological examination of water IS 1622 : 1981	IS:3025 & Standard Methods for Examination of Water and Wastewater Analysis, published by APHA 23rd edition, 2016
D. Soil Quality	Laboratory Guide for Conducting Soil Test & Plant Analysis, by J. Benton Jones, Jr.	FAO Chapter 3, EPA Method 3050 B & Method 7000B
E. Land Use & Land Cover	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat
F. Geology & Geo-Hydrology	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat

Attributes	METHOD	
	Sampling / Preservation	**Analysis**
G. Ecological Data	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat	Akshar Enviromatics (Environment and Geomatics), Vadodara, Gujarat
H. Socioeconomic Data	Census Dept., GOI	--

3.2.3 BASELINE ENVIRONMENTAL STATUS

The baseline environmental study was carried out for Ambient Air, Water, Land, Noise, Biological & Socioeconomic environment. The study period was 1st July, 2022 to 30th September, 2022. The environmental samples were collected from the selected location of the study area. The scenario of environmental condition of the area revealed from the sample & data analysis is described below in subsequent paragraphs.

3.3 MICROMETEOROLOGY

The nearby India Meteorological Department station that is generating meteorological data is 60 km from the site i.e. IMD, Bengaluru. Hence, secondary information on meteorological conditions has been collected from IMD station at Bengaluru International Airport.

Indian Meteorological Department at Bengaluru regularly monitors wind direction, wind speed, relative humidity, temperature, rainfall, evaporation and pressure at 08.30 hours and 17.30 hours every day. Wind rose diagrams are collected from IMD for the period 1971 – 2000 .

Temperature

The monthly mean maximum temperature recorded during the period 1981-2010 ranged between 26^0C to 34^0C. The monthly mean minimum temperature recorded during the same period ranged between 14^0C to 22^0C.

Relative Humidity

The monthly mean relative humidity recorded at 08.30 hours for the period 1981-2010 ranged between 70% to 86% and the monthly mean relative humidity recorded at 17.30 hours for the same period ranged from 28% to 67%.

Rainfall

The monthly total rainfall recorded for the period 1981-2010 ranged between 1.4 mm to 183.5 mm.The annual meteorological data (Temperature, Relative Humidity, Rainfall and Wind speed) for the year 2021 was collected. An onsite meteorological station was setup to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.

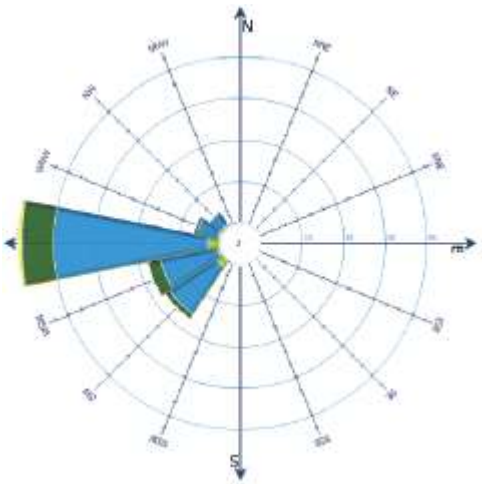
3.3.1 SUMMARY OF THE METEOROLOGICAL DATA

TABLE 3.3

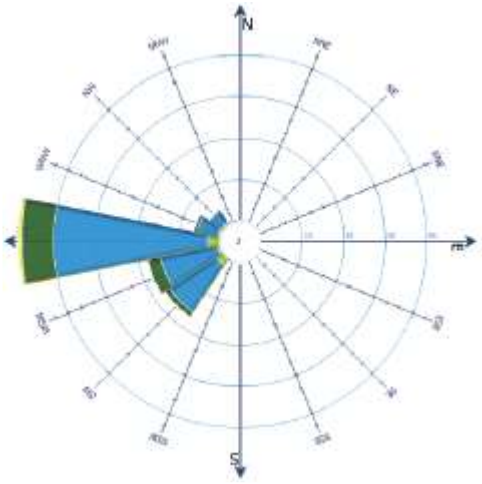
Meteorological Data from IMD data, Bengaluru (A) 1981-2010

Month	Temperature (˚C)		Relative Humidity (%)		Rainfall (mm)
	Max	Min	08.30	17.30	
January	27.6	14.8	86	41	1.4
February	30.3	16.2	76	31	5.7
March	32.7	18.7	70	28	15.5
April	33.8	21	74	35	42.7
May	33.1	21.2	76	46	94.5
June	29.8	20.1	83	62	91.1
July	28.6	19.6	85	65	97.7
August	28.1	19.5	86	67	122.2
September	28.6	19.5	85	63	183.5
October	28.1	19.2	84	65	155.9
November	26.9	17.5	83	61	50.6
December	26.2	15.4	86	54	13.8

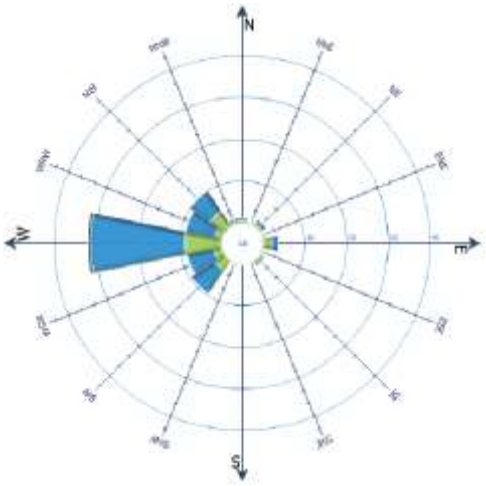
FIGURE – 3.1: WINDROSE DIAGRAM OF IMD, BENGALURU (A) 1971-2000



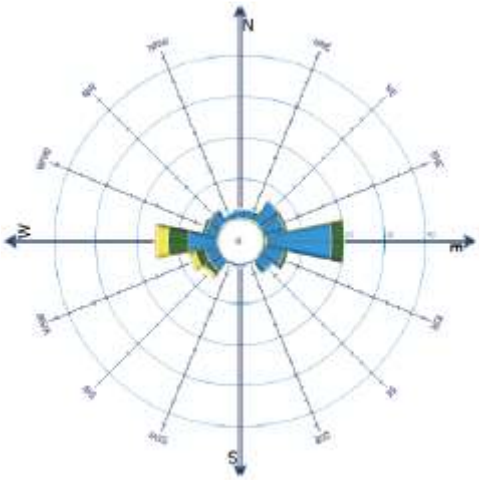
Windrose Diagram – July Month



Windrose Diagram – August Month



Windrose Diagram – September Month



Windrose Diagram – Annual

3.3.6 TEMPERATURE, RELATIVE HUMIDITY & WIND SPEED

The meteorological parameters were recorded at site on hourly basis during the study period and consists of parameters like wind speed, wind direction and temperature. The total rainfall was recorded daily once at 0830 hrs. The maximum and minimum values for all the parameters except wind speed and wind direction are presented in Table 3.4.

TABLE - 3.4

Summary of the Meteorological Data Generated at Site (Period: July, 2022 to September, 2022)

Month	Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)
	Max	Min	Max	Min	
July 2022	31	20	100	52	109
August 2022	30	20	100	51	105
September 2022	31	19	100	28	215

Source: ABC Techno Labs India Private Limited

There was no rainfall during the study period.

Summary of Wind Pattern in Study Area

Month / Season	First Predominant Wind Direction	Second Predominant Wind Direction	Average Wind Speed (m/s)
July 2022	W	SW	8.13
August 2022	W	SW	2.23
September 2022	W	NW	3.02

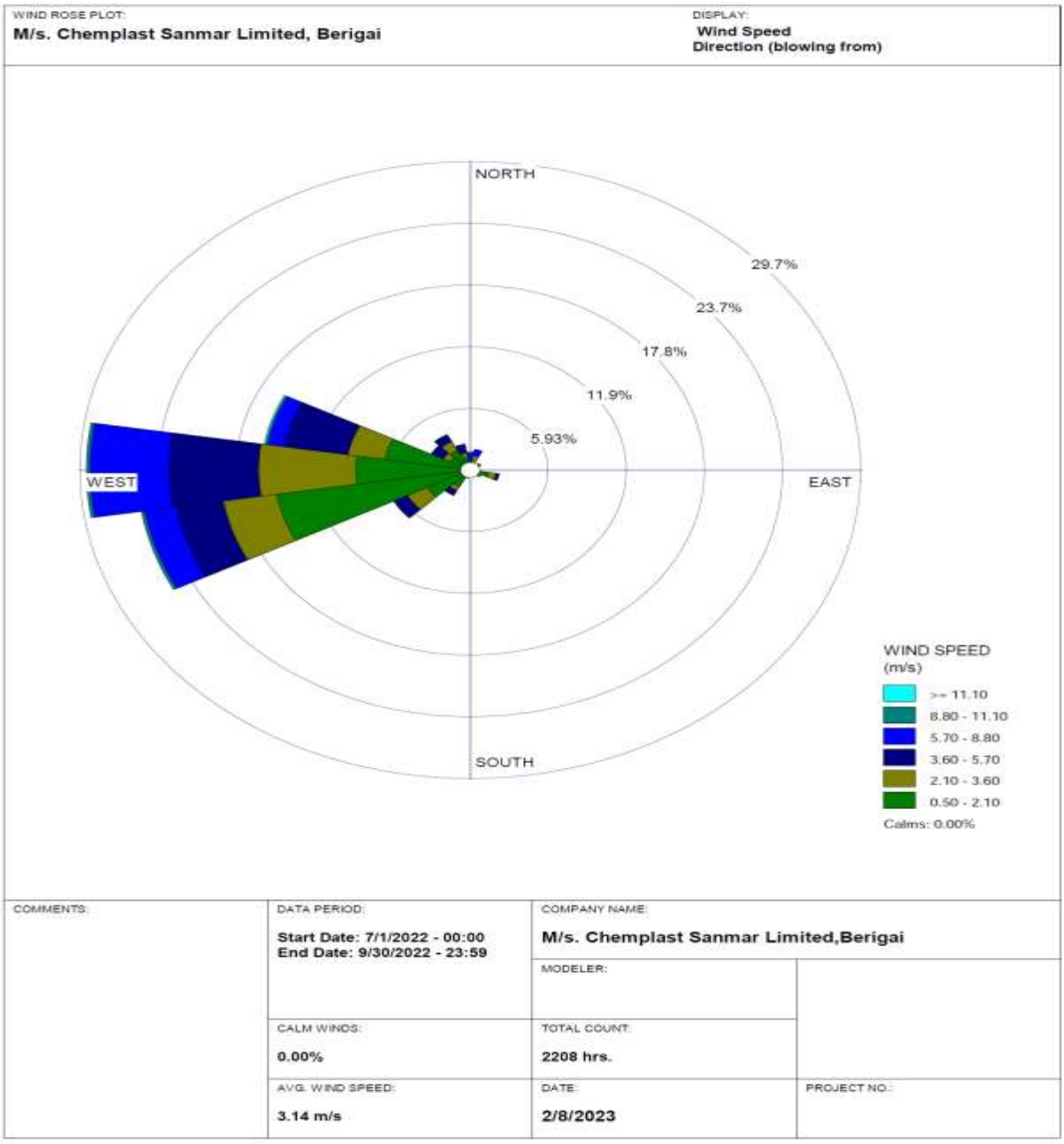
Source: ABC Techno Labs India Private Limited

3.3.7 WIND ROSE

Wind rose is a graphical representation of the magnitude and direction of wind speed considering all the directions. With the help of wind rose diagram one can easily predict the direction and extent of spreading of the gaseous and particulate matter from the source. . Wind rose diagrams & stability class distribution are prepared for the site specific (M/s. Chemplast Sanmar Ltd.) and presented in Figures - 3.1 & 3.2 respectively.

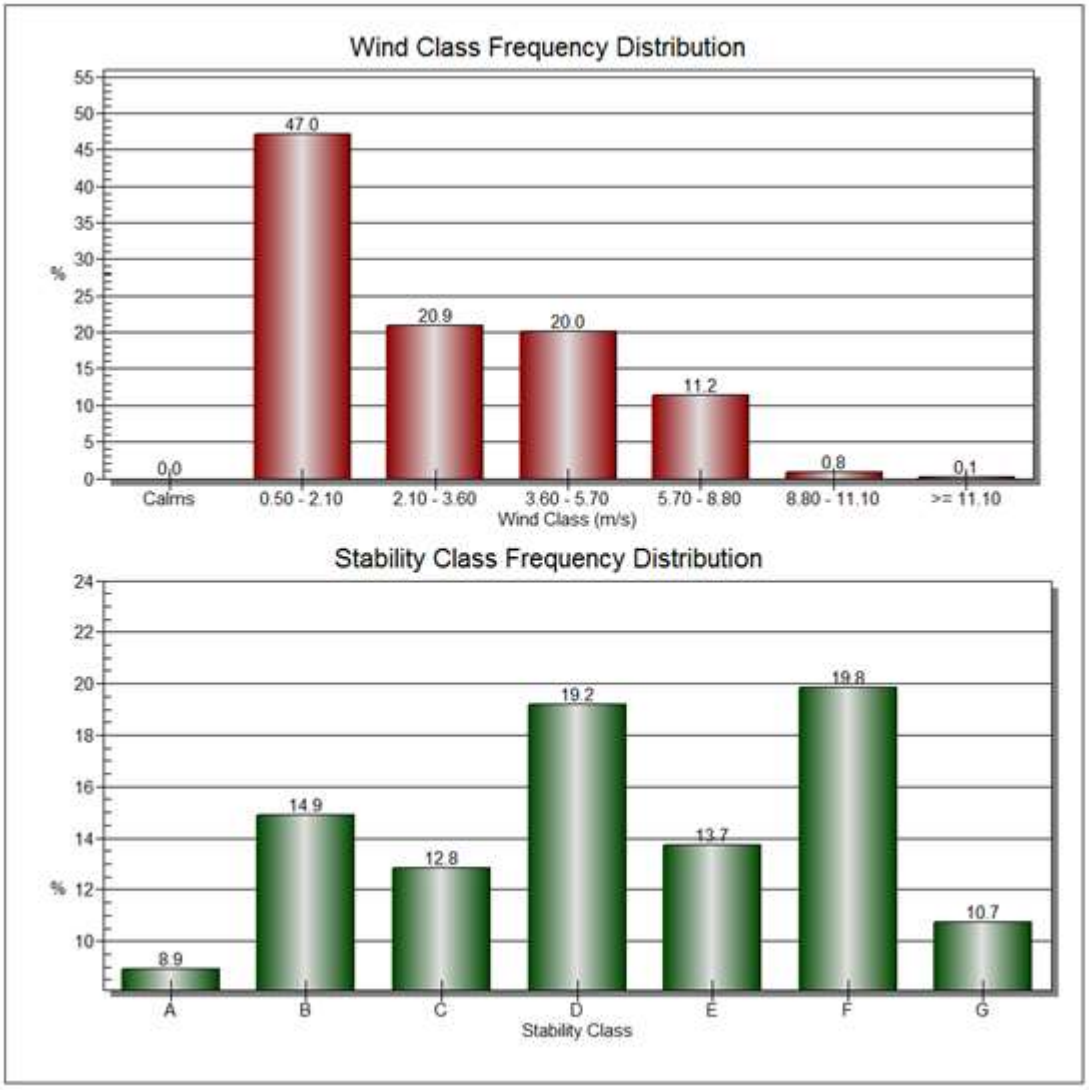
FIGURES - 3.1

WIND ROSE DIAGRAM



Source: Software "ISC-AERMOD View" version 9.3.0 by Lakes Environmental, Canada

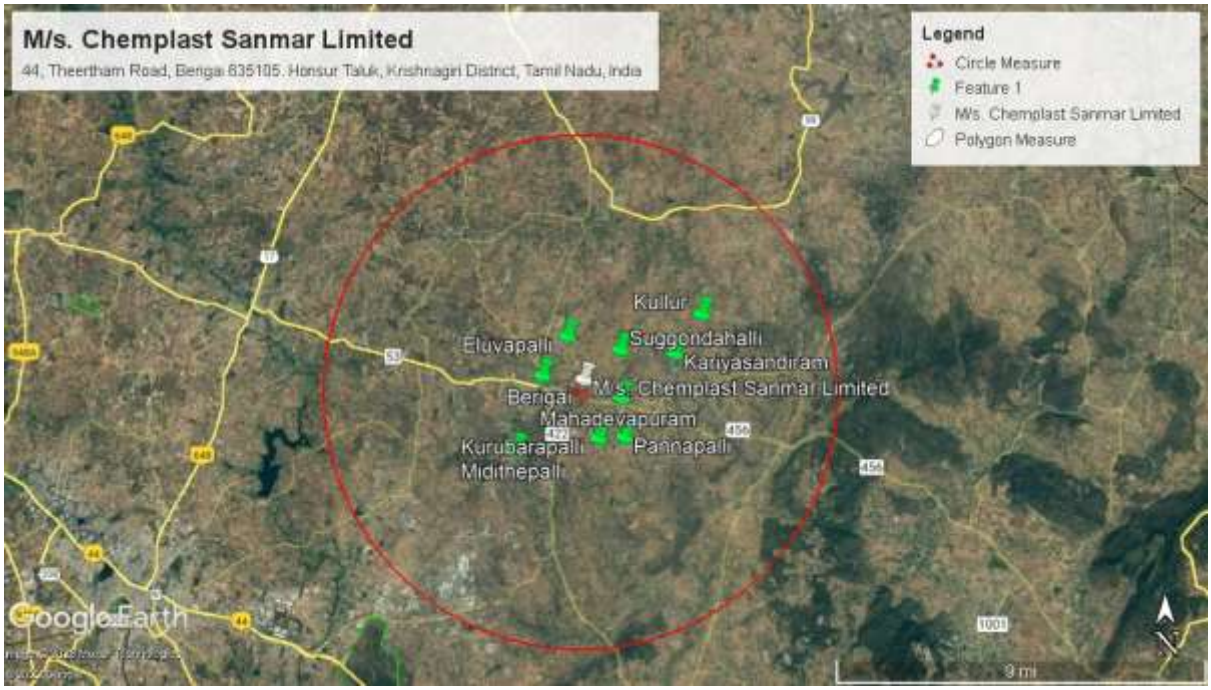
FIGURE-3.2 STABILITY CLASS DISTRIBUTION



Source: Software "ISC-AERMOD View" version 9.3.0 by Lakes Environmental, Canada

FIGURE - 3.3

LOCATIONS OF THE AMBIENT AIR, NOISE, WATER AND SOIL



Note: Selection of location is considered base on CPCB guideline. Minimum one location in downwind direction and minimum one location in upwind direction. We have selected 2 nos. of location in down wind direction and 2 nos. of location in up wind direction.

TABLE - 3.5

LOCATIONS OF THE AMBIENT AIR, NOISE, WATER AND SOIL

SR. NO.	NAME OF VILLAGE	BEARING W.R.T. PROJECT SITE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	LATTITUDE	LONGITUDE	AMBIENT AIR	NOISE	WATER	SOIL	TYPE OF AREA
1.	Project Site	--	0.0	12°48'14.27"N	77°59'9.12"E	A1	N1	GW1	S1	Industrial
2.	Berigai	W	2.0	12°48'18.84"N	77°58'15.37"E	A2	N2	GW2	S2	Residential
3.	Suggondahalli	NE	2.5	12°48'51.43"N	77°59'56.38"E	A3	N3	GW3	S3	Residential
4.	Kurubarapalli	SSE	2.5	12°46'59.62"N	77°59'28.39"E	A4	N4	GW4	S4	Residential
5.	Kariyasandiram	ENE	5.0	12°48'46.88"N	78° 1'7.07"E	A5	N5	GW5	S5	Residential
6.	Suligunta	ESE	0.5	12°48'4.17"N	77°59'27.89"E	A6	N6	GW6	S6	Residential
7.	Pannapalli	SSE	4.0	12°47'1.22"N	78° 0'1.81"E	A7	N7	GW7	S7	Residential
8.	Midithepalli	SSW	5.0	12°46'44.87"N	77°57'41.20"E	A8	N8	GW8	S8	Residential
9.	Eluvapalli	NNW	4.0	12°49'8.53"N	77°58'47.52"E	A9	N9	GW9	S9	Residential
10.	Mahadevapuram	ESE	2.5	12°47'51.15"N	77°59'57.38"E	A10	N10	GW10	S10	Residential
11.	kullur	ENE	6.4	12°49'36.76"N	78° 1'41.78"E	A11	N11	GW11	S11	Residential
12	Berigai Lake	W	2.0	12°48'38.81"N	77°58'4.04"E	--	--	SW1	--	--
13	Pond near Gandlapalli Sri Thimmaraya Swamy Temple	N	1.16	12°48'52.34"N	77°59'14.52"E	--	--	SW2	--	--

3.4 AIR ENVIRONMENT

The ambient air quality monitoring was carried out in accordance with National Ambient Air Quality Standards (NAAQS) of CPCB. Ambient Air Quality Monitoring (AAQM) was carried out at elevan locations during the study period.

The air quality status in the impact zone is assessed through a network of ambient air quality monitoring locations. The tropical climatic conditions mainly control the transport and dispersion of air pollutant emissions during various seasons.

The conventional and project specific parameters such as Suspended Particulate Matter, Respirable Suspended Particulate Matter (RSPM-PM_{10}), Respirable Suspended Particulate Matter (RSPM-$PM_{2.5}$),Sulphur Dioxide (SO_2), Nitrogen dioxide (NO_x), Ammonia (NH_3), Ozone (O_3), Lead (Pb), Benzene (C_6H_6), Benzo (α) Pyrene (BaP), Hydro Carbon (HC), Arsenic (As), Nickel (Ni), & Carbon Monoxide (CO) were monitored at site.

The values for mentioned concentrations of various pollutants at all the monitoring locations were processed for different statistical parameters like arithmetic mean, minimum concentration, and maximum concentration and percentile values. The baselines levels of Suspended Particulate Matter, Respirable Suspended Particulate Matter (RSPM-PM_{10}), Respirable Suspended Particulate Matter (RSPM-$PM_{2.5}$),Sulphur Dioxide (SO_2), Nitrogen dioxide (NO_x), Ammonia (NH_3), Ozone (O_3), Lead (Pb), Benzene (C_6H_6), Benzo (α) Pyrene (BaP), Hydro Carbon (HC), Arsenic (As), Nickel (Ni), & Carbon Monoxide (CO) are expressed in terms of various statistical parameters.

To establish the baseline status around the project site of the study region monitoring was conducted at 11 Ambient Air Quality Monitoring (AAQM) Stations in and around the study region during 1st July, 2022 to 30th September, 2022.

TABLE – 3.6 AMBIENT AIR QUALITY STATUS (1ST JULY, 2022 TO 30TH SEPTEMBER, 2022)

SR. NO.	SAMPLING LOCATION	SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH_3
		$\mu g/Nm^3$					
1.	Project Site (A1)	118.20	62.21	29.21	10.41	18.73	BDL
2.	Berigai (A2)	102.38	56.88	26.79	9.97	18.20	BDL
3.	Suggondahalli (A3)	81.38	45.21	21.38	6.71	13.62	BDL
4.	Kurubarapalli (A4)	88.88	49.38	23.25	8.25	16.55	BDL
5.	Kariyasandiram (A5)	75.23	41.79	19.92	BDL	13.12	BDL
6.	Suligunta (A6)	106.43	59.13	28.13	10.41	19.10	BDL
7.	Pannapalli (A7)	82.88	46.04	21.96	7.55	14.05	BDL
8.	Midithepalli (A8)	84.75	47.08	22.42	6.69	13.83	BDL
9.	Eluvapalli (A9)	97.65	54.25	25.63	10.28	16.62	BDL
10.	Mahadevapuram (A10)	76.68	43.71	20.92	BDL	13.60	BDL
11.	Kullur (A11)	75.08	41.71	19.67	BDL	13.36	BDL
NAAQS		--	**100**	**60**	**80**	**80**	**400**

SR. NO.	SAMPLING LOCATION	As	Ni	HCl mist	HBr	O_3	CO
		ng/m^3	ng/m^3	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3
1.	Project Site (A1)	BDL	BDL	BDL	BDL	14.41	0.26
2.	Berigai (A2)	BDL	BDL	BDL	BDL	14.37	0.21
3.	Suggondahalli (A3)	BDL	BDL	BDL	BDL	11.05	BDL
4.	Kurubarapalli (A4)	BDL	BDL	BDL	BDL	13.65	0.22
5.	Kariyasandiram (A5)	BDL	BDL	BDL	BDL	10.51	BDL
6.	Suligunta (A6)	BDL	BDL	BDL	BDL	14.54	0.28
7.	Pannapalli (A7)	BDL	BDL	BDL	BDL	11.03	BDL
8.	Midithepalli (A8)	BDL	BDL	BDL	BDL	11.30	BDL
9.	Eluvapalli (A9)	BDL	BDL	BDL	BDL	13.61	0.26
10.	Mahadevapuram (A10)	BDL	BDL	BDL	BDL	10.83	BDL
11.	Kullur (A11)	BDL	BDL	BDL	BDL	10.82	BDL
NAAQS		**6**	**20**	**--**	**--**	**180**	**4**

SR. NO.	SAMPLING LOCATION	Pb	BaP	C_6H_6	VOC
		µg/m³	ng/m³	µg/m³	ppm
1.	Project Site (A1)	BDL	BDL	BDL	BDL
2.	Berigai (A2)	BDL	BDL	BDL	BDL
3.	Suggondahalli (A3)	BDL	BDL	BDL	BDL
4.	Kurubarapalli (A4)	BDL	BDL	BDL	BDL
5.	Kariyasandiram (A5)	BDL	BDL	BDL	BDL
6.	Suligunta (A6)	BDL	BDL	BDL	BDL
7.	Pannapalli (A7)	BDL	BDL	BDL	BDL
8.	Midithepalli (A8)	BDL	BDL	BDL	BDL
9.	Eluvapalli (A9)	BDL	BDL	BDL	BDL
10.	Mahadevapuram (A10)	BDL	BDL	BDL	BDL
11.	Kullur (A11)	BDL	BDL	BDL	BDL
NAAQS		**1**	**1**	**5**	**--**

Note: BDL = Below Detectable Limit
NAAQS- National Ambient Air Quality Standards (2009)
The Minimum Detectable Limits for various parameters are as below:

Parameter		Min. Detectable Limit
SO_2		5 µg/m³
Ammonia (NH_3)	:	5 µg/m³
Lead (as Pb)	:	0.1 µg/m³
Arsenic (as As)	:	1 ng/m³
Nickel (as Ni)	:	1 ng/m³
Benzene (as C_6H_6)	:	0.1 µg/m³
Benzo (α) Pyrene (BaP)	:	0.01 ng/m³
Carbon Monoxide(as CO)	:	0.1 mg/m³

TABLE 3.7

AMBIENT AIR QUALITY STATUS- MINIMUM, MAXIMUM, 98TH PERCENTILE VALUE & AVERAGE (1ST JULY, 2022 TO 30TH SEPTEMBER, 2022)

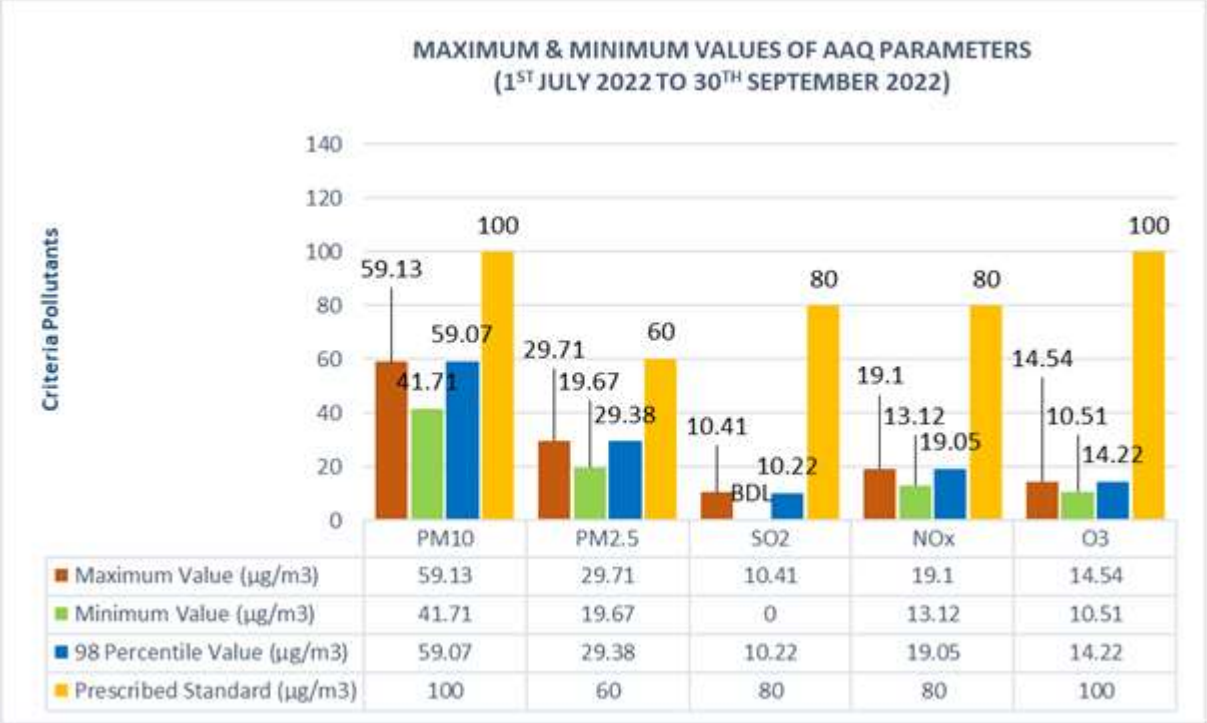
SR. NO.	SAMPLING LOCATION	PM_{10}	$PM_{2.5}$	SO_2	NOx	O_3
		µg/m³				
1	**Project-Site (A1)**					
	Arithmetic Mean	62.21	29.21	10.41	18.73	14.41
	Min – Max	55-69	26-33	8.6-12.6	16.6-22	12.8-16.2
	98th Percentile	69	33	12.324	21.58	16.062
2	**Berigai (A2)**					
	Arithmetic Mean	56.88	26.79	9.97	18.20	14.37
	Min – Max	50-64	24-31	8.3-11.7	15.8-20.4	12.7-16.6
	98th Percentile	64	31	11.562	20.262	16.18
3	**Suggondahalli (A3)**					
	Arithmetic Mean	45.21	21.38	6.71	13.62	11.05
	Min – Max	38-53	19-26	5.5-8	12.5-15	9.5-12.7
	98th Percentile	52.54	25.54	7.908	14.816	12.7
4	**Kurubarapalli (A4)**					
	Arithmetic Mean	49.38	23.25	8.25	16.55	13.65
	Min – Max	44-57	21-27	6.9-9.3	14.7-16.55	12.5-15.1
	98th Percentile	56.08	26.54	9.3	18.108	14.96
5	**Kariyasandiram (A5)**					
	Arithmetic Mean	41.79	19.92	BDL	13.12	10.51
	Min – Max	37-47	17-23	BDL	11.8-14.3	8.9-12.3
	98th Percentile	46.54	22.54	BDL	14.3	12.254
6	**Suligunta (A6)**					
	Arithmetic Mean	59.13	28.13	10.41	19.10	14.54
	Min – Max	51-68	25-33	8.8-12.4	16.8-21.4	12.8-15.9
	98th Percentile	67.54	28.13	12.032	21.262	15.9
7	**Pannapalli (A7)**					
	Arithmetic Mean	46.04	21.96	7.55	14.05	11.03
	Min – Max	38-52	18-25	5.9-9.3	12.8-15.5	9.6-12.3
	98th Percentile	52	25	9.116	15.27	12.25
8	**Midithepalli (A8)**					
	Arithmetic Mean	47.08	22.42	6.69	13.83	11.31
	Min – Max	40-52	19-25	5.6-7.8	12.8-15.1	9.5-12.9
	98th Percentile	52	25	14.91	14.91	12.85
9	**Eluvapalli (A9)**					
	Arithmetic Mean	54.25	25.63	10.28	16.62	13.61
	Min – Max	47-66	23-31	8.6-11.7	14.8-18.6	11.7-15.1
	98th Percentile	64.62	30.54	10.28	18.50	15.008
10.	**Mahadevapuram (A10)**					
	Arithmetic Mean	43.71	20.92	BDL	13.60	10.83
	Min – Max	38-53	18-25	BDL	12.5-15	9.3-12.7
	98th Percentile	52.08	25	BDL	14.77	12.654
10.	**Kullur (A11)**					
	Arithmetic Mean	41.71	19.67	BDL	13.36	10.82
	Min – Max	37-47	17-22	BDL	12.5-14.7	9.4-12.5
	98th Percentile	47	22	BDL	14.60	12.408
	Limit	**100**	**60**	**80**	**80**	**180**

3.4.1 SUMMARY

- During the study **SPM** concentration was observed in the range of 75.08 – 118.20 µg/m^3. Maximum concentration of **SPM** was found at **Project Site (118.20 µg/m^3)**.
- During the study **$PM_{10.0}$** concentration was observed in the range of 41.71 – 62.21 µg/m^3. Maximum concentration of **$PM_{10.0}$** was found at **Project Site (62.21 µg/m^3),** which is well within the standard limit.
- During the study **$PM_{2.5}$** concentration was observed in the range of 19.67 – 29.21 µg/m^3. Maximum concentration of **$PM_{2.5}$** was found at **Project Site (29.21µg/m^3)**, which is well within the standard limit.
- During the study **SO_2** concentration was observed in the range of BDL – 10.41 µg/m^3. Maximum concentration of **SO_2** was found at **Project Site & Suligunta (10.41 µg/m^3)**, which is well within the standard limit.
- During the study **NO_x** concentration was observed in the range of 13.12 – 19.10 µg/m^3. Maximum concentration of **NO_x** was found at **Suligunta (19.10 µg/m^3)**, which is well within the standard limit.
- During the study **O_3** concentration was observed in the range of 10.51 – 14.54 µg/m^3. Maximum concentration of **O_3** was found at **Suligunta (14.54 µg/m^3)**, which is well within the standard limit.

The statistical interpretation of observed ambient air quality concentrations in summary. They represent the cross sectional distribution of the baseline air quality status of the study region.

Figure -3.4



	PM10	PM2.5	SO2	NOx	O3
Maximum Value (µg/m3)	59.13	29.71	10.41	19.1	14.54
Minimum Value (µg/m3)	41.71	19.67	0	13.12	10.51
98 Percentile Value (µg/m3)	59.07	29.38	10.22	19.05	14.22
Prescribed Standard (µg/m3)	100	60	80	80	100

INTERPRETATION:

The PM10 and PM2.5 concentrations at all the AAQM locations were primarily caused by local phenomena including industrial & vehicular activities and natural dust getting air borne due to manmade activities and blowing wind. PM10 and PM2.5 concentrations were observed below stipulated standards of CPCB for Residential & Other Area at all air quality monitoring locations during the monitoring period. Results of all parameters are found within limit. In Mahadevpuram, Anikarahalli & Kullur villages, SO2 values are below detection limit of 5 µg/m3. These villages are free remote area and there is no source for SO2 pollution.

3.5 NOISE ENVIRONMENT

The objective of the noise level survey around the project site was to identify existing noise sources and to measure background noise levels. Major noise sources in the study area are industries, commercial, and vehicular movements. Major human settlement in the study area is Berigai which is about 2.0 km away from project site. The noise monitoring locations are given in Table - 3.8 and while the results of noise monitoring are shown in Figure - 3.5

3.5.1 METHODOLOGY FOR NOISE MONITORING

The noise monitoring was carried out at 11 locations in day time during (6 am to 9 pm) and at night time (9 pm to 6 am) in the study area covering all the areas i.e. industrial and residential as mentioned in Noise (Pollution and Control) Rules, 2000. CPCB Recommendations for community noise exposure are attached as Annexure – 3. Hourly Equivalent noise levels Leq (day) and Leq (night) were measured at each monitoring locations. Monitoring was done during day and night time was carried out at all the locations. Besides, damage risk criteria for hearing loss given by Occupational Safety & Health Administration (OSHA) are enclosed as Annexure - 2.

The noise sources identified around the site are vehicular traffic, industrial and commercial activities. CPCB recommendation for community noise exposure in different category of area (i.e. residential, commercial, industrial and silence zone) is enclosed as Annexure - 3 while Damage risk criteria for hearing loss given by occupational safety & health administration (OSHA) is enclosed as Annexure - 2. The noise levels were below the stipulated standards of CPCB.

The equivalent noise level Leq (60 min average) measured at a distance of 10 m and 20 m from the edge of the road at each of the locations are presented in Table 3.8. The communities close to the project site are not exposed to major noise sources. The commercial activities and transport apart from natural sources contribute to community noise levels.

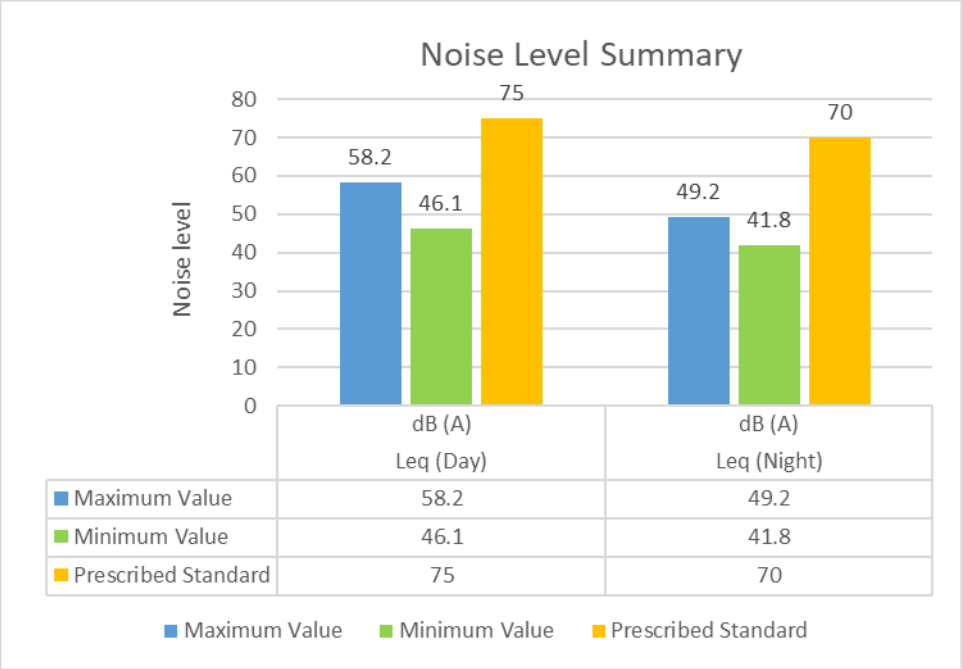
TABLE - 3.8 BACKGROUND NOISE LEVELS

Location Code	Location	Lday [dB(A)]	Lnight [dB(A)]	Leq [dB(A)]
N1	M/s. Sanmar Speciality Chemicals Limited, Berigai	58.2	49.2	56 .7
N2	Berigai	56.2	45.6	54.6
N3	Suggondahalli	47.7	42.8	46.6
N4	Kurubarapalli	54.5	44.7	53.0
N5	Kariyasandiram	48.6	43.1	47.4
N6	Suligunta	57.5	47.3	55.9
N7	Pannapalli	49.8	44	48.6
N8	Midithepalli	48.4	43.3	47.3
N9	Eluvapalli	54	44.8	52.5
N10	Mahadevapuram	48.1	43	47.0
N11	Kullur	46.1	41.8	45.1

3.5.2 SUMMARY

- During the study of noise monitoring level was observed during day time is the range of 46.1 - 58.2 dB (A) & during night time 41.8 – 49.2 dB (A). Maximum noise level in day time in night time was found at Project Site (58.2 dB (A)) & (49.2 dB (A)) respectively.

Figure-3.5



3.5.2.1 INTERPRETATION

Based on noise level data obtained during the survey, Noise level varied at some place at different times due to fluctuations in traffic movements as well as in residential due to nearest Industrial / commercial and domestic activities going on in the study area. It is interpreted that noise levels of Project site and all villages are within the standard norms prescribed by MoEF&CC.

3.6 WATER ENVIRONMENT

The annual rainfall in the region was 802.1 mm. The baseline water quality status in the region is established by analyzing surface water and ground water. Water requirement at site would be met through CGWA water supply and remaining get from government water source.

3.6.1 METHODOLOGY FOR WATER QUALITY MONITORING

11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. These samples were analyzed for physic-chemical parameters to ascertain the baseline status in the existing surface water and ground water bodies. Samples were collected during the study period of 1st July, 2022 To 30th September, 2022 and analyzed as per the Standard Methods of Water.

TABLE - 3.9 GROUND WATER QUALITY + SURFACE WATER QUALITY

WATER QUALITY- PHYSICAL PARAMETERS

SR. NO.	SAMPLING LOCATION	pH	TEMPERATURE (^{0}C)	TURBIDITY (NTU)	T.D.S. (mg/L)	T.S.S. (mg/L)
1.	Project Site (GW1)	7.56	26.3	BDL (<0.5)	693	BDL (<2)
2.	Berigai (GW2)	7.38	25.8	0.9	758	BDL (<2)
3.	Suggondahalli (GW3)	7.63	26.9	0.7	842	BDL (<2)
4.	Kurubarapalli (GW4)	7.48	26.4	BDL (<0.5)	670	BDL (<2)
5.	Kariyasandiram (GW5)	7.39	26.9	0.6	774	BDL (<2)
6.	Suligunta (GW6)	7.52	26.7	BDL (<0.5)	952	BDL (<2)
7.	Pannapalli (GW7)	7.29	26.5	0.7	648	BDL (<2)
8.	Midithepalli (GW8)	7.22	25.7	BDL (<0.5)	781	BDL (<2)
9.	Eluvapalli (GW9)	7.53	27.3	0.7	707	BDL (<2)
10.	Mahadevapuram (GW10)	7.36	25.7	BDL (<0.5)	1012	BDL (<2)
11.	Kullur (GW11)	7.32	25.9	0.5	578	BDL (<2)
12.	Berigai Lake (SW1)	8.07	27.3	4.1	424	6
13.	Pond near Gandlaalli Sri Thimmaraya Swamy Temple (SW2)	7.81	26.9	4.3	356	4
Indian Standard IS:10500 norms (Acceptable Limit)		**6.5 -8.5**	--	**1**	**500**	--
Indian Standard IS:10500		**No**	--	**5.0**	**2000**	--

norms (permissible Limit)	**relaxation**				

WATER QUALITY - NUTRIENTS, OXYGEN DEMAND AND ORGANIC PARAMETERS

SR. NO.	SAMPLING LOCATION	AMMONICAL NITROGEN (as NH_3-N)	DO	COD	BOD_3[27]	Oil & GREASE
		(mg/L)				
1.	Project Site (GW1)	BDL(<0.05)	5.4	<4	BDL (<2)	BDL (<1)
2.	Berigai (GW2)	BDL(<0.05)	5.5	<4	BDL (<2)	BDL (<1)
3.	Suggondahalli (GW3)	BDL(<0.05)	5.5	4	BDL (<2)	BDL (<1)
4.	Kurubarapalli (GW4)	BDL(<0.05)	5.7	<4	BDL (<2)	BDL (<1)
5.	Kariyasandiram (GW5)	BDL(<0.05)	5.5	<4	BDL (<2)	BDL (<1)
6.	Suligunta (GW6)	BDL(<0.05)	5.6	8	BDL (<2)	BDL (<1)
7.	Pannapalli (GW7)	BDL(<0.05)	5.4	<4	BDL (<2)	BDL (<1)
8.	Midithepalli (GW8)	BDL(<0.05)	5.5	8	BDL (<2)	BDL (<1)
9.	Eluvapalli (GW9)	BDL(<0.05)	5.6	<4	BDL (<2)	BDL (<1)
10.	Mahadevapuram (GW10)	BDL(<0.05)	5.5	4	BDL (<2)	BDL (<1)
11.	Kullur (GW11)	BDL(<0.05)	5.7	<4	BDL (<2)	BDL (<1)
12.	Berigai Lake (SW1)	0.27	5.6	21	3.3	BDL (<1)
13.	Pond near Gandlaalli Sri Thimmaraya Swamy Temple (SW2)	0.28	5.3	24	3.6	BDL (<1)
Indian Standard IS:10500 norms (Acceptable Limit)		--	--	--	--	--
Indian Standard IS:10500 norms (permissible Limit)		--	--	--	--	--

WATER QUALITY - INORGANIC PARAMETERS

SR. NO.	SAMPLING LOCATION	TOTAL ALKALINITY (as $CaCO_3$)	T.H. (as $CaCO_3$)	Calcium	CL^-	SO_4^{--}	Mg

		(mg/L)					
1.	Project Site (GW1)	340	370	81	178	66	41
2.	Berigai (GW2)	290	430	96	202	78	46
3.	Suggondahalli (GW3)	350	410	102	219	90	37.6
4.	Kurubarapalli (GW4)	300	270	72	184	66	22
5.	Kariyasandiram (GW5)	330	372	97	203	84	31.4
6.	Suligunta (GW6)	410	460	118	241	112	40
7.	Pannapalli (GW7)	290	342	85	166	70	31
8.	Midithepalli (GW8)	380	372	94	167	83	33
9.	Eluvapalli (GW9)	360	412	108	151	60	34
10.	Mahadevapuram (GW10)	440	470	121	254	86	41
11.	Kullur (GW11)	270	300	66	147	56	32
12.	Berigai Lake (SW1)	160	180	48	127	28	14.5
13.	Pond near Gandlaalli Sri Thimmaraya Swamy Temple (SW2)	152	130	35	96	20	10
Indian Standard IS:10500 norms (Acceptable Limit)		**200**	**200**	**75**	**250**	**200**	**30**
Indian Standard IS:10500 norms (permissible Limit)		**600**	**600**	**200**	**1000**	**400**	**100**

WATER QUALITY - HEAVY METALS

SR. NO.	SAMPLING LOCATION	Ni	T-Cr^{+3}	Cu	Pb	Fe	Zn	As	F^-	Cd
		(mg / L)								
1.	Project Site (GW1)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	BDL (<0.05)	0.04	BDL (<0.01)	0.57	BDL (<0.003)
2.	Berigai (GW2)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.12	0.08	BDL (<0.01)	0.50	BDL (<0.003)
3.	Suggondahalli (GW3)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.15	0.12	BDL (<0.01)	0.47	BDL (<0.003)
4.	Kurubarapalli (GW4)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.05	0.14	BDL (<0.01)	0.41	BDL (<0.003)
5.	Kariyasandiram (GW5)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.10	0.11	BDL (<0.01)	0.49	BDL (<0.003)
6.	Suligunta (GW6)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	BDL (<0.05)	0.13	BDL (<0.01)	0.63	BDL (<0.003)
7.	Pannapalli (GW7)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.10	0.03	BDL (<0.01)	0.37	BDL (<0.003)

8.	Midithepalli (GW8)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	BDL (<0.05)	0.06	BDL (<0.01)	0.36	BDL (<0.003)
9.	Eluvapalli (GW9)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.08	0.04	BDL (<0.01)	0.39	BDL (<0.003)
10.	Mahadevapuram (GW10)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	BDL (<0.05)	0.05	BDL (<0.01)	0.45	BDL (<0.003)
11.	Kullur (GW11)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.13	0.12	BDL (<0.01)	0.44	BDL (<0.003)
12.	Berigai Lake (SW1)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.3	0.14	BDL (<0.01)	0.27	BDL (<0.003)
13.	Pond near Gandlaalli Sri Thimmaraya Swamy Temple (SW2)	BDL (<0.01)	BDL (<0.03)	BDL (<0.03)	BDL (<0.01)	0.29	0.16	BDL (<0.01)	0.23	BDL (<0.003)
Indian Standard IS:10500 norms (Acceptable Limit)		**0.02**	**0.05**	**0.05**	**0.01**	**0.3**	**5**	**0.01**	**1**	**0.003**
Indian Standard IS:10500 norms (permissible Limit)		**No relax ation**	**No relax ation**	**No relax ation**	**No relax ation**	**No relax ation**	**15**	**0.05**	**1.5**	**No relax ation**

Note: GW: Ground Water

BDL: Below Detectable Limit

SR. NO.	SAMPLING LOCATION	TOTAL COLIFORMS MPN/100ML	E.COLI
1.	Project Site (GW1)	<2	<2
2.	Berigai (GW2)	<2	<2
3.	Suggondahalli (GW3)	<2	<2
4.	Kurubarapalli (GW4)	2	<2
5.	Kariyasandiram (GW5)	<2	<2
6.	Suligunta (GW6)	2	<2
7.	Pannapalli (GW7)	<2	<2
8.	Midithepalli (GW8)	<2	<2
9.	Eluvapalli (GW9)	<2	<2
10.	Mahadevapuram (GW10)	<2	<2
11.	Kullur (GW11)	<2	<2
12.	Berigai Lake (SW1)	>1600	>1600
13.	Pond near Gandlaalli Sri Thimmaraya Swamy Temple (SW2)	>1600	>1600

Minimum Detection Limit:								
Total Iron (as Fe)	:	0.05 mg/L	Fluoride (as F^-)	:	0.05 mg/L	*Cadmium (as Cd)	:	0.003 mg/L
Copper (as Cu)	:	0.03 mg/L	**Total Chromium (as Cr^{+3})	:	0.03 mg/L	*Arsenic (as As)	:	0.01 mg/L
Nickel (as Ni)	:	0.01 mg/L	*Zinc (as Zn)	:	0.022 mg/L	*Lead (as Pb)	:	0.01 mg/L

SUMMARY

The statistical interpretation of observed ground water & surface water quality is presented.

3.6.2 BASELINE GROUND WATER QUALITY

- **pH** of Ground water samples varied from 7.22 to 7.63 Maximum **pH** was found at **Suggondahalli (7.63)** , which is well within the standard limit.
- **Total Dissolved Solids** was varied in range of 578 to 1012 mg/L. Maximum **Total Dissolved Solids** was found at **Mahadevapuram (1012 mg/L)**, which is well within the standard limit.
- **Total Suspended Solids** was found <2 mg/L.
- **DO** was varied in range of 5.4 to 5.7 mg/L. Maximum **DO** was found at **Kurubarapalli and Kullur (5.7 mg/L)**.
- **COD** was varied in range of <4 to 8 mg/L. Maximum **COD** was found at **Suligunta and Midithepalli (8 mg/L)**.
- **Total Hardness (as CaCO3)** was varied in the range of from 270 to 470 mg/L. Maximum **Total Hardness** was found at **Mahadevapuram (470 mg/L)**, which is well within the standard limit.
- **Total Alkalinity** was varied in the range of from 290 to 440 mg/L. **Total Alkalinity** was found at **Mahadevapuram (440 mg/L)**, which is well within the standard limit.
- **Chlorides** were varied in the range of 147 to 254 mg/L. Maximum **Chlorides** was found at **Mahadevapuram (254 mg/L)**, which is well within the standard limit.

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Desirable Limit	Maximum Permissible Limit
1.	pH	pH Scale	7.63	7.22	6.5-8.5	No Relaxation
2.	Total Dissolved Solids	mg/l	1012	578	500	2000
3.	Total Suspended Solids	mg/l	<2	<2	--	--

4.	Total Hardness	mg/l	470	270	200	600
5.	Fluoride	mg/l	0.63	0.36	1	1.5
6.	Chlorides	mg/l	254	147	250	1000
7.	Zinc	mg/l	0.14	0.03	5	15
8.	Total Alkalinity	mg/l	440	290	200	600

3.6.3 BASELINE SURFACE WATER QUALITY

- pH of Surface water samples varied from 7.81 to 8.07. Maximum **pH** was found at **Berigai Lake (8.07)**, which is well within the standard limit.
- DO was varied in range of 5.3 to 5.6 mg/L. Maximum **DO** was found at **Berigai Lake (5.6 mg/L)**.
- COD was varied in range of 21 to 24 mg/L. Maximum **COD** was found at **Pond near Gandlaalli Sri Thimmaraya Swamy Temple (24 mg/L)**.
- **BOD_3^{27}** was varied in range of 3.3 to 3.6. Maximum **BOD_3^{27}** was found at **Pond near Gandlaalli Sri Thimmaraya Swamy Temple (3.6 mg/L)**.

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Classification of inland water body
1.	pH	pH Scale	8.07	7.81	A
2.	DO	mg/l	5.6	5.3	A
3.	COD	mg/l	24	21	--
4.	BOD	mg/l	3.6	3.3	B
5.	Total Dissolved Solids	mg/l	424	356	--
6.	Total Suspended Solids	mg/l	6	4	--
7	Total Hardness	mg/l	180	130	--
8	Fluoride	mg/l	0.27	0.23	--
9	Chlorides	mg/l	127	96	--
10	Zinc	mg/l	0.16	0.14	--
11	Total Alkalinity	mg/l	160	152	--
12	Total Coliform	MPN/100ml	2	<2	--

INTERPRETATION:

Ground Water Quality: Based on comparison study with drinking water standards, it is interpreted that water samples collected from the villages should not be directly used in drinking but can be used in other domestic purposes like washing, bathing and irrigation. Ground water is fit for use as domestic purpose after basic filtration and disinfection treatment.

It can be observed that ground water qualities in terms of various desirable characteristics are found within the limits specified by IS 10500:2012.

Surface Water Quality: There is one lake and one pond considered in the study area. However, these water is not used for domestic/industrial activities; as the raw water is available through pipelines of local authorities. These water sources cannot be utilized for drinking but the water of these pond & lake can be used in irrigation.

3.7 LAND ENVIRONMENT

3.7.1 SOIL QUALITY

Soil samples were collected from eleven locations during 1st July, 2022 To 30th September, 2022 within the study area to assess its physico-chemical characteristics. The analysis results of soil samples are given in Table 3.10.

Table 3.10

PHYSICO-CHEMICALS CHARACTERISTICS OF SOIL

Sr. No	Parameter	Unit	Project Site	Berigai	Suggondahalli	Kurubarapalli	Kariyasandiram	Suligunta
1.	Moisture Content	%	2.98	4.77	3.13	4.53	3.97	5.02
2.	pH	--	7.14	6.59	6.87	6.98	7.37	6.82
3.	Electrical Conductivity	mS/cm	0.156	0.198	0.094	0.218	0.175	0.141
4.	Bulk Density	gm/cm^3	1.39	1.37	1.46	1.38	1.47	1.45
5.	Porosity	%	33	31	26	29	26	24
6.	Water Holding Capacity (WHC)	%	34.4	30.7	27.3	31.1	27.6	25.8
7.	*Specific Gravity	--	2.38	2.41	2.29	2.42	2.33	2.36
8.	Calcium (as Ca^{+2})	mg/Kg	18.2	17.1	15.2	16.6	15.3	14.8
9.	Magnesium (as Mg^{+2})	m.eq/100g	3.77	4.61	3.29	4.23	3.77	3.52
10.	Total Phosphorus (as P)	mg/Kg	51.2	39.3	63.8	58.6	73.7	49.3
11.	Available Phosphorus	mg/Kg	298	354	320	356	334	290
12.	Organic Matter (OM)	%	0.96	1.13	0.86	1.22	0.69	0.78
13.	Total Nitrogen	mg/Kg	114	178	142	132	108	153

14.	Available Nitrogen	mg/Kg	68	91	79	45	29	53
15.	Nitrate Nitrogen (as NO_3^--N)	mg/Kg	32	52	41	35	29	53
16.	Sulphates (as SO_4^{-2})	mg/Kg	148	210	182	210	128	176
17.	Total Iron (as Fe)	mg/Kg	514	698	354	715	536	674
18.	Copper (as Cu)	mg/Kg	8.23	9.11	4.26	6.14	2.77	4.69
19.	Nickel (as Ni)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
20.	Lead (as Pb)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
21.	Arsenic (as As)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
22.	Organic Carbon	%	0.96	1.13	0.86	0.70	0.40	0.45
23.	Color	--	Reddish Brown	Reddish Brown	Reddish Brown	Reddish Brown	Reddish Brown	Reddish Brown
24.	Sodium (as Na)	mg/Kg	1.37	1.53	1.03	1.37	0.96	0.83
25.	Potassium (as K)	mg/Kg	298	354	320	356	334	290
26.	Cadmium (as Cd)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
27.	Zinc (as Zn)	mg/Kg	36.3	17.2	14.6	22.3	19.6	26.6
28.	Chloride (as Cl)	mg/Kg	96	112	87	102	78	137
29.	Permeability	cm/hr	4.3	3.9	5.2	3.9	4.8	5.1
30.	Texture Classification	--	Loam	Loam	Sandy Loam	Loam	Sandy Loam	Sandy Loam
	Grain Size Analysis:							
31.	Sand	%	40.5	38.6	55.2	38.2	57.1	58.2
	Clay	%	25.7	26.3	14.7	27	13.9	14.4
	Silt	%	33.8	35.1	30.1	34.8	29	27.4

Sr. No	Parameter	Unit	Pannapalli	Midithepalli	Eluvapalli	Mahadevapuram	Kullur
1.	Moisture Content	%	3.69	3.97	4.59	2.77	5.63
2.	pH	--	7.48	6.71	6.94	7.18	6.37
3.	Electrical Conductivity	mS/cm	0.107	0.142	0.196	0.077	0.118
4.	Bulk Density	gm/cm^3	1.36	1.44	1.35	1.39	1.38
5.	Porosity	%	30	27	32.2	31.9	29.6
6.	Water Holding Capacity (WHC)	%	32.8	26.5	30.8	31.4	30.5
7.	*Specific Gravity	--	2.47	2.33	2.46	2.37	2.42
8.	Calcium (as Ca^{+2})	mg/Kg	17	16.1	17.3	16.9	15.5
9.	Magnesium (as Mg^{+2})	m.eq/100g	4.56	3.66	4.79	4.11	5.06
10.	Total Phosphorus (as P)	mg/Kg	68.7	50.8	77	63	82.4
11.	Available Phosphorus	mg/Kg	258	342	394	316	252
12.	Organic Matter (OM)	%	1.12	0.85	0.77	1.03	0.91
13.	Total Nitrogen	mg/Kg	96	138	114	172	96
14.	Available Nitrogen	mg/Kg	48	49	38	67	26
15.	Nitrate Nitrogen (as NO_3^--N)	mg/Kg	26	36	41	33	38
16.	Sulphates (as SO_4^{-2})	mg/Kg	142	174	208	112	156
17.	Total Iron (as Fe)	mg/Kg	431	697	763	512	394
18.	Copper (as Cu)	mg/Kg	8.06	6.99	9.13	10.3	4.33
19.	Nickel (as Ni)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
20.	Lead (as Pb)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)

21.	Arsenic (as As)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
22.	Organic Carbon	%	0.65	0.49	0.44	0.59	0.53
23.	Color	--	Reddish Brown	Reddish Brown	Reddish Brown	Reddish Brown	Reddish Brown
24.	Sodium (as Na)	mg/Kg	1.03	0.96	1.11	1.06	0.88
25.	Potassium (as K)	mg/Kg	258	342	394	316	252
26.	Cadmium (as Cd)	mg/Kg	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
27.	Zinc (as Zn)	mg/Kg	25.6	23.6	31.1	19.6	28
28.	Chloride (as Cl)	mg/Kg	91	118	141	105	84
29.	Permeability	cm/hr	3.6	5.4	3.7	3.5	4
30.	Texture Classification	--	Loam	Sandy Loam	Loam	Loam	Loam
	Grain Size Analysis:						
31.	Sand	%	41.1	58.8	37.1	39.3	40.4
	Clay	%	26.8	15	25.3	27.1	26.9
	Silt	%	32.1	26.2	37.6	33.6	32.7

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NOTE: BDL: Below Detectable Limit

Minimum Detection Limit:								
Copper (as Cu)	:	0.05 mg/Kg	Lead (as Pb)	:	0.001 mg/Kg	Cadmium (as Cd)	:	0.001 mg/Kg
Nickel (as Ni)	:	0.03 mg/kg	Arsenic (as As)	:	0.0001 mg/kg			

3.7.2 SUMMARY OF SOIL QUALITY

Based on the soil analysis report, the following can be concluded:

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value
1.	pH	pH Scale	7.48	6.59
2.	Nitrogen (N)	mg/Kg	178	96
3.	Phosphorus (P)	mg/Kg	77	39.3
4.	Potassium (K)	mg/Kg	394	258
5.	Electric Conductivity	mS/cm	0.218	0.077
6.	Calcium	mg/kg	18.2	14.8
7.	Magnesium	m.eq/100g	5.06	3.29
8.	Organic Carbon as C	%	1.13	0.40

- **pH** of samples varied from **6.59 to 7.48.** Maximum pH was found at **Pannapalli (7.48).**
- **Nitrogen (N)** was varied in range of **96 to 178 mg/kg**. Maximum Nitrogen (N) was found at **Berigai (178 mg/kg).**
- **Phosphorus (P)** was varied in range of **39.3 to 77 mg/kg**. Maximum Phosphorus (P) was found at **Eluvapalli (77 mg/kg).**
- **Potassium (K)** was varied in range of **258 to 394 mg/kg**. Maximum Potassium (K) was found at **Eluvapalli (394 mg/kg).**
- **Electric Conductivity** was varied in range of **0.077 to 0.218 mS/cm**. Maximum Electric Conductivity was found at **Kurubarapalli (0.218 mS/cm).**
- Calcium of samples varied from **14.8-18.2 mg/kg**. Maximum Calcium was found at **Project Site (18.2 mg/kg)**
- Magnesium of samples varied from **3.29-5.06 m.eq/100g.** Maximum Magnesium was found at **Kullur (5.06 m.eq/100g)**
- Organic Carbon as C of samples varied from **0.40-1.13%.** Maximum Organic Carbon as C was found at **Kullur (1.13%).**

INTERPRETATION

The porosity of soils can be considered as moderate to good for air and water movement in the soil. The concentration of available Nitrogen, Phosphorous and Potassium in the soil samples signifies that the soil of the area is fertile.

Figure-3.6

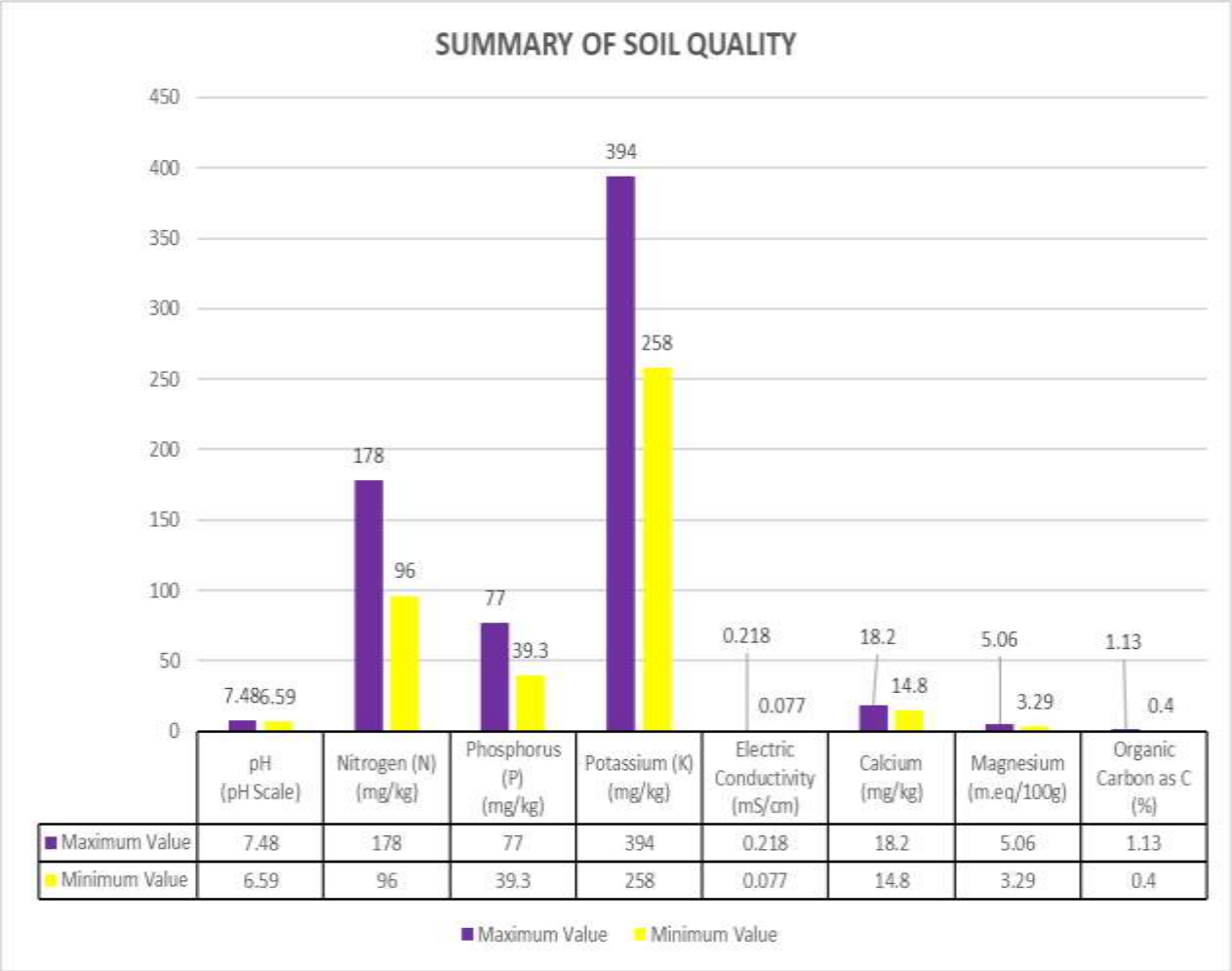

SUMMARY OF SOIL QUALITY
450
400
350
300
250
200
150
100
50
0
394
258
178
96
77
39.3
7.48
6.59
0.218
0.077
18.2
14.8
5.06
3.29
1.13
0.4
pH (pH Scale)
Nitrogen (N) (mg/kg)
Phosphorus (P) (mg/kg)
Potassium (K) (mg/kg)
Electric Conductivity (mS/cm)
Calcium (mg/kg)
Magnesium (m.eq/100g)
Organic Carbon as C (%)
Maximum Value 7.48 178 77 394 0.218 18.2 5.06 1.13
Minimum Value 6.59 96 39.3 258 0.077 14.8 3.29 0.4
Maximum Value
Minimum Value

FIGURE 3.7 MONITORING PHOTOGRAPHS

1. Project Site









2. Berigai







3. Kurubarapalli






4. Kariyasandiram






Pannapali









5. Midithepalli






6. Eluvapalli









7. Mahadevapuram







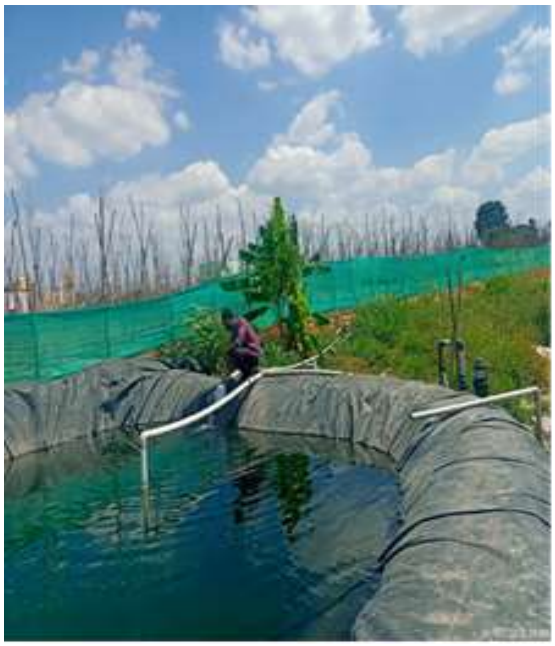


8. Kullur






9. Suggondhali









10. Suligunta









3.8 REPORT ON ENVIRONMENTAL PARAMETERS SUCH AS GEOLOGY, SOIL, HYDROLOGY, LAND USE PATTERN, DRAINAGE NETWORK AND KEY-INFRASTRUCTURE AND ECOLOGY AND BIODIVERSITY

3.8.1 INTRODUCTION

The Land Use Land Cover study has been carried out for Chemplast Sanmar is located at Berigai, Krishnagiri District, Tamilnadu State, India.

The mapping of Land use Land Cover has been carried out with help of Bhuvan Data and Google Earth Imagery using QGIS Software and verified by reconnaissance survey.

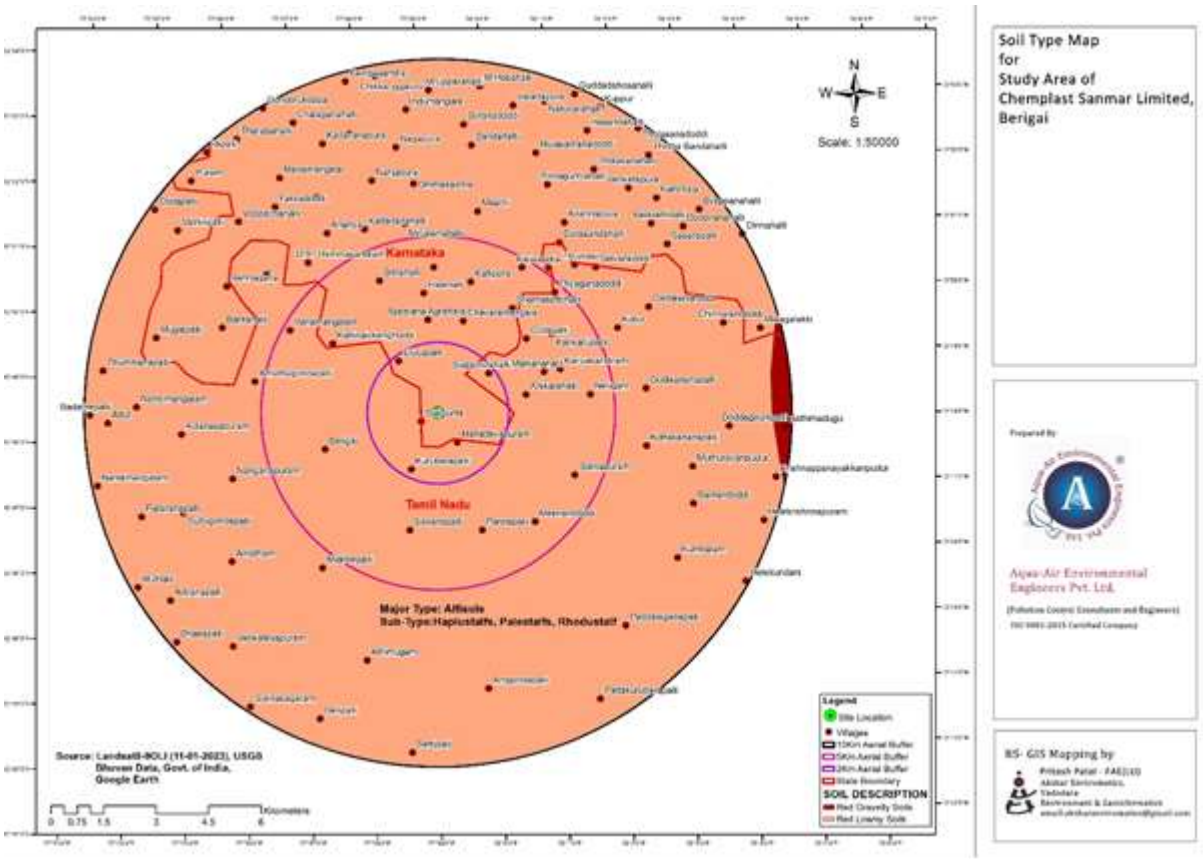
The 10 Km Aerial buffer area was identified in with the help of Lat-Lon using Google Earth Pro. The same area is than identified from Bhuvan database and the both the layers were super imposed using Geo Reference technique in QGIS. Based on Visual interpretation the Land use classes were identified and the same was verified with the help of field survey. The area calculation was also done for each land use classes occurring in that region.

3.8.2 SOIL INFORMATION

Different types of the soils such as black or mixed loamy red ferocious and gravel are found in the district. The black of rigor loam is very fertile due to its moisture absorbing character. Red soil is seen in Hosur, Shoolagiri, Thally and Kelamangalam. In general, the soil in the district is quite loose and fresh with its colour from red to dark brown. The soil has low nitrogen and phosphate content with marked variation between different taluks. The following table explains type of soils found in the district. However, based on the particulars contained in the Hydro-geological Atlas of Tamil Nadu, brought out by the Central Ground water Board, the soils in the Krishnagiri district are grouped as - mainly (i) Red sandy clay loam soils, Recent old alluvium soils and Rock outcrops with loamy sand soils in Krishnagiri district. The red sandy clay loam soils are partly matured soils and they are shallow to deep, possessing good drainage characteristics. These soils are suitable for cultivation of large variety of crops including ragi, bajra, jowar, paddy, etc., both under irrigated and rainfed conditions. The recent/old Alluvial soils are generally fertile and respond well to management practices and are suitable for cultivation of crops like paddy, sugarcane, jowar, groundnut, chillies, pulses etc., The rock outcrops with loamy sand soils respond well to irrigation, manuring and other management practices.

FIGURE – 3.8

SOIL MAP



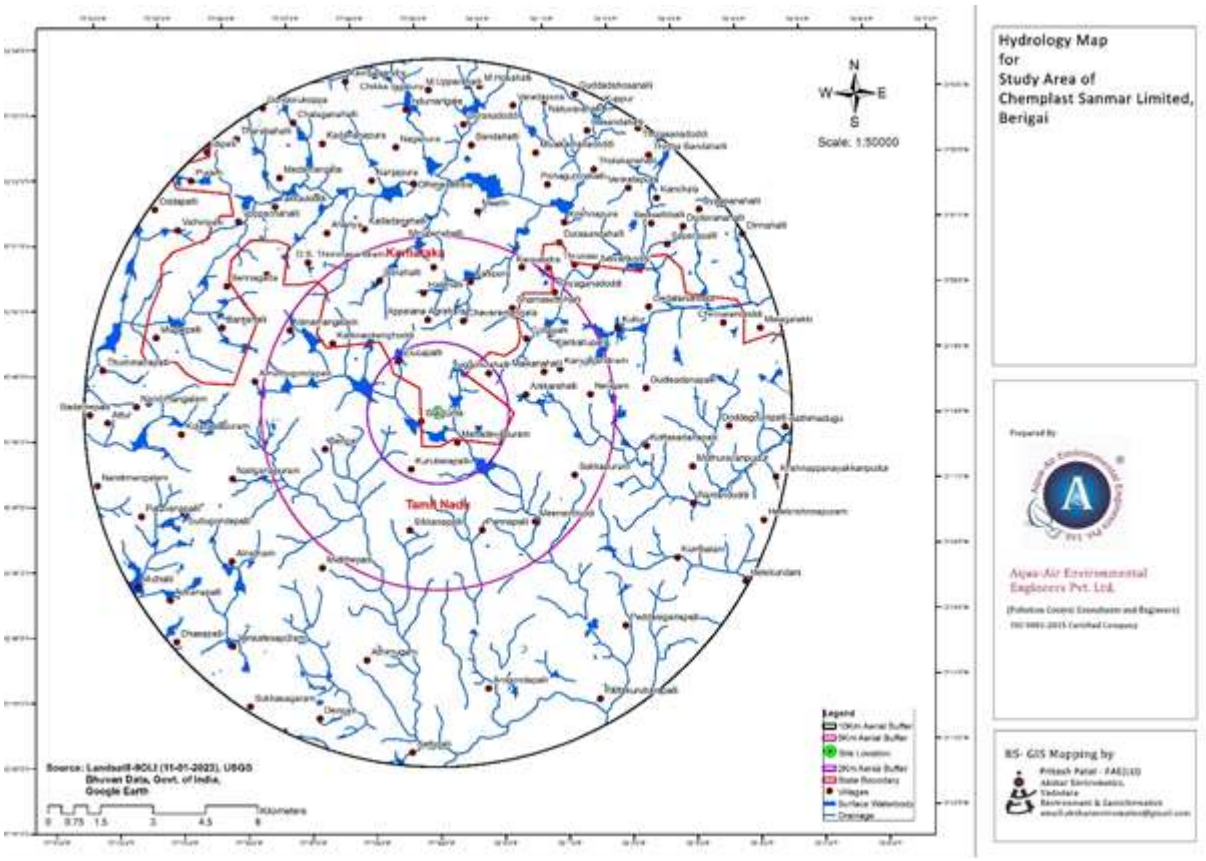
Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

3.8.3 HYDROLOGY

The study area has no any perennial reservoirs, river or any big-large water body. There is no any seasonal river present within the study area. But due to rough terrain and altitude variations there are numerous natural drainage and its network is present in the study area which is very well connected to each other and natural water bodies. There are scattered waterbodies are there and people have made agricultural farm ponds which also contributes to the surface waterbodies within the study area. There are mining practices being done within the study area and it has also deep water bodies in the excavated regions.

FIGURE – 3.9

HYDROLOGY MAP



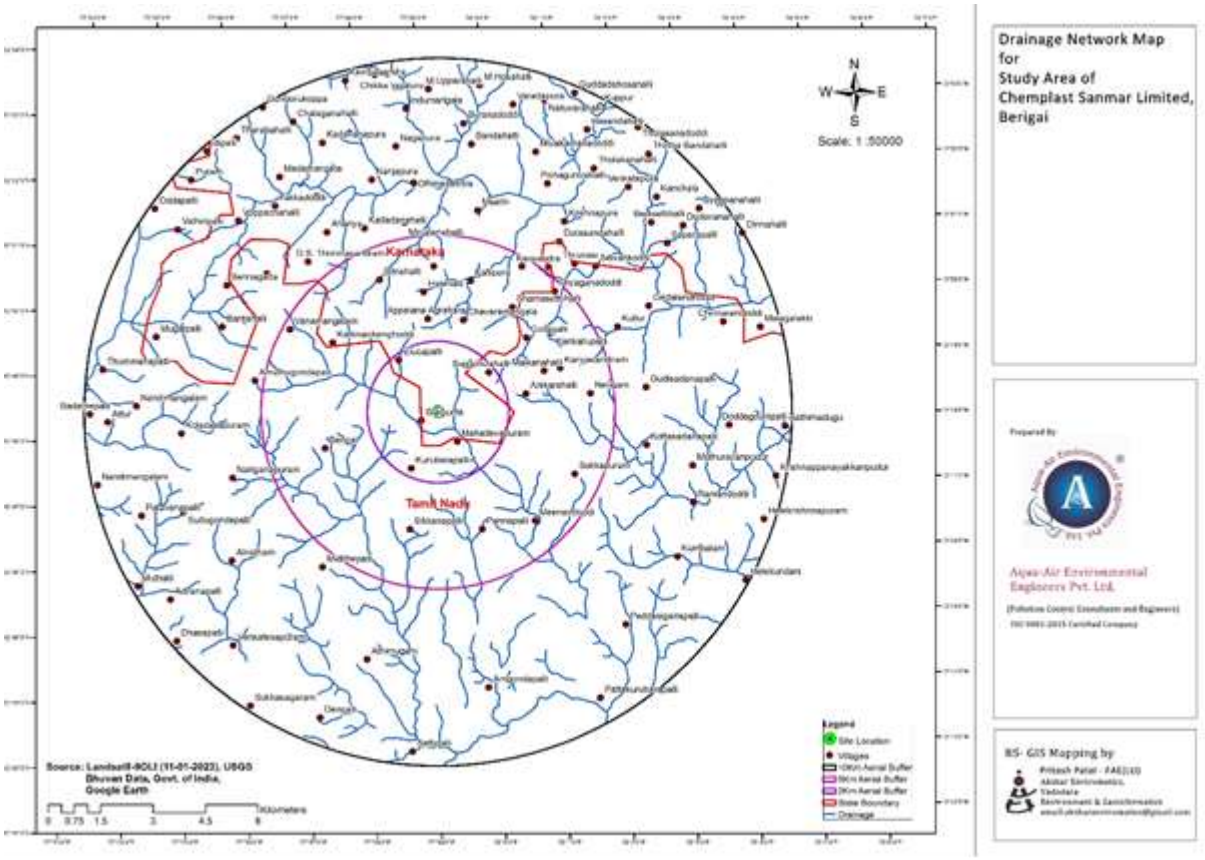
Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

3.8.4 DRAINAGE PATTERN

Generally, by drainage system, we mean the network of mains and branches of underground conduits for the conveyance of sewerage to the point of disposal. Sewers that carry only household and industrial wastage are called separate sewers; those that carry storm water from roofs, streets and other surfaces are known as storm water drains, while those carrying both sewage and storm water are called combined sewers. However, in towns, which are not provided with such underground sewerage system, it is mentioned whether it has open drainage system. There may be possibility of the town having both closed as well as open drainage systems.

The Drainage network of the study area is prepared with line strings using QGIS. ISRO's Open Data Archive, Bhuvan Data and Topo-sheet data was used as base layer to prepare the map. Drainage layer is generated after scanning the thematic manuscripts which is further edited for line errors. Two different layers were made separately for line drainage. Drainage order was given to all the drain lines in the layer. Strahler's method of ordering is used for giving order to drainage. Wherein the smallest permanent streams are designated as the first order and the confluences of two first order streams give rise to second order stream and so on. The order of trunk stream is not altered by the addition of lower order. The order of the stream will increase only by the addition of streams of same order.

The study area has no any perennial river or any big river. There is no any seasonal river present within the study area. But due to rough terrain and altitude variations there are numerous natural drainage and its network is present in the study area which is very well connected to each other and natural water bodies.



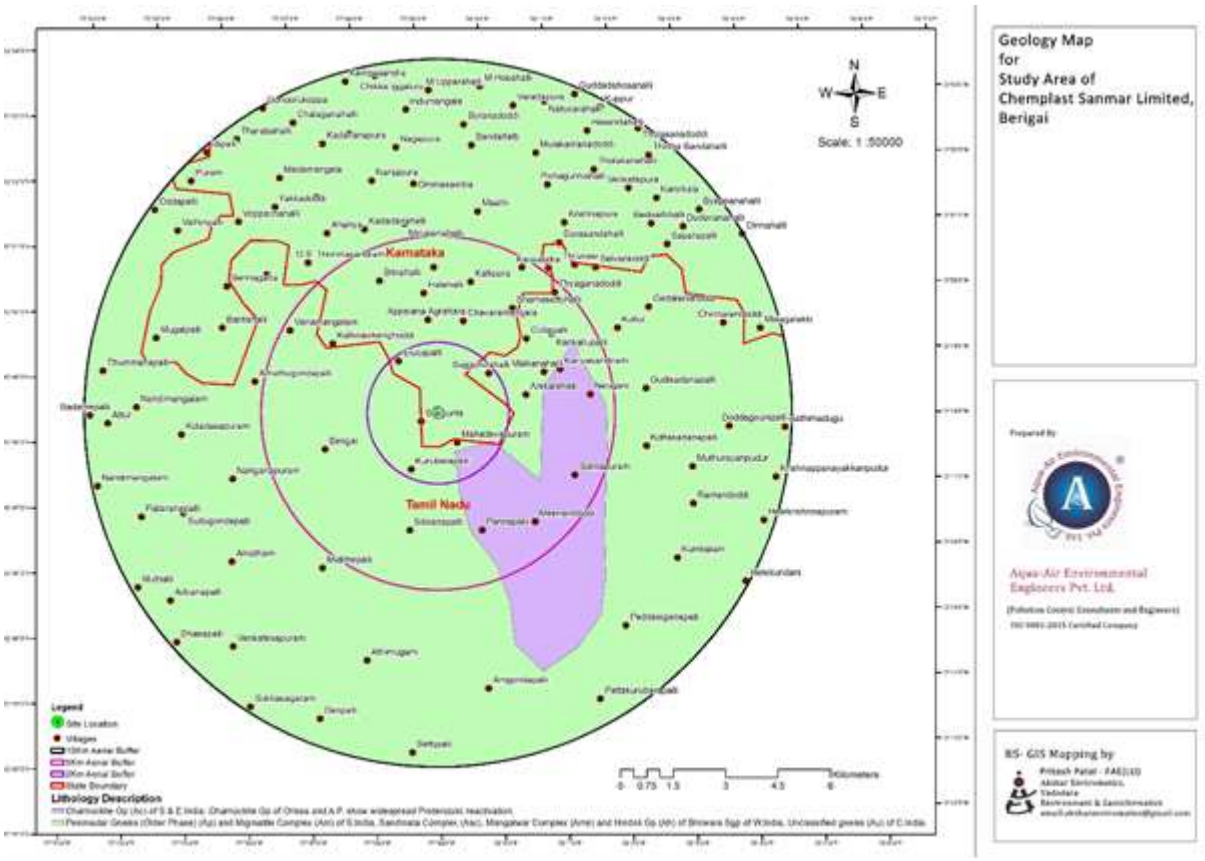
Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

3.8.5 GEOLOGICAL INFORMATION

The study area is mainly composed of Archaean crystalline metamorphic complex. The rock type noticed in the study area for lease is Granite Gneiss which contains mostly quartz and Feldspar with some ferromagnesian minerals. The Granite gneiss is part of peninsular gneisses, a high grade metamorphic rock. In Krishnagiri district, the predominant geological formations are Recent Alluvium, Upper Proterozoic, Lower Proterozoic and Archaeons, whereas Alluvium, Granite gneisses and Charnockite geological formations also present in the district.

The prominent geomorphic units identified in the district through interpretation of satellite imagery are structural hills in the southwestern part of the district, denudational land forms like buried pediments in the plains and inselbergs and plateaus represented by conical hills aligned with major lineaments. Krishnagiri district forms part of the upland plateau region with many hill ranges and undulating plains. The western part of the district has hill ranges of Mysore plateau with a chain of undulating hills and deep valleys extending in NNE-SSW direction. The plains of the district have an average elevation of 488 m amsl. The plateau region along the western boundary and the northwestern part of the district has an average

elevation of 914 m amsl. The Guthrayan Durg with an elevation of 1395 m amsl is the highest peak in the district.



Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

3.9 LAND USE PATTERN

Based on features interpretation from satellite data, further analyses for Landuse Land cover feature extraction is carried out. This is derived from the spectral reflectance of land features. The Land use map is finalized for the 10 Km aerial buffer from the project site using Google Earth, Bhuvan NRSC (National Remote Sensing Centre), Hyderabad, Q-GIS and Landsat-8-9OLI satellite data.

Land use pattern of the study area as well as the catchment area was carried out by standard methods of analysis of remotely sensed data and followed by ground truth collection (Benchmark) and interpretation of satellite data. The outcome of land use study has been presented below.

Land Use & Land Cover Classification Results

Land Cover is the physical material at the surface of the earth (it include grass, asphalt, trees, bare ground, water, etc.) whereas Land use is the human use of land.

Land Use involves the management and modification of natural environment or wilderness into built environment such as fields, pastures, and settlements. It has also been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it".

There is no one ideal classification of land use and land cover, and it is unlikely that one could ever be developed. There are different perspectives in the classification process, and the process itself tends to be subjective, even when an objective numerical approach is used.

Concepts concerning land cover and land use activity are closely related and in many cases have been used interchangeably. The purposes for which lands are being used commonly have associated types of cover, whether they are forest, agricultural, residential, or industrial.

The present Land use / Land cover map for the proposed project activity is prepared with help of satellite image. This report thus will enable assessing the impact on land use pattern in the study area due to the proposed project activity.

Data Used

Open Source Landsat 9 satellite image as well as Google Earth Pro along with Open data provided by Indian Government's Remote Sensing Agency is used for preparation of Landuse map of the study area. Also, Survey of India's Open Topographic sheets used as a reference map on 1:50,000 scale has been used for preparation of base layer data like road, rail network, village and mine site and for geo-rectification of satellite image.

Technical Details

Satellite Image – Landsat 8-9OLI Satellite image, USGS.

Other Data Sets- Bhuvan Data, Govt. of India

Software Used – Google Earth Pro and QGIS.

Methodology

Land use / Land cover map preparation, Base map creation; Geometric and Radiometric correction of satellite image has been processed using Q-GIS Software.

Salient features of the adopted methodology are given below:

- Acquisition of satellite data.
- Spectral Bands Combination and processing for Land use estimation.
- Rectification of Satellite Data.
- Preparation of base map from Survey of India Topo-sheets.
- Land use class layer creation and data analysis using visual interpretation techniques for satellite data.
- Further editing using Google Earth Pro
- Ground truth studies or field checks.
- Finalization of the map.
- Area calculation for statistics generation.

Interpretation of Remote Sensing Data

Satellite images are composed of array of grid, each grid has a numeric value that is known as digital number. Smallest unit of this grid is known as a pixel that captures reflectance of ground features represented in terms of Digital number, each representing specific land features. Using image classification technique, the satellite data is converted into thematic information, map based on the user's knowledge about the ground area. Hybrid technique has been used i.e. visual interpretation and digital image processing for identification of different land use and vegetation cover classes based on spectral signature of geographic feature.

Spectral signature represents various land use classes. Image interpretation keys are developed based on image characteristics like colour, tone, size, shape, texture, pattern, shadow, association etc., which enables interpretation of satellite images for ground feature. Training sites are then assigned based on their spectral signature and interpretation elements. Using image classification algorithm land use map is generated.

Table – 3.11

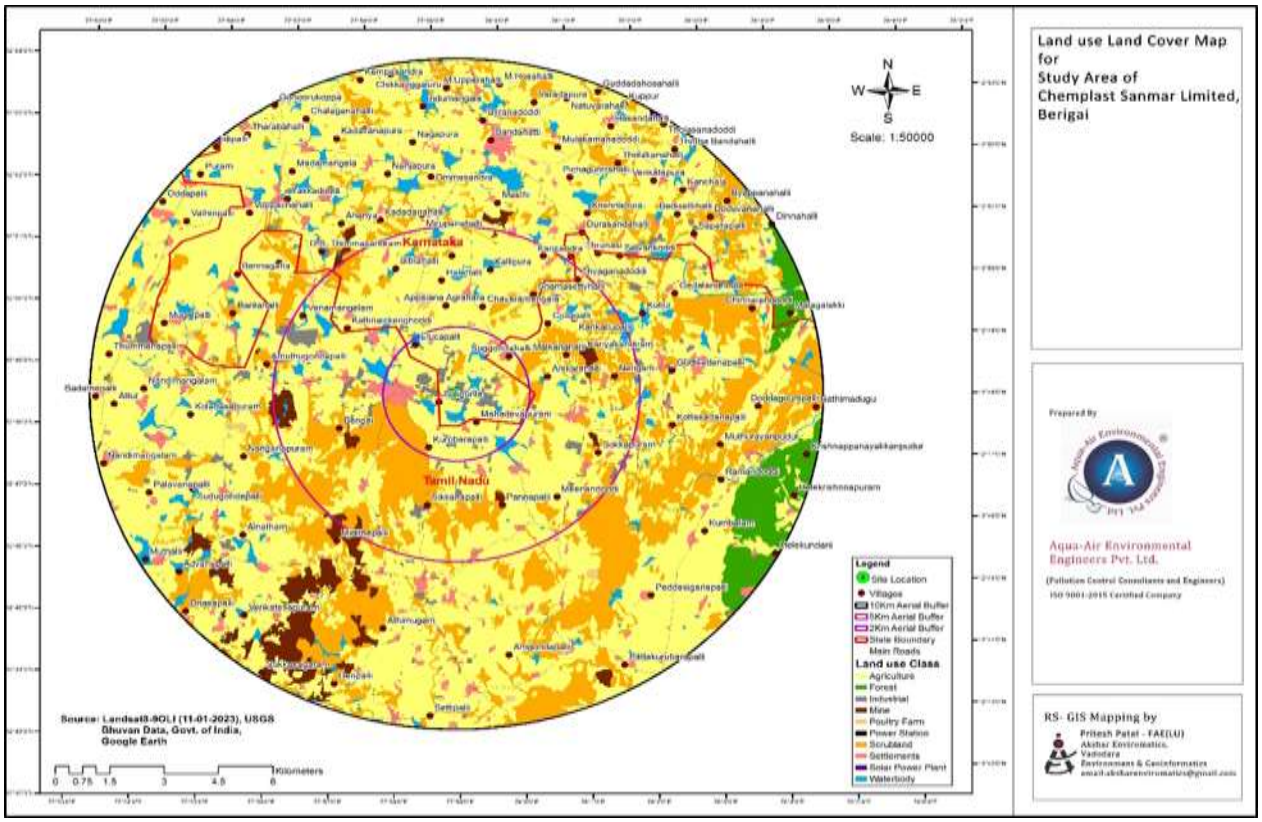
Areas Under Different Land use

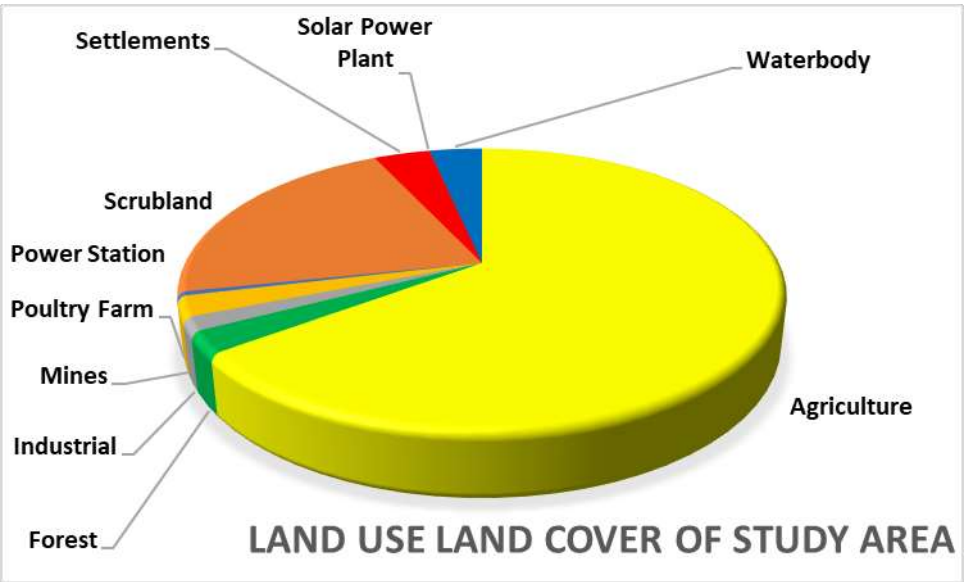
Land use Class	Area in Ha	Area in %
Agriculture	20419.27	64.89
Forest	783.21	2.49
Industrial	493.05	1.57
Mines	735.72	2.34
Poultry Farm	142.74	0.45
Power Station	1.53	0.00
Scrubland	6692.36	21.27
Settlements	1134.50	3.61
Solar Power Plant	8.95	0.03
Waterbody	1057.04	3.36
TOTAL	**31468.37**	**100**

Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

Figure – 3.10

Land use / Land cover





According to habitat condition and satellite image interpretation there are several classes derived which shows land use and its pattern in the study area.

The major of the area occupied by **Agriculture** practices in this region as it shows major area occupied by agriculture fields. There is 65% of the total area is occupied by Agriculture in which people practices mainly large scale Flower farming together with Fruits, Paddy and other Crops. Some area of **Berigai Extention forest** is also present in the study area which is 8.5 % of the total area. It is also observed that **Poultry Farming** practices are present on remarkable amount and the same has occupied 0.5% of the total study area.

The other classes observed are the **waterbodies** class includes Reservoir/ Lakes/ Ponds/ Tanks, and River bed covers around 4 % of the study area. **Scrubland** are also there in this region which is almost 21 % of the total area. There are mainly *Prosopis sp.* And other associated thorny species occupied in all these scrubland along with seasonal Herbs and some shrubs. There are stony barren land with sparse scrub also considered together in the land use class of scrub land.

There is less urbanization observed in satellite image. The area occupied under **Residential Settlement** class is 4 % of the total area which is very less as study area have scattered habitatations with less population. Industries are also present as the **Industrial Area** class is 1.5% of the total area. Apart from these major classes there are other land use classes also observed in the study area area is some portion of Solar Energy park which is situated in North direction of the study area is almost 0.03% of the total area. It is also very well reflected in satellite data that scattered **mining** practices are also there in the region and the same has contributed 2.3% of the total area.

3.10 TOPOSHEET & KEY-INFRASTRUCTURE MAP

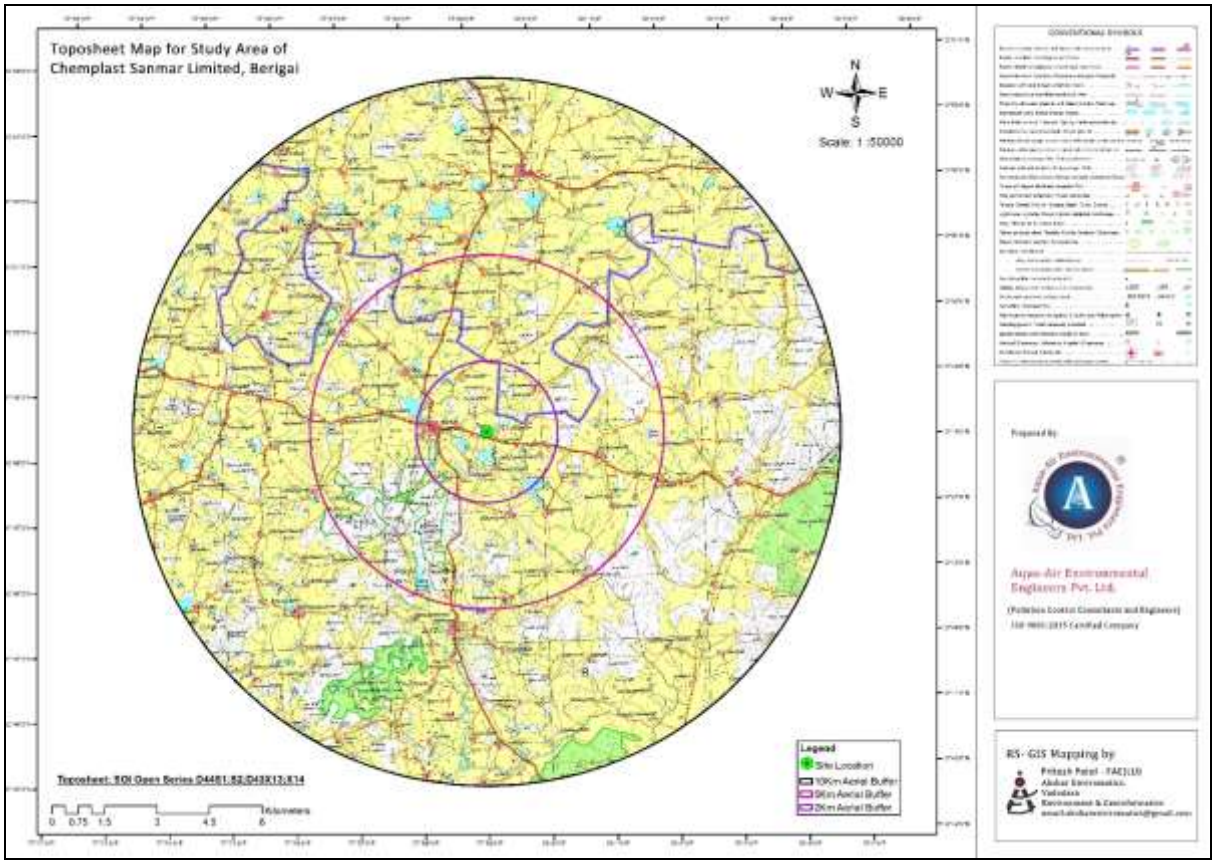
The Land Use Land Cover study has been carried out for Chemplast Sanmar is located at Berigai, Krishnagiri District, Tamilnadu State, India.

The mapping of Land use Land Cover has been carried out with help of Bhuvan Data and Google Earth Imagery using QGIS Software and verified by reconnaissance survey.

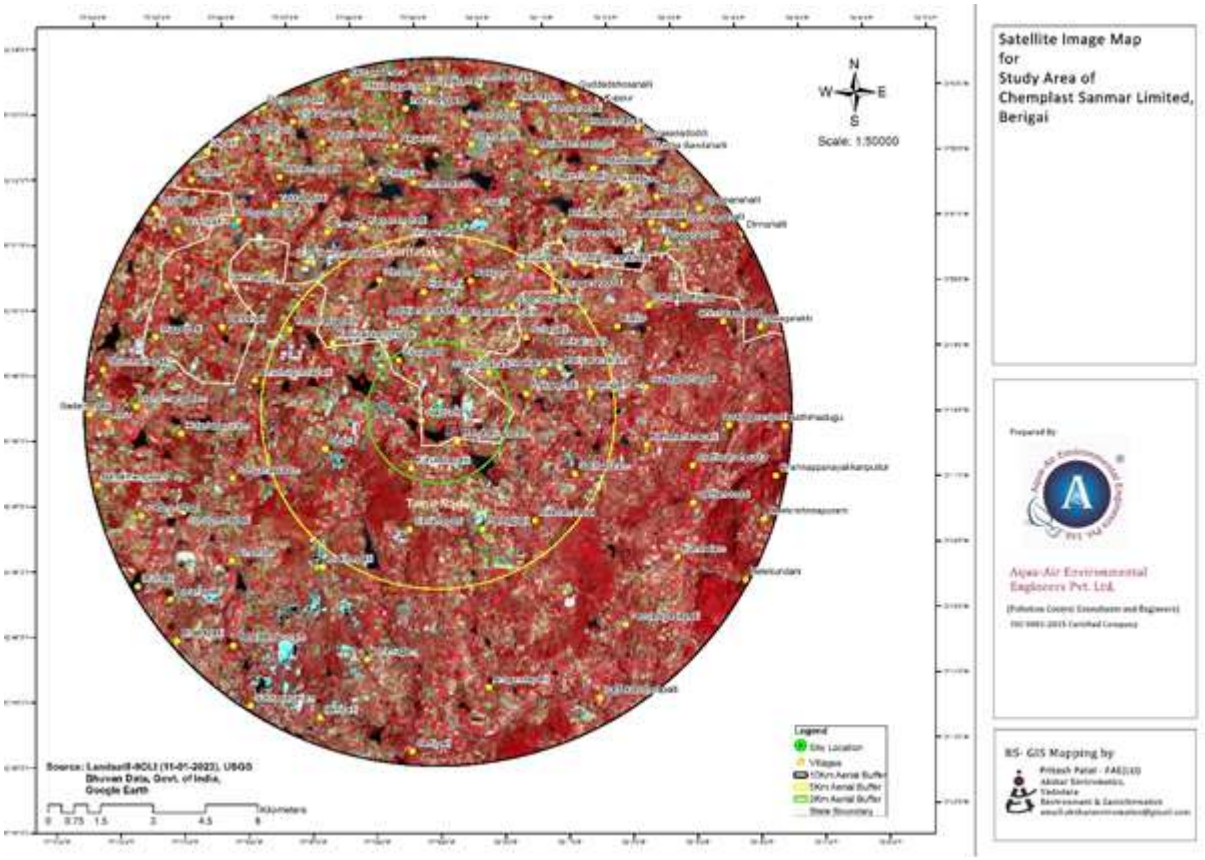
The 10 Km Aerial buffer area was identified in with the help of Lat-Lon using Google Earth Pro. The same area is than identified from Bhuvan database and the both the layers were super imposed using Geo Reference technique in QGIS. Based on Visual interpretation the Land use classes were identified and the same was verified with the help of field survey. The area calculation was also done for each land use classes occurring in that region.

Figure 3.11

TOPOSHEET



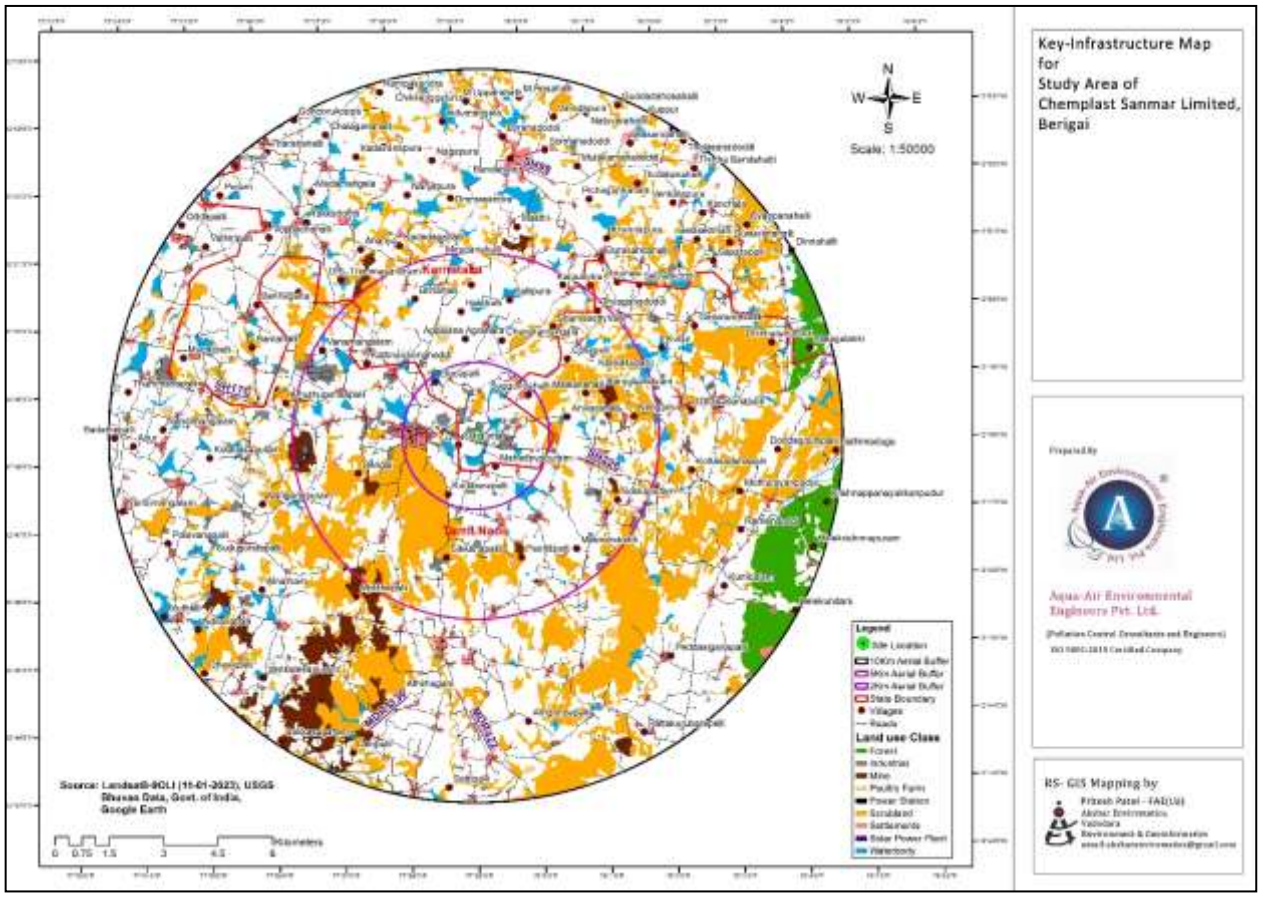
Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)



Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

Satellite images are the very best and perfect source of interpretation of land forms. There are different kind of scanners and sensors are there in satellite. Here we have used Multi Spectral satellite data. Each band of a multispectral image can be displayed one band at a time as a grayscale image, or as a combination of three bands at a time as a colour composite image. The three primary colours of light are red, green, and blue (RGB). Computer screens can display an image composed of three different bands, by using a different primary colour for each band. When we combine these three images, the result is a colour image with each pixel's colour determined by combination of RGB of different brightness.

Key- Infrastructure:



Source: Akshar Enviromatics, Vadodara (Mr. Pritesh Patel – Empanelled Expert of M/s. Aqua-Air Environmental Engineers Pvt. Ltd.)

The area of industrial settlements are there in this study area along with it human settlements forms the key infrastructure in this region. As the area is having mainly industrial development the transportation facilities by Road network is quite well developed and it is well connected with villages all over in the study area. Almost every villages in this region is well connected with metalled road network. Apart from road network development the railway also present in the study area. There are some developments of Green energy production unit such as Solar Energy parks is also present within the study area. There are scattered mining practices are also remarkably present in the study area.

3.11 TRAFFIC STUDY

The traffic studies have been conducted to know the prevailing traffic volumes on the existing roads. It is essential to consider these details for assessing the anticipated future traffic volumes as a part of overall impacts assessment for the project. The variations of traffic densities depend upon the working days and time and also vary in day and night times. In order to assess the prevailing traffic volumes on the roads, the survey was conducted during normal

working days of the week by avoiding local holidays or abnormal situations to reflect the true picture of the traffic densities.

Objectives of the Traffic Survey

- To analyze the characteristics and issues of transportation in Berigai
- To formulate basic data for traffic demand in the future
- To grasp the variation of traffic movement from the previous

Methodology

A. Vehicle Count

The vehicles passing through the road (in both ways) were counted separately for 24 hours at one location from 06:00 hrs to 06:00 hrs next day continuously. Category-wise vehicle counting has been done continuously and recorded in the traffic volume count on hourly basis under respective categories.

B. Categorization of Traffic

The engine driven vehicles were categorized into various heads viz. Trucks/Bus, Light Carriage Vehicles, Car/Jeep, Multi Axle Vehicles, Two/Three Wheelers and Cycles/others. Survey was conducted during the weekdays and weekend.

EXISTING TRAFFIC SURVEY REPORT DETAILS

Fast Vehicle					Slow Vehicle			
Day	Car/jeep/ van & four wheelers	Bus/ coach	Heavy motor vehicle	Trucks	Motor cycle & scooter	Three wheelers	Cycle	Farm vehicle (tractor/ combine harvester)
Monday	246	54	24	6	650	5	57	32
Tuesday	205	51	22	3	625	3	51	31
Wednesday	218	56	18	5	634	3	64	36
Thursday	225	51	17	5	680	11	56	28
Friday	238	57	26	6	653	3	42	30
Saturday	229	53	28	4	658	2	21	23
Sunday	170	39	26	2	425	6	8	7
Total	1531	361	161	31	4325	33	299	187
Average	219	52	23	4	618	5	43	27

1003

ADDITINAL PROPOSAL FOR VEHICLE DISTRIPUTION

Sr. No.	Vehicles Distribution	No. of Vehicles/ Day	Passenger Car Unit	Total No. of Vehicle (PCU)	Total No. of Vehicle (PCU) / Hour
1.	Car/jeep/ van & four wheelers	219	1.0	219	9
2.	Bus/ coach	52	3.7	192	8
3.	Heavy motor vehicle	23	0.5	12	1
4.	Trucks	4	3.7	15	1
5	Motor cycle & scooter	618	0.5	309	55
6	Three wheelers	5	2.0	10	1
7	Cycle	43	0.2	9	1
8	Farm vehicle (tractor/ combine harvester)	27	6.0	162	7
	Total	**293**		**928**	**83**

1004

TRAFFIC MANAGEMENT MEASURES

- Yellow paint junction boxes are painted at the locations to create psychological barrier for through drivers to control the speed.
- All gates are manned with efficient security who can guide the entry and exit of vehicles.
- Merging of vehicles will be performed only to left traffic from the exit gates and this ensures safety.
- An evaluation of alternative routes, that can be used in the event of difficulties
- Adequate internal road of will provided for uninterrupted movement of fire tender.
- All precautionary measures are ensured for the safety of construction laborers while working at the site.

3.12 TERRESTRIAL ECOLOGY

3.12.1. Introduction

An ecosystem is composed of plant and animal populations, and it differs from natural community designation in that it involves the total nutrient and energy economics of the system as well as the organisms involved. Ecosystems are self-maintained and self-contained. Natural ecosystems are invariably richer in species and more stable than those of artificially developed, due to their many inter-dependencies and inter-relationships.

The plant and animal populations in an area from recognizable associations called Natural communities. These are characterized by a few species called dominants. Natural communities have structure based on the life forms (e.g. grass) of the species that make them up. A hardwood forest has a given structure by virtue of the trees and shrubs that compose it. The species composition refers to the kinds of species making up to the community. The variety of species and their relative numbers are referred to as species diversity. The greater the biotic diversity, the greater the number and kind of habitats for the inhabitants of the community. Based on the physical setting and the kind of distribution of flora and fauna, the study area can be classified into crop, terrestrial and aquatic ecosystems.

Generally, biological communities are good indicators of climatic and edaphic factors because of their strong relationships with them. The studies on the biological aspects of the ecosystem are important in Environment Impact Assessment studies for the suitability of natural flora and fauna. Information on the impact of environment stress on the community structure serves as an inexpensive and efficient early warning system to check the damage on a particular ecosystem.

A change in the composition of biotic communities under stress is reflected through a change in the distribution pattern, density, diversity, frequency dominance and abundance of natural species of fauna and flora existing in the ecosystem. These changes over a span of times can be quantified and related to the existing environment.

Chemplast Sanmar Limited, is a leading supplier of intermediates for global Agrochemical, Pharmaceutical and Fine Chemical innovators has proposed to Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit located at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A Suligunta Village, Berigai 635105, Shoolagiri Taluk, Krishnagiri District, Tamil Nadu with a project cost of Rs. 2292.398 Crores [Existing: 292.398 Crores + Proposed: 2000 Crores].

3.12.2 Objectives

The objectives of ecological study during the study period of EIA may be outlined as follows:

- To characterize the environmental components like land, water, flora and fauna;

- To understand their present status;
- To understand carrying capacity of the ecosystem;
- To assess present bio-diversity; and
- To identify susceptible and sensitive areas.

3.12.3 Regional Biodiversity

Tamil Nadu has a total land area of 1,30,060 km² which constitute of about 3.96% of the total geographical area of the country. Physiographically, the State can be divided into four major regions viz Coastal Plains, Eastern Ghats, Central Plateau and Western Ghats. The main rivers of the State are Cauvery, Bhavani, Palar, Vaigai etc. which drain into the Bay of Bengal. Tamil Nadu has a Humid Tropical Climate. Tamil Nadu shares the Western Ghats Biodiversity (one of the 12 Global mega biodiversity Hotspots) with Western Ghats States of Kerala, Karnataka, Maharashtra and Goa. It shares the Eastern Ghats with the States of Andhra Pradesh and Orissa. It also shares the East-coast with the States of Andhra Pradesh, Orissa and West Bengal.

The State is endowed with rich biodiversity, from marine coastal systems in the Gulf of Munnar to the terrestrial evergreen forests in the Western Ghats and temperate forests in the hilly regions. As per the Champion & Seth Classification of Forest Types (1968), the forests in Tamil Nadu belong to nine Forest Type Groups, which are further divided into 39 Forest Types. The Nilgiri Biosphere Reserve represents a unique and threatened ecosystem in the tropics inside the Western Ghats Mountain system and is one of the biodiversity hotspots. Tamil Nadu has been a pioneer State in the biodiversity conservation, particularly in Protected Area management, including conservation of marine fauna. Tamil Nadu is famous for its Teak and Sandalwood forests.

Forest Biodiversity in the State is mainly confined to Western Ghats and Eastern Ghats. Forest Cover of the State is 26,364 km² which is 20.27% of the State's geographical area (GA). In terms of forest canopy density classes, the State has 3,605 km² (2.77% of GA) very dense forest, 11,030 km² (8.48% of GA) moderately dense forest and open forest and 11,729 km² (9.02 % of GA) respectively. There is an increase of 83.02 km² in the forest cover of the state as compared to 2017 assessment (Source: www.forests.tn.gov.in).

In Tamil Nadu, during the period 1st January 2015 to 5th February 2019, a total of 542.40 hectares of forest land was diverted for non-forestry purposes under the Forest Conservation Act, 1980 (MoEF&CC, 2019). As per the information received from the State during the last two years, 74,030 ha of plantations were raised in the State.

Five National Parks, 29 Wildlife Sanctuaries and two Conservation Reserves constitute the Protected Area network of the State covering 4.97% of its geographical area (India State Forest Report, 2019). There are about 3,072 hamlets bordering the forest areas of the state.

Tropical dry Deciduous Forest covers an area of 12.23 lakh ha constituting 54.30%, Tropical Thorn Forest covers an area of 5 lakh ha constituting 22.10%, Tropical Moist Deciduous

Forest covers an area of 2.60 lakh ha constituting a percentage of 11.10%. The Biodiversity rich forest types are the Tropical Wet Evergreen Forest covering an area of 0.60 lakh ha constituting 2.67%, Tropical Semi Evergreen Forest covering a area of 0.23 lakh ha constituting 1.01%, Subtropical Broad leaved Hill Forest covers an area of 1.14 lakh ha constituting 5.04%, the Tropical Dry Evergreen Forest which is a unique type of Tamil Nadu covers an area of 0.26 lakh ha constituting 1.16%, the mangrove forest covers an area of approximately 0.23 lakh ha constituting 1.01%.

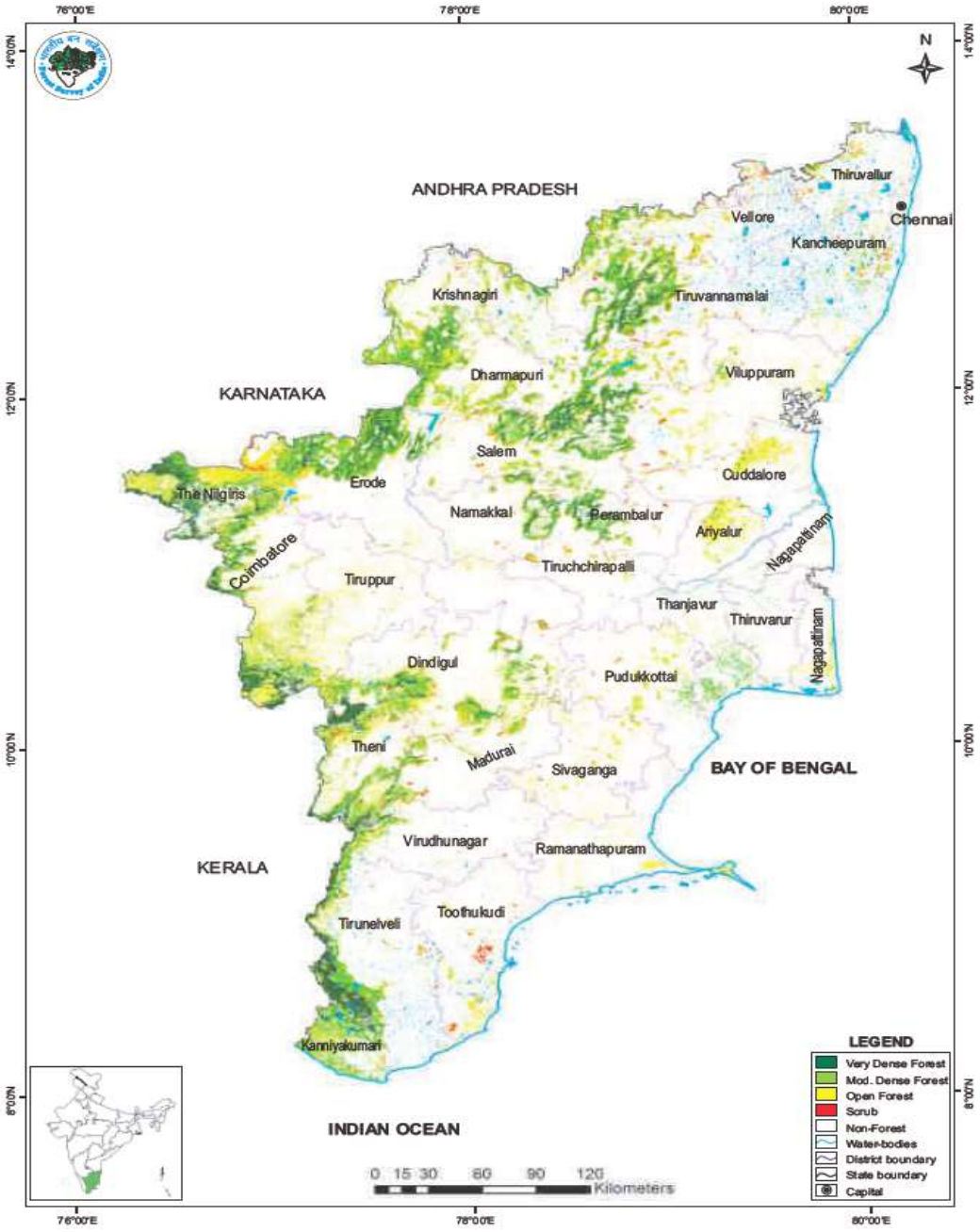


Figure : Forest Map of Tamil Nadu (Source: Forest Survey of India, 2009)

Habitat fragmentation is the process by which habitats which were once continuous become divided into separate fragments. This mainly happens due to human activities such as agriculture, rural development and urbanization. As cities and civilization grow in size, the fragmentation of habitats causes extinction of many plant and animal species and is the largest threat to biodiversity on earth. Designing with nature can improve the quality of cities for people, plants and animals. In doing so, ecosystem services can be enhanced.

The state's rich biodiversity and the natural resources are facing a serious threat from the growing human encroachments, cattle grazing, collection of fire wood, man-animal conflict, poaching, illicit felling, mass tourism and pilgrimage etc. and also from various developmental activities. Biodiversity Conservation has been structured covering the Ecosystem Diversity, Species Diversity and Genetic Diversity. Species Diversity has been structured separately for plants and animals. Wild plant diversity has been structured on the lines of Red-listed plants, Endemic plants, Medicinal plants, Wild relatives of cultivated plants, allied species of cultivated species and others.

Wild Animal diversity has been structured on the lines of Red listed animals, Endemic animals, Flagship species, Keystone species, Pollinators and others. Domesticated species diversity has been structured on the lines of Cultivated Plants and Domesticated animals.

Krishnagiri District

Krishnagiri District has a total geographical area of 5143 Sq. km. The district shares borders with Tirupattur to the southeast, Thiruvannamalai districts to the east, Dharmapuri district to the south and Kolar, Bangalore Rural, Bangalore Urban, Ramanagara and Chamarajanagar districts of the state of Karnataka to the northwest and west and Chittoor district of the state Andhra Pradesh to the north.

This district mainly has a mountainous terrain. The flatlands are irrigated by the South Pennar River. Krishnagiri district forms parts of Cauvery and Pennaiyar Rivers basins. Cauvery River forms the southwestern boundary of the district. Dodda Halla is the most important tributary of Cauvery draining the rugged terrain in the northwestern part of the district. Ponnaiyar River is another major river draining the district. It originates from Nandhi hills in Karnataka, and enters Tamil Nadu and flows almost in a southeasterly direction. Pambar and Burgur, are the important tributaries of Ponnaiyar draining in the district.

The area under forests is 2024.09 Sq. km which is only 39 % of the total geographical area of the district. The major crops cultivated in the district are paddy, maize, ragi, banana, sugarcane, cotton, tamarind, coconut, mango, groundnut, vegetables and flowers. This district is famous for mangoes, and for the granite industry with quarries and processing units spread around the district. With a 40% share, the district is the top producer of ragi in Tamil Nadu.

3.12.4 Biogeographic zone, province and Forest type

This study has been carried out during the month of August 2022 for the purpose of providing an independent and comprehensive baseline assessment of the flora, terrestrial vertebrate, aquatic fauna and associated habitat values of the site and within 10 km radius area around the project site located at S.F No. 5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A Suligunta Village, Berigai 635105, Shoolagiri Taluk, Krishnagiri District, Tamil Nadu and a subsequent assessment of potential ecological impacts.

Shoolagiri Taluk is in Krishnagiri District with the total geographical area of total area of 10.8828 Sq. Km. It is overlooked by a hill with three peaks. Shoolagiri's name is derived from Hill, which is like Trident (Threesulam). Berigai is a village located in Shoolagiri Taluk of Krishnagiri District. The total geographical area of village is 997.95 hectares. The study area falls under semi-arid category as far as the Indian biogeographical zones (Rodger, Panwar, Mathur 2000) are concerned. Under the biogeographical provinces, the study area falls under the category of 6E-Deccan Peninsula-Deccan South.

The field investigation and satellite imagery data show that the study area is a remote dry agricultural and predominantly barren lands covered with some thorny bushes in patches, and includes water bodies such as Berigai Lake located about 2.10 km from the study area. There is no protected area, important or sensitive species within 15 kms from the proposed project boundary. Other major land use feature of the study area is comprised habitation and agricultural lands.

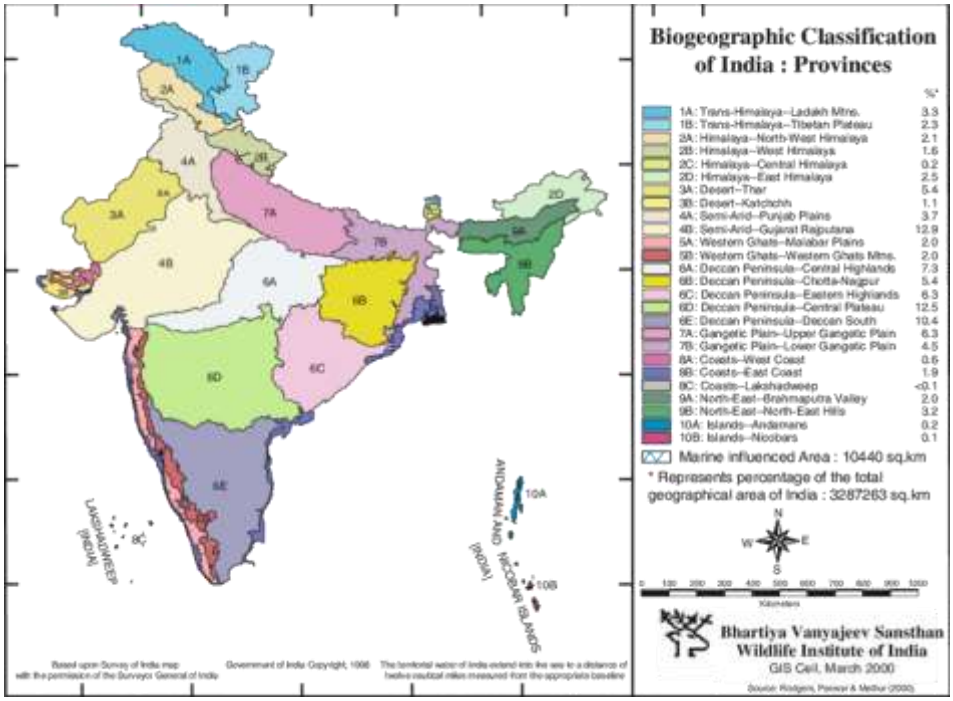


FIGURE : MAP SHOWING THE BIO-GEOGRAPHIC PROVINCES OF INDIA

The detailed ecological assessment of the study area has been carried out with the following objectives:

- To establish the present status of ecological conditions surrounding the project location;
- To study the existing anthropogenic stresses on the prevailing ecosystem.
- To identify and predict the likely impacts on the local ecosystem from the proposed activities;
- To list out floral species, terrestrial vertebrate and aquatic flora and fauna present within the study area, and significance status under The Wildlife (Protection) Act, 1972;
- To define ecological/conservation status of each species as per IUCN categories (Red Data List).
- To formulate migratory measures and a sustainable Environmental Management Plan (EMP) basing upon the likely impacts.
- During survey, following aspects were considered for ecological studies:
- Assessment of present status of flora and fauna;
- Identification of rare and endangered species of plants and animals (if any);
- Identification of ecologically sensitive areas within the study area;
- Assessment of migratory route of wildlife (if any).

Methodology

A desktop review (published documents etc.) was conducted to determine the forest area through Satellite imagery, vegetation type (Champion and Seth, 1962), floral and faunal assemblage in the study area. Terrestrial investigations for flora and fauna records were collected by random field survey and a checklist was prepared. During field survey, discussions with the local people were carried-out to collect information related to local biodiversity in and around the villages. The ecological status of the study area has been assessed based on the following methodology:

Primary field surveys to establish primary baseline of the study area;

Compilation of secondary information available in published literatures/ forest working plans etc.

Site Verification and finalization in consultation with Project proponent, local inhabitants.

- ❑ **List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972**

Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN. Various methods used for study animals are as follows:

A. Point Survey Method: Observations were made at each site for 15-20 min duration.

B. Road Side Counts: The observer travelled by motor vehicles from site to site and all sightings were recorded.

3.12.5 Floristic composition within the study area

The ecology and diversity survey were conducted in the 10 km radius in the study area and the surrounding area. It is observed that human settlements present in and around the project site and within the study area of 10 km radius and many of villages/ colonies have moderate ranges of plantations. Most of the vegetations observed in the study area are natural vegetation and in agricultural fields. During site assessment several floral species encountered within the 10 km radius area.

The study area does not have any forest land or permanent natural vegetation and the main land use feature of the study area is comprised of habitation and cultivating lands. From the primary observation, the tree species recorded in the study area in the plantation area were Cocos nucifera, Acacia nilotica, Azadirachta indica, Mangifera indica etc. The terrestrial flora in the study area consisting of various under shrubs and herbs is conspicuous during and after the rainy season only. Some of the common shrub species are Lantana camara, Hibiscus rosa-sinensis, Calotropis giganteaa, Datura metel, Ricinus communis etc. and Cynodon dactylon, Achyranthes aspera, Boerhavia diffusa, Tridax procumbens, Eclipta prostrate etc. among herbaceous species.

The project area covering 10 km radial distance did not reveal any notified/ protected ecologically sensitive area including National Park or wildlife sanctuary, Elephant and Tiger reserves.

However, the vegetation within the study area is sparse, with the existence of some weeds as per the survey conducted within 10 km radius of the site. The results of survey exhibited sparsy vegetation with the existence of 131 terrestrial flora. However, Coconut, Neem, Acacia, Mango and Tamarind trees are abundant widely distributed in and away from the study area.

The following species were encountered from the study area during the field visits as given in Table 3.12.

3.12.5.1 FLORA

Table 3.12 Floristic Diversity in the Study Area

S. No.	Botanical Name	Common Name	Family	IUCN Conservation Status
Trees				
1	*Cocos nucifera*	Tennai	Arecaceae	Not Assessed
2	*Acacia nilotica*	Karuvelan	Fabaceae	Least Concern
3	*Azadirachta indica*	Vembu	Meliaceae	Not Assessed
4	*Acacia auriculiformis*	Acacia	Fabaceae	Least Concern

S. No.	Botanical Name	Common Name	Family	IUCN Conservation Status
5	*Carica papaya*	Pappali	Caricaceae	Data Deficient
6	*Aegle marmelos*	Vilvam	Rutaceae	Not Assessed
7	*Ailanthus excels*	Perumaram	Simaroubaceae	Not Assessed
8	*Annona squamosal*	Sithapalzham	Annonaceae	Least Concern
9	*Murraya koenigii*	kariveppilai	Rutaceae	Not Assessed
10	*Syzygium cumini*	Naval	Myrtaceae	Not Assessed
11	*Ficus benghalensis*	Alai	Moraceae	Not Assessed
12	*Emblica officinalis*	Nelli	Phyllanthaceae	Not Assessed
13	*Plumeria rubra*	Nela sampangi	Apocynaceae	Not assessed
14	*Delonix regia*	Cemmayir-konrai	Caesalpiniaceae	Least Concern
15	*Diospyros melanoxylon*	Karundumbi	Ebanaceae	Not Assessed
16	*Pongamia pinnata*	Pungai	Fabaceae	Least Concern
17	*Musa paradisiaca*	Vaazha	Musaceae	Not Assessed
18	*Psidium guajava*	Koyya	Myrtaceae	Least Concern
19	*Tamarindus indica*	Puli	Fabaceae	Not Assessed
20	*Cassia fistula*	Konrai	Fabaceae	Least Concern
21	*Madhuca longifolia*	iluppai	Sapotaceae	Not Assessed
22	*Mangifera indica*	Mamaram	Anacardiaceae	Data Deficient
23	*Albizia amara*	Unjai	Fabaceae	Not Assessed
24	*Terminalia arjuna*	Marudha	Combretaceae	Not Assessed
25	*Ceiba pentandra*	Pancu	Malvaceae	Least Concern
26	*Casuarina equisetifolia*	Savukku	Casuarinaceae	Least Concern
27	*Borassus flabellifer*	Panai maram	Arecaceae	Endangared
28	*Ficus hispida*	peyatti	Moraceae	Least Concern
29	*Morinda tinctoria*	Nuna	Rubiaceae	Not Assessed
30	*Albizia lebbeck*	Siridam	Fabaceae	Not assessed
31	*Phyllanthus emblica*	Nellikkai	Phyllanthaceae	Not Assessed
32	*Polyalthia longifolia*	Nettilinkam	Annonaceae	Not Assessed
33	*Terminalia catappa*	Nattuvaduma	Combritaceae	Least Concern
34	*Tectona grandis*	Tekku	Lamiaceae	Not Assessed
35	*Eucalyptus leptophylla*	Neelagiri thailam	Myrtaceae	Not assessed
36	*Manilkara zapota*	Sapota	Sapotaceae	Not assessed
37	*Wrightia tinctoria*	Palai	Apocynaceae	Least Concern
38	*Gmelina arborea*	Kumalaamaram	Lamiaceae	Least Concern
39	*Bombax ceiba*	Ilavu	Bombacaceae	Not Assessed
40	*Terminalia chebula*	Kadukkai	Combritaceae	Not assessed
41	*Ziziphus mauritiana*	Elandhai	Rhamnaceae	Not assessed
42	*Dalbergia sissoo*	Shisham	Fabaceae	Not assessed
43	*Butea monosperma*	Palasam	Fabaceae	Not assessed
44	*Albizia saman*	Thoongumoonji maram	Fabaceae	Secure

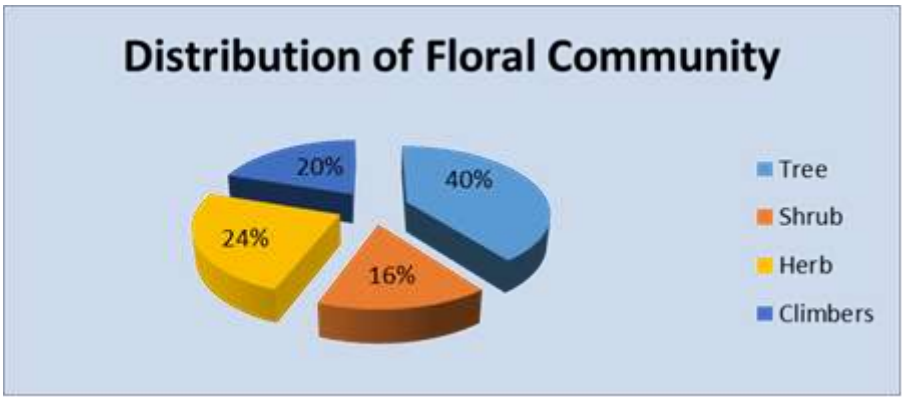
S. No.	Botanical Name	Common Name	Family	IUCN Conservation Status
45	*Bambusa arundinacea*	Kulay-munkil	Poaceae	Not assessed
46	*Sesbania sesban*	Sithagathi	Fabaceae	Not assessed
47	*Citrus limon*	Elumicchai	Rutaceae	Not assessed
48	*Morus alba*	Kambli chedi	Moraceae	Not assessed
49	*Melia azedarach*	Kattu vembhu	Meliaceae	Not assessed
50	*Limonia acidissima*	Vilamaram	Rutaceae	Not assessed
51	*Leucaena leucocephala*	Subabul	Fabaceaae	Not assessed
52	*Ficus religiosa*	Arasamaram	Moraceae	Not assessed
Shrubs				
1	*Hibiscus rosa-sinensis*	Sembaruthi	Malvaceae	Not Assessed
2	*Calotropis gigantea*	Erukku	Apocynaceae	Not Assessed
3	*Jasminum sessiliflorum*	Sooman (Jasmin)	Oleaceae	Not Assessed
4	*Ocimum gratissimum*	Tulasi	Labsiatae	Not Assessed
5	*Bougainvillea glabra*	Kaahitha Poo	Nyctaginaceae	Not Assessed
6	*Hibiscus radiatus*	Pulicha Keerai	Malvaceae	Not Assessed
7	*Calotropis procera*	Vellai Erukku	Asclepiadaceae	Not assessed
8	*Vitex negundo*	Nochi	Verbenaceae	Not assessed
9	*Cassia auriculata*	Avarai	Fabaceae	Not Assessed
10	*Ipomoea carnea*	Kattamanakku	Convolvulaceae	Not Assessed
11	*Jatropha curcas*	Kattukkottai	Euphorbiaceae	Not assessed
12	*Lantana camara*	Unni chedi	Verbenaceae	Not Assessed
13	*Sida cordifolia*	Nilatutthi	Malvaceae	Not Assessed
14	*Parthenium hysterophorus*	Mookkuththi	Asteraceae	Not Assessed
15	*Prosopis juliflora*	Vaelikaruvai	Fabaceaae	Not assessed
16	*Solanum incanum*	Karimulli	Solanaceae	Not assessed
17	*Datura metel*	Umathai	Solanaceae	Not assessed
18	*Euphorbia tirucalli*	Amman-paccarici	Euphorbiaceae	Least Concern
19	*Ziziphus nummularia*	Narielandai	Rhamnaceae	Not assessed
20	*Ricinus communis*	Amanakku	Euphorbiaceae	Not Assessed
21	*Tecoma stans*	Yellow bells	Bignoniaceae	Not Assessed
Herbs / Grasses				
1	*Cynodon dactylon*	Arugampillu	Poaceae	Not Assessed
2	*Achyranthes aspera*	Nayuruvi	Amaranthaceae	Not Assessed
3	*Boerhavia diffusa*	Mukaratte kirai	Nyctaginaceae	Not assessed
4	*Amaranthus viridis*	kuppai-k-kirai	Amaranthaceae	Not Assessed
5	*Tridax procumbens*	Kenathuppoondu	Asteraceae	Not Assessed
6	*Croton sparsiflorus*	Milakai	Euphorbiaceae	Not Assessed
7	*Aerva lanata*	Ciru-pulai	Amaranthaceae	Not assessed
8	*Chloris barbata*	Kuruthu Pillu	Cyperaceae	Not Assessed

S. No.	Botanical Name	Common Name	Family	IUCN Conservation Status
9	*Cassia tora*	Taghrai	Ceasalpinaceae	Not Assessed
10	*Ageratum conyzoides*	Aappakkoti	Asteraceae	Not assessed
11	*Amaranthus spinosus*	Mullukkeerai	Amaranthaceae	Not assessed
12	*Argemone Mexicana*	Kudiyotti	Papaveraceae	Not Assessed
13	*Butea superba*	Pilacchi valli	Papilionaceae	Not Assessed
14	*Mimosa pudica*	Thottaccurungi	Mimosoideae	Least Concern
15	*Digitaria tomentosa*	Linn	Poaceae	Not Assessed
16	*Xanthium strumarium*	Marul-umatta	Asteraceae	Not Assessed
17	*Commelina benghalensis*	Kanang-karai	Comllinaceae	Not assessed
18	*Cyperus rotundus*	Panni-korai	Cyperaceae	Not assessed
19	*Sida acuta*	Palambasi	Malvaceae	Not Assessed
20	*Asystasia gangetica*	Miti-kirai	Acanthaceae	Not assessed
21	*Sida rhombifolia*	Chitramutti	Malvaceae	Not assessed
22	*Phyllanthus amarus*	Keelanelli	Phyllanthaceae	Not assessed
23	*Eclipta prostrate*	Karisalanganni	Asteraceae	Not assessed
24	*Euphorbia hirta*	Amanpatchaiarisi	Euphorbiaceae	Not assessed
25	*Solanum nigrum*	Manathakkaali	Solanaceae	Not Assessed
26	*Indigofera oblongifolia*	Avuri	Fabaceae	Not assessed
27	*Ocimum sanctum*	Thulasi	Lamiaceae	Not assessed
28	*Sorghum bicolor*	Cholam	Poaceae	Not assessed
29	*Physalis minima*	Sodakkuthakkaali	Solanaceae	Not assessed
30	*Vernonia cinerea*	Puvamkuruntal	Asteraceae	Not assessed
31	*Acalypha indica*	Kuppai-meni	Euphorbiaceae	Not assessed
32	*Cassia occidentalis*	Pei- avarai	Caesalpiniaceae	Not assessed
Climbers/Creepers				
1	*Abrus precatorius*	Kundumani	Fabaceae	Not assessed
2	*Aristolochia bracteolata*	Aduthendapalai	Aristolochiaceae	Not assessed
3	*Basella rubra*	Pasalakkirai	Basellaceae	Not assessed
4	*Bougainvillea spectabilis*	Kakitha poo	Nyctaginaceae	Not assessed
5	*Cansjera rheedei*	Vandikodi	Opiliaceae	Not assessed
6	*Cissus quadrangularis*	Perandai	Vitaceae	Not assessed
7	*Citrullus colocynthis*	Kumatti	Cucurbitaceae	Not assessed
8	*Clitoria ternatea*	Sangu Poo	Fabaceae	Not assessed
9	*Coccinia grandis*	Kovaikkaai	Cucurbitaceae	Not assessed
10	*Croton bonplandianus*	Railpodu	Euphorbiaceae	Not assessed
11	*Cyclea peltata*	Pon-mucuttai	Menispermaceae	Not assessed
12	*Gloriosa superba*	Sengandhal	Liliaceae	Not assessed
13	*Hemidesmus indicus*	Nannari	Apocynaceae	Not assessed
14	*Ipomoea nil*	Kotikkakkattan	Convolvulaceae	Not assessed
15	*Ipomoea obscura*	Siruthalai	Convolvulaceae	Not assessed

S. No.	Botanical Name	Common Name	Family	IUCN Conservation Status
16	*Ipomoea reptans*	Vallaikkirai	Convolvulaceae	Not assessed
17	*Ipomoea staphylina*	Onaankodi	Convolvulaceae	Not assessed
18	*Luffa cylindrical*	Peerkankai	Cucurbitaceae	Not assessed
19	*Pergularia daemia*	Velipparuthi	Apocynaceae	Not assessed
20	*Pueraria tuberosa*	Nilapoosani	Fabaceae	Not assessed
21	*Solena amplexicaulis*	Pulivanci	Curcurbitaceae	Not assessed
22	*Tragia involucrata*	Kanchori	Euphorbiaceae	Not assessed
23	*Trichosanthes cucumerina*	Pudalankaai	Curcurbitaceae	Not assessed
24	*Tylophora asthmatica*	Kalutai-p-palai	Asclepidaceae	Not assessed
25	*Tylophora indica*	Nachchuruppam	Asclipedaceae	Not assessed
26	*Zehneria scabra*	Naai Pagal	Cucurbitaceae	Not assessed

Source: ABC Techno Labs India Pvt. Ltd.

The detailed study revealed dominance of Cocos nucifera, Acacia nilotica, Azadirachta indica, Mangifera indica etc. Totally 52 species of trees found in the study area along with 21 shrub species, 32 herb species and 26 climber species. Lantana camara, Hibiscus rosa-sinensis, Calotropis giganteaa, Datura metel, Ricinus communis are found to be the predominant species among shrub. Among the herbaceous species Cynodon dactylon, Achyranthes aspera, Boerhavia diffusa, Tridax procumbens, Eclipta prostrate etc. found to be abundant.



Source: ABC Techno Labs India Pvt. Ltd.

3.12.5.2 Economically important Flora of the study area

Agricultural crops: The major crops grown in study area are banana, papaya and mangoes. Different fruits like guava, custard apple and vegetables like brinjal, tomato, drumsticks, onion, and coriander also grown by the local people.

Medicinal plant species: The nearby area is also endowed with the several medicinal plants. The common medicinal plants of the region is *Azadirachta indica* (Neem).

Rare and endangered floral species: As per IUCN red list *Borassus flabellifer* (Nonkuppanai) categorized as endangered species. During the vegetation survey in the study area did not encounter any such species which are endangered or threatened under IUCN (International Union for Conservation of Nature and Natural resources) guidelines.

3.12.6 Fauna

3.12.6.1 Faunal Communities

Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area. Additionally reference of relevant literatures (published/ unpublished) and conversations with local villagers were also carried out to consolidate the presence of faunal distribution in the area *(Smith 1933-43, Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar 1988).*

Mammals: No wild mammalian species was directly sighted during the field survey. Conversation with local villagers around the study area also could not confirm presence of any wild animal in that area. Little Indian field mouse, House mouse, Bonnet Macaque, Common Palm Squirrel, Indian Grey Mongoose, Black rat, Rat, Short nosed fruit bat, Indian porcupine, Indian Hare, Indian mole-rat etc. were observed during primary survey.

Avifauna: Since birds are considered to be the indicators for monitoring and understanding human impacts on ecological systems *(Lawton, 1996*) attempt was made to gather quantitative data on the avifauna by walk through survey within the entire study area and surrounding areas. From the primary survey, a total of 40 species of avifauna were identified and recorded in the study area. The diversity of avifauna from this region was found to be quite high and encouraging. The list of avifauna species found in the study area is mentioned in Table 3.13.

The Indian Chameleon, tree lizard, common garden lizards and common toads are also seen. Variety of butterflies (like Common mime, Southern birdwing, Common Mormon, Indian Skipper, Common tiger, Common crow, Small Grass Yellow, Great Eggfly, Common Pierrot, Indian Sunbeam, Crimson rose, Lime Butterfly, Common Castor, Common rose, Common sailor) is spotted in abundance in the study zone.

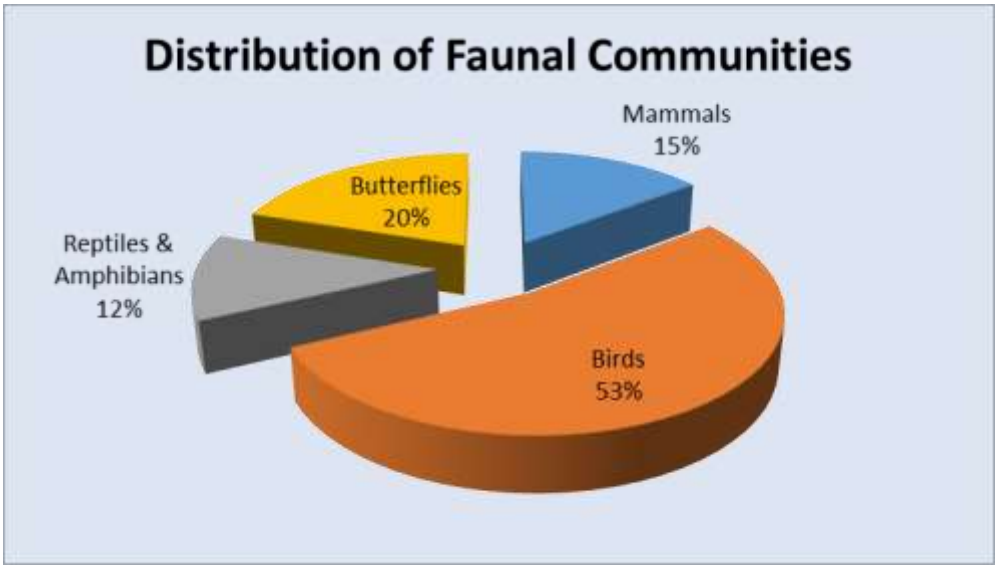
TABLE 3.13: FAUNA RECORDED FROM THE PRIMARY SURVEY IN THE STUDY AREA AND THEIR CONSERVATION STATUS

S. No.	Scientific Name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
Mammals					
1	*Mus booduga*	Little Indian field mouse	IV	Least Concern	DS
2	*Mus musculus*	House mouse	IV	Least Concern	DS
3	*Macaca radiata*	Bonnet Macaque	II	Vulnerable	DS
4	*Funambulus palmarum*	Common Palm Squirrel	IV	Least Concern	DS
5	*Herpestes edwardsi*	Indian Grey Mongoose	II	Least Concern	DS
6	*Rattus rattus*	Black rat	IV	Least Concern	DS
7	*Bandicota indica*	Rat	IV	Least Concern	DS
8	*Cynopterus sphinx*	Short nosed fruit bat	IV	Least Concern	DS
9	*Hystrix indica*	Indian porcupine	IV	Least Concern	DS
10	*Lepus nigricollis*	Indian Hare	IV	Least Concern	DS
11	*Bandicota bengalensis*	Indian mole-rat	IV	Least Concern	DS
Birds					
1	*Alcedo atthis*	Common Kingfisher	IV	Least Concern	DS
2	*Passer domesticus*	House Sparrow	IV	Least Concern	DS
3	*Acridotheres tristis*	Common myna	IV	Least Concern	DS
4	*Corvus splendens*	House crow	V	Least Concern	DS
5	*Dicrurus macrocercus*	Black Drongo	IV	Least Concern	DS
6	*Dicrurus adsimilis*	Fork-tailed drongo	IV	Least Concern	DS
7	*Bubulcus ibis*	Cattle Egret	IV	Least Concern	DS
8	*Pelargopsis capensis*	Storkbilled kingfisher	IV	Least Concern	DS
9	*Hypsipetes madagascariensis*	Black bulbul	IV	Least Concern	DS
10	*Dicrurus paradiseus*	Racket tailed drongo	IV	Least Concern	DS
11	*Turdoides caudatus*	Common Babbler	IV	Least Concern	DS
12	*Psittacula krameri*	Rose ringed parakeet	IV	Least Concern	DS
13	*Coturnix coturnix*	Grey quail	IV	Least Concern	DS
14	*Halcyon smyrnensis*	White-breasted kingfisher	IV	Least Concern	DS
15	*Pycnonotus cafer*	Red vented Bulbul	IV	Least Concern	DS
16	*Accipiter badius*	Shikra	IV	Least Concern	DS
17	*Megalaima viridis*	Small green barbet	IV	Least Concern	DS
18	*Cuculus canorus*	Cuckoo	IV	Least Concern	DS
19	*Spilopelia chinensis*	Spotted dove	IV	Least Concern	DS
20	*Merops orientalis*	Small green bee eater	IV	Least Concern	DS
21	*Calidris minuta*	Llittle stint	IV	Least Concern	DS
22	*Ardeola grayii*	Pond Heron	IV	Least Concern	DS

S. No.	Scientific Name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
23	*Columba livia*	Rock pigeon	IV	Least Concern	DS
24	*Milvus migrans*	Common Kite	IV	Least Concern	DS
25	*Eudynamys scolopacea*	Koel	IV	Least Concern	DS
26	*Egretta garzetta*	Little Egret	IV	Least Concern	DS
27	*Anthus hodgsoni*	Tree pipit	IV	Least Concern	DS
28	*Apus apus*	Common swift	IV	Least Concern	DS
29	*Ardea cinerea*	Grey heron	IV	Least Concern	DS
30	*Egretta intermedia*	Intermediate egret	IV	Least Concern	DS
31	*Megalaima zeylanica*	Brown-headed barbet	IV	Least Concern	DS
32	*Nectarinia minima*	Small sunbird	IV	Least Concern	DS
33	*Nectarinia zeylonica*	Indian Purple rumped sunbird	IV	Least Concern	DS
34	*Tringa hypoleucos*	Common sandpiper	IV	Least Concern	DS
35	*Turdoides striatus*	Jungle Babbler	IV	Least Concern	DS
36	*Phalacrocorax niger*	Little cormorant	IV	Least Concern	DS
37	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	IV	Least Concern	DS
38	*Haliastur indus*	Brahminy kite	IV	Least Concern	DS
39	*Copsychus fulicatus*	Indian robin	IV	Not Assessed	DS
40	*Coracias benghalensis*	Indian roller	IV	Least Concern	DS
Reptiles & Amphibians					
1	*Chamaeleo zeylanicus*	Indian chameleon	II	Least Concern	DS
2	*Hemidactylus frenatus*	House Lizard	-	Not assessed	DS
3	*Calotes calotes*	Garden Lizard	III	Not assessed	DS
4	*Ptyas mucosus*	Rat Snake	III	Not assessed	DS
5	*Bungarus caeruleus*	Common krait	IV	Least Concern	NS
6	*Naja naja*	Common cobra	II	Not assessed	NS
7	*Hemidactylus giganteus*	Giant Gecko	-	Least Concern	DS
8	*Euphlyctis hexadactylus*	Indian Pond Frog	IV	Least Concern	DS
9	*Duttaphrynus melanostictus*	Common toads	IV	Least Concern	DS
Butterflies					
1	*Papilio clytia*	Common mime	-	Not assessed	DS
2	*Troides minos*	Southern birdwing	-	Least Concern	DS
3	*Papilio polytes*	Common Mormon	-	Not assessed	DS
4	*Spialia galba*	Indian Skipper	-	Not assessed	DS
5	*Danaus genutia*	Common tiger	-	Not assessed	DS
6	*Euploea core*	Common crow	-	Least Concern	DS
7	*Eurema brigitta*	Small Grass Yellow	-	Not assessed	DS
8	*Hypolimnas bolina*	Great Eggfly	-	Not assessed	DS

S. No.	Scientific Name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
9	*Castalius rosimon*	Common Pierrot	-	Not assessed	DS
10	*Curetis thetis*	Indian Sunbeam	-	Not assessed	DS
11	*Pachliopta hector*	Crimson rose	-	Not assessed	DS
12	*Papilio demoleus*	Lime Butterfly	-	Not assessed	DS
13	*Ariadne merione*	Common Castor	-	Not assessed	DS
14	*Pachliopta aristolochiae*	Common rose	-	Not assessed	DS
15	*Neptis hylas*	Common sailor	-	Not assessed	DS

Source: ABC Techno Labs India Pvt. Ltd.



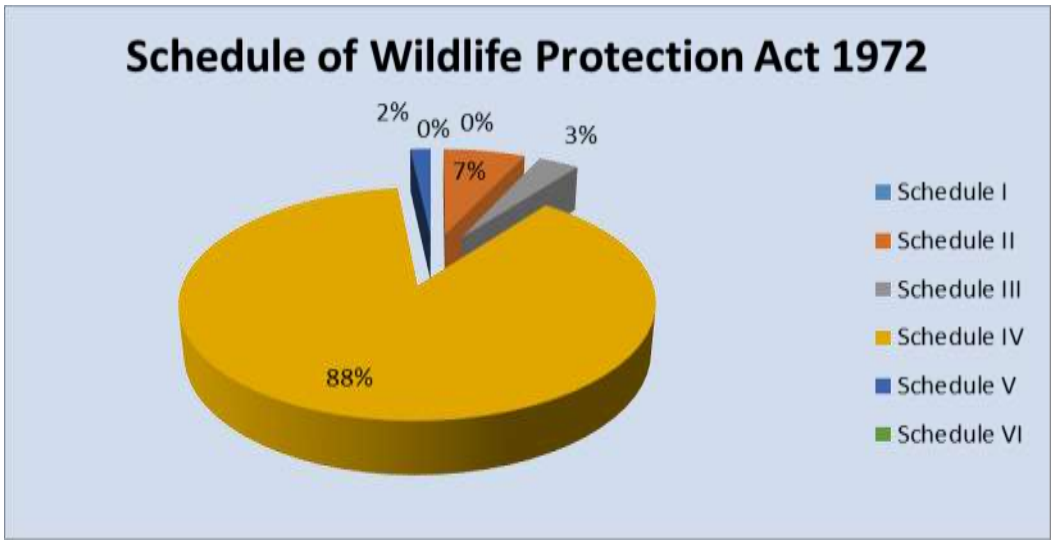
Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area.

The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table 3.14.

TABLE 3.14: CHARACTERIZATION OF FAUNA IN THE STUDY AREA (AS PER W.P ACT, 1972)

S. No.	Schedule of Wildlife Protection Act 1972	No. of species	Remark
1	Schedule I	0	-
2	Schedule II	4	-
3	Schedule III	2	-
4	Schedule IV	51	-
5	Schedule V	1	-
6	Schedule VI	0	-

Source: ABC Techno Labs India Pvt. Ltd.



The detailed interpretation of flora and fauna identified within 10 km radius of the project site are tabulated In Table 3.14.

TABLE 3.14: DESCRIPTION OF FLORA & FAUNA

S. No.	Type of Species	Name	Local Name
Flora			
1	Endangered species	*Borassus flabellifer*	Nonkuppanai
2	Threatened species	None	None
3	Near Threatened species	None	None
4	Vulnerable species	None	None
Fauna			
1	Endangered species	None	None
2	Threatened species	None	None
3	Near Threatened species	None	None
4	Vulnerable species	*Macaca radiata*	Bonnet Macaque
5	Migratory Corridors & Flight Paths	No corridors & flight paths	--
6	Breeding & Spawning grounds	None	--

Source: ABC Techno Labs India Pvt. Ltd.

A comprehensive Central Legislation namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) presented in Table 3 are the species recorded/reported from the study area, out of which 4 species belongs to

schedule-II, 2 species belongs to schedule-III, 1 species belongs to schedule-V and rest of the species belongs to schedule-IV of Wildlife protection Act, 1972.

3.13 SOCIO - ECONOMIC ENVIRONMENT

An assessment of socio - economic environment forms an integral part of an EIA study. Therefore, baseline information for the same was collected during the study period. The baseline socio - economic data collected for the study region, before the proposed expansion project is operational, has been identified for the four major indicators viz. demography, civic amenities, economy and social culture. The baseline status of the above indicators is compiled in forthcoming sections.

3.13.1 DEMOGRAPHY

The population details (i.e. population distribution and population density) of the Taluka Vagra, District Bharuch and the study area within 10 km radius are presented in Table-3.15 & its graphical representation is given in Figure-3.9.

TABLE – 3.15

DEMOGRAPHIC DATA

Sr. No.	State Name	District Name	Village Name	CD Block Name	Total House holds	Total Population of Village	Total Male Population of Village	Total Female Population of Village
	10 Km Area covered Village							
1	Tamil Nadu	Krishnagiri	Baliganapalli	Hosur	157	674	348	326
2	Tamil Nadu	Krishnagiri	Puram	Hosur	140	589	318	271
3	Tamil Nadu	Krishnagiri	D.S. Thimmasandram	Shoolagiri	357	1552	790	762
4	Tamil Nadu	Krishnagiri	Selvankoddi	Shoolagiri	246	1155	588	567
5	Tamil Nadu	Krishnagiri	Saparapalli	Shoolagiri	51	231	117	114
6	Tamil Nadu	Krishnagiri	Gedalandhoddi	Shoolagiri	112	472	242	230
7	Tamil Nadu	Krishnagiri	Chinnarendoddi	Shoolagiri	164	715	363	352
8	Tamil Nadu	Krishnagiri	Doddagounipalli	Shoolagiri	202	940	484	456
9	Tamil Nadu	Krishnagiri	Gudisadanapalli	Shoolagiri	321	1355	674	681
10	Tamil Nadu	Krishnagiri	Kullur	Shoolagi	107	453	229	224

				ri				
11	Tamil Nadu	Krishnagiri	Vathiripalli	Hosur	53	229	118	111
12	Tamil Nadu	Krishnagiri	Oddapalli	Hosur	102	519	273	246
13	Tamil Nadu	Krishnagiri	Mallasandiram	Hosur	116	528	286	242
14	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	221	857	429	428
15	Tamil Nadu	Krishnagiri	Midithepalli	Shoolagiri	287	1287	667	620
16	Tamil Nadu	Krishnagiri	Kottasadanapalli	Shoolagiri	26	100	48	52
17	Tamil Nadu	Krishnagiri	Muthurayanpudur	Shoolagiri	100	382	202	180
18	Tamil Nadu	Krishnagiri	Ramandoddi	Shoolagiri	133	582	295	287
19	Tamil Nadu	Krishnagiri	Kumbalam	Shoolagiri	164	761	394	367
20	Tamil Nadu	Krishnagiri	Peddasigarlapalli	Shoolagiri	841	3928	2025	1903
21	Tamil Nadu	Krishnagiri	Athimugam	Shoolagiri	937	4540	2339	2201
22	Tamil Nadu	Krishnagiri	Advanapalli	Hosur	58	239	123	116
23	Tamil Nadu	Krishnagiri	Sudugondapalli	Hosur	87	447	229	218
24	Tamil Nadu	Krishnagiri	Palavanapalli	Hosur	258	1096	540	556
25	Tamil Nadu	Krishnagiri	Nandimangalam	Hosur	591	2602	1314	1288
26	Tamil Nadu	Krishnagiri	Badathepalli	Hosur	150	735	373	362
27	Tamil Nadu	Krishnagiri	Karupalli	Hosur	73	332	181	151
28	Tamil Nadu	Krishnagiri	Muthalli	Hosur	108	444	223	221
29	Tamil Nadu	Krishnagiri	Attur	Hosur	77	354	187	167
30	Tamil Nadu	Krishnagiri	Dhasapalli	Hosur	152	894	443	451
31	Tamil Nadu	Krishnagiri	Doripalli	Shoolagiri	852	3681	1898	1783
32	Tamil Nadu	Krishnagiri	Pattakurubarapalli	Shoolagiri	533	2340	1211	1129
33	Tamil Nadu	Krishnagiri	Amgondapalli	Shoolagiri	543	2634	1371	1263
34	Tamil Nadu	Krishnagiri	Alnatham	Hosur	71	327	170	157
35	Tamil Nadu	Krishnagiri	Chembarasanapalli	Shoolagiri	1179	5312	2725	2587
36	Tamil Nadu	Krishnagiri	A.Settipalli	Shoolagiri	605	2764	1428	1336
37	Tamil Nadu	Krishnagiri	Mallasandiram	Shoolagiri	119	481	242	239

38	Tamil Nadu	Krishnagiri	Nallaganakothapalli	Shoolagiri	968	3933	2028	1905
39	Tamil Nadu	Krishnagiri	Krishnappanayakkanpudur	Veppanapalli	129	578	282	296
40	Tamil Nadu	Krishnagiri	Helekundani	Veppanapalli	149	650	344	306
41	Tamil Nadu	Krishnagiri	Gollapalli	Veppanapalli	130	525	270	255
42	Karnataka	Kolar	Tharabahalli	Malur	75	292	142	150
43	Karnataka	Kolar	Chalaganahalli	Malur	263	1227	634	593
44	Karnataka	Kolar	Voppachahalli	Malur	158	738	381	357
45	Karnataka	Kolar	Dadinayakanadoddi	Malur	130	564	276	288
46	Karnataka	Kolar	Bennagatta	Malur	218	929	470	459
47	Karnataka	Kolar	Bantahalli	Malur	335	1492	730	762
48	Karnataka	Kolar	Ahanya	Malur	177	726	367	359
49	Karnataka	Kolar	Padavanahalli	Malur	193	919	464	455
50	Karnataka	Kolar	Kadadanahalli	Malur	110	502	256	246
51	Karnataka	Kolar	Mirupanahalli	Malur	95	507	260	247
52	Karnataka	Kolar	Nagapura	Malur	93	472	247	225
53	Karnataka	Kolar	Baliganahalli	Malur	116	527	265	262
54	Karnataka	Kolar	Kadavanapura	Malur	36	199	99	100
55	Karnataka	Kolar	Indumangala	Malur	154	794	431	363
56	Karnataka	Kolar	M.Hosahalli	Malur	137	712	365	347
57	Karnataka	Kolar	M.Upparahalli	Malur	86	369	189	180
58	Karnataka	Kolar	Byranadoddi	Malur	55	332	180	152
59	Karnataka	Kolar	Bandahatti	Malur	65	290	141	149
60	Karnataka	Kolar	Natuvarahalli	Malur	91	452	227	225
61	Karnataka	Kolar	Guddadahosahalli	Malur	35	191	87	104
62	Karnataka	Kolar	Tholasanadoddi	Malur	20	117	61	56
63	Karnataka	Kolar	Doddadanavahalli	Malur	112	622	313	309
64	Karnataka	Kolar	Chickadanavahalli	Malur	120	566	288	278
65	Karnataka	Kolar	Thirtha Bandahatti	Malur	6	30	17	13
66	Karnataka	Kolar	Tholakanahalli	Malur	123	529	274	255
67	Karnataka	Kolar	Pichaguntrahalli	Malur	93	426	218	208
68	Karnataka	Kolar	Masthi	Malur	1619	7345	3823	3522
69	Karnataka	Kolar	Kanchala	Malur	116	534	267	267

70	Karnataka	Kolar	Duduvanahalli	Malur	140	642	332	310
71	Karnataka	Kolar	Byappanahalli	Malur	40	203	114	89
72	Karnataka	Dharwad	Kadadahalli	Navalgund	153	825	415	410
73	Karnataka	Kolar	Kesaragere	Malur	154	751	362	389
	5 Km Area covered Village							
74	Tamil Nadu	Krishnagiri	Vanamangalam	Shoolagiri	120	569	285	284
75	Tamil Nadu	Krishnagiri	Collapalli	Shoolagiri	97	440	234	206
76	Tamil Nadu	Krishnagiri	Nerigam	Shoolagiri	242	1034	537	497
77	Tamil Nadu	Krishnagiri	Kariyasandiram	Shoolagiri	95	346	184	162
78	Tamil Nadu	Krishnagiri	Mahadevapuram	Shoolagiri	89	371	189	182
79	Tamil Nadu	Krishnagiri	Suligunta	Shoolagiri	217	962	495	467
80	Tamil Nadu	Krishnagiri	Berigai	Shoolagiri	1807	7884	3970	3914
81	Tamil Nadu	Krishnagiri	Amuthugondapalli	Shoolagiri	120	543	274	269
82	Tamil Nadu	Krishnagiri	Mugalpalli	Hosur	239	970	500	470
83	Tamil Nadu	Krishnagiri	Pannapalli	Veppanapalli	547	2304	1154	1150
84	Tamil Nadu	Krishnagiri	Eluvapalli	Hosur	283	1323	688	635
85	Tamil Nadu	Krishnagiri	Sikkanapalli	Shoolagiri	135	555	279	276
86	Tamil Nadu	Krishnagiri	Pannapalli	Shoolagiri	997	4431	2275	2156
87	Tamil Nadu	Krishnagiri	Meenandoddi	Shoolagiri	83	358	180	178
88	Tamil Nadu	Krishnagiri	Sokkapuram	Shoolagiri	280	1285	633	652
89	Tamil Nadu	Krishnagiri	Venkatesapuram	Shoolagiri	650	2873	1484	1389
90	Tamil Nadu	Krishnagiri	Kurubarapalli	Shoolagiri	339	1571	820	751
91	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	221	857	429	428
93	Tamil Nadu	Krishnagiri	Alnatham	Hosur	71	327	170	157
94	Tamil Nadu	Tiruchirappalli	Shanamangalam	Manachanallur	649	2,381	1,186	1,195
95	Karnataka	Kolar	Bitnahalli	Malur	95	439	230	209
96	Karnataka	Kolar	Halehalli	Malur	116	434	224	210

97	Karnataka	Kolar	Appaiana Agrahara	Malur	112	546	282	264
98	Karnataka	Kolar	Chavaramangala	Malur	110	486	249	237
99	Karnataka	Kolar	Suggondahalli	Malur	152	690	333	357
100	Karnataka	Kolar	Anikarahalli	Malur	181	879	455	424
101	Karnataka	Kolar	Malkanahalli	Malur	161	710	351	359
102	Karnataka	Kolar	Thyaganadoddi	Malur	41	191	99	92
103	Karnataka	Kolar	Karisandra	Malur	53	233	120	113
104	Karnataka	Kolar	Shamasettyhalli	Malur	176	722	376	346

TABLE - 3.16

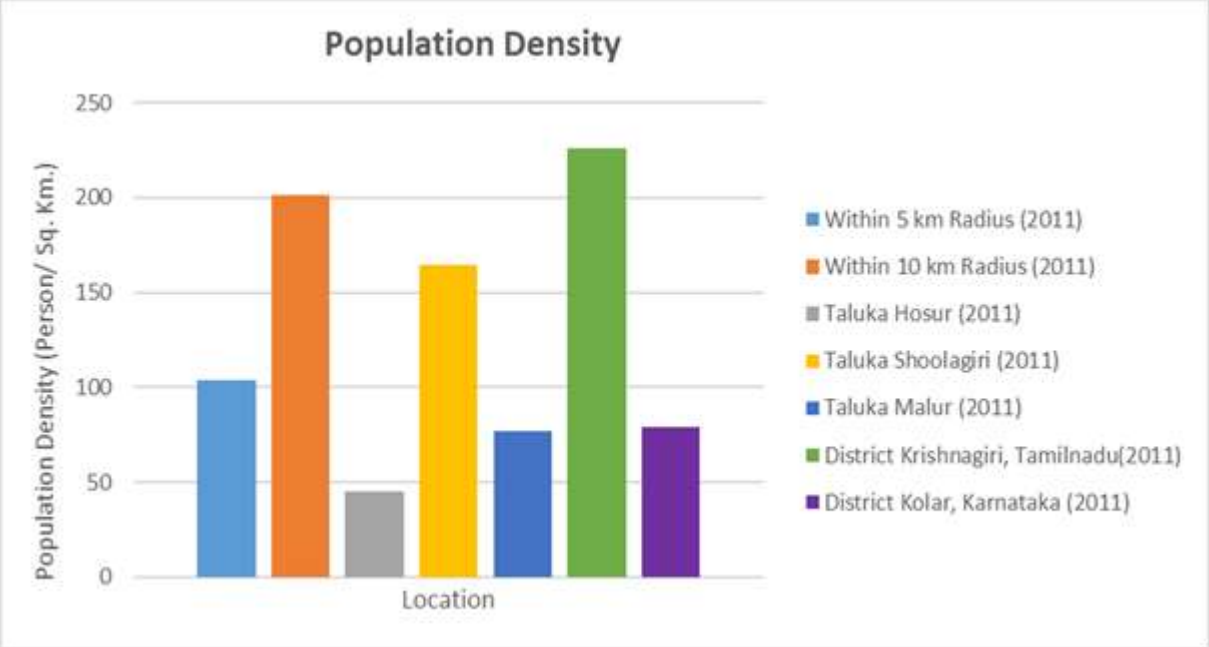
POPULATION DENSITY

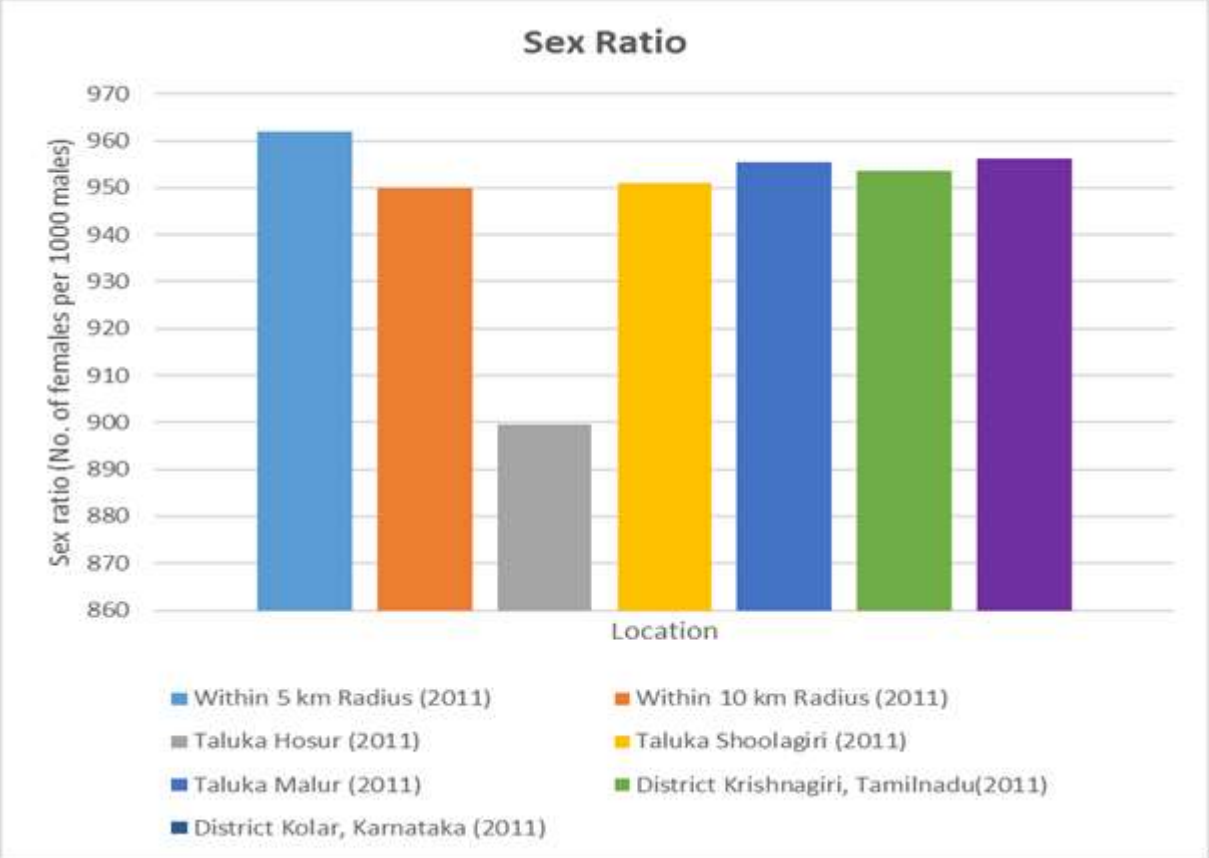
Name	**Population (Persons)**	**Population Density (Person / sq. km.)**	**Sex ratio (No. of females per 1000 males)**
Within 5 km Radius (2011)	39587	104	962
Within 10 km Radius (2011)	77041	202	950
Taluka Hosur (2011)	17,216	45	900
Taluka Shoolagiri (2011)	62820	164	951
Taluka Malur (2011)	29329	77	955
District Krishnagiri, Tamilnadu(2011)	86474	226	954
District Kolar, Karnataka (2011)	30154	79	956

(Courtesy: Census Dept., GOI)

FIGURE - 3.12

POPULATION DENSITY





3.13.2 LITERACY RATE

The literacy rate is a major factor, which influences the socio-cultural condition of a particular place. Details of literacy rate in District krishnagiri & Kolar, Taluka Hosur, shoolagiri & Malur and within 10 km radius and 5 km radius of project site are given in Table 3.17 while their graphical representation is shown in Figure 3.13. It is observed that the literacy rate in krishnagiri District as per 2011 Census data is 54.06% as percentage of literate population to the total population, with 61.10 % among male and 46.67% among female. Literacy rate in Kolar District, as per 2011 Census data is 56.59%, with 69.57% among male and 46.67% among female. Literacy rate in Taluka Hosur as per 2011 Census data is 57.32% with 64.57% among males and 52.51% among females. Literacy rate in Taluka Shoolagiri as per 2011 Census data is 53.17% with 60.03% among males and 46.12% among females. Literacy rate in Taluka Malur as per 2011 Census data is 58.89% with 66.16% among males and 51.28% among females.

TABLE - 3.17 (CONTD.)

LITERACY RATE

Sr. No.	State Name	District Name	Village Name	CD Block Name	Total literate	No. of Male Literate	No. of Female Literate	Population Illiterate	Male Illiterate	Female Illiterate
	10 Km Area covered Villages									
1	Tamil Nadu	Krishnagiri	Baliganapalli	Hosur	396	227	169	278	121	157
2	Tamil Nadu	Krishnagiri	Puram	Hosur	399	245	154	190	73	117
3	Tamil Nadu	Krishnagiri	D.S. Thimmasandram	Shoolagiri	887	496	391	665	294	371
4	Tamil Nadu	Krishnagiri	Selvankoddi	Shoolagiri	498	284	214	657	304	353
5	Tamil Nadu	Krishnagiri	Saparapalli	Shoolagiri	107	58	49	124	59	65
6	Tamil Nadu	Krishnagiri	Gedalandhoddi	Shoolagiri	320	189	131	152	53	99
7	Tamil Nadu	Krishnagiri	Chinnarendoddi	Shoolagiri	383	215	168	332	148	184
8	Tamil Nadu	Krishnagiri	Doddagounipalli	Shoolagiri	347	206	141	593	278	315
9	Tamil Nadu	Krishnagiri	Gudisadanapalli	Shoolagiri	811	462	349	544	212	332
10	Tamil Nadu	Krishnagiri	Kullur	Shoolagiri	250	155	95	203	74	129
11	Tamil Nadu	Krishnagiri	Vathiripalli	Hosur	139	81	58	90	37	53
12	Tamil Nadu	Krishnagiri	Oddapalli	Hosur	253	153	100	71	38	33
13	Tamil Nadu	Krishnagiri	Mallasandiram	Hosur	356	217	139	172	69	103
14	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	492	276	216	365	153	212
15	Tamil Nadu	Krishnagiri	Midithepalli	Shoolagiri	630	369	261	657	298	359
16	Tamil Nadu	Krishnagiri	Kottasadanapalli	Shoolagiri	58	33	25	42	15	27
17	Tamil Nadu	Krishnagiri	Muthurayanpudur	Shoolagiri	173	105	68	209	97	112
18	Tamil Nadu	Krishnagiri	Ramandoddi	Shoolagiri	254	153	101	328	142	186
19	Tamil Nadu	Krishnagiri	Kumbalam	Shoolagiri	413	254	159	348	140	208

20	Tamil Nadu	Krishnagiri	Peddasigarlapalli	Shoolagiri	1641	971	670	2287	1054	1233
21	Tamil Nadu	Krishnagiri	Athimugam	Shoolagiri	2297	1317	980	2243	1022	1221
22	Tamil Nadu	Krishnagiri	Advanapalli	Hosur	125	75	50	114	48	66
23	Tamil Nadu	Krishnagiri	Sudugondapalli	Hosur	217	128	89	230	101	129
24	Tamil Nadu	Krishnagiri	Palavanapalli	Hosur	637	349	288	459	191	268
25	Tamil Nadu	Krishnagiri	Nandimangalam	Hosur	1406	797	609	1196	517	679
26	Tamil Nadu	Krishnagiri	Badathepalli	Hosur	365	201	164	370	172	198
27	Tamil Nadu	Krishnagiri	Karupalli	Hosur	181	113	68	151	68	83
28	Tamil Nadu	Krishnagiri	Muthalli	Hosur	222	132	90	222	91	131
29	Tamil Nadu	Krishnagiri	Attur	Hosur	190	105	85	164	82	82
30	Tamil Nadu	Krishnagiri	Dhasapalli	Hosur	363	202	161	531	241	290
31	Tamil Nadu	Krishnagiri	Doripalli	Shoolagiri	2013	1165	848	1668	733	935
32	Tamil Nadu	Krishnagiri	Pattakurubarapalli	Shoolagiri	1251	735	516	1089	476	613
33	Tamil Nadu	Krishnagiri	Amgondapalli	Shoolagiri	1296	771	525	1338	600	738
34	Tamil Nadu	Krishnagiri	Alnatham	Hosur	464	266	198	151	52	99
35	Tamil Nadu	Krishnagiri	Chembarasanapalli	Shoolagiri	2668	1582	1086	2644	1143	1501
36	Tamil Nadu	Krishnagiri	A.Settipalli	Shoolagiri	1595	960	635	1169	468	701
37	Tamil Nadu	Krishnagiri	Mallasandiram	Shoolagiri	278	151	127	203	91	112
38	Tamil Nadu	Krishnagiri	Nallaganakothapalli	Shoolagiri	2309	1378	931	1624	650	974
39	Tamil Nadu	Krishnagiri	Krishnappanayakkanpudur	Veppanapalli	186	94	92	392	188	204
40	Tamil Nadu	Krishnagiri	Helekundani	Veppanapalli	445	270	175	205	74	131
41	Tamil Nadu	Krishnagiri	Gollapalli	Veppanapalli	241	158	83	293	133	160
42	Karnataka	Kolar	Tharabahalli	Malur	143	78	65	149	65	85
43	Karnataka	Kolar	Chalaganahalli	Malur	683	404	279	544	230	314
44	Karnataka	Kolar	Voppachahalli	Malur	414	241	173	324	140	184

1030

45	Karnataka	Kolar	Dadinayakanadoddi	Malur	337	177	160	227	99	128
46	Karnataka	Kolar	Bennagatta	Malur	498	301	197	431	169	262
47	Karnataka	Kolar	Bantahalli	Malur	872	482	390	620	248	372
48	Karnataka	Kolar	Ahanya	Malur	493	280	213	233	87	146
49	Karnataka	Kolar	Padavanahalli	Malur	544	314	230	375	150	225
50	Karnataka	Kolar	Kadadanahalli	Malur	297	172	125	205	84	121
51	Karnataka	Kolar	Mirupanahalli	Malur	265	152	113	242	108	134
52	Karnataka	Kolar	Nagapura	Malur	281	176	105	191	71	120
53	Karnataka	Kolar	Baliganahalli	Malur	342	192	150	185	73	112
54	Karnataka	Kolar	Kadavanapura	Malur	114	61	53	85	38	47
55	Karnataka	Kolar	Indumangala	Malur	445	281	164	349	150	199
56	Karnataka	Kolar	M.Hosahalli	Malur	427	244	183	285	121	164
57	Karnataka	Kolar	M.Upparahalli	Malur	202	116	86	167	73	94
58	Karnataka	Kolar	Byranadoddi	Malur	221	129	92	111	51	60
59	Karnataka	Kolar	Bandahatti	Malur	137	72	65	153	69	84
60	Karnataka	Kolar	Natuvarahalli	Malur	239	136	103	213	91	122
61	Karnataka	Kolar	Guddadahosahalli	Malur	102	46	56	89	41	48
62	Karnataka	Kolar	Tholasanadoddi	Malur	68	37	31	49	24	25
63	Karnataka	Kolar	Doddadanavahalli	Malur	321	181	140	309	132	169
64	Karnataka	Kolar	Chickadanavahalli	Malur	268	162	106	289	126	172
65	Karnataka	Kolar	Thirtha Bandahatti	Malur	16	12	4	14	5	9
66	Karnataka	Kolar	Tholakanahalli	Malur	313	186	127	216	88	128
67	Karnataka	Kolar	Pichaguntrahalli	Malur	212	116	96	214	102	112
68	Karnataka	Kolar	Masthi	Malur	4799	2719	2080	1388	696	692
69	Karnataka	Kolar	Kanchala	Malur	339	196	143	197	71	124

70	Karnataka	Kolar	Duduvanahalli	Malur	311	178	133	331	154	177
71	Karnataka	Kolar	Byappanahalli	Malur	127	85	42	76	29	47
72	Karnataka	Dharwad	Kadadahalli	Navalgund	297	172	125	205	84	121
73	Karnataka	Kolar	Kesaragere	Malur	505	276	229	246	86	160
	5 Km Area covered Village									
74	Tamil Nadu	Krishnagiri	Vanamangalam	Shoolagiri	336	203	133	233	82	151
75	Tamil Nadu	Krishnagiri	Collapalli	Shoolagiri	192	120	72	248	114	134
76	Tamil Nadu	Krishnagiri	Nerigam	Shoolagiri	512	317	195	522	220	302
77	Tamil Nadu	Krishnagiri	Kariyasandiram	Shoolagiri	47	23	24	299	161	138
78	Tamil Nadu	Krishnagiri	Mahadevapuram	Shoolagiri	177	106	71	194	83	111
79	Tamil Nadu	Krishnagiri	Suligunta	Shoolagiri	496	284	212	466	211	255
80	Tamil Nadu	Krishnagiri	Berigai	Shoolagiri	5529	3007	2522	2355	963	1392
81	Tamil Nadu	Krishnagiri	Amuthugondapalli	Shoolagiri	228	131	97	315	143	172
82	Tamil Nadu	Krishnagiri	Mugalpalli	Hosur	597	344	253	373	156	217
83	Tamil Nadu	Krishnagiri	Pannapalli	Veppanapalli	2207	1292	915	2224	983	1241
84	Tamil Nadu	Krishnagiri	Eluvapalli	Hosur	743	434	309	580	254	326
85	Tamil Nadu	Krishnagiri	Sikkanapalli	Shoolagiri	346	200	146	209	79	130
86	Tamil Nadu	Krishnagiri	Pannapalli	Shoolagiri	2207	1292	915	900	351	549
87	Tamil Nadu	Krishnagiri	Meenandoddi	Shoolagiri	176	94	82	182	86	96
88	Tamil Nadu	Krishnagiri	Sokkapuram	Shoolagiri	660	347	313	625	286	339
89	Tamil Nadu	Krishnagiri	Venkatesapuram	Shoolagiri	1655	960	695	1218	524	694
90	Tamil Nadu	Krishnagiri	Kurubarapalli	Shoolagiri	757	437	320	814	383	431
91	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	492	276	216	365	153	212
93	Tamil Nadu	Krishnagiri	Alnatham	Hosur	176	118	58	151	52	99
94	Tamil Nadu	Tiruchirappalli	Shanamangalam	Manachanallur	1,619	905	714	762	281	481

95	Karnataka	Kolar	Bitnahalli	Malur	258	152	106	181	78	103
96	Karnataka	Kolar	Halehalli	Malur	271	169	102	163	55	108
97	Karnataka	Kolar	Appaiana Agrahara	Malur	277	164	113	269	118	151
98	Karnataka	Kolar	Chavaramangala	Malur	298	181	117	188	68	120
99	Karnataka	Kolar	Suggondahalli	Malur	401	221	180	289	112	117
100	Karnataka	Kolar	Anikarahalli	Malur	449	254	195	430	209	229
101	Karnataka	Kolar	Malkanahalli	Malur	319	191	128	391	160	231
102	Karnataka	Kolar	Thyaganadoddi	Malur	138	78	60	53	21	32
103	Karnataka	Kolar	Karisandra	Malur	144	86	58	89	34	55
104	Karnataka	Kolar	Shamasettyhalli	Malur	382	225	157	340	151	189

TABLE – 3.17

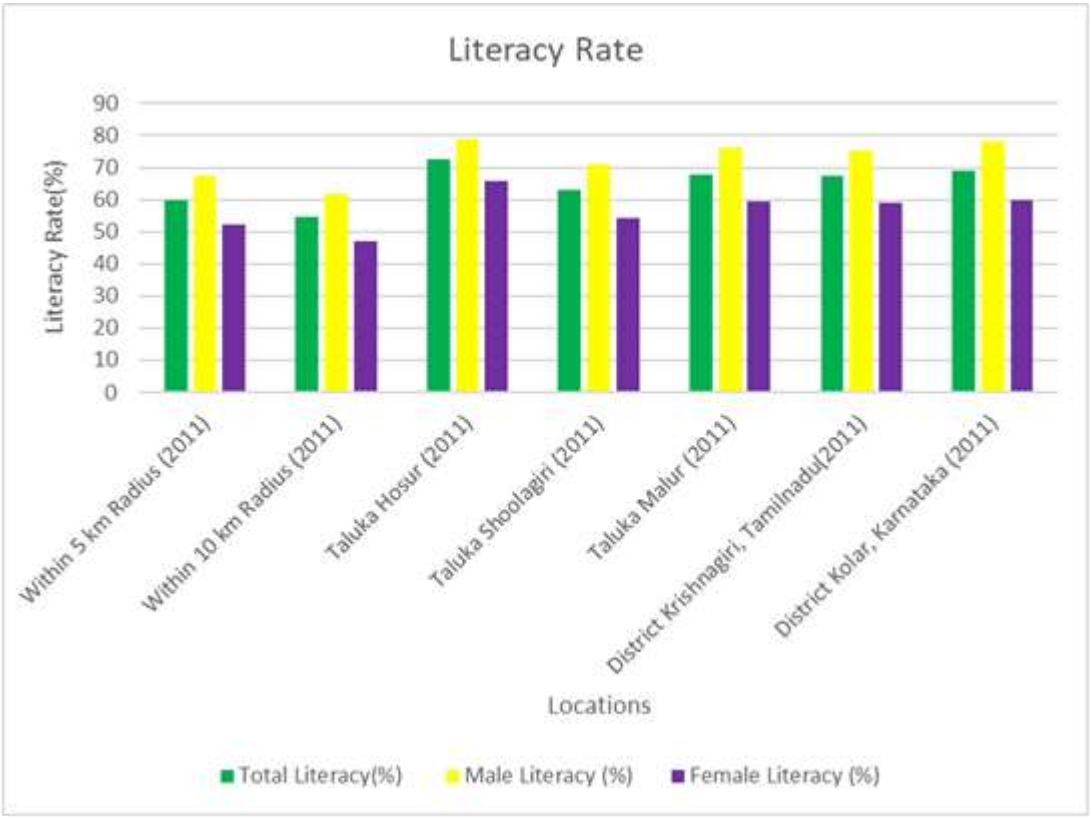
LITERACY RATE

Name	Total Literacy(%)	Male Literacy (%)	Female Literacy (%)
Within 5 km Radius (2011)	59.98	67.29	52.39
Within 10 km Radius (2011)	54.76	61.95	47.20
Taluka Hosur (2011)	72.66	79.03	65.98
Taluka Shoolagiri (2011)	62.93	70.95	54.45
Taluka Malur (2011)	67.93	76.02	59.44
District Krishnagiri, Tamilnadu(2011)	67.32	75.43	58.88
District Kolar, Karnataka (2011)	69.08	78.11	59.82

(Courtesy: Census Dept., GOI)

FIGURE - 3.13

LITERACY DATA



3.13.3 OCCUPATIONAL STRUCTURE

In economic development of the region its geographical location, natural resources, business and employment, industries and manpower play vital role. Table 3.18 provides the occupational patterns in all villages falling within the area of interest.

TABLE - 3.18

OCCUPATIONAL STRUCTURE

Sr. No.	State Name	District Name	Village Name	CD Block Name	Total workers	Main workers	Cultivators	Agricultural labourers	Household industry workers	Other works
	10 Km Area covered Village									
1	Tamil Nadu	Krishnagiri	Baliganapalli	Hosur	300	284	157	70	4	53
2	Tamil Nadu	Krishnagiri	Puram	Hosur	213	118	16	24	23	55
3	Tamil Nadu	Krishnagiri	D.S. Thimmasandram	Shoolagiri	1029	1015	491	440	6	78
4	Tamil Nadu	Krishnagiri	Selvankoddi	Shoolagiri	593	485	152	330	1	2
5	Tamil Nadu	Krishnagiri	Saparapalli	Shoolagiri	171	169	2	166	0	1
6	Tamil Nadu	Krishnagiri	Gedalandhoddi	Shoolagiri	322	322	0	318	0	4
7	Tamil Nadu	Krishnagiri	Chinnarendoddi	Shoolagiri	240	456	221	229	0	6
8	Tamil Nadu	Krishnagiri	Doddagounipalli	Shoolagiri	532	527	183	295	12	37
9	Tamil	Krishnagiri	Gudisadanapalli	Shoolagiri	889	885	455	409	0	21

	Nadu									
10	Tamil Nadu	Krishnagiri	Kullur	Shoolagiri	184	181	58	120	0	3
11	Tamil Nadu	Krishnagiri	Vathiripalli	Hosur	121	88	86	1	0	1
12	Tamil Nadu	Krishnagiri	Oddapalli	Hosur	48	36	31	0	1	4
13	Tamil Nadu	Krishnagiri	Mallasandiram	Hosur	330	313	200	71	0	42
14	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	431	401	79	161	3	158
15	Tamil Nadu	Krishnagiri	Midithepalli	Shoolagiri	729	727	259	406	2	60
16	Tamil Nadu	Krishnagiri	Kottasadanapalli	Shoolagiri	60	51	35	9	4	3
17	Tamil Nadu	Krishnagiri	Muthurayanpudur	Shoolagiri	227	52	34	17	0	1
18	Tamil Nadu	Krishnagiri	Ramandoddi	Shoolagiri	308	307	165	94	3	45
19	Tamil Nadu	Krishnagiri	Kumbalam	Shoolagiri	329	227	46	174	0	7
20	Tamil Nadu	Krishnagiri	Peddasigarlapalli	Shoolagiri	1176	1137	757	755	4	445
21	Tamil Nadu	Krishnagiri	Athimugam	Shoolagiri	1936	1525	485	547	35	458
22	Tamil Nadu	Krishnagiri	Advanapalli	Hosur	68	48	37	1	0	10
23	Tamil	Krishnagiri	Sudugondapalli	Hosur	329	211	202	3	3	2

	Nadu									
24	Tamil Nadu	Krishnagiri	Palavanapalli	Hosur	480	478	220	239	0	19
25	Tamil Nadu	Krishnagiri	Nandimangalam	Hosur	1260	1134	497	475	47	115
26	Tamil Nadu	Krishnagiri	Badathepalli	Hosur	302	285	106	100	4	75
27	Tamil Nadu	Krishnagiri	Karupalli	Hosur	135	132	98	15	3	16
28	Tamil Nadu	Krishnagiri	Muthalli	Hosur	252	241	100	5	2	48
29	Tamil Nadu	Krishnagiri	Attur	Hosur	136	136	101	17	0	18
30	Tamil Nadu	Krishnagiri	Dhasapalli	Hosur	521	519	0	516	0	3
31	Tamil Nadu	Krishnagiri	Doripalli	Shoolagiri	1140	1056	353	243	16	444
32	Tamil Nadu	Krishnagiri	Pattakurubarapalli	Shoolagiri	1112	1066	561	296	2	207
33	Tamil Nadu	Krishnagiri	Amgondapalli	Shoolagiri	1249	1225	735	384	2	104
34	Tamil Nadu	Krishnagiri	Alnatham	Hosur	91	69	62	0	0	7
35	Tamil Nadu	Krishnagiri	Chembarasanapalli	Shoolagiri	3112	3024	1246	1199	27	552
36	Tamil Nadu	Krishnagiri	A.Settipalli	Shoolagiri	1577	1415	463	716	37	199
37	Tamil	Krishnagiri	Mallasandiram	Shoolagiri	215	192	68	70	2	52

	Nadu									
38	Tamil Nadu	Krishnagiri	Nallaganakothapalli	Shoolagiri	1659	1383	489	118	25	751
39	Tamil Nadu	Krishnagiri	Krishnappanayakkanpudur	Veppanapalli	308	300	200	93	0	7
40	Tamil Nadu	Krishnagiri	Helekundani	Veppanapalli	495	402	104	260	22	16
41	Tamil Nadu	Krishnagiri	Gollapalli	Veppanapalli	308	308	78	227	0	3
42	Karnataka	Kolar	Tharabahalli	Malur	135	121	78	12	5	26
43	Karnataka	Kolar	Chalaganahalli	Malur	564	525	137	313	0	75
44	Karnataka	Kolar	Voppachahalli	Malur	458	328	132	131	0	65
45	Karnataka	Kolar	Dadinayakanadoddi	Malur	259	227	67	89	7	69
46	Karnataka	Kolar	Bennagatta	Malur	352	221	135	34	3	49
47	Karnataka	Kolar	Bantahalli	Malur	804	348	215	35	6	116
48	Karnataka	Kolar	Ahanya	Malur	294	248	78	79	11	80
49	Karnataka	Kolar	Padavanahalli	Malur	481	250	111	80	5	54
50	Karnataka	Kolar	Kadadanahalli	Malur	297	250	116	57	1	4
51	Karnataka	Kolar	Mirupanahalli	Malur	223	142	86	39	0	17
52	Karnataka	Kolar	Nagapura	Malur	248	168	67	54	0	47
53	Karnataka	Kolar	Baliganahalli	Malur	350	179	123	14	0	42
54	Karnataka	Kolar	Kadavanapura	Malur	132	75	41	21	0	13
55	Karnataka	Kolar	Indumangala	Malur	442	86	47	17	1	21
56	Karnataka	Kolar	M.Hosahalli	Malur	274	137	73	23	2	39
57	Karnataka	Kolar	M.Upparahalli	Malur	188	33	4	17	0	12
58	Karnataka	Kolar	Byranadoddi	Malur	132	72	11	25	0	36

59	Karnataka	Kolar	Bandahatti	Malur	175	79	0	2	0	5
60	Karnataka	Kolar	Natuvarahalli	Malur	283	257	132	17	0	8
61	Karnataka	Kolar	Guddadahosahalli	Malur	120	111	99	4	0	8
62	Karnataka	Kolar	Tholasanadoddi	Malur	53	53	20	26	0	7
63	Karnataka	Kolar	Doddadanavahalli	Malur	400	400	289	104	0	7
64	Karnataka	Kolar	Chickadanavahalli	Malur	319	308	69	230	0	9
65	Karnataka	Kolar	Thirtha Bandahatti	Malur	6	4	3	1	0	0
66	Karnataka	Kolar	Tholakanahalli	Malur	334	163	135	11	8	9
67	Karnataka	Kolar	Pichaguntrahalli	Malur	281	14	1	1	1	11
68	Karnataka	Kolar	Masthi	Malur	295	4799	367	584	31	1246
69	Karnataka	Kolar	Kanchala	Malur	315	315	194	80	1	40
70	Karnataka	Kolar	Duduvanahalli	Malur	304	56	41	2	3	10
71	Karnataka	Kolar	Byappanahalli	Malur	123	123	18	72	0	33
72	Karnataka	Dharwad	Kadadahalli	Navalgund	297	198	116	77	1	4
73	Karnataka	Kolar	Kesaragere	Malur	396	166	62	42	1	61
	5 Km Area covered Village									
74	Tamil Nadu	Krishnagiri	Vanamangalam	Shoolagiri	207	197	42	99	4	52
75	Tamil Nadu	Krishnagiri	Collapalli	Shoolagiri	267	259	18	241	0	0
76	Tamil Nadu	Krishnagiri	Nerigam	Shoolagiri	568	550	300	159	1	90
77	Tamil Nadu	Krishnagiri	Kariyasandiram	Shoolagiri	241	240	0	240	0	0
78	Tamil Nadu	Krishnagiri	Mahadevapuram	Shoolagiri	189	187	64	106	0	17

79	Tamil Nadu	Krishnagiri	Suligunta	Shoolagiri	488	466	116	102	108	140
80	Tamil Nadu	Krishnagiri	Berigai	Shoolagiri	3335	3089	514	775	107	1693
81	Tamil Nadu	Krishnagiri	Amuthugondapalli	Shoolagiri	199	191	187	2	1	1
82	Tamil Nadu	Krishnagiri	Mugalpalli	Hosur	512	462	220	140	2	100
83	Tamil Nadu	Krishnagiri	Pannapalli	Veppanapalli	2068	1810	986	536	35	253
84	Tamil Nadu	Krishnagiri	Eluvapalli	Hosur	870	633	533	72	3	25
85	Tamil Nadu	Krishnagiri	Sikkanapalli	Shoolagiri	206	198	75	77	22	46
86	Tamil Nadu	Krishnagiri	Pannapalli	Shoolagiri	1124	914	508	220	11	175
87	Tamil Nadu	Krishnagiri	Meenandoddi	Shoolagiri	200	200	25	134	77	41
88	Tamil Nadu	Krishnagiri	Sokkapuram	Shoolagiri	607	604	234	300	1	69
89	Tamil Nadu	Krishnagiri	Venkatesapuram	Shoolagiri	1211	965	815	91	4	55
90	Tamil Nadu	Krishnagiri	Kurubarapalli	Shoolagiri	716	614	173	322	18	101
91	Tamil Nadu	Krishnagiri	Koladasapuram	Hosur	431	401	79	161	3	158
93	Tamil Nadu	Krishnagiri	Alnatham	Hosur	91	69	62	0	0	7

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94	Tamil Nadu	Tiruchirappalli	Shanamangalam	Manachanallur	92	80	12	0	0	0
95	Karnataka	Kolar	Bitnahalli	Malur	272	68	64	2	0	2
96	Karnataka	Kolar	Halehalli	Malur	172	151	109	22	0	20
97	Karnataka	Kolar	Appaiana Agrahara	Malur	503	4	1	2	0	1
98	Karnataka	Kolar	Chavaramangala	Malur	315	37	6	6	0	25
99	Karnataka	Kolar	Suggondahalli	Malur	496	482	231	195	0	56
100	Karnataka	Kolar	Anikarahalli	Malur	556	539	154	380	0	5
101	Karnataka	Kolar	Malkanahalli	Malur	443	357	6	347	1	3
102	Karnataka	Kolar	Thyaganadoddi	Malur	126	119	111	1	0	7
103	Karnataka	Kolar	Karisandra	Malur	148	142	50	81	0	11
104	Karnataka	Kolar	Shamasettyhalli	Malur	499	314	97	100	0	117

(Courtesy: Census Dept., GOI)

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3.12.4 AMENITIES

TABLE – 3.19 DETAILS OF AMMENITIES AVAILABLE IN STUDY AREA

Taluka	Village	Educational	Medical	Drinking Water	Post & Telegraph	Communication	Approachto Village	Power Supply
Krishnagiri	Baliganapalli	P(2),ASC(1),EC(c),MC(c)	PHC(a),PHS(3),MCW(a),TBC(a),HA(a),D(a)FWC(a)	T,HP,TW	P&TO, LL	BS	PR,KR	EA
	Puram	P(a),ASC(c),EC(c),MC(c)	PHC(c),PHS(b),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO, LL	BS	PR,KR	--
	D.S. Thimmasandram	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,TW	P&TO(b),LL(b)	BS	PR,KR	EA
	Selvankoddi	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(b),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T,TW	P&TO(c), LL	BS	PR,KR	--
	Saparapalli	P(c),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c),LL(a)	BS	PR,KR	--
	Gedalandhoddi	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS	PR,KR	--
	Chinnarendoddi	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(c),TBC(c),HA(c),D(a)FWC(c)	T,HP	P&TO,(c)LL(a)	BS	PR,KR	--
	Doddagounipalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP	P&TO(b),LL(b)	BS(a)	PR,KR	EA

	Gudisadanapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(b),LL(b)	BS	PR,KR	--
	Kullur	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(b),LL(a)	BS	PR,KR	--
	Vathiripalli	P(b),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Oddapalli	P(a),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Mallasandiram	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,TW	P&TO(c), LL	BS	PR,KR	--
	Koladasapuram	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T	P&TO(c),LL(b)	BS(a)	PR,KR	--
	Midithepalli	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(c),HA(c),D(a)FWC(a)	T,HP	P&TO(a), LL	BS	PR,KR	EA
	Kottasadanapalli	P(a),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP	P&TO(b),LL(a)	BS	PR,KR	EA
	Muthurayanpudur	P(a),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T,TP,R	P&TO(b),LL	BS	PR,KR	EA
	Ramandoddi	P(1),ASC(c),EC(c),	PHC(c),PHS(b),MCW(c),TBC(c),	T,TW	P&TO(c),	BS(b)	PR,KR	EA

		MC(c)	HA(c),D(c)FWC(c)		LL(c)			
	Kumbalam	P(2),ASC(c),EC(c),MC(c)	PHC(c),PHS(1),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS	PR,KR	EA
	Peddasigarlapalli	P(3),ASC(c),EC(c),MC(c)	PHC(c),PHS(1),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T,HP,TW	P&TO(c),LL(c)	BS	PR,KR	EA
	Athimugam	P(2),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	EA
	Advanapalli	P(a),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Sudugondapalli	P(a),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Palavanapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(b),HA(b),D(b)FWC(b)	T	P&TO(b),LL	BS	PR,KR	--
	Nandimangalam	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Badathepalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	--
	Karupalli	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS(a)	PR(a),KR	EA

	Muthalli	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(1),MCW(b),TBC(b),HA(b),D(c)FWC(c)	T	P&TO(b),LL(b)	BS	PR,KR	EA
	Attur	P(a),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS(a)	PR(a),KR	EA
	Dhasapalli	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c),LL(a)	BS(a)	PR(a),KR	EA
	Doripalli	P(3),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T,TW	P&TO(c), LL	BS	PR,KR	EA
	Pattakurubarapalli	P(2),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T,HP	P&TO(b),LL(b)	BS	PR,KR	EA
	Amgondapalli	P(4),ASC(c),EC(b),MC(c)	PHC(c),PHS(b),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T,TW	P&TO(c),LL(c)	BS(a)	PR,KR	EA
	Alnatham	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(c),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL	BS	PR,KR	EA
	Chembarasanapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP,TW	P&TO(b),LL	BS(b)	PR,KR	EA
	A.Settipalli	P(2),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(b),HA(c),D(b)FWC(b)	T,TW	P&TO(b),LL	BS	PR,KR	EA
	Mallasandiram	P(a),ASC(c),EC(c),MC(c)	PHC(c),PHS(b),MCW(c),TBC(c),HA(c),D(c)FWC(	T	P&TO(c), LL	BS	PR,KR	EA

			c)					
	Nallaganakothapalli	P(5),ASC(1),EC(1),MC(c)	PHC(b),PHS(1),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP,TW	P&TO(b), LL	BS	PR,KR	EA
	Krishnappanayakkanpudur	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP	P&TO(c), LL	BS	PR,KR	--
	Helekundani	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(b),MCW(b),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS	PR,KR	EA
	Gollapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(c), LL(a)	BS(b)	PR,KR	EA
	Vanamangalam	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(c),HA(c),D(a)FWC(a)	T	P&TO(a),LL(a)	BS(a)	PR,KR	EA
	Collapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	--	P&TO(b),LL	BS(a)	PR,KR	EA
	Nerigam	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,TW	P&TO(b), LL	BS	PR,KR	--
	Kariyasandiram	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(1),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(b), LL(a)	BS	PR,KR	EA
	Mahadevapuram	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(c),HA(c),D(a)FWC(a)	T	P&TO(b), LL(a)	BS(a)	PR(a),KR	EA
	Suligunta	P(1),ASC(c),EC(c),	PHC(a),PHS(a),MCW(a),TBC(c),	T,TW	P&TO(a),	BS(a)	PR,KR	EA

		MC(c)	HA(c),D(a)FWC(a)		LL(a)			
	Berigai	P(1),ASC(c),EC(c),MC(c)	PHC(1),PHS(1),MCW(1),TBC(1),HA(c),D(1)FWC(1)	T,TW	P&TO,LL	BS	PR,KR	EA
	Amuthugondapalli	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(1),MCW(a),TBC(c),HA(c),D(a)FWC(a)	T	P&TO(a),LL(a)	BS(a)	PR,KR	EA
	Mugalpalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,TW	P&TO(c), LL	BS(b)	PR,KR	--
	Pannapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP,TW	P&TO(b),LL	BS	PR,KR	--
	Eluvapalli	P(1),ASC(b),EC(b),MC(c)	PHC(b),PHS(a),MCW(b),TBC(b),HA(b),D(b)FWC(b)	T,TW	P&TO(b),LL	BS(a)	PR,KR	--
	Sikkanapalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T	P&TO(b),LL(b)	BS(b)	PR,KR	EA
	Meenandoddi	P(2),ASC(c),EC(c),MC(c)	PHC(b),PHS(a),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP	P&TO(b),LL(b)	BS(a)	PR,KR	EA
	Sokkapuram	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(a),MCW(c),TBC(c),HA(c),D(c)FWC(c)	T	P&TO(c), LL	BS	PR,KR	EA
	Venkatesapuram	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(c),HA(c),D(b)FWC(b)	T,HP	P&TO(c), LL	--	--	--
	Kurubarapalli	P(6),ASC	PHC(a),PHS(a),	T,HP,TW	P&TO	BS	PR(a),K	EA

		(c),EC(c), MC(c)	MCW(a),TBC(c), HA(c),D(a)FWC(a)		(c), LL		R	
Kolar	Tharabahalli	P(1),ASC(c),EC(c), MC(c)	PHC(b),PHS(b), MCW(b),TBC(b), HA(c),D(a)FWC(b)	T,HP,TW	P&TO(c), LL	BS	PR,KR	EA
	Chalaganahalli	P(1),ASC(c),EC(c), MC(c)	PHC(b),PHS(b), MCW(b),TBC(b), HA(c),D(a)FWC(b)	T,HP,TW	P&TO(c), LL	BS	PR,KR	EA
	Voppachahalli	P(1),ASC(c),EC(c), MC(b)	PHC(a),PHS(a), MCW(a),TBC(a), HA(c),D(a)FWC(a)	T,HP,TW	P&TO(c), LL	BS(a)	PR,KR	EA
	Dadinayakanadoddi	P(1),ASC(c),EC(c), MC(c)	PHC(1),PHS(2), MCW(1),TBC(1), HA(c),D(a)FWC(2)	T,HP,TW	P&TO(c), LL	BS	PR,KR	EA
	Bennagatta	P(1),ASC(c),EC(c), MC(c)	PHC(a),PHS(a), MCW(a),TBC(a), HA(c),D(a)FWC(a)	T,HP,TW	P&TO(c), LL	BS(a)	PR,KR	EA
	Bantahalli	P(1),ASC(c),EC(c), MC(c)	PHC(a),PHS(a), MCW(a),TBC(a), HA(c),D(c)FWC(a)	T,HP,TW	P&TO(c), LL	BS	PR,KR	EA
	Ahanya	P(1),ASC(c),EC(c), MC(c)	PHC(a),PHS(a), MCW(a),TBC(a), HA(c),D(c)FWC(a)	T,HP,TW	P&TO(c), LL	BS(a)	PR,KR	EA
	Padavanahalli	P(2),ASC(c),EC(c), MC(c)	PHC(b),PHS(b), MCW(b),TBC(b), HA(c),D(c)FWC(b)	T,HP,TW	P&TO(b), LL(b)	BS	PR,KR	EA
	Kadadanahalli	P(1),ASC(c),EC(c), MC(c)	PHC(b),PHS(b), MCW(b),TBC(b), HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c), LL(b)	BS(a)	PR,KR	EA

	Mirupanahalli	P(b),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL(b)	BS(b)	PR,KR	EA
	Nagapura	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL(b)	BS(b)	PR,KR	EA
	Baliganahalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(1),MCW(b),TBC(b),HA(c),D(c)FWC(1)	T,HP,TW	P&TO(c),LL(b)	BS(b)	PR,KR	EA
	Kadavanapura	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL(b)	BS(b)	PR,KR	EA
	Indumangala	P(1),ASC(c),EC(c),MC(c)	PHC(c),PHS(b),MCW(c),TBC(c),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(a), LL	BS	PR,KR	EA
	M.Hosahalli	P(1),ASC(c),EC(c),MC(b)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP	P&TO(a),LL(b)	BS(b)	PR,KR	EA
	M.Upparahalli	P(1),ASC(c),EC(c),MC(a)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,HP,TW	P&TO(a), LL	BS(a)	PR,KR	EA
	Byranadoddi	P(1),ASC(c),EC(c),MC(b)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(a), LL	BS(b)	PR,KR	EA
	Bandahatti	P(a),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,HP	P&TO(b),LL(b)	BS	PR,KR	EA
	Natuvarahalli	P(1),ASC(c),EC(c),MC(b)	PHC(a),PHS(b),MCW(a),TBC(a),HA(b),D(c)FWC(	T,HP,TW	P&TO(c), LL	BS	PR,KR	EA

			b)					
	Guddadahosahalli	P(b),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP	P&TO(b),LL(b)	BS(b)	PR,KR	EA
	Tholasanadoddi	P(a),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	HP	P&TO(a),LL(a)	BS(a)	PR,KR	EA
	Doddadanavahalli	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(1),MCW(a),TBC(a),HA(c),D(b)FWC(1)	T,TW	P&TO(a), LL	BS	PR,KR	EA
	Chickadanavahalli	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(1),MCW(a),TBC(a),HA(c),D(a)FWC(a)	T,HP,TW	P&TO(b),LL	BS	PR,KR	EA
	Thirtha Bandahatti	P(a),ASC(c),EC(c),MC(b)	PHC(a),PHS(1),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,HP,TW	P&TO(b),LL	BS	PR,KR	EA
	Tholakanahalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL(b)	BS(a)	PR,KR	EA
	Pichaguntrahalli	P(1),ASC(c),EC(c),MC(b)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,TW	P&TO(c), LL	BS(a)	PR,KR	EA
	Masthi	P(9),ASC(c),EC(c),MC(b)	PHC(1),PHS(1),MCW(1),TBC(1),HA(c),D(c)FWC(1)	T,HP,TW	P&TO,LL	BS	PR,KR	EA
	Kanchala	P(1),ASC(c),EC(c),MC(a)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,TW	P&TO(b),LL	BS	PR,KR	EA
	Duduvanahalli	P(1),ASC(c),EC(c),	PHC(a),PHS(a),MCW(a),TBC(a),	T,HP,TW	P&TO(a),LL	BS(a)	PR,KR	EA

		MC(c)	HA(c),D(c)FWC(a)					
	Byappanahalli	P(1),ASC(c),EC(c),MC(a)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(a),LL	BS(a)	PR,KR	EA
	Kesaragere	P(2),ASC(c),EC(c),MC(c)	PHC(a),PHS(1),MCW(a),TBC(a),HA(c),D(c)FWC(1)	T,HP	P&TO(c),LL	BS	PR,KR	EA
	Bitnahalli	P(1),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL	BS(b)	PR,KR	EA
	Halehalli	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,HP,TW	P&TO(a),LL	BS	PR,KR	EA
	Appaiana Agrahara	P(1),ASC(c),EC(c),MC(c)	PHC(a),PHS(a),MCW(a),TBC(a),HA(c),D(c)FWC(a)	T,HP,TW	P&TO(c),LL	BS	PR,KR	EA
	Chavaramangala	P(1),ASC(a),EC(a),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL	BS	PR,KR	EA
	Suggondahalli	P(2),ASC(c),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL	BS	PR,KR	EA
	Anikarahalli	P(2),ASC(b),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL(b)	BS(b)	PR,KR	EA
	Malkanahalli	P(1),ASC(b),EC(c),MC(c)	PHC(b),PHS(b),MCW(b),TBC(b),HA(c),D(c)FWC(b)	T,HP,TW	P&TO(c),LL	BS(b)	PR,KR	EA
	Thyaganadoddi	P(1),ASC	PHC(a),PHS(a),	T,TW	P&TO	BS(a)	PR,KR	EA

		(c),EC(c), MC(c)	MCW(a),TBC(a), HA(c),D(c)FWC(a)		(c),LL			
	Karisandra	P(1),ASC(c),EC(c), MC(c)	PHC(a),PHS(a), MCW(a),TBC(a), HA(c),D(c)FWC(a)	T,HP,TW	P&TO(c),LL	BS(a)	PR,KR	EA
	Shamasetty halli	P(1),ASC(c),EC(c), MC(c)	PHC(b),PHS(b), MCW(b),TBC(b), HA(c),D(c)FWC(b)	T,HP	P&TO(c),LL	BS(b)	PR,KR	EA

(Courtesy: Census Dept., GOI)

Table 3.20 ABBREVIATIONS

1. Education P-Primary Elementary School EC-Engineering college MC-Medical college ASC-Degree college of arts, science & commerce	**2. Medical Facilities** PHS-Primary Health Sub-Centre PHC-Primary Health Centre MCW-Maternity and Child Welfare Center TBC-T.B. Clinic HA-Hospital-Allopathic D-Dispensary FWC – Family Welfare Centre
3. Drinking Water T-Tap Water HP-Hand Pump R-River Water TW- Tube well Water	**4. Post & Telegraph** P&TO-Post & Telegraph Office LL-Telephone (Land Lines) **5. Communication** BS-Bus Service **6. Approaches to Village** PR-Pucca Road KR-Kuchcha Road
7. Power Supply EA-Electricity for all purposes	

INTERPRETATION:

Within 10 km radius of the study area,Population density is 202 persons per sq. km. and the literacy rate is observed to be 54.76% having 61.95% among males and 47.20% among females and it can be interpreted that there is need to promote education to more and more people specifically promotion of education to girl child. Almost all the villages have more than 50% people as non-workers. It indicates that the problem of unemployment can be solved by providing proper training and education and also the need to establish more industries so that maximum number of employment can be generated. Basic amenities like Education facilities, Health care facilities, water supply, electric power supply, mode of transportation etc. are available in all villages.

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACT & MITIGATION MEASURES

4.1 IDENTIFICATION OF IMPACTS

Various sources of pollution with respect to wastewater, the flue gas / process emission, hazardous waste and noise generation along with their qualitative and quantitative analysis as well as measures taken to control them are discussed herein with details. The network method was adopted to identify potential impact, which involves understanding of cause-condition-effect relationship between an activity and environmental parameters.

4.2 PREDICTIONS AND EVALUATION OF IMPACTS

An impact can be defined as any change in physical, chemical, biological, cultural and/or socioeconomic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts. Scientific techniques and methodologies based on mathematical modeling are available for studying impacts of various project activities on environmental parameters.

The nature of the impacts due to said project activities are discussed here in detail. Each parameter identified in the proceeding chapter, is singularly considered for the anticipated impact due to various activities listed. The impact is quantified using numerical scores 0, 1, 2, 3, 4 and 5 in increasing order of activity. In order to assess the impact accurately, each parameter is discussed in detail covering the following:

1) Project activities likely to generate impact
2) Quantification and prediction of impact

4.2.1 WATER ENVIRONMENT

- The Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/PWD available and remaining 1000 KLD applied to get from government water source.
- The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day). and will be segregated into two stream High COD Stream & Low COD stream.
  - **Low COD stream:** Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system.
  - **High TDS Stream:** Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility).
  - Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.

4.2.2 AIR ENVIRONMENT

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. A number of models have been developed for the prediction of pollutant concentration at any point from an emitting source. The Industrial Source Complex – Short Term (ISCST3) dispersion model is a steady-state Gaussian plume model. It is most widely accepted for its interpretability. It gives reasonably correct values because this obeys the equation of continuity and it also takes care of diffusion, which is a random process. For the present study, this model is used for the prediction of maximum ground level concentration (GLC).

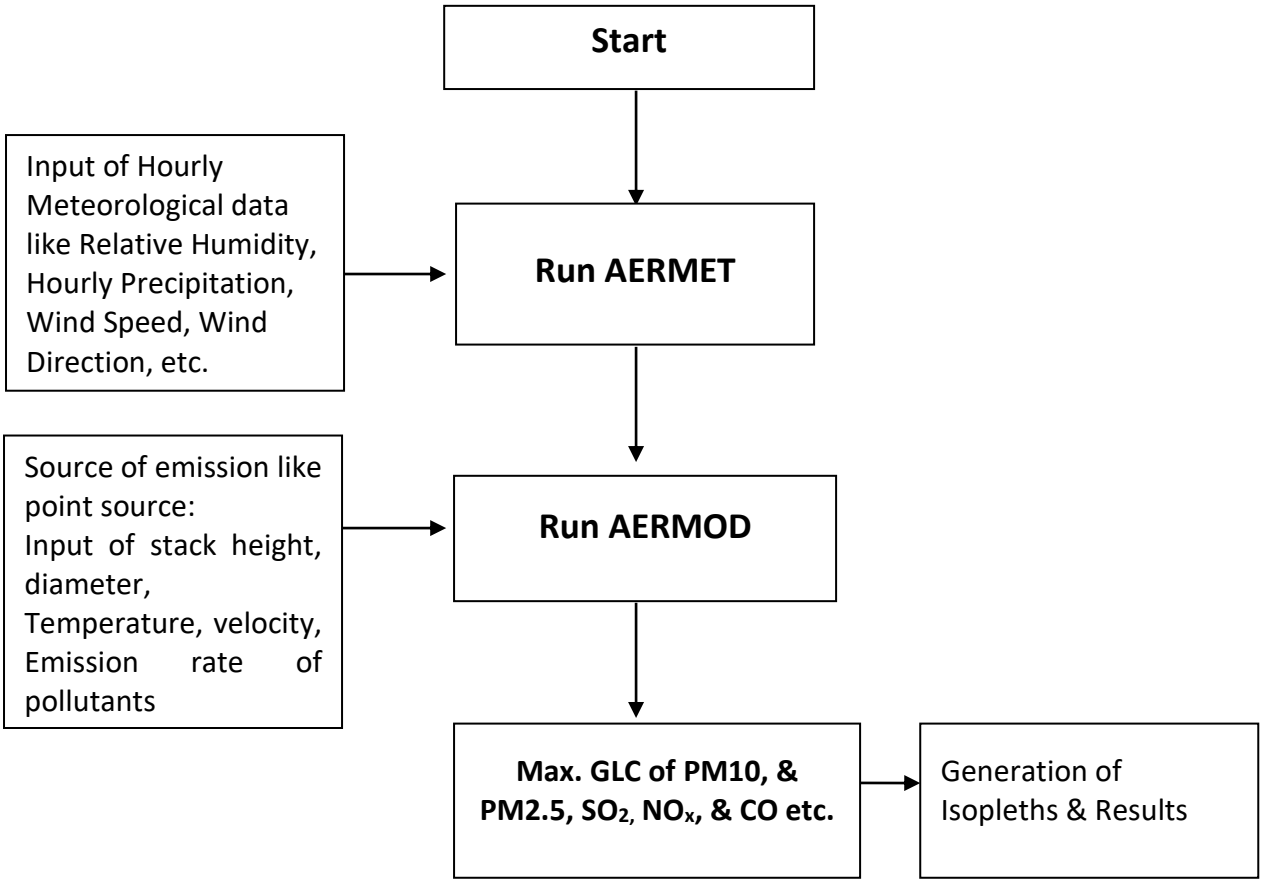
The proposed air emissions at M/s. Chemplast Sanmar Limited. are PM10, PM2.5, SO_2, NO_x, & CO. The site specific and monitored details considered for input data for the software "ISC-AERMOD View" by Lakes Environmental, Canada for prediction of impact on air environment are given in Table 4.2. The site-specific hourly meteorological data measured at site is given in Table 3.8. In order to conduct a refined air dispersion modeling using ISCST3 and ISC-PRIME short-term air quality dispersion models, the site specific hourly meteorological data measured at site is pre-processed using the U.S. EPA PCRAMMET and U.S. EPA AERMET programs. Before starting air dispersion modeling with ISC-AERMOD View, a building downwash analysis using BPIP View was done. BPIP View is a graphical user interface designed to speed up the work involved in setting up input data for the U.S. EPA Building Profile Input Program (BPIP) and Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME).

The air pollution caused by the gaseous emissions from a single or small group of stacks is a local phenomenon. Its impacts will occur at a distance ranging from within the immediate vicinity of the stack to several kilometers away from the stack. Maximum ground level concentration will occur within this range. All plumes at more downwind distances from the source by stack emission become so diluted by diffusion in the ambient atmosphere, that concentrations of pollutants become negligible. The maximum ground level concentration for different parameters is given in Table 4.4. Equal concentration contour plots for PM_{10}, $PM_{2.5}$, SO_2, NO_x, & CO are given in Figure 4.2. Adequate measures shall be taken to minimize air pollution by providing air pollution control equipment. Flue gases are discharged from stacks at adequate height.

The methodology for Air Quality Modeling using AERMOD View model is given in Figure 4.1.

FIGURE-4.1

METHODOLOGY FOR AQM



TABLE–4.1

DETAILS OF EMISSION FROM STACK & VENTS

PROPOSED EMISSION FROM STACK

Sr. No	Operating Parameter	Unit	Source of Emission								
			Boiler-1 (50 TPH)	Boiler-1 (50 TPH)	DG set - 2000KVA	DG set - 2000KVA	DG set - 2000KVA	DG set - 2000KVA	DG set - 2000KVA	Thermic Fluid Heater 2 Lakh Kcal/Hr	Thermic Fluid Heater 2 Lakh Kcal/Hr
1.	Stack Height	Meter	40	40	30	30	30	30	30	9	9
2.	Stack Diameter	Meter	2	2	0.4	0.4	0.4	0.4	0.4	0.25	0.25
3.	Flue Gas Velocity	m/s	9	9	24	24	24	24	24	25	25
4.	Flue Gas Temperature	^0K	423	423	600	600	600	600	600	600	600
5.	Air Pollution Control Equipment	-	Mechanical Dust collector ,Stack or ESP	Mechanical Dust collector ,Stack	Stack	Stack	Stack	Stack	Stack	Stack	Stack
6.	Emission concentration PM_{10}	mg/Nm^3 g/S	59 (1.1824)	54 (1.0823)	30 (0.0452)	30 (0.0452)	30 (0.0452)	30 (0.0452)	30 (0.0452)	36 (0.0220)	36 (0.0220)

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	$PM_{2.5}$	mg/Nm^3	40	36	20	20	20	20	20	24	24
		g/S	(0.7883)	(0.7215))	(0.0301)	(0.0301)	(0.0301)	(0.0301)	(0.0301)	(0.0147)	(0.0147)
	SO_2	mg/Nm^3	400	600	40	40	40	40	40	50	50
		g/S	(7.9635)	(12.0255)	(0.0603)	(0.0603)	(0.0603)	(0.0603)	(0.0603)	(0.0306)	(0.0306)
	NOx	mg/Nm^3	500	300	15	15	15	15	15	20	20
		g/S	(9.9544)	(6.0127)	(0.0226)	(0.0226)	(0.0226)	(0.0226)	(0.0226)	(0.0122)	(0.0122)
	CO	mg/Nm^3	500	120	140	140	140	140	140	140	140
		g/S	(9.9544)	(2.4051)	(0.2110)	(0.2110)	(0.2110)	(0.2110)	(0.2110)	(0.0858)	(0.0858)
7.	Fuel	--	Briquettes	Furnace Oil	HSD	HSD	HSD	HSD	HSD	HSD	HSD

PROPOSED EMISSION FROM PROCESS VENT

Sr. No	Operating Parameter	Unit	Source of Emission								
			Scrubber -1	Scrubber -2	Scrubber -3	Scrubber -4	Scrubber -5	Scrubber -6	Scrubber -7	Scrubber -8	Scrubber -9
1.	Stack Height	Meter	17	17	17	17	17	17	17	17	17
2.	Stack Diameter	Meter	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
3.	Flue Gas Velocity	m/s	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.	Flue Gas Temperature	^0K	303	303	303	303	303	303	303	303	303
5.	Air Pollution Control Equipment	-	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stac	Wet Alkali Scrubber,stac	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack

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				k	k						
6.	Emission concentration										
	PM_{10}	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
	$PM_{2.5}$	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
	SO_2	mg/Nm^3	3	3	3	3	3	--	--	--	--
		g/S	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	--	--	--	--
	NOx	mg/Nm^3	--	--	--	--	--	5	5	5	5
		g/S	--	--	--	--	--	(0.0010)	(0.0010)	(0.0010)	(0.0010)
	CO	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
7.	Fuel	--	--	--	--	--	--	--	--	--	

Sr. No	**Operating Parameter**	**Unit**	**Source of Emission**								
			Scrubber -10	Scrubber -11	Scrubber -12	Scrubber -13	Scrubber -14	Scrubber -15	Scrubber -16	Scrubber -17	Scrubber -18
1.	Stack Height	Meter	17	17	17	17	17	17	17	17	17
2.	Stack Diameter	Meter	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
3.	Flue Gas Velocity	m/s	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.	Flue Gas Temperature	^0K	303	303	303	303	303	303	303	303	303

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5.	Air Pollution Control Equipment	-	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack
6.	Emission concentration										
	PM_{10}	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
	$PM_{2.5}$	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
	SO_2	mg/Nm^3	--	--	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--	--	--
	NOx	mg/Nm^3	5	--	--	--	--	--	--	--	--
		g/S	(0.0010)	--	--	--	--	--	--	--	--
	CO	mg/Nm^3	--	30	30	30	30	30	30	30	30
		g/S	--	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)
7.	Fuel	--	--	--	--	--	--	--	--	--	--

Sr. No	Operating Parameter	Unit	Source of Emission						
			Scrubber -19	Scrubber -20	Scrubber -21	Scrubber - 22	Scrubber - 23	Scrubber - 24	Scrubber - 25

1.	Stack Height	Meter	17	17	17	17	17	17	17
2.	Stack Diameter	Meter	0.25	0.25	0.25	0.25	0.25	0.25	0.25
3.	Flue Gas Velocity	m/s	4.4	4.4	4.4	4.4	4.4	4.4	4.4
4.	Flue Gas Temperature	^0K	303	303	303	303	303	303	303
5.	Air Pollution Control Equipment	-	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack	Wet Alkali Scrubber,stack
6.	Emission concentration								
	PM_{10}	mg/Nm^3	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--
	$PM_{2.5}$	mg/Nm^3	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--
	SO_2	mg/Nm^3	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--
	NOx	mg/Nm^3	--	--	--	--	--	--	--
		g/S	--	--	--	--	--	--	--
	CO	mg/Nm^3	30	30	30	30	30	30	30
		g/S	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)	(0.0064)
7.	Fuel	--	--	--	--	--	--	--	--

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FIGURE-4.2 CONTD.

ISOPLETHS OF PROPOSED PM10

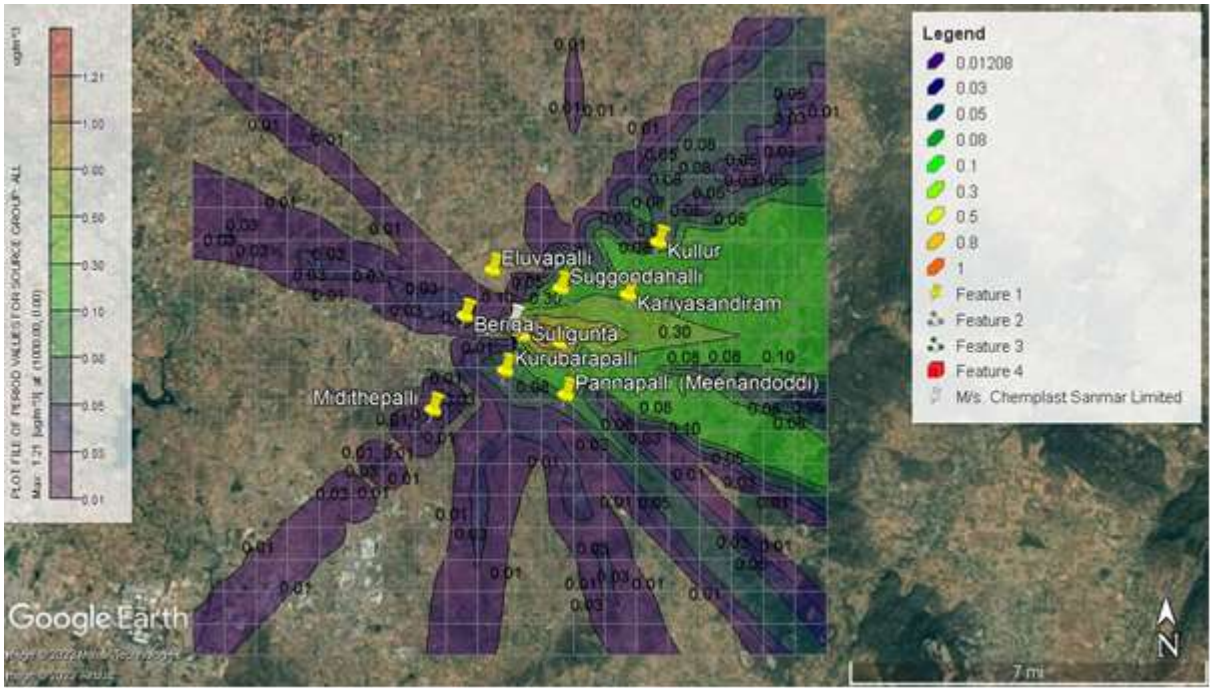


FIGURE-4.2 CONTD.

ISOPLETHS OF PROPOSED PM2.5

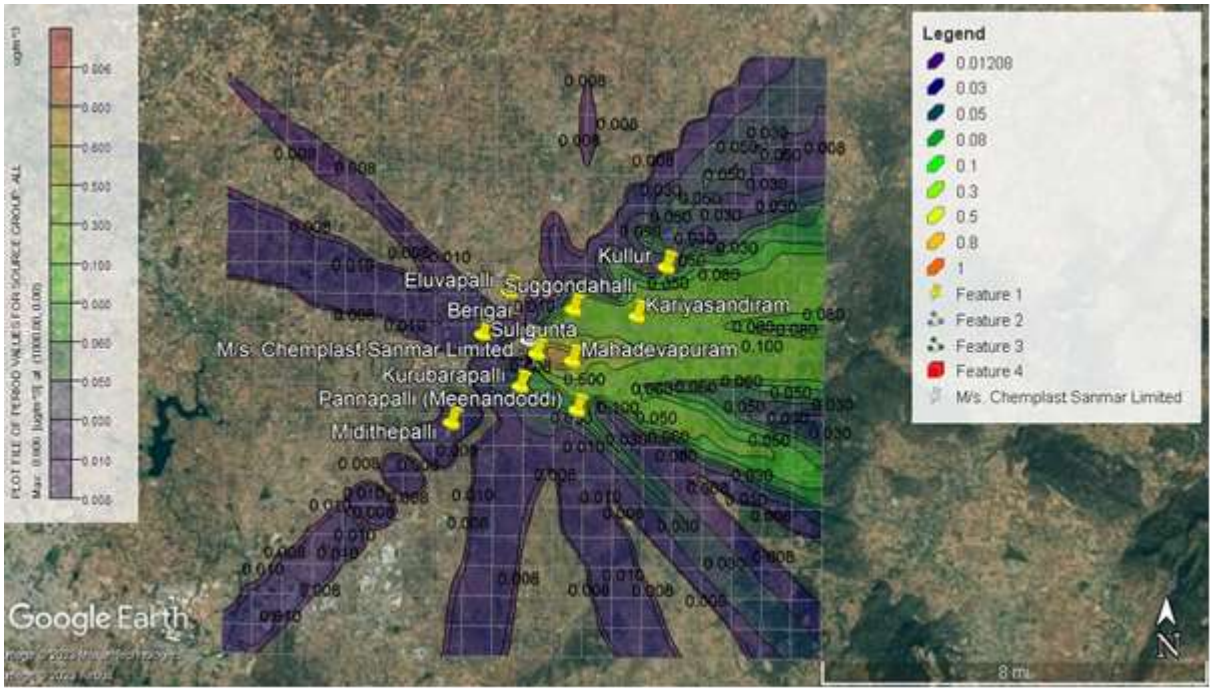


FIGURE-4.2 CONTD.

ISOPLETHS OF PROPOSED SO_2

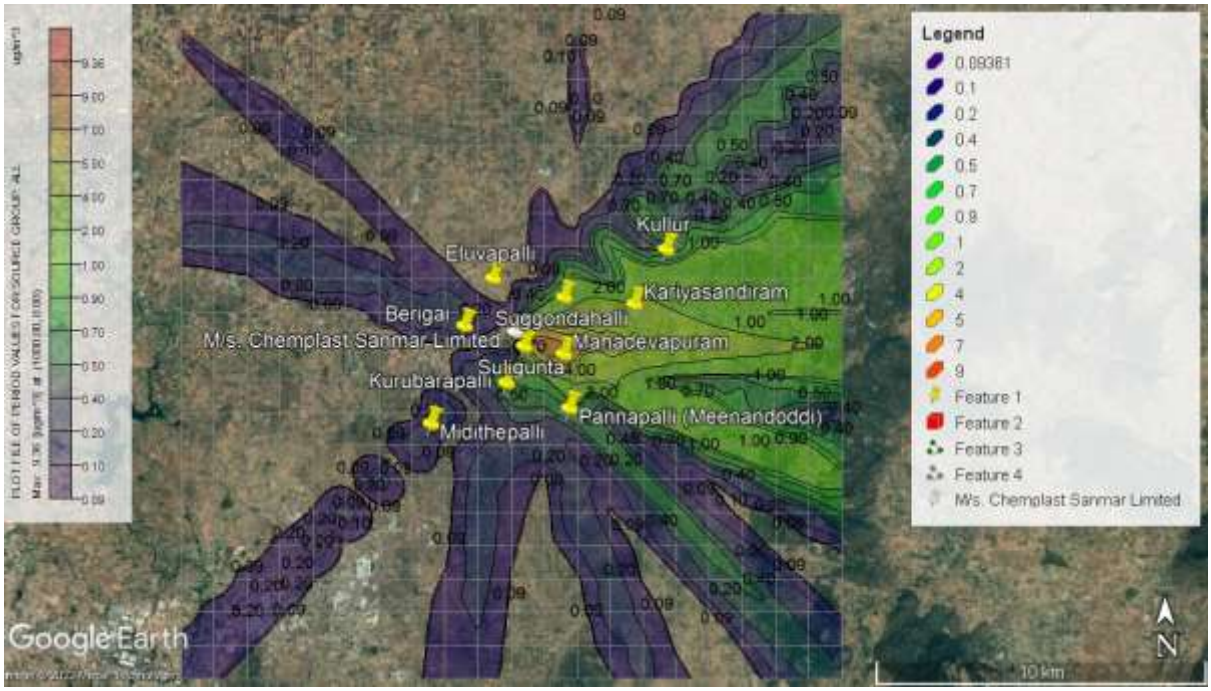


FIGURE-4.2 CONTD.

ISOPLETHS OF PROPOSED NO_x

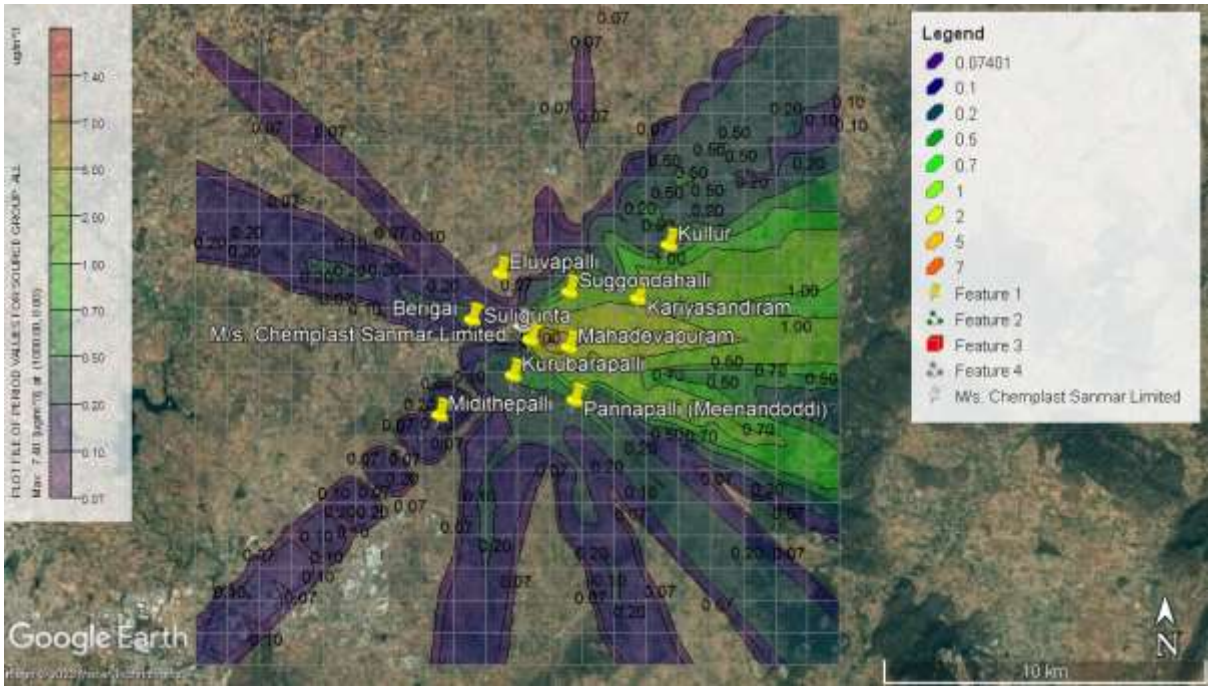


FIGURE-4.2 CONTD.

ISOPLETHS OF PROPOSED CO

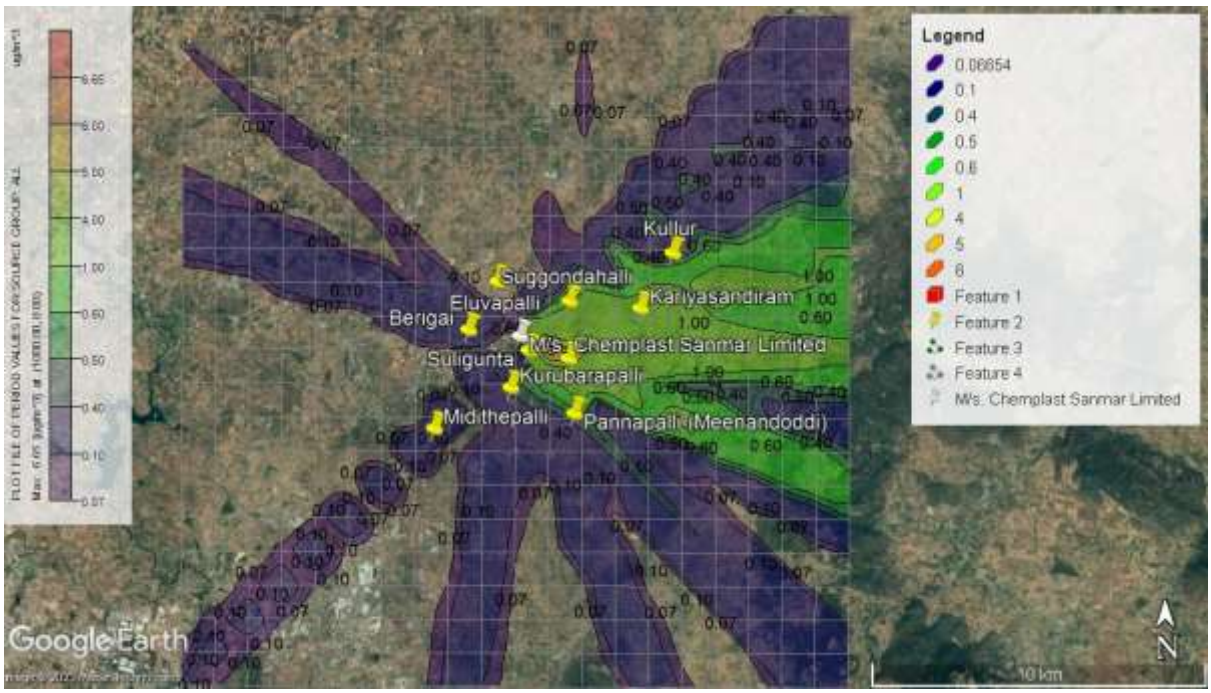


TABLE-4.2

SUMMARY OF ISCST3 MODEL OUTPUT FOR PROPOSED PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO

SR. NO.	LOCATIONS	X, Y CO-ORDINATES		CONCENTRATION				
				PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)
1.	Project Site	0	0	0.00000	0.00000	0.00000	0.00000	0.00000
2.	Berigai	0	-1733	0.06027	0.04018	0.50840	0.03414	0.32741
3.	Suggondahalli	-1600	533	0.05184	0.03459	0.34728	0.27120	0.29045
4.	Kurubarapalli	2267	-400	0.24804	0.16538	2.10356	1.67493	1.35096
5.	Kariyasandiram	1067	3467	0.01763	0.01175	0.13636	0.10771	0.09557
6.	Suligunta	533	-667	0.11410	0.07610	0.86743	0.68533	0.63662
7.	Pannapalli	2400	-1467	0.07882	0.05255	0.67010	0.53363	0.42882
8.	Midithepalli	-3067	-2800	0.03132	0.02089	0.23836	0.18801	0.16982
9.	Eluvapalli	1200	1467	0.10003	0.06670	0.80609	0.63920	0.54544
10.	Mahadevapuram	667	-1600	0.08130	0.05422	0.61782	0.48783	0.44953
11.	Kullur	2533	4667	0.00395	0.00263	0.03414	0.02723	0.02149

As proposed manufacturing activities have not yet started, ground level concentrations calculated for proposed activities are superimposed on existing ambient air quality monitoring results and combined values (Table-4.4) are found within permissible National Ambient Air Quality Standards.

Sr. No.	X, Y Co-ordinates	Maximum Concentration (μg/m3)				mg/m^3
		Proposed PM_{10}	Proposed $PM_{2.5}$	Proposed SO_2	Proposed NO_x	Proposed CO
1.	(1000,0)	1.20873	--	--	--	--
2.	(1000,0)	--	0.80609			
3.	(1000,0)	--	--	9.3611	--	--
4.	(1000,0)	--	--	--	7.40194	--
5.	(1000,0)	--	--	--	--	6.65489

TABLE-4.3

PREDICTED AMBIENT AIR QUALITY FOR PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO

SR. NO.	Sampling Location	PM_{10}			$PM_{2.5}$		
		AAQ Value	Model Value	Predicted Value	AAQ Value	Model Value	Predicted Value
		$\mu g/m^3$					
1.	Project Site	62.21	0.00	62.21	29.21	0.00	29.21
2.	Berigai	56.88	0.06	56.94	26.79	0.04	26.83
3.	Suggondahalli	45.21	0.05	45.26	21.38	0.03	21.41
4.	Kurubarapalli	49.38	0.24	49.62	23.25	0.16	23.41
5.	Kariyasandiram	41.79	0.01	41.80	19.92	0.01	19.93
6.	Suligunta	59.13	0.11	59.24	28.13	0.07	28.20
7.	Pannapalli	46.04	0.07	46.11	21.96	0.05	22.01
8.	Midithepalli	47.08	0.03	47.11	22.42	0.02	22.44
9.	Eluvapalli	54.25	0.10	54.35	25.63	0.06	25.69
10.	Mahadevapuram	43.71	0.08	43.79	20.92	0.05	20.97
11.	Kullur	41.71	0.00	41.71	19.67	0.00	19.67
NAAQS		**100**			**60**		

SR. NO.	Sampling Location	SO_2		
		AAQ Value	Model Value	Predicted Value
		$\mu g/m^3$		
1.	Project Site	10.41	0.00	10.41
2.	Berigai	9.97	0.50	10.47
3.	Suggondahalli	6.71	0.34	7.05
4.	Kurubarapalli	8.25	2.10	10.35
5.	Kariyasandiram	BDL	0.13	0.13
6.	Suligunta	10.41	0.86	11.27
7.	Pannapalli	7.55	0.67	8.22
8.	Midithepalli	6.69	0.23	6.92
9.	Eluvapalli	10.28	0.80	11.08
10.	Mahadevapuram	BDL	0.61	0.61
11.	Kullur	BDL	0.03	0.03
NAAQS		**80**		

SR. NO.	Sampling Location	NO_x			CO		
		AAQ Value	Model Value	Predicted Value	AAQ Value	Model Value	Predicted Value
		$\mu g/m^3$			mg/m^3		
1.	Project Site	18.73	0.00	18.73	0.26	0.00	0.26
2.	Berigai	18.20	0.03	18.23	0.21	0.32	0.53
3.	Suggondahalli	13.62	0.27	13.89	BDL	0.29	0.29

4.	Kurubarapalli	16.55	1.67	18.22	0.22	1.35	1.57
5.	Kariyasandiram	13.12	0.10	13.22	BDL	0.09	0.09
6.	Suligunta	19.10	0.68	19.78	0.28	0.63	0.91
7.	Pannapalli	14.05	0.53	14.58	BDL	0.42	0.42
8.	Midithepalli	13.83	0.18	14.01	BDL	0.17	0.17
9.	Eluvapalli	16.62	0.63	17.25	0.26	0.54	0.80
10.	Mahadevapuram	13.60	0.48	14.08	BDL	0.45	0.45
11.	Kullur	13.36	0.02	13.38	BDL	0.02	0.02
NAAQS		**80**			**4**		

BDL = Below Detectable Limit

Conclusion: Max. GLC value is at village **Kurubarapalli**

Level of PM10 & PM2.5 at village: Kurubarapalli is 49.380 μg/m^3 & 23.250 μg/m^3 and due to proposed project, **Max. incremental GLC of PM10 & PM2.5 –** 0.248 μg/m^3 & 0.165 μg/m^3 will increase at village: Kurubarapalli and **predicted level PM10 & PM2.5 at Village:** Kurubarapalli **–** 49.628 μg/m^3 & 23.415 μg/m^3 respectively. Distance GLC is 2.5 Km from Project Site.

Level of PM_{10}, $PM_{2.5}$, SO_2 and NOx, after prediction also were found within NAAQS.

4.2.3 NOISE ENVIRONMENT

During Construction Phase

Following measures are taken for abatement of noise during construction phase:

- Noise emissions from construction equipment are kept to a minimum by regular maintenance.
- Heavy and noisy construction jobs were avoided during night hours.
- Noise generation due to movement/operation of vehicles and equipment/ machineries are well managed by restricting the movement/operation during night hours.
- Management ensures effective set up of traffic management system in order to minimize the usage of horns and other such equipment which may add to noise generation.
- Further the management decide to restricted the movement of heavy vehicles during night.
- All machineries to be used for construction purpose are of high standard of reputed make and compliance of noise pollution control norms by this equipment are emphasized by the company.
- Further, it also ensures to carried out periodic and regular maintenance of the equipment, machines and spare parts which are including lubrication, replacement of defective parts etc. in order to bring down the decibel of noise to maximum possible extent.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels are also explored.
- Management ensures that no hazard is caused due to noise generation during the course of work. For this purpose, they ensure that the workers are provided with individual protective equipment like ear muffs or ear plugs in areas with high exposure to noise.

During Operation Phase

Following measures are adopted for abatement of noise during operation phase:

- Acoustic laggings, enclosures and silencers are provided wherever necessary for high noise generating equipment.
- Sound proof glass paneling are provided for all operating stations / control rooms as well as for shift rooms at critical places.
- Strict implementation/ compliance of all statutory norms w.r.t. noise generation, occupational exposure is done.
- Noise generating sources in the plant areas shall be monitored regularly. Monitoring of ambient noise levels are be carried out regularly both inside the premises as well as outside the greenbelt.

However, due to the attenuation of noise level within the factory and due to the fact that the project site is situated in a well-developed industrial estate and not in the immediate vicinity of human settlement, significant impact is not expected in the nearest present human settlement. The volume of transport vehicles to be handled is very low. The company shall develop a green belt around the periphery of the premises, which shall act as a barrier to the propagation of noise from the factory premises. This shall further reduce the noise levels appreciably.

4.2.4 HAZARDOUS WASTE MANAGEMENT

Storage of Hazardous Waste:

- Hazardous waste shall not be stored for a period more than 90 days. And shall maintain records and make them available for inspection.
- Store at a designated Onsite-secured area with impervious floor that affords protection from sun & rain fall, spreading of leachate, mixing of wastes etc.

Transportation of Hazardous Waste:

- Properly packed & labeled waste transport through dedicated vehicle to a captive facility/ authorized TSDF facility.

4.2.5 INFRASTRUCTURE AND SERVICES

The plant is located in a well-developed industrial area, which has all essential facilities such as water, power, fuel, post, telecommunication, bank, etc. M/s. Chemplast Sanmar Limited shall get water from CGWA or government water source and re-use. The Power requirement will be 14000 KVA from State Electricity Department . The transportation of raw materials and finished products shall be by road. As stated earlier, the site is adjacent to State Highway. As a result of proposed project there will be a marginal increase in transportation activity as compared to present total traffic up to plant premises. As a result of development of industrial estate, the neighboring areas have developed for commercial use. The infrastructure services e.g. roads, state transport, post and telegraph, communication, education and medical facilities, housing, etc. have improved in the surrounding areas in recent years.

4.2.6 ENVIRONMENTAL HAZARD

Raw material such as different chemicals etc. shall be transported by road and are stored in the plant premises. On site emergency plan are prepared for storage and handling of hazardous chemicals and also be submitted to relevant authorities. This report are prepared with the consideration of hazards associated with the chemicals and taken care for all aspects of environmental hazards. The project proponent has consider all the safety aspects in planning, designing and operation of the plant as per standard practices. Hence, no adverse impact on this account is anticipated.

4.2.7 HOUSING

Enough number of dwellings are available in the town for accommodating extra workforce. On neighboring towns or villages, the impact on this account is minimal.

4.2.8 ECOLOGY

The impact due to operation of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity could be summarized as below.

4.2.8.1 NATURAL VEGETATION

The industry has develop a green belt on the surrounding periphery. Since the effluents and emissions generated from the project activities will be treated and disposed as per the EMP provisions. Therefore any adverse impact over any of the ecological components of the environment is reduced to minimum.

4.2.8.2 CROPS

Since, the project is on a non-agricultural land, it shall not alter the crop production of the area. Further, the necessary environmental protection measures have been planned under EMP e.g. air pollution control systems shall be designed to take care of even emergency releases of the gaseous pollutants and regular environmental surveillance shall be done, so as not to have any short-term or cumulative effect on the crops and the natural vegetation of the area.

4.2.8.3 FISHERIES AND AQUATIC LIFE

Since the effluents and emissions generated from the project activities shall be treated and disposed as per the EMP provisions, proposed project shall not envisage any adverse effect on fisheries and aquatic life.

4.2.8.4 AESTHETIC ENVIRONMENT

The project will be developed on industrial land with good landscape and plantation. Increase in fugitive emission due to very limited construction activities and increase in the vehicular movement due to the proposed project may have minimal adverse impact on the visual quality. However, this impact can be minimized with implementation of an environment management plan. The proposed activities and further plantation will enhance the aesthetic environment.

4.2.8.5 DEMOGRAPHY, ECONOMICS, SOCIOLOGY AND HUMAN SETTLEMENT

M/s. Chemplast Sanmar Limited will generate direct and indirect employment as per prevailing norms of state government for skilled and unskilled people for the proposed expansion project for manufacturing pesticide & pesticide intermediate. There is a positive effect due to improved communication and health services, which have lead to economic prosperity, better educational opportunities and access to better health and family welfare facilities. There has been a beneficial effect on human settlement due to employment opportunities from various industries in region in addition to employment generated by

M/s. Chemplast Sanmar Limited proposed expansion project more direct and indirect employment will be generate.

Local quality of life has improved. This factor combined with all other mitigation measures, like proper treatment and disposal of hazardous waste; liquid effluent and gaseous emission, has minimized the adverse impact on ecology and has a beneficial impact on human settlement and employment opportunities. There has been a beneficial impact on the local socio-economic environment. There shall be no displacement of any population in plant area. Any major activity that may lead to resettlement of the people is considered as permanent impact. Hence, there is no permanent impact on this account. The increasing industrial activity will boost the commercial and economical status of the locality up to some extent.

Socio-Economic Environment

Environmental Impact Assessment is a study or an estimate of the probable positive or negative impact a proposed project or activity on the environment, consisting of natural, social and economic aspects. An assessment of socio-economic environment forms an integral part of an EIA study. Therefore, base-line information for the same was collected during the study period. The base-line Socio-Economic data collected for the study region has been identified in four major indicators namely - Demography, civic amenities, Economy and social culture.

Employment:

During construction phase of the company, skilled and un-skilled manpower were required and their requirement met with from the local community. The manpower requirement for the proposed project will generate permanent and secondary jobs for the operation and maintenance of plant. M/s. Chemplast Sanmar Limited will give direct employment to 1350 Nos. (Existing – 350 Nos. + Proposed – 1000 Nos.) local people based on qualification and requirement. In addition to direct employment, indirect employment shall generate ancillary business to some extent for the local population. With the employment opportunities, local people's income will increase and thereby, their economic status will boost up. Further, secondary jobs shall also increase in the local area to provide day-to-day needs/services to the working men. Demand for essential daily utilities in the market will also temporarily increase to some extent.

Public Health:

During construction period the workers will be provided wills safe water supply, low-cost sanitation facilities, first Aid Treatment, necessary personal protective equipment etc, to prevent an increase in diseases related to personal hygiene. With some other industrial units coming up in the surrounding area, Govt. dispensary, medical check-up, medicines,

services of nurses & doctors etc. are likely to be increased with a view to taking care of general health of the local community.

Transport:

With increased employment opportunities and higher economic status of the local community and with an increase in market conditions, transport facilities by way of buses, two-wheeler & four-wheeler vehicles will develop in future. Thus, overall development of the local community and their health is likely to become a matter of fact with the co-operation and support of industrial organizations of the local area. There is likely to be a beneficial impact on the local Socio-Economic environment. There shall be no displacement of any population in the plant area. The increasing industrial activity will boost up the commercial and economical status of the locality to some extent. To control the emission from process and utility stacks, the company would regularly examine, inspect and test its emission to make sure that the emission is below the permissible limit. With this, the status of sanitation and community health of the area would not change.

4.2.8.6 FOREST, NATIONAL PARKS / SANCTUARIES

There is no reserved forest & no national park or sanctuary within 10 km radius of the plant. There shall be no impact on the same.

4.2.8.7 PLACES OF ARCHAEOLOGICAL/HISTORICAL/RELIGIOUS/TOURIST INTEREST

There is no place of archaeological, historical, religious or tourist interest within the study area i.e.10 km radius of plant site. Hence, there shall be no impact on places of interest.

4.2.8.8. BENEFICIAL IMPACT OF GREEN-BELT

Plants grown in such a way as to function as pollutant sinks are referred to as green belts. Green belts are an effective tool in mitigating air pollution as they form a surface capable of absorbing air pollutants and forming sinks for pollutants. Leaves with their vast area in a tree crown, absorb pollutants on their surface, thus effectively reduce their concentrations in the ambient air. Apart from functioning as pollutant sinks, green belts provide other benefits like aesthetic improvement and providing possible habitats for birds and animals, thus re creating hospitable nature in an otherwise drab urban- Industrial scene. An important aspect of a green belt that is to be considered is that the plants constituting green belts are living organisms with limits to their tolerance towards air pollutants. As a result crossing the threshold limits in terms of pollution load, would lead to injury to plants causing death of tissues and reducing their absorption potential. Thus green belt is effective as pollution sink only within the tolerance limits of constituent plants.

Advantages of Green-Belt:-

- Air Pollution control- Trees help in removing carbon dioxide and other pollutants from air and by release of oxygen into the air thereby improving air quality. A green belt development can also help in removing particulate matter from the air by trapping such particulate matter.
- Noise control- A green belt reduces the intensity of sound. It functions as a barrier. Trees can either deflect, refract or may absorb sound to reduce its intensity. The intensity reduction depends on the distance sound has to travel from source. Trees can also modify suitably the humidity and climate which affects sound intensity.
- Help in soil erosion control. Plant species help in improving soil quality and bind soil particles thereby preventing erosion. Green belts also help in containing water run offs.

4.3 IMPACTS ON HUMANS

Positive Impact:

The unit will generate the local employment for the proposed project. The project is likely to give a boost to the economy of the area and provide primary and secondary sectors employment to local people.

Project will lead to development of ancillary industries and an overall economic growth of nearby towns to supplement the population of the area.

Project proponent will ensure to connect even last people with the infrastructural facility like educational, health, road etc in the locality.

Other needs and social-economic aspects of local inhabitants will be dealt with CSR activities & CER activities in the region.

Negative Impact:

There will be transformation of many aspects of human life like social structures, livelihood pattern, health institution, education etc which is subject to realization and behavioural change of the Project Affected Family (PAFs).

4.4 IMPACT AND MITIGATION MEASURES OF GEOLOGY

Impact:

During Operation, Accidents and risk assessments - Changes in soil chemistry due to addition of foreign material due to system failures and/or accidents.

In case of accidents mentioned in the risk scenarios proper actions will be taken according to the mitigation measures.

Storage, Transportation and Handling of Construction and other Raw Material and Hazardous Waste - Changes in soil texture will lead to change in porosity, permeability & other such physical characteristics of soil of the area.

Mitigation Measures:

Properly lined/paved area for the works having potential of leakage/spillage of fuel or material like area for Storage of construction and other raw material etc. Proper mitigative measures like use of efficient pollution control systems, proper stack height, use of top soil in plantation results in no significant impact on soil of the core zone. There will be no impact on soil of the study area located beyond the working area of the proposed project. Soil samples will be collected and tested at regular intervals from the nearby areas. This will help in mitigation of any harmful impact on soil due to the project activity, if any. Transportation of hazardous waste will be done as per CPCB Guidelines. The dumpers will be covered to prevent spillage or dusting. The drivers will be imparted training. The containers/ dumpers will be marked with the name of TSDF where it is to be sent, contact details and the other details required.

4.5 IMPACT AND MITIGATION MEASURES OF GEOHYDROLOGY

Impact:

Temporary contamination of groundwater may occur due to leakage and spillages. The existing water level is less than 10 m hence care is required during the transportation and storage. Contamination of groundwater may occur due to existing water level during any kind of accidents or leakage. This will affect villages located around the site and crops may also get affected.

Mitigation Measures:

Properly lined/paved area for the works having potential of leakage/spillage of fuel or material like area for Storage of raw material etc. Transportation of hazardous waste will be done as per CPCB Guidelines. The dumpers will be covered to prevent spillage or dusting. The drivers will be imparted training. The containers / dumpers will be marked with the name of TSDF where it is to be sent, contact details and the other details required.

Plant water/ wastewater treatment and its conveyance system shall be designed and proper monitoring and care shall be taken for effective management of treated effluents.

4.6 IMPACT ON ECOLOGICAL ENVIRONMENT

There will be negligible impact on Ecology and Biodiversity of the study area as the project site is located outside Notified Industrial Estate of and the unit will not be disposing any effluent on land or water body.

The land at present is barren and does not support any flora & fauna. After the commissioning greenbelt of approx. 33% developed around the periphery of the projects site which will have positive impact since it will support various Faunal & Floral diversity.

Also greenbelt will help in purifying the air and reduce noise pollution Greenbelt will increase the aesthetic value of the site and increase employment.

Hence the proposed project will create positive impact on EB environment by increasing the green area of the region.

4.7 TRAFFIC MANAGEMENT

Impact of Transportation

The vehicular traffic of trucks will increase during the construction phase. There will be increase of 4 trucks, 219 cars, 23 bikes per day and may cause additional air pollution to the surrounding areas. The effects may be more prominent.

During Operation, Trucks, tankers and other vehicles may cause traffic jam outside and within the premises and cause additional air pollution.

Mitigation Measures:

This will be temporary and restricted to construction phase only. However proper traffic management will be followed as per the specified norms.

A well-developed main road and internal road are made and having carrying capacity to take care of additional traffic due to proposed project.

Therefore no additional roads will required to be constructed therefore there will not be any change in land use of the study area.

However, Separate entry and exit gate shall be provided and trained security guards shall be deployed to ensure proper management and movement of vehicles within premises. Internal RCC road along with signboard of traffic sign will be provided. Traffic rules and discipline shall be strictly implemented.

Adequate internal road of will provided for uninterrupted movement of fire tender.

Speed break bumper shall be provided on internal road at regular interval to avoid over speed.

No vehicles will stop near weight bridge, wheel washing area after completion of activities.

To prevent Road accident following precautions to be taken :

- Transportation of waste/raw materials/ products by only authorized vehicles
- Regular training to drivers
- Organize awareness program
- Implementation of MSDS and TREM card

4.8 MATRIX REPRESENTATION

The parameters discussed are presented in the form of a matrix. The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

4.8.1 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative impact chart presented in Table-4.5. Any particular parameter having an individual score greater than 5 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures. It is evident from the matrices that the resultant impact is beneficial to the local population.

The scores for various parameters and activities are presented in Table 4.5.

TABLE – 4.4

ENVIRONMENTAL IMPACT MATRIX

Activities	Environmental Parameter										
	Air Quality	Noise & Odour	Water Quality	Land Environment	Infrastructure	Services	Environmental Hazard	Housing	Terrestrial Ecology/ Land use	Socioeconomic Status	Aquatic Ecology
Water Requirement	0	0	1	0	1	1	1	0	0	1	1
Effluent Discharge	0	0	0	0	1	1	0	0	0	0	0
Gaseous Emissions	1	0	0	0	0	0	1	0	1	0	0
Fugitive Emissions	1	0	0	0	0	0	1	0	1	0	0
Solid Waste Disposal	1	0	1	1	1	1	1	0	0	0	0
Raw Material Storage/ Transport	1	1	1	2	2	1	1	0	1	1	1
Raw Material Handling	1	1	0	1	0	0	1	0	1	0	0

Product Storage	1	0	0	1	0	0	1	0	0	0	0
Spills & Leaks	1	1	1	1	1	1	1	0	1	0	0
Shut down/ Start up	1	1	1	0	1	1	0	0	1	1	0
Equipment Failure	0	1	1	0	0	1	1	0	1	0	0
Plant Operations	1	1	1	0	1	1	1	1	1	1	0
Transport of workers	1	1	0	0	1	1	1	0	1	1	0
Movement of Vehicles	1	1	0	1	1	1	1	0	1	1	0
Housing Needs	0	1	0	1	1	1	0	1	0	1	0
Utilities	1	1	1	0	0	1	1	0	0	0	0
Cumulative score	**12**	**10**	**8**	**8**	**11**	**12**	**13**	**2**	**10**	**7**	**2**

TABLE – 4.5

CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	**TOTAL CUMULATIVE SCORE**
Air Quality	12
Noise and Odour	10
Water Quality	8
Land Requirement	8
Infrastructure	11
Service	12
Environmental Hazards	13
Housing	2
Terrestrial Ecology/ Land use	10
Socio Economic Status	7
Aquatic Ecology	2

Significance of impacts can be calculated based on Cumulative Score. The maximum cumulative score will be 13. The significance has been calculated as below:

0 to 15	Adequate
15 to 25	Inadequate

It is observed from the Table 4.5, cumulative impact chart that the cumulative score of each of the environmental parameters for all activities are well within the limit. Therefore, it is concluded that, if the proper mitigation measures are taken for identified impacts, no adverse cumulative impact is envisaged due to project.

SUMMARY

Regular water sprinkling on roads and regular vehicular maintenance is done to reduce fugitive emissions during vehicle movements. Vehicles having PUC certificates will only be allowed to transport materials, equipment's and will be closed/ covered with tarpaulin sheet to avoid dust dispersion at site. Company is using Furnace Oil & Diesel for existing Boiler, Thermic Fluid Heater & D.G.Sets. After expansion, Company will use Imported Briquettes/ Furnace Oil & Diesel as fuel for proposed Boiler, TFH, & D.G.Sets. Mechanical Dust collector & Stack is provided to control flue gas emission.

After expansion, Company will provide Mechanical Dust collector or ESP + water scrubber & Stack to control flue gas emission. Adequate Scrubber system will be provided to control process gas emission and to mitigate the impact of air pollution. Unit has provided separate entry and exit for the smooth traffic movement. Power requirement supplied by State Electricity Department and D. G. set will be used only in case of power failure. The Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/PWD available and remaining 1000 KLD applied to get from government water source. The total wastewater generation will be 705 KL/Day and will be segregated into two stream High COD Stream & Low COD stream. Solid/ hazardous wastes will be disposed as per Hazardous waste rules, 2016. Approximately 1350 people [Existing: 350 people + proposed: 1000 people] will be employed to local skilled and unskilled people based on qualification and requirement and preference will be given to local person for fulfilment of the manpower requirement.

CHAPTER – 5
ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

5.1 ANALYSIS OF ALTERNATIVES (TECHNOLOGY)

- Existing Manufacturing facility is well equipped with advanced technologies and this project is just the expansion similar to existing facility.
- We have well equipped and established R&D to develop and scale up the new products from the group of Synthetic Organic chemicals and Pesticide intermediates.
- We have both Technical and non-technical man power in existing facility and hence readily available to oversee the expansion and commissioning.

5.2 ANALYSIS OF ALTERNATIVES (SITE)

No other sites were considered for the proposed expansion project for the following reasons,

- Land of the existing site is classified for the industry usage.
- Adequate land is available adjacent to the existing site for the expansion.
- No rehabilitation or resettlement of local people required.
- All the existing amenities like transportation of materials, fuels, waste disposal, etc... Can continue as such for expansion project.

CHAPTER - 6

ENVIRONMENTAL MONITORING PROGRAM

6.1 PROJECT ENVIRONMENT MONITORING PLAN

M/s. Chemplast Sanmar Limited will adopt comprehensive environmental monitoring plan which is essential to take into account the changes in the environment.

The objective of monitoring is:

- To verify the result of the impact assessment study in particular with regards to new developments.
- To follow the trend of parameters which have been identified as critical
- To check or assess the efficiency of controlling measures
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new project.

To monitor effectiveness of Control Measures:

- Monitor daily, assess effectiveness of the Control Measures being implemented, Explore the need to modify or add new Control Measures particularly if a violation is observed & Report weekly.
- Regular monitoring of environmental parameters will be made to find out any deterioration in environmental quality.
- Monitoring of the proposed project area will be regularly conducted. The attributes, which merit regular monitoring, are specified underneath.

6.2 LABORATORY FACILITIES

M/s. Chemplast Sanmar Limited has developed its own laboratory equipped with different equipment i.e. analytical balance, pH meter, COD digester (heating) apparatus, oven, incubator, Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC),Liquid chromatography with Mass Spectrophotometer (LCMS),TDS meter, Filter Kit, KF titrator, moisture detector and necessary glass-wares. Equipment of quality control laboratory is also available for analysis of environment parameters**. M/s. Chemplast Sanmar Limited** has made plan of the regular monitoring to ensure that pollution will be limited to below prescribed limits and to take corrective action. In case the monitored results of environment pollution shall be found to exceed the prescribed limits, remedial actions shall be taken through the concerned plant authorities.

6.2.1 DOCUMETATION & RECORDS

The environmental department with respect to operation of pollution control facility is being/will maintain following records:

- Instruction manual for operation and maintenance of pollution control equipments.
- Log sheet for self-monitoring of pollution control equipments.
- Manual for monitoring of Air, water for ambient conditions.
- Instruction manual for monitoring of water, solid and gaseous parameter discharged from the factory and also for various parameters of pollution control facilities.
- Statutory records as per the Environmental Acts.
- Monthly and annual progress reports.
- Medical checkup of employees.
- Regularly these documents & records shall be reviewed for necessary improvement of the monitoring plan/mitigation measures/environmental technologies as well as for necessary actions of Environmental Management Cell.

6.3 POST PROJECT MONITORING PLAN

Environment monitoring plan for proposed plant has described in Table-6.1 along with Environment Components, parameter, standards to be followed, location and frequency.

TABLE - 6.1

PROJECT ENVIRONMENT MONITORING PLAN

Environmental Component	Parameters	Standards	Frequency
Air Environment			
AAQM at plant site	PM2.5, PM10, SO2, NOx, CO, HCl and VOC monitored at six location within premises	Prescribed by CPCB	Once in a month through NABL Lab.
Stack emission monitoring	Parameters prescribed by TNPCB of Flue Gas emission (PM_{10}, SO2, NO_x, CO) and Process Gas Emission (PM_{10}, SO2, NO_x, CO & HCN)	Prescribed by TNPCB	Once in a month by NABL Lab.
Fugitive emissions/ work place monitoring within the plant side	VOC	Prescribed by TNPCB	Once in a year by NABL Lab using LDAR study
Water Environment			
Treated effluent water and STP outlet	Parameters prescribed by TNPCB	Water quality Standards	Once in a month by NABL lab
Ground water quality	Monitored at six locations within premises as per Parameters prescribed by TNPCB	Water quality Standards	Once in a month by NABL lab
Noise Environment			
Ambient Noise at plant site	Noise level in dB(A) will be monitored at the six locations within premises	As per National Noise Standards	Once in a Month
Soil Environment			
At plant site	Analysis of pH, conductivity, Sulphates, calcium, magnesium, Cl-, AOX monitored at six location within premises	--	Once in a year by NABL lab

Meteorological data			
At plant site	Monitoring of Wind direction & velocity, relative Humidity, temperature and Rain fall	-	Daily basis at in-house
Occupation Health Check-Up			
At plant site	Pre-employment and periodical health checkup	--	Once in six months
Greenbelt Development			
At plant site	Number of plantation (Units), Number of Survived Plants/ Trees, Number of Poor plant/ Trees	--	Once in quarter
Hazardous Waste Generation Monitoring / Record Keeping			
At plant site	Records of generation, collection,, storage, transportation and disposal of hazardous/solid waste	--	To be updated daily
Compliance of EC Conditions			
Submission of 6 monthly EC compliance report		--	Every Six Month – June and November

6.3.1 MONITORING METHODOLOGIES

Monitoring of environmental samples shall be collected as per the guidelines provide by MoEF&CC/ CPCB/ TNPCB. The method followed shall be recommended/standard method approved/recommended by MoEF&CC/ CPCB.

Method of Environmental Sampling & Analysis

Attributes	Method	
	Sampling / Preservation	**Analysis**
A. Air Environment 1. Micro meteorological data 2. Ambient Air Quality	Mechanical/automatic 1. Mechanical or automatic weather station/Meteorological Department 2. Samplers (Designed as per USEPA) to collect $PM_{2.5}$, PM_{10} and the gaseous samples	-- Standard methods such as IS - 5182 & CPCB guideline, ASTM, etc.
B. Noise	Instrument: Noise level meter	--

6.4 ENVIRONMENT POLICY

SANMAR

CHEMPLAST SANMAR LIMITED

Custom Manufactured Chemicals Divn.

OCCUPATIONAL HEALTH, SAFETY, ENVIRONMENT AND QUALITY POLICY

Chemplast Sanmar Limited (Custom Manufactured Chemicals Divn), Berigai, has established and applies an Occupational Health, Safety, Environmental and Quality (OHSE& Q) Management System for the Development and Manufacture of Active Pharmaceutical Ingredients, Drug Intermediates, Speciality Chemicals and Phytochemicals.

Chemplast Sanmar Limited (Custom Manufactured Chemicals Divn), is committed to combine integrity with excellence to ensure prosperity to all the stakeholders on continuous basis and improve its OHSE&Q Management System and Wellbeing performance with emphasis on

- **Compliance with the applicable legal and other requirements including Responsible Care code and Together** for Sustainability (TfS) of practices pertaining to Occupational Health, Wellbeing, Safety, Environment and Quality aspects.
- **Clear assignment of Roles, Responsibility, Accountability and Authority and providing resources, information,** instruction, supervision, training and knowledge to all the employees and contractors to improve their awareness and competencies.
- **Identifying and managing risks and opportunities throughout the organisation their by inculcating safe** working practices to prevent injuries, ill health and to ensure Occupational Health, Wellbeing and Safety at workplace by identification, eliminating the hazards and reduces the risk.
- **Regular monitoring, measuring and evaluating the Occupational Health, Wellbeing, Safety, Environment and** Quality performance for continual improvement.
- **Conducting periodic audit, assessment of Occupational Health, Wellbeing, Safety, Environment and Quality management by relevant techniques and analyze to take corrective and preventive actions.**
- **Encouraging consultation, communication, participation and respond effectively by recognizing the views of** the employees and contractors, relevant interested parties and stakeholders in periodic reviews of the Occupational Health, Wellbeing, Safety, Environment and Quality Management System.
- **Systematically determine the customer requirements and strive for continuous improvement of our people,** our processes and our products to meet the customer's satisfaction.
- **To ensure continual improvement in all its management systems by setting Occupational Health, Wellbeing, Safety, Environment and Quality objectives and achieving the same by planning, providing adequate** resources and technologies.
- **Consideration of Occupational Health, Wellbeing, Safety, Environment and Quality aspects in Product** Development, Purchase, Manufacture, Storage, Transport and Waste Disposal activities.
- **Protecting the Environment and Prevent Pollution by minimizing Waste through Process optimization,** Reduction, Recovery, Reuse and Recycle.

The Occupational Health, Wellbeing, Safety, Environment and Quality Policy will be communicated within the organisation and made available to interested parties.

The Policy will be reviewed for its adequacy once in two year or earlier if required.

R. Krishna Kumar

Dr. Krishna Kumar Rangachari
Deputy Managing Director
Date: 29/08/2022

Rev No:10

6.5 ENVIRONMENTAL MANAGEMENT CELL

Apart from having an environmental management plan, it is also necessary to have a permanent organizational set up charged with the task of ensuring effective implementation. In this effect, **M/s. Chemplast Sanmar Limited** will assign responsibilities to officers from various disciplines to co-ordinate the activities concerned with management and implementation of environment control measures.

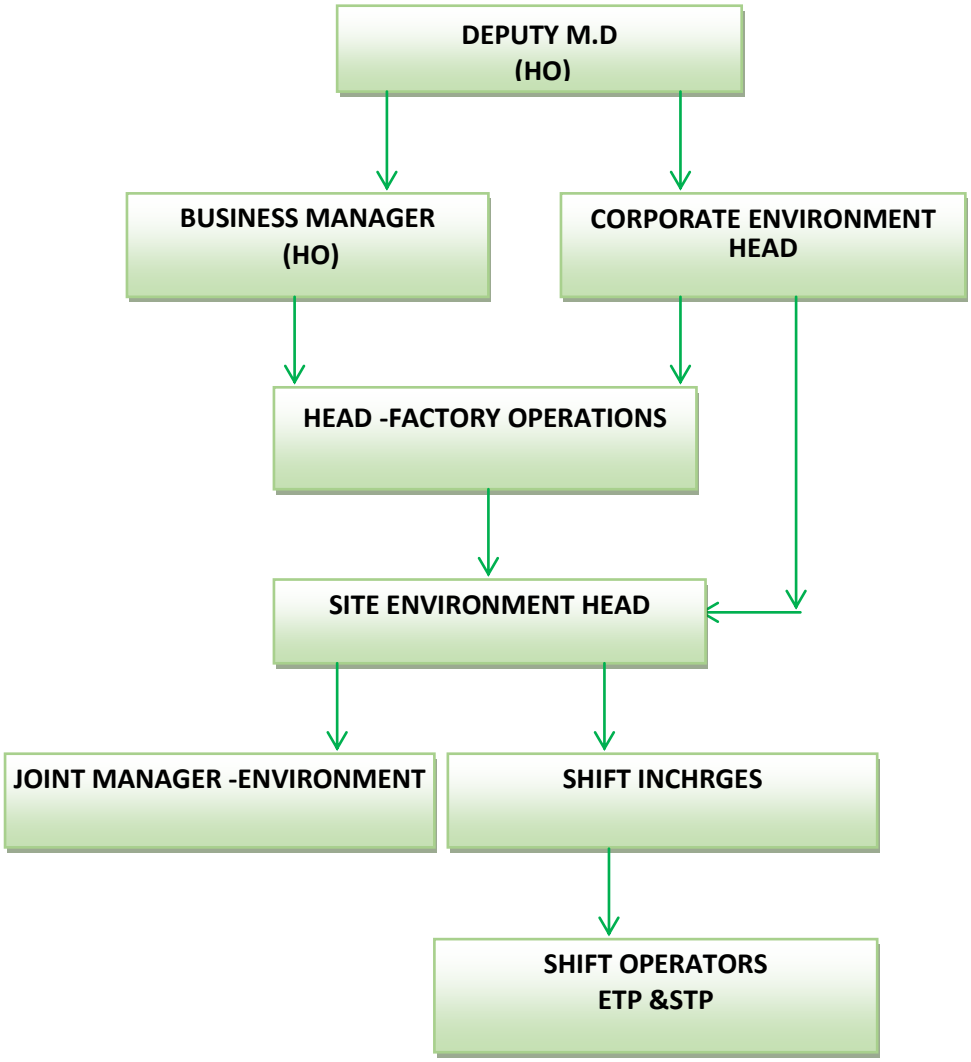
An organogram of environment management cell is shown in Figure 6.1. This department shall undertake the monitoring of environment pollution level by measuring stack emissions, Ambient air quality, water and effluent quality, Noise level, etc. either departmentally or by appointing external agency whenever necessary.

M/s. Chemplast Sanmar Limited will carry out the regular monitoring in future as well as ensure that pollution is limited below prescribed limits and shall take corrective action by providing new pollution control equipment if required. In case the monitored results of environment pollution are found to exceed the prescribed limits, remedial actions are taken through the concerned plant authorities. The actual operation and maintenance of pollution control equipment of each department is under respective department heads.

The environmental department shall also look after preparation and submission of Water Cess Return, Environmental statement and Consolidated Consent & Authorization application/ renewal under water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, Ambient Air Quality as per NAAQS Standards, 2009 and Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 under Environment Protection Act, 1986.

FIGURE - 6.1

ORGANOGRAM OF ENVIRONMENT MANAGEMENT CELL



6.6 SYSTEM OF REPORTING OF NON COMPLIANCES / VIOLATIONS OF ENVIRONMENTAL NORMS TO THE BOARD OF DIRECTORS OF THE COMPANY AND / OR SHAREHOLDERS OR STAKEHOLDERS AT LARGE.

Company have a system of reporting of non compliances / violations of environmental norms to the Partner

- Operators will be responsible for Operation of EHS system. If any problem will be observed in operation, then the operator will report the same to the shift in-charge.
- Shift in-charge will be responsible for implementing HSE Management Programs. If any non-compliances/ violations of environmental norms will be observed, then the shift in-charge will report the same to the Site Environmental Head
- Site Environmental Head will be responsible to define and monitor the key characteristics for measure of performance in production, maintenance and EHS. Site Environmental Head is responsible to report the non-compliances received to Head factory operation.
- Head factory operation (Plant Manager) will have overall responsibility for effective implementation of Occupational Health, Safety & Environment Management System (OHS & EMS) and the Head factory operation will conduct management review every twice a month to assess the effectiveness of HSE Management System. If necessary, resources will be allocated for taking Corrective and Preventive action on Non-Conformance within time period. Head factory operation is responsible to report the non-compliances received to Top management (Business manager, Corporate Environmental Head, Deputy MD).
- Top management (Business manager, Corporate Environmental Head, Deputy MD) will advise and monitor the establishment and implementation of HS & EMS.
- Verification activities, including internal HSE Audits shall be carried out at the direction of Head factory operation & \ Top management.

CHAPTER - 7

ADDITIONAL STUDIES

In order to support the environment impact assessment and environment management plan, following additional studies have been included in the report.

- Risk assessment
- Disaster Management Plan
- On-site and off-site emergency action plan
- Occupational Health and Safety Management System

7.1 PUBLIC HEARING

The TNPCB has conducted the Public Hearing/public consultation, as per the provisions of EIA notification, 2006. Public consultation for this project was conducted on **12th May 2023** at 10:30 A.M. at **HMS Mahal, 4/1332, Berigai Checkpost, Shoolagiri Road, Berigai, Shoolagiri Taluk, Krishnagiri (DT.) Pin Code – 635105** which was presided over by the **Sub Collector, Hosur (Representative of the District Collector, Krishnagiri) and District Environmental Engineer of TNPCB, Hosur** attended by Assistant Engineer of TNPCB.

The public hearing was attended by 134 nos. of Person from local resident, experts and representatives of company management.

Requisite publicity through local newspapers/ media i.e. **The New Indian Express (in English) & Daily Thanthi (in local language Tamilnadu),** Dated **07th April 2023** was given 30 days in advance of the date.

PUBLIC HEARING MINUTES OF MEETING & ITS ACTION PLAN WITH BUDGET AND TIMELINE

Sr. No.	Name and Address	Point Represented and/or written submission	Reply given by the representative of project proponent and concerned officer	Reply given by concerned officer	Action Plan along with budgetary allocation
1	Thiru. Seenapa, Head Master, Panchayat Primary School, Sulikunda Village	• Thiru. Seenapa, Head Master of Panchayat Primary School welcomed all those who attended the Public Hearing Meeting and he said that nearby schools and villages got benefited through M/s. Chemplast Sanmar Limited and he thanked for giving this opportunity	• The representative of unit replied that the cost of expansion activity is around Rs. 2000 Crore in which 10% is CSR fund, from this fund 15 Crore Rupees will be spent to provide basic facilities for the nearby villages. Now, the plant is equipped with sophisticated and continuous monitoring techniques based air pollution control devices so that the changes in the plant operation can be monitored and controlled immediately. Hence, the problems that prevailed	--	Company will contribute 0.25 % of the additional project cost (i.e. 2000 Crore) for the CER activity and CSR fund will be provided by the company in the surrounding villages within the 2 or 3 years of time period after getting EC & CTE.
2	Thiru. Venkatesappa, V. Sigarapalli Village	• Thiru. Venkatesappa has said that he use to get a lot of job works from M/s. Chemplast Sanmar Limited such as setting up of bus shelter, construction of road for public and painting works for Government Schools and temples in the nearby villages.			
3	Thiru. Sonnepalliyappa,	• Thiru. Sonnipalliyappa, B. Kurubarapalli village mentioned that			Company is providing the CSR activities in the nearby

	B. Kurubarapalli	12 years ago M/s. Chemplast Sanmar Ltd has helped to resolve the water shortage of B. Kurubarapalli Village people by constructing bore wells and pipelines. Also, they agreed to provide pure drinking water facility and painting for schools in nearby villages of B. Kurubarapalli Village, V. Sigarapalli Village, Sikkanapalli Village and Suligunta Village. Then he asked to provide similar facilities in the other villages surrounding the unit of M/s. Chemplast Sanmar Ltd. He also asked to fulfil the other basic needs of B. Kurubarapalli, Panapalli, Berigai Village people. Further, he added that since the unit has provided high technology equipments, they have now resolved the odour problem persisted 20 years back.	20 years back will not occur.		areas and shall continue to do so.
4.	Thiru. Bethalappa, B. Kurubarapalli Village	• Thiru. Bethalappa said that, M/s. Chemplast Sanmar Ltd provide necessary facilities in the school for the students of 11th and 12th in the village, he also mentioned that	• The representative of M/s. Chemplast Sanmar Ltd has said that, the company will give preference to those who	• **The Sub Collector, Hosur** The Sub Collector,	--

		agriculture is the main work for the people in and around the villages of unit. Further, he added that most of the members who are attending the meeting were farmers. He requested the unit to carry out a research about the insects which affects cultivation of mango flowers in Hosur Taluk and produce pesticides to help farmers. Also, he told that he has raised this issue infront of the District Collector during Agri Grievance Day petition.	have studied Diploma (Chemical Technology), Master's Degree in Chemistry, Degree in Chemical Engineering. Also, our company's preference is to recruit locally qualified individuals. Because, they will continue to come for work without any break and it will be great benefit to the company. Since the employment camp is conducted only in Hosur and not in other places like Chennai and Bangalore. So, that the candidate from Krishnagiri can easily participate in interview.	Hosur said that, during recruitment, inform the local public in advance about the job vacancies and job qualifications. Therefore, local people can benefit by knowing the employment information through this, she also requested the local people to make proper use of these employment camps.	
5.	Thiru. Radhakrishnan, Ex Service Man, Madivala Village	• Thiru. Radhakrishnan said that, a lake is located 1 km from their village and 500 meters from M/s. Chemplast Sanmar Ltd. He also said that, if it is properly cleared and maintained, it will benefit to the agricultural activity of nearby villages. Also, the unit has not provided any assistance to their village, so he requested to fulfil this request.			Company will contribute Rs. 1.50 Crores to desilting of lakes and improve beautification of surrounding pond or lake within a year. Also, Company will properly maintain the same.
6.	Thiru. Murali Kumar, Berigai	• Thiru. Mural Kumar has pointed that, "the management said			Action plan for odour control:

	Panchyat	that, Corporate Social Responsibility (CSR) fund is about Rs. 7 crore per year". They said that, they have helped the village a lot. But, there is no year-wise breakdown of expenses shown in the presentation. He said that he studied in Berigai Government School in the year 2010 and this school is located at a distance of 1 km from the Industry. Also, he said that, still there is a problem of bad odour arises in the company presently, the annual production of the company was 1600 tons, now it has proposed to increase by 16 to 17 times and it is about 20,000 tons. He asked how the problems caused by the proposal expansion will be solved by the unit. Further, He also said that, the company does not provide employment to the villagers here. Further, he informed the Sub Collector, Hosur that, he had no objection to the proposed expansion of the plant, provided that the			• All liquid raw materials will be charged into Reactors with pumps or under gravity through closed pipes. • Closed loop handling will be carried out. • Suction Hoods will be placed near the Man-holes & Charging funnels of Reactors & Filters so that chemical vapors and dust do not escape into the Plant & surroundings, when the man-hole covers are opened for inspection or charging of RM. • All storage tanks of low boiling chemicals will be provided with Vents. • Vent lines of Dosing vessels will be connected back to the vents of storage tanks to prevent contaminated air release during material transfer.

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		company should give priority in employing the people of nearby villages and provide adequate basic facilities to the general public.			• All pumps handling hazardous chemicals will be provided with mechanical seals to prevent fugitive emission. • Wherever possible magnetic coupled pumps will be used. • The contaminated absorbent will be safely dispose off along with hazardous waste. Company will take care to reduce the Odour problem and release of chemical vapour in atmosphere. For that company will contribute funds for Environment protection measures. (Approx. Cost: 118.482 Crores & Time Period: 1 year after getting EC & CTE).

7.	Thiru. Naresh Babu, Berigai Panchyat	• Thiru. Naresh Babu said that, the company had not made any announcement about the job vacancies and he did not know if the announcement was made in the nearby villages as well. Therefore, he requested to take proper action in this regard and make an announcement in future. He also said that, the company did not provide any assistance to Berigai village. He said that, he is opposing this project, because people from other places come here and settle down for work, but educated and uneducated youth in their village are still unemployed. Further, he added that, the proposed expansion is likely to provide direct employment to 1,000 people and indirect employment to 2,000 to 3,000 people. So, he requested that these jobs should be provided to the local people.	• The representative of M/s. Chemplast Sanmar Ltd has said that, they are going to conduct employment camps within 6 to 8 months, at that time the local people will be properly notified. Also, an overhead water reservoir has been completed in the Berigai village through "Namaku Naamae" scheme: one electrical engineer and one quality control engineer from Berigai village are currently employed in the company, buildings for 11th and 12th classes have been constructed in a local high school, road facilities have been provided to the school, further toilets and a passenger shelter have been constructed in a local	• The Sub Collector, Hosur The Sub Collector, Hosur- said that, the local people can get to know the information about the employment of their company, if they provide information to Gram Panchayat Office, Block Development Office and Taluk Office.	The proposed project will increase the employment opportunity. Employment would be as per prevailing norms of state government for skilled and unskilled people for the proposed project. approximately 1000 people will be employed after getting EC & CTE.

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			village. He also said that, a lake located in the village was desilted last year. Finally, he informed that the Social Need Assessment is currently being done and based on that the Corporate Social Responsibility Fund will be spent.		
8.	Thiru. P.S.R Praveen Kumar, Berigai Village	• Thiru. P.S.R Praveen Kumar said that, he did not know about the public hearing was taking place here. He said that, he was unable to give his opinion on the project as it was only explained in the power point presentation and no reports were provided about the cost of the pollution control devices and the measures taken in order not to harm the environment. He said that, the proposed expansion will increase the production capacity by 15 times. Also, the government has banned the use of pesticides for agriculture but the	• The representative of M/s. Chemplast Sanmar Ltd has said that, if employment is given to outsiders they will leave the job within two years which affects the performance of the company. Therefore, he said that they have no objection in providing employment to the local public. Further, he added that, presently, we are producing 35 chemicals	--	• Company is manufacturing 35 products and after expansion, company will manufacture 60 products and all these will not be pesticides products, they are synthetic organic products and only one product will be pesticide intermediate which is incorporate in the environmental impact assessment report.

		company is manufacturing raw materials for such banned pesticides on a large scale. As a result, the farmers are the ones who suffer the most. He also said that, the people and children here have been affected by this company for the past 25 years, the public had protested against the company for excessive smoke coming out of the company. He said that, the factory is running with only a few air pollution control devices. He further said that: there is no objection to the operation of this company, but he requested to clarify to what extent the public will be benefited by this company. He said that, the company management told that, "standard of living of the common people will increase more and more, but he asked them to tell how much it would increase" and to announce that priority should be given in employment to the common people of the nearby villages. He said that,	and after expansion, we are planning to produce 60 to 70 chemicals and all these are not pesticides, they are intermediate products to produce pesticides, which was reported in the environmental impact assessment report. He also said that, the pesticide is produced from the intermediate product only after two or three reactions in the process. He also said that, we are exporting this intermediate product to foreign countries to produce pesticide. He said that, agriculture is the livelihood of the people of this village and water is the basis for it. Thus, our company has a proper		• Proposed expansion will increase the production capacity by 15 times. However, Company has proposed adequate APCM to control air emission. Also, no effluent will be discharged into any surface water body. Hence, this company is/will be total Zero Liquid Discharge unit. • Company will install Mechanical Dust collector & ESP to control flue gas emission and Wet scrubber with stack will be install to control process gas emission.

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		many people are unemployed in the surrounding village such as Berigai, B. Guruparapalli, Chinnachandram and the employment camps have been advertised in news papers but they have not informed the Panchayat President. He worried that: if he had made it known, he would have sent the unemployed people in his area to the employment camp. He said that, he was informed shortly before the public hearing by the management and therefore the meeting was conducted for sake of eye wash. Those who spoke before me said that they have done a lot of development work for the village. But it is well known that it is the duty of the company to undertake such development activities from the CSR fund. Even though the company has spent Rs.4.20 lakhs for the development work in Berigai, we will not allow the expansion activity which affects the public.	water management system. Further, He said that, at present they are using ground water and the water required for the expansion is planned to be taken from Kelavarapalli dam presently sewage from Bangalore is being mixed with river water in the dam. They proposed to treat and use this water for the industry, the same has been reported in the EA. So, the ground water and agriculture will not be affected due to the proposed expansion. He informed that, from the year of 2003-04, zero liquid discharge system has been set up in all the Sanmar factories and all the trade effluent is treated and reused for the		

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		• He pointed out that, he was not informed about the pros and cons of the project and that there are more educated people in their area, and when they are informed about the pros and cons, they can know about it. Also, he added that, it is an eye-wash to hold this meeting without clarifying anything about the details of the raw materials of the products manufactured in the factory and the description of the manufacturing process. Also, he said that he is opposing this project on behalf of people of Berigai panchayat public.	production and no trade effluent is discharged from the factory, so the agriculture will not be affected. Further, he added that the Trade Effluent generated from the unit treated in ETP, RO followed by Reject Management System (ZLD) the treated trade effluent is recycled back to the process. Thus the hazardous waste generated from the ETP is sent to a common hazardous waste disposal facility authorized by the Tamil Nadu Pollution Control Board. And the report is being submitted to the Tamil Nadu Pollution Control Board regularly. In the unit, the vaporized chemicals from		

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			the reactors are condensed at about (-20°C) in the condenser and recovered and re-used in the process. Also, in our factory, we have two stage absorption system (i.e., Scrubber). So, the vaporized chemicals from the reactors will not pollute the air. Also, Ambient Air Quality Survey was conducted at 11 places in 3 months and there is no detection of air pollutants. He also said that, the weightage will be given to the local people in company's employment opportunities.		
9.	Thiru. P.S.R Praveen Kumar, Berigai Village	• Thiru. P.S.R Praveen Kumar said that, according to the management, they release the chemical vapours only after extracting the toxic substances as much as	• The representative of M/s. Chemptast Sanmar Ltd has said that, it is our duty to operate the factory in a safe environment by	--	--

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		possible in the surrounding villages, but only 300 or 500 houses in the neighbouring villages, so they could not affect much. Whereas there are 2500 houses in their village with the population of 1000-1500, so they are mostly affected than the others. Now, the factory is not increased production at present, so we have no issues. But, if it is in operation, who will be responsible for the damage to be caused to them due to increasing their production as per their demand in the future	installing modern industrial pollution control devices for the proposed expansion and operate it in a such a way that it does not affect the environment rather than operating with old pollution control techniques.		
10.	Thiru. P.S.R Praveen Kumar, Berigai Village	• Thiru. P.S.R Praveen Kumar said that, even though, it is right to conduct public hearing, he also requested to conduct public hearing again by giving proper announcement to us with bit notices to the public. No announcement has been done in our Berigai Village and announcement has been made in other areas. He said it was an eye wash, since the meeting held without giving notice to the	--	The DEE, TNPCB, Hosur The DEE, TNPCB, Hosur has informed that, has issued Environmental Impact Assessment, 2006 notification vide its S.O. No.1533 of MOEF, New	--

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		people of their village. Even though, I am the president of this village panchayat, I was not informed properly, so there is no possibility for the public to know about this project.		Delhi, dated 14.09.2006, as per this notification a public hearing to be conducted for some projects before granting environmental clearance. Accordingly, the details of the public hearing meeting for the proposed expansion project of M/s. Chemplast Sanmar Ltd. have already been published in Tamil and English dailies "Dinathanti" and "The New Indian Express" on 07.04.2023. Also, he highlighted	
11.	Thiru. Nagesh, Berigal Councillor	• Thiru. Nagesh has said that, for the past 25 years, we held a public protest in front of the company for bad odour and ground water problems. Following that, they informed that the trade effluent generated in the factory would be treated and recycled again, and they set it up it immediately and arranged for the public to visit it. He also informed that after that there was no problem of bad smell and ground water. Further, he said that, agriculture in their village has not been affected for the past 10 years and educated youth from their panchayat and neighbouring panchayats are seeking for job in out of village, if they provide employment to the educated youth in our village			--

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		area, this will be an opportunity for our villagers to know and clarified about the production processes of the company. So, he requested that, the employment opportunity should be provided to the locals. He said that, the unit is constantly providing assistance to meet the drinking water needs of the villager under this panchayat by constructing groundwater with pipe lines, providing necessary facilities to schools, and setting up bus shelter etc.,		that, the public announcements have been made through vehicle announcement and provided pamphlets to the public in the surrounding areas of the villages of B. Guruparapalli, Seekkanapalli and Suligunta	
12.	Thiru. Rajan, Maruthi Nagar, Berigai	• Thiru. Rajan has said that, no announcement has been made in his village about the public hearing, so the public of his village does not know about the meeting. Further he added that, the ground water level has decreased in this area and there is bad smell arises from the company. Yesterday, he said, two people were carrying waste from the company and that caused bad odour for 30			--

		minutes. He also said that the details of the transportation of wastes from the company were still unknown to us. He said that, half of the people who attended the meeting were employees of M/s. Chemplast Sanmar Ltd and others were brought by the management of the unit, so this meeting is conducted for eye wash.			
13.	Thiru. Punit, Berigai	• Thiru. Punit, has said that, there are many educated youth in the area and they are engaged in agriculture. The unit should explain the effects on cultivation of carrots, chillies, beans and flowers in the area due to this expansion activity and also any road accidents occurs to the vehicles which carrying the industrial wastes to the disposal site, what will happen, whether, they have any plan to transport such waste in some other route which by-pass his village and it should be clarified.	--	--	--

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14.	Thiru. V. Sunantha Reddy, Environmentalist, Nalkoda, Telugana	• Thiru. V. Sunantha Reddy has said that, he was the first environmentalist to support industrial growth and wished for the proposed expansion of M/s. Chemplast Sanmar Limited Company's proposed expansion of the production in synthetic organic chemicals and specific pesticide intermediates from 1601.4 MT per annum to 20031.4 MT per annum. He also suggested some points regarding industrial development. The Environmental Consultant has already conducted air, water, land, noise pollution and baseline survey conducted was good and satisfactory. He suggested that, collecting the health status of people, crop production status, and ground water availability status for about 10 Km radius of project and it will definitely help to take precautionary measures in maintaining the ecological balance in future. He requested the management to	--	--	Company will contribute 0.25 % of the additional project cost (i.e. 2000 Crore) for the CER activity and CSR fund will be provided by the company in the surrounding villages within the 2 or 3 years of time period after getting EC & CTE.

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		include his suggestion in preparing the DA report. He asked the management to carry out the proposed activity with planting more trees inside the premises. He also asked the management to maintain the ecological balance, it will definitely help to grow the resources of the country. He also requested the management to provide employment to the local educated people and give preference to skill development programs. He also requested the management to use the CSR and CER funds for the betterment of the village peoples.			
15.	Thiru. V. Nagaraj, Ex — President, V. Sigrapalli	• Thiru. V. Nagaraj has said that, I agree with the statements made by the president of the Berigai Village and also Mr. Nagesh, Berigai Councilor's. It is a fact that, 10 years ago, there was a bad odour and ground water problem in the village, then the manager Mr. Jacob said that, he has been fixing these problems	--	--	Company will contribute funds for Environment protection measures. (Approx. Cost: 118.482 Crores & Time Period: 1 year after getting EC & CTE).

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		and fixed it. He further added that, the company shall assure in front our villagers that the advanced pollution control devices will be installed to control the pollution. So, the expansion activity will not harm the public agriculture in that area. He requested that, the company management should provide employment opportunities to the local people and they should inform about the employment camps in advance to the local people. He said that there is nothing wrong, to inform the factory management if the public has any problem.			
16.	Thiru. Appi Naidu, Mahadevapuram	• Thiru. Appi Naidu has said that, the company is providing employment to the general public in their vicinity and my son is working in the company after selected in the employment camp held two months ago at Hosur. He also said that, the employment should be provided to	--	--	Company will give employment to the local people as per prevailing norms of state government for skilled and unskilled people for the proposed project. Approximately 1000 people will be employed.

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		the educated youth in local.			

During the public hearing meeting, 66 number of written representation received on favour for the industry and two number of representation against the proposed expansion activity of M/s. Chemplast Sanmar limited.

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7.2 REHABILITATION AND RESETTLEMENT (R & R)

The unit is located outside Notified Industrial Area. There is no habitation on the proposed expansion project activity area and it is inside the existing industry land. There shall not be displacement of any population in project area. The increasing industrial activity will boost the commercial and economical status of the locality up to some extent. Hence, R & R policy is not applicable to this project.

7.3 RISK ASSESSMENT

7.3.1 INTRODUCTION

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions). On the other hand, risk assessment deals with recognition and computation of risks, the equipment in the plant and personnel, due to accidents resulting from the hazards present in the plant.

Risk assessment follows an extensive hazard analysis. It involves the identification and assessment of risks the neighboring populations are exposed to as a result of hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population etc. Much of this information is difficult to get or generate. Consequently, the risk assessment is often confined to maximum credible accident studies. It provides basis for what should be type and capacity of its on-site and off-site emergency plan also what types of safety measures shall be required.

7.3.2 APPROACH TO THE STUDY

Risk involves the occurrence or potential occurrence of some accidents consisting of an event or sequence of events. The risk assessment study covers the following:

- Identification of potential hazard area;
- Identification of representative failure cases;
- Visualization of the resulting scenarios in terms of fire and explosion;
- Assess the overall damage potential of the identified hazardous events and the impact zones form the accidental scenarios;
- Furnish the recommendations on the minimization of the worst accident possibilities
- Preparation of Disaster Management Plan;
- Emergency Plan, which includes Occupational and Health Safety Plan;

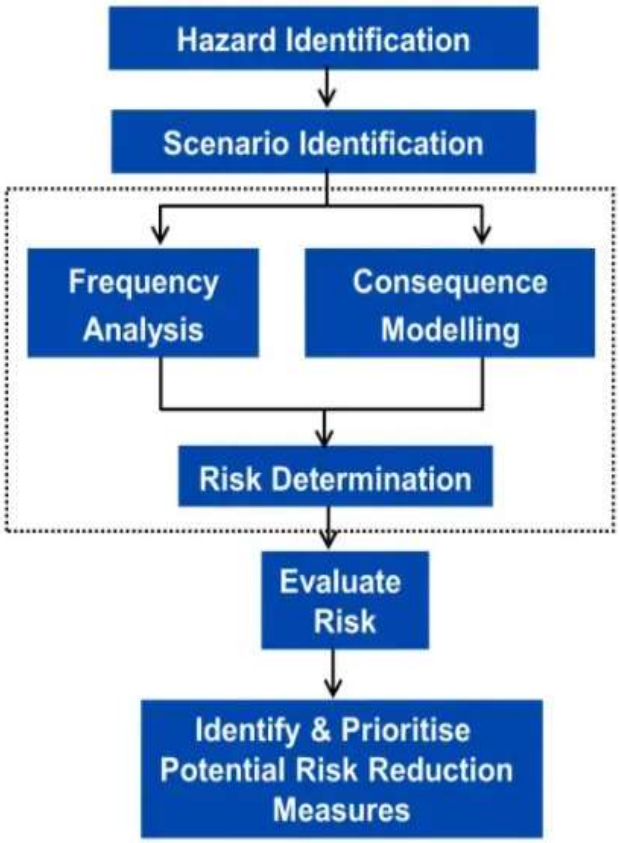
7.3.3 METHODOLOGY

Quantitative risk assessment (QRA) is a means of making a systematic assessment of the risks from hazardous activities, and forming a rational evaluation of their significance, in order to provide input to a decision-making process. The term ‘quantitative risk assessment’ is widely used, but strictly this refers to the purely numerical assessment of risks without any evaluation of their significance. The study has been conducted based on the premises of

a traditional Quantitative Risk Assessment. The key components of a QRA are explained below, and illustrated in Figure-7.1 and Figure-7.2.

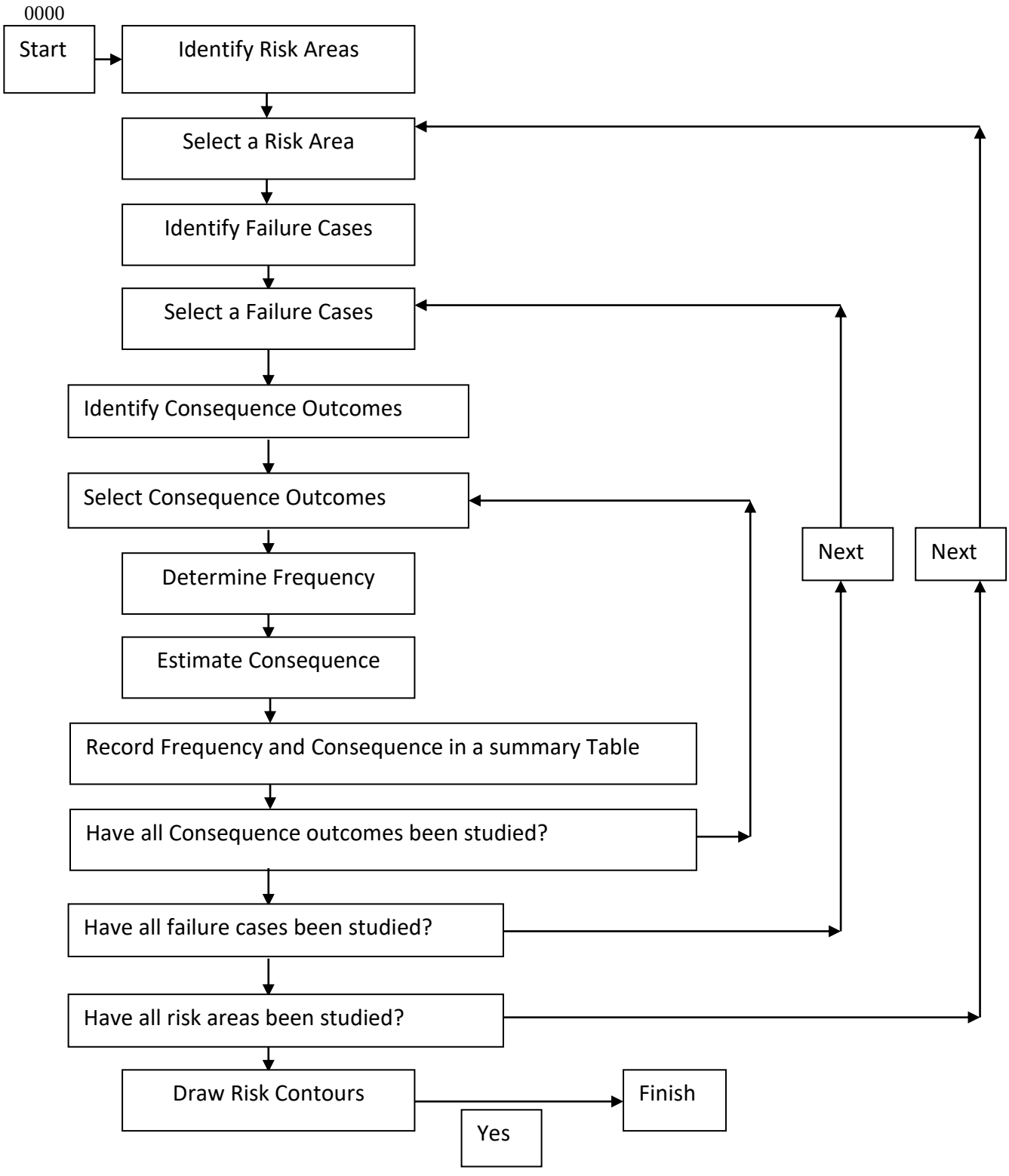
FIGURE – 7.1

QRA METHODOLOGY



FIGURE–7.2

FLOW CHART FOR QUANTITATIVE RISK ASSESSMENT



7.3.4 HAZARD IDENTIFICATION

Identification of hazards in the project activity is of primary significance of the analysis, and quantification. Hazard states the characteristics of system/plant/process that presents potential for an accident. 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.

7.3.4.1 IDENTIFICATION OF HAZARDOUS AREAS

The procedure for QRA starts with identification of major risk areas in the installation. Operation carried out in specialty and agrochemical Industries usually come under certain board, general categories. At M/s. Chemplast Sanmar Limited, major risk areas are as follows:

- Bulk storage area for Raw Materials at ambient temperature and atmospheric pressure.
- Process Plant involving pumping, transportation, reactors, distillation, heating, cooling, etc.
- Bulk loading and unloading from storage tanks to road takers and vice versa.

7.3.4.2 IDENTIFICATION OF FAILURE CASES FOR HAZARDOUS AREAS

- Release due to catastrophic failure of storage tanks or process vessels.
- Rupture of connected pipe with storage tank or process vessels.
- Continuous release at significant rates for long durations transfer pipelines caused by sudden, major break of the pipeline.
- Continuous release at low rate through small holes or cracks in piping and vessels, flange leaks, and leakage from pump glands and similar seals.

  It is to be noted that for Quantitative Risk Assessment, worst case scenarios has been considered, though their frequency of occurrence is much lower than the cases of small leaks.

7.3.4.3 MAJOR HAZARDOUS AREAS AND SAFETY PRECAUTIONS

The hazardous chemical storage area is shown in Figure-7.3. The major Hazardous chemicals to be stored, transported, handled and utilized within the plot area are summarized in the Table-7.1. Other hazards and control measures are summarized in Table-7.2. Facilities / System for process safety, transportation, firefighting system and emergency capabilities to be adopted are stated below.

FIGURE-7.3

HAZARDOUS CHEMICAL STORAGE AREA



TABLE-7.1

STORAGE AND HANDLING DETAILS OF HAZARDOUS CHEMICALS

Sr. No.	Name of the Material	Type of Hazard	Kind of Storage	Max. quantity to be stored (MT)	Storage condition i.e. temp., pressure	Tank Dimensions in (m)	Dyke Dimensions
1	Acrylonitrile	Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
2	Acetic Acid	corrosive	Carboys	1MT	25 TO 35 C	NA	Hx34cm Wx13cm
3	Ammonia Gas	toxic	Cylinder	0.1 MT	-20 to -60 C	NA	NA
4	Acetonitrile	Toxic &Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
5	Acetone	Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx38c Wx24cm
6	Acetyl Chloride	Corrosive	MS Drums	0.50 MT	25 TO 35 C	NA	Hx34cm Wx13cm
7	Aluminum chloride	Corrosive	Plastic Drums	0.50 MT	25 TO 35 C	NA	Hx34cm Wx13cm
8	Ammonium carbonate	Irritation	Bags	10 MT	25 TO 35 C	NA	NA
9	Ammonium Chloride	Irritation	Bags	0.25MT	25 TO 35 C	NA	Hx34cm Wx13cm
10	Caustic Soda	Severe Burns	Bags	10 MT	25 TO 35 C	NA	NA
11	Caustic soda lye	Severe Burns	Tank	23 MT	25 TO 35 C	Wx254 CM HX200 CM	WX500CM LX515CM HX80 CM
12	Cyano acetic acid	Severe Burns	Carboy	0.25MT	25 TO 35 C	NA	Hx34cm Wx13cm

13	Chloroform	Toxic &Fire	Plastic Drums	3 MT	25 TO 35 C	NA	Hx38cm Wx24cm
14	Cyclohexanone	Fire	MS Drums	4 MT	25 TO 35 c	NA	Hx38cm Wx24cm
15	Diesel	Fire	Tank	32 MT (35 KL and 15 KL capacity *Total 2 Nos tank)	25 TO 35 C	WX258CM HX 460 CM 2.HX420CM	WX500CM LX515 CM HX 80CM
16	Formic Acid	Irritation	Carboy	0.1 MT	25 TO 35 C	NA	Hx34cm Wx13cm
17	Hexane	Toxic &Fire	MS Drums	0.50 MT	25 TO 35 C	NA	Hx38cm Wx24cm
18	Hydro chloric acid	Corrosive	Tank	53 MT (30 KL capacity *2 Nos)	25 TO 35 C	WX258CM HX 460 CM 2.HX420CM	WX500CM LX515 CM HX 80CM
19	Isopropyl Alcohol	Toxic &Fire	MS Drums	1.8 MT	25 TO 35 C	NA	Hx34cm Wx13cm
20	Hydrogen gas	Extremely Flammable	Truck (Cylinder & manifold)	120 Cubic meter 3* 2 No of truck	25 TO 35 C	NA	NA
21	Methanol	Toxic &Fire	Tank	50 MT	25 TO 35 C	WX264CM HX400	WX445CM LX590CM HX80CM

						CM	
22	Potassium Hydroxide Flakes	Irritation	Bags	0.50 MT	25 TO 35 C	NA	NA
23	Phenol	Toxic &Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
24	Sodium Cyanide	Highly Toxic	MS Drums	25.MT	25 TO 35 c	NA	NA
25	Sulphuric acid	Corrosive	Tank	50MT	25 TO 35 C	LX380 CM HX 250C M	LX1240CM WX560 CM HX60CM
26	Ethylene oxide	Flammable &Toxic	Cylinder	0.03 MT	25 °C ML- 0 °C	NA	NA
27	Thionyl Chloride	Corrosive	MS Drums	10 MT	25 TO 35 C	NA	Hx34cm Wx13cm
28	Toluene	Toxic &Fire	Tank	20 MT	25 TO 35 C	WX25 4CM HX300 CM	WX445CM LX590CM HX80CM
29	Chlorine Gas	Toxic	Cylinder	0.05 MT	-15 to -34 C at 11 kg/cm^2	NA	NA
30	Bromine	Toxic	Cylinder	0.05 MT	-30 to -60 C at 6 kg/cm^2	NA	NA
31	Nitric acid	Corrosive	Carboy	0.5 MT	25 TO 35 C	NA	Hx34cm Wx13cm

TABLE 7.2

OTHER HAZARDS AND CONTROL

SR. NO.	NAME OF THE POSSIBLE HAZARD OR EMERGENCY	ITS SOURCES & REASONS	ITS EFFECTS ON PERSONS, PROPERTY & ENVIRONMENT	PLACE OF ITS EFFECT	CONTROL MEASURES PROVIDED
1	**BOILER** (1) Burning (2) Physical injury (3) Explosion	Over pressure in the boiler if safety valve not working. Water level indicator not working. Low water level indicator fails. High temp. System fails.	Minor/Major Injury Loss of human life Loss of property (Loss of Main/ Machine Material)	Boiler House and surroun ding places	Lower & Upper Level Indication System provision. Safety valves for pressure control fixed temp. & pressure indicator provided. Blow down & blowing system provided for cleaning tube and shell. Soft water used. Inter locking provided on pumps, FD fan, ID fan. Periodical checking & inspection maintenance done. Yearly inspection done by Boiler Inspector.
2	**ELECTRICITY** (1) Burning (2) Fire (3) Shock	Loose Contacts, Weak earthling Short Circuit Improper Insulation	Burning, Shock, Death	Surroun ding the accident area	Proper Earthing, Periodical Checking of joints, proper insulations of Equipments, etc. Flame proof fitting in solvent storage area, bounding and jumpers to all solvent barrier lines provided.
3	**HOUSE KEEPING** (1) Physical (2) Burning (3) Fire (4) Chemical Exposure	Bad House keeping	Physical / Chemical Thermal Burn Injury (Major / Minor)	In all surroun ding areas i.e. Storage, Plants	Proper Handling, regular cleaning, Proper placement of material (RIGHT THING AT THE RIGHT PLACE)
4	**PIPE LINE LEAKAGES SPILLAGES etc**. (1) Corrosion (2) Toxic gas release	Leaking of pipe line due to corrosion, Loose contact etc.	Physical / Chemical Thermal Burn Injury (Major / Minor)	Plant area	Proper maintenance, Proper Selection of Material for pipe lines, Immediate attention, Earthing provided, flame proof fitting, NO SMOKING Boards displayed.
5	**Structural Failure**	Inside the factory (Corrosion)	Injury/Death to persons, damage to property	Within the factory	Automatic operation Periodic Testing of safety valves Regular Inspection and Maintenance
6	**Toxic Release from outside**	Outside the factory	Injury/Death	Within & outside the unit	Alarm, Evacuation rescue & shelter/ Welfare
7	**Natural Calamity**	Nature	Injury / Death to persons, damage to property	Within & outside the unit	Alarm, Evacuation rescue & shelter/ Welfare

TABLE 7.3

HAZARDOUS PROPERTIES OF THE CHEMICALS, COMPATIBILITIES, SPECIAL HAZARD AND ANTIDOTES

Name of Chemical	Hazard	F.P (°C)	BP (°C)	LEL %	UEL %	SP.GR. 20 °C	VD	NFPA H F R	TLV/ TWA	IDLH	LC50	LD50	Antidote
Toluene	T & F	4.444	110.6	1.1	7.1	0.8636	3.1	2 3 0	300 ppm	500 ppm	49000 mg/m [Rat]	636 mg/kg [Rat]	Oxygen
Methanol	T & F	12	64.5	6	36.5	0.7915	1.11	1 3 0	250 ppm	6000 ppm	64000 ppm [Rat]	5628 mg/kg [Rat]	Ethanol (30% solution through oral, 5% solution through injection)
Acetone	F	-17	56	2	12.8	0.786	2	1 3 0	1000 ppm	2500 ppm	50100 mg/m3	5340 mg/kg	NA
Hexane	T & F	-18	66	NA	NA	0.678	2.97	2 3 0	50 ppm	1100 ppm	48000 ppm	25 gm/kg	NA
Hydrochloric Acid	T & C	NA	50.5	NA	NA	1.16	1.267	3 0 1	5 ppm	50 ppm	4701 ppm [Rat]	900 mg/kg [Rabbit]	Drink Large Quantity of Water
Sulphuric acid	T & C	NA	270	NA	NA	1.84	3.4	3 0 2	3 mg/m^3	15 mg/m^3	510 mg/m [Rat]	2140 mg/kg [Rat.]	Milk of magnesia
Caustic lye	T & C	NA	1390	NA	NA	2.13	NA	3 0 1	2 mg/m3	10 mg/m3	NA	2000 mg/kg (rat)	NA
Acetonitrile	F	20° C	81°C	4.4	16	0.783	1.4	2 3 0	40 ppm	500 ppm	50 mg/kg [Rabbit]	50 mg/kg [Rabbit]	NA
Thionyl chloride	T & C	NA	76	NA	NA	1.64	4.1	3 1 0	0.2 ppm	5 mg/m^3	500ppm/ [Rat]	270 mg/kg [Rat]	maintain an open airway and prevent aspiration
Nitric Acid	C	NA	86	NA	NA	1.4	2	4 0 0	2 ppm	25 ppm	130 mg/m3 [Rat]	90 mL/kg [Rat]	Milk of magnesia
Chlorine	T & C	NA	-34.05	NA	NA	2.524	1.267	3 0 0	3 ppm	10 ppm	146.5 ppm [Rat]	293 ppm [Rat]	NA
Bromine	T & C	NA	58.7	NA	NA	3.11	7.5	4 0 1	0.66 ppm	3 ppm	750ppm [Rat]	2600 mg/kg [Rat]	NA
Hydrogen	F & E	NA	-253	NA	NA	NA	NA	0 4 0	10 ppm	100 ppm	713 ppm [Rat]	5000 mg/kg [Rat]	NA
Acetic Acid	T & F	39	118	4	19.9	1.00	2.1	3 2 0	10 ppm	50 ppm	40 mg/L [Rat] 4 h	3310 mg/kg (Rat)	Milk of magnesia
Acrylonitrile	T, C &F	-0.2	77.3	3.1	17.0	0.8	1.83	4 3 2	1 ppm	60 ppm	0.47 mg/L (Rat) 4 h	63 mg/kg (Rabbit)	Use of amyl nitrite pearls as an antidote
Ammonia	T & C	NA	-33	16	25	0.59	0.59	1 3 0	25 ppm	300 ppm	NA	7338 ppm (rat)	NA
Aluminium chloride	C	NA	194	NA	NA	2.44	NA	3 0 2	2 mg/m3	NA	NA	NA	NA
Chlorohexane	F	26	135	1	9.6	0.87	4.16	2 2 0	0.5 mg/m3	100 mg/m3	7.0 mg/kg [Rat]	27,4 mg/l - 48 h [Leuciscus idus (Golden orfe)]	NA
Cyano acetic acid	T, C &F	107	108	NA	NA	NA	NA	3 1 1	NA	NA	1.4 mg/L (Rat) 4 h	1500 mg/kg (Rat)	NA

F	= FIRE	T	= TOXIC
E	= Explosive	R	= REACTIVE
BP	= BOILING POINT	LEL	= LOWER EXPLOSIVE LIMIT
UEL	= UPPER EXPLOSIVE LIMIT	SP.GR	= SPECIFIC GRAVITY
VD	= VAPOUR DENSITY	ER	= EVAPORATION RATE
H	= HEALTH HAZARD CLASS	F	= FIRE HAZARD CLASS
R	= REACTIVE HAZARD	BR	= BURNING RATE

7.4 SAFETY PRECAUTIONS DURING STORAGE AND TRANSPORTATION OF HAZARDOUS CHEMICALS

7.4.1 Control measures provided for Solvent Tank Farm:

1. Construction & Installation of solvent storage facility is provided as per explosive act, (License & local rules / regulation followed).
2. Flame proof electrical fitting & intrinsically safe instruments are installed.
3. Flame arrestor installed on vent pipe with breather valve & emergency vent valve provided.
4. Flame arresters are provided on tank farm.
5. Earth fault relay trip installed for solvent tanker unloading system (Solvent pump having interlock with grounding of the tanker to make 100% grounding.).
6. Grounding (double earthing) & Jumper for flange joint provided for all installation & it is monitored periodically.
7. Road Tanker grounded before unloading.
8. Deep in let pipe provided inner side of the solvent tanks.
9. Check list is followed for loading & unloading.
10. Level indicator provided on the tank.
11. Adequate dyke wall (non-combustible) is provided.
12. Leakage collection bund with foam system is provided.
13. Combustible Gas Detection system, Fire (Foam / Powder) extinguisher, Foam monitors is provided.
14. F-30 coating provided for solvent storage tanks.
15. Nitrogen blanketing system is provided.
16. Closed handling system is provided.
17. Online LEL detector is provided
18. Area is covered with hard barricading for restricted person access.

7.4.2 Control measures provided for Acid / Alkali Tank Farm:

1. Adequate dyke wall (with acid proof coating) provided.
2. Level indicator with high level alarm provided on the tank.
3. Scrubber system installed storage tank & used during road tanker unloading.
4. Adequate flexible SS hose provided for tanker connection for unloading.
5. Dedicated pumps are provided and located with its close proximity to the respective tank to avoid unintentional mistake of mixing of chemicals.
6. Leakage / Spillage handling kit provided.
7. To avoid chemical exposure, closed handling system is provided.
8. Fire hydrant system provided including water curtain system.

Transportation, Unloading and handling procedure for Solvents

SR. NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	MITIGATION MEASURES
1	Transportation of Solvents by road tanker	Leakage& Spillage Fire, Toxic release	• Check the source of leakage point. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Stop leak if you can do it without risk. • Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container. • Keep combustibles (wood, paper, oil, etc.) away from spilled material. • Isolate the area • Isolate the tank • Training will be provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling, use of SCBA sets. • Instructions will be given not to stop road tanker in populated area. • Clear Hazard Identification symbol and emergency telephone number will be displayed as per HAZCHEM CODE.
2	Road tanker unloading Solvents at site	Leakage& Spillage Fire, Toxic release	• Check the source of leakage point. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Stop leak if you can do it without risk. • Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container. • Keep combustibles (wood, paper, oil, etc.) away from spilled material. • Isolate the area & Isolate the tank • Check the source of leakage point. • Spray the water on leakage • Priority will be given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road. • Security person will check License, TREM CARD, Fire extinguisher condition; SCBA set

			condition, required PPEs as per SOP laid down. • Operator will take sample as per sampling SOP from sampling point. • After approval of QC department unloading procedure will be allowed be started. **Following precautions will be adopted during unloading** • Static earthing and earthing relay will be provided to road tanker. • Tanker unloading procedure will be followed according to check list and implemented. • The quantity remaining in the hose pipeline will be drained to a small underground storage tank, which will be subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for transfer from road tanker. • Finally earthing connection and wheel stopper will be removed. • Only day time unloading will be permitted.
3	Solvents Storage tank safety	Leakage& Spillage, Fire Toxic release.	• Check the source of leakage point. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Stop leak if you can do it without risk. • Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container. • Keep combustibles (wood, paper, oil, etc.) away from spilled material. • Check the source of leakage point. • Spray the water on leakage • SS storage tank will be provided as per IS code. • Dyke wall will be provided to storage tank. • Level transmitter will be provided with low level high level auto cut-off provision. • Vent will be connected to water trap and vent of water trap will be provided with flame arrestor. • Water sprinkler system will be provided to storage tank. • Fire hydrant monitor with foam attachment facility will be provided. • Dumping / Drain vessel/alternate vessel will be

			provided to collect dyke wall spillage material. • FLP type pump will be provided. • Nitrogen blanketing will be provided to storage tank. • Double static earthing will be provided to storage tank. • Double Jumper clip will be provided to all Solvent handling pipeline flanges. • Online LEL detector is provided
4	Solvents transfer from storage tank to Day tank	Leakage& Spillage due to Line rupture, Flange Gasket failure, Fire, Toxic release.	• Double on / off switch will provided at tank farm and process area near day tank. Pump auto cut off with day tank high level will be provided. • Flame arrestor will be provided on day tank vent. • Over flow will be provided for additional safety and it will be connected to main storage tank. • NRV will be provided on pump discharge line. • Double Jumper clip will be provided to all solvent handling pipelines. • Double static earthing will be provided to day tank.
5	Solvents transfer from Day tank to reactor	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Toxic release.	• Gravity transfer. • Total quantity of day tank material will be charged in to reactor at a time. • NRV will be provided on day tank outlet line. • Static earthing will be provided to storage tank. • Double Jumpers will be provided to pipeline flanges.

7.5 HAZARD CONTROL MEASURES

A) Hazard Control Measures:		
1) Fire Hazard	**2) Others Hazard**	**3) Chemical / Solvent leakage**
▪ Flameproof electrical apparatus installed at probable fire hazard area. ▪ Well maintained Fire Fighting Apparatus (fire extinguisher, fire hydrant system) in sufficient quantity. ▪ Well defined storage facility for fire hazard substances. ▪ Copper Jumpers are provided on	❖ WH & Solvent Building located away from other plants. ❖ Online flammable gas detection meters with audible alarm / hooter. ❖ Explosion proof wall & doors of process area where such hazards are apparent. ❖ Copper Jumpers are provided on solvent transferring lines.	✓ Handling of chemicals with confined containers / drums only. ✓ Availability of spillage control kit & sand buckets on specific locations. ✓ Regular monitoring of VOC level of plant by internally and externally agency and precaution are taken to avoid

solvent transferring lines. ▪ Earthing/Bonding system is provided at designated areas. ▪ Smoke detectors and fire alarm system installed at site. ▪ Process / operation handling by competent person only. ▪ Permit to work system. ▪ Round the clock availability of qualified Safety Officer & Paramedic. ▪ Mutual aid with nearby industries and Disaster Preventive Management Centre.	❖ Earthing/Bonding system is provided at designated areas. ❖ Process operated by competent person only. ❖ Regular testing / inspection of pressure vessels by competent person ❖ Installation of safety valve on probable explosion hazards vessels. ❖ Permit to work system.	exposure. ✓ PPEs like organic cartridge mask, air bubbler and full body pressure suit with breathing air provision are provided as and when required. ✓ People in vicinity of area are trained to use spillage control kit. ✓ SCBA set is readily available at designated locations for emergency scenario.

7.6 CONSEQUENCE ANALYSIS

In a plant handling hazardous chemicals, the main hazard arises due to storage, handling & use of these chemicals. If these chemicals are released into the atmosphere, they may cause damage due to resulting fires or vapour clouds. Blast Overpressures depend upon the reactivity class of material between two explosive limits.

Operating Parameters

Potential vapour release for the same material depends significantly on the operating conditions. Especially for any liquefied gas, the operating conditions are very critical to assess the damage potential. If we take up an example of ammonia, if it is stored at ambient temperature, say 30^{o}C, and then the vapour release potential of the inventory is much higher as compared to the case if it is stored at 0^{o}C.

Inventory

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard.
Larger the inventory of a vessel or a system, larger the quantity of potential release. The potential vapour release (source strength) depends upon the quantity of liquid release, the properties of the materials and the operating conditions (pressure, temperature). If all these influencing parameters are combined into a matrix and vapour source strength estimated for each release case, a ranking should become a credible exercise.

Loss of Containment

Plant inventory can get discharged to Environment due to Loss of Containment. Certain features of materials to be handled at the plant need to the clearly understood to firstly list out all significant release cases and then to short list release scenarios for a detailed examination. Liquid release can be either instantaneous or continuous. Failure of a vessel

leading to an instantaneous outflow assumes the sudden appearance of such a major crack that practically all of the contents above the crack shall be released in a very short time. The more likely event is the case of liquid release from a hole in a pipe connected to the vessel. The flow rate is depending on the size of the hole as well as on the pressure, which was present, in front of the hole, prior to the accident. Such pressure is basically dependent on the pressure in the vessel. The vaporisation of released liquid depends on the vapour pressure and weather conditions. Such consideration and others have been kept in mind both during the initial listing as well as during the short listing procedure. In the study, Maximum Credible Loss accident methodology is to be used, therefore, the largest potential hazard inventories have been considered for consequence estimation.

7.6.1 DAMAGE CRITERIA

In consequence analysis, use is made of a number of calculation models to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

a) Determination of the source strength parameters;
b) Determination of the consequential effects;
c) Determination of the damage or damage distances.

The basic physical effect models consist of the following.

Source strength parameters

* Calculation of the outflow of liquid, vapour or gas out of a vessel or a pipe, in case of rupture. Also two-phase outflow can be calculated.
* Calculation, in case of liquid outflow, of the instantaneous flash evaporation and of the dimensions of the remaining liquid pool.
* Calculation of the evaporation rate, as a function of volatility of the material, pool dimensions and wind velocity.
* Source strength equals pump capacities, etc. in some cases.

Consequential effects

* Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
* Intensity of heat radiation [in kW/ m^2] due to a fire or a BLEVE, as a function of the distance to the source.
* Energy of vapour cloud explosions [in N/m^2], as a function of the distance to the distance of the exploding cloud.
* Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

It may be obvious, that the types of models that must be used in a specific risk study strongly depend upon the type of material involved:

- Gas, vapour, liquid, solid
- Inflammable, explosive, toxic, toxic combustion products
- Stored at high/low temperatures or pressure
- Controlled outflow (pump capacity) or catastrophic failure?

Selection of Damage Criteria

The damage criteria give the relation between extent of the physical effects (exposure) and the percentage of the people that will be killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. For instance, much more is known about the damage caused by heat radiation, than about the damage due to toxic exposure, and for these toxic effects, the knowledge differs strongly between different materials.

In Consequence Analysis studies, in principle three types of exposure to hazardous effects are distinguished:

1. Heat radiation, from a jet, pool fire, a flash fire or a BLEVE.
2. Explosion
3. Toxic effects, from toxic materials or toxic combustion products.

In the next three paragraphs, the chosen damage criteria are given and explained.

Heat Radiation

The consequence caused by exposure to heat radiation is a function of:

- The radiation energy onto the human body [kW/m^2];
- The exposure duration [sec];
- The protection of the skin tissue (clothed or naked body).
- The limits for 1% of the exposed people to be killed due to heat radiation, and for second-degree burns are given in the table herein:

Damages to Human Life Due to Heat Radiation

Exposure Duration	Radiation for 1% lethality (kW/m^2)	Radiation for 2nd degree burns (kW/m^2)	Radiation for first degree burns (kW/m^2)
10 Sec	21.2	16	12.5
30 Sec	9.3	7.0	4.0

Since in practical situations, only the own employees will be exposed to heat radiation in case of a fire, it is reasonable to assume the protection by clothing. It can be assumed that people would be able to find a cover or a shield against thermal radiation in 10 sec. time. Furthermore, 100% lethality may be assumed for all people suffering from direct contact with flames, such as the pool fire, a flash fire or a jet flame. The effects due to relatively lesser incident radiation intensity are given below.

Effects Due to Incident Radiation Intensity

INCIDENT RADIATION kW/m²	TYPE OF DAMAGE
0.7	Equivalent to Solar Radiation
1.6	No discomfort for long exposure
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burns are likely)
9.5	Pain threshold reached after 8 sec. second degree burns after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.

Explosion

In case of vapour cloud explosion, two physical effects may occur:

* a flash fire over the whole length of the explosive gas cloud;
* a blast wave, with typical peak overpressures circular around ignition source.

As explained above, 100% lethality is assumed for all people who are present within the cloud proper.

For the blast wave, the lethality criterion is based on:

* A peak overpressure of 0.1 bar will cause serious damage to 10% of the housing/structures.
* Falling fragments will kill one of each eight persons in the destroyed buildings.

The following damage criteria may be distinguished with respect to the peak overpressures resulting from a blast wave:

Damage Due to Overpressures

Peak Overpressure	Damage Type
0.83 bar	Destruction
0.30 bar	Heavy Damage
0.10 bar	Moderate Damage
0.03 bar	Significant Damage
0.01 bar	Minor Damage

From this it may be concluded that p = 0.17 E+5 pa corresponds approximately with 1% lethality. Furthermore, it is assumed that everyone inside an area in which the peak overpressure is greater than 0.17 E+ 5 pa will be wounded by mechanical damage. For the gas cloud explosion this will be inside a circle with the ignition source as its centre.

Intoxication

The consequences from inhalation of a toxic vapour/gas are determined by the toxic dose. This dose D is basically determined by:

- Concentration of the vapour in air;

- Exposure duration.

Furthermore, of course, the breathing rates of the victim, as well as the specific toxic mechanism unto the metabolism play an important role.

The dose is defined as $D = C^n.t$, with:

C = concentration of the toxic vapour, in [ppm] or [mg/m^3];

t = exposure duration, in [sec] or [min];

n = exponent, mostly > 1.0; this exponent takes into account the fact that a high concentration over a short period results in more serious injury than a low concentration over a relatively longer period of exposure. The value of n should be greater than zero but less than 5.

The given definition for D only holds if the concentration is more or less constant over the exposure time; this may be the case for a (semi) continuous source. In case of an instantaneous source, the concentration varies with time; the dose D must be calculated with an integral equation:

$$D = \int C^n.dt$$

For a number of toxic materials, so-called Vulnerability Models (V.M.) has been developed. The general equation for a V.M. (probit function) is:

$Pr = a + b.\ln (C^n.t)$, with

Pr = probit number, being a representation of the percentage of people suffering a certain kind of damage, for instance lethality

Pr = 2.67 means 1% of the population;

Pr = 5.00 means 50% of the population;

a and b material dependent numbers;

$C^n.t$ = dose D, as explained above.

The values for a and b are mostly derived from experiments with animals; occasionally, however, also human toxicity factors have been derived from accidents in past. In case only animal experiments are available, the inhalation experiments with rats seem to be best applicable for predicting the damage to people from acute intoxication. Although much research in this field have been done over the past decades, only for a limited number of toxic materials consequence models have been developed. Often only quite scarce information is available to predict the damage from an acute toxic exposition. Data transformation from oral intoxication data to inhalation toxicity criteria is sometimes necessary. Generally, in safety evaluations pessimistic assumptions are applied in these transformation calculations. The calculated damage (distance) may be regarded as a maximum. For the purposes of a response to a major incident, the IDLH value level has been chosen for the 'wounded' criteria. This type of injury will require medical attention.

7.6.2 MAXIMUM CREDIBLE LOSS ACCIDENT SCENARIOS

A Maximum Credible Accident (MCA) can be characterised as the worst credible accident. In other words: an accident in an activity, resulting in the maximum consequence distance

that is still believed to be possible. A MCA-analysis does not include a quantification of the probability of occurrence of the accident. Another aspect, in which the pessimistic approach of MCA studies appears, is the atmospheric condition that is used for dispersion calculations. As per the reference of the study, weather conditions having an average wind speed have been chosen.

The Maximum Credible Loss (MCL) scenarios have been developed for the Facility. The MCL cases considered, attempt to include the worst "Credible" incidents- what constitutes a credible incident is always subjective. Nevertheless, guidelines have evolved over the years and based on basic engineering judgement, the cases have been found to be credible and modelling for assessing vulnerability zones is prepared accordingly. Only catastrophic cases have been considered and not partial or small failures (as is the case in Quantitative Risk Assessment where contributions from low frequency - high outcome effect as well as high frequency - low outcome events are distinguished). The objective of the study is emergency planning, hence only holistic & conservative assumptions are used for obvious reasons. Hence though the outcomes may look pessimistic, the planning for emergency concept should be borne in mind whilst interpreting the results.

7.6.2.1 CONSEQUENCE ANALYSIS CALCULATIONS

The Consequence Analysis has been done for selected scenarios. This has been done for weather conditions having wind speed. In Consequence Analysis, geographical location of the source of potential release plays an important role. Consideration of a large number of scenarios in the same geographical location serves little purpose if the dominant scenario has been identified and duly considered.

7.6.2.2 SOFTWARE USED FOR CALCULATIONS

PHAST MICRO: Phast is the most comprehensive software available for performing Process Hazard Analysis (PHA), Quantitative Risk Assessment (QRA) and Financial Risk Analysis (FRA). Our extensively validated software for consequence and risk assessment is used by governments and industry helping them to comply with local safety regulation and their own corporate best practice. Phast contains all the discharge, dispersion, effects and risk models you will need to accurately assess all your major hazards and associated risks. Phast Consequence provides you with comprehensive hazard analysis facilities to examine the progress of a potential incident from the initial release to its far-field effects.

TOXIC AND FLAMMABLE IMPACT

It calculates the initial discharge, as the material expands from its storage conditions to atmospheric, through dispersion, as the material mixes with air and dilutes, and the subsequent toxic or flammable effects. Phast includes a wide range of models for discharge and dispersion as well as flammable, explosive and toxic effects.

DISCHARGE

- Phast requires basic information about storage or process conditions and material properties in order to perform discharge calculations
- The software comes with an integrated material property database containing more than 1,600 pre-defined pure component chemicals

- Various discharge scenario options have been implemented to represent common process failures, and model their behaviour. These include:
  - ❖ Leaks and line ruptures from long & short pipelines
  - ❖ Catastrophic ruptures
  - ❖ Relief valve and disc ruptures
  - ❖ Tank roof collapse
  - ❖ Vent from vapour spaces
  - ❖ In building release effects

DISPERSION

The dispersion models within Phast are able to model the following phenomena

- Dispersion of gas, liquid and two-phase releases
- Liquid droplet thermo dynamics calculations and liquid droplet rainout
- Pool spreading and vaporization
- Building wake dispersion effects for vapour releases

FLAMMABLE EFFECTS

For releases of flammable material Phast calculates

- Radiation profiles and contours from a range of fire scenarios including pool fires, flash fires, jet fires and fire balls, including cross-wind effects on a jet fire
- Vapour Cloud Explosion modeling using industry standards models including the TNO Multi-energy, and TNT Equivalence models

TOXIC EFFECTS

- Graphs of toxic concentration profile
- Indoor and outdoor toxic dose prediction
- Reporting of distance to specific dose and concentration
- Calculated exposure time and use as “averaging time” for passive dispersion effects

PHAST RISK

Phast Risk allows you to combine the flammable and toxic consequences from each scenario in your QRA model with their likelihood to quantify the risk of fatalities. Phast Risk allows you to take account of local population distribution, sources of ignition, land usage and local prevailing weather conditions. It is designed to perform all the analysis, data handling and results presentation elements of a QRA within a structured framework.

Phast Risk allows you to quickly identify major risk contributors so that time and efforts can be directed to mitigating these highest risk activities. Based on effects calculations and population vulnerabilities, Phast Risk can integrate over all scenarios and weather conditions to estimate the total risk. The established individual and societal risk indicators

are predicted by Phast Risk across your facility and surrounding area using the classical QRA methodology. Risk ranking reports can be produced at points of strategic importance to show the relative influence of the various failure scenarios and their contribution to both the individual and societal risk metrics.

A key benefit of Phast Risk is the ability to identify major risk contributors and differentiate these from incidents with worst case consequences which might otherwise dominate the safety reviews. Whilst medium scale incidents have lesser consequences, they may have a higher frequency, which, when combined with their hazardous effects, generate a higher level of risk. Time and effort directed to mitigating high consequence but often low frequency events may not be well spent. Phast Risk helps you direct this effort more effectively.

Phast Risk also provides facilities to help you manage large quantities of input data, including scenarios, parameters, wind roses, ignition and population, and combine these in many ways. This is critical when looking at sensitivity analyses and assessing the merits of a range of risk reduction measures.

Benefits

- Facilitates cost reduction in terms of losses and insurance
- Allows optimization of plant and process design
- Assist in compliance with safety regulators
- Enables quicker response to hazardous incidents
- Improve engineer's understanding of potential hazards
- Regular software upgrades incorporate industry experience and expertise, and advances in consequence modeling technology

7.7 SCENARIOS

TABLE 7.4

POSSIBLE ACCIDENT SCENARIOS

Scenario	MCL Scenario	Mode of storage	Quantity
1	Release of Toluene	Tank	20 MT
2	Release of Methanol	Tank	50 MT
3	Release of Diesel	Tank	35 KL & 15 KL
4	Release of Hydrochloric Acid	Tank	30 KL
5	Release of Sulphuric Acid	Tank	50 MT
6	Release of Caustic lye	Tank	23 MT
7	Release of Chlorine	Cylinder	0.05 MT
8	Release of Bromine	Cylinder	0.05 MT
9	Release of Hydrogen	Cylinder	120 m3

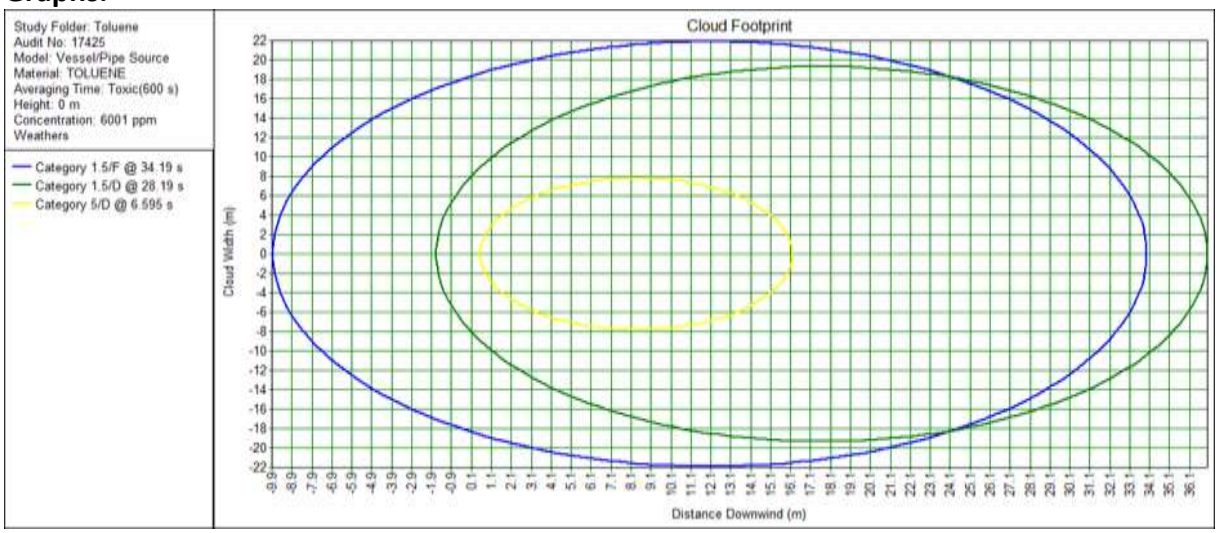
10	Release of Ammonia	Cylinder	0.1 MT
11	Release of Ethylene oxide	Cylinder	0.03 MT
12	Unconfined Pool Fire Simulations for Drum Storage Area	Drums	65 MT

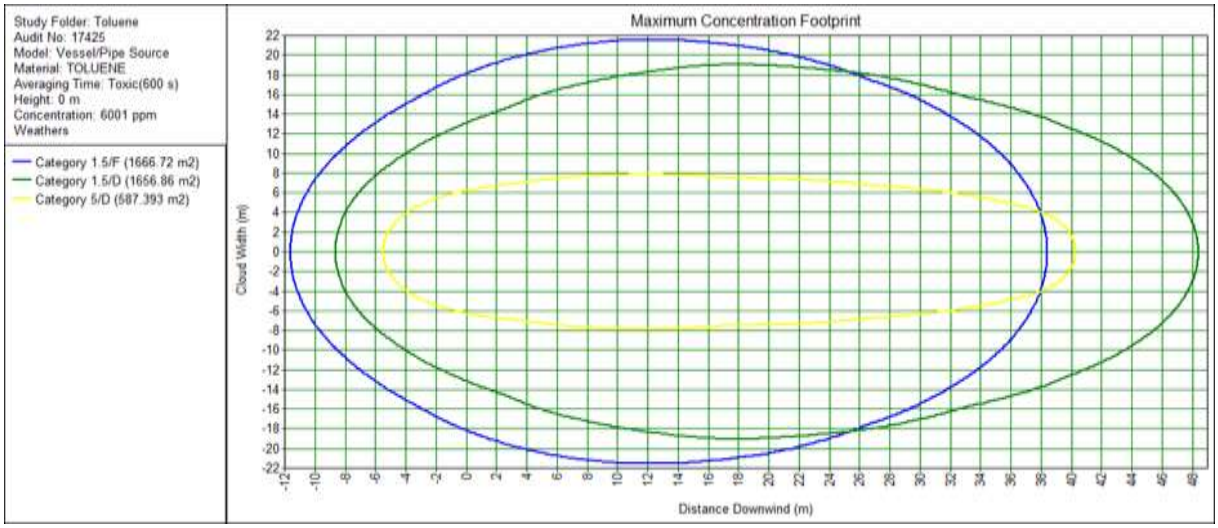
Scenario 1: Release of Toluene

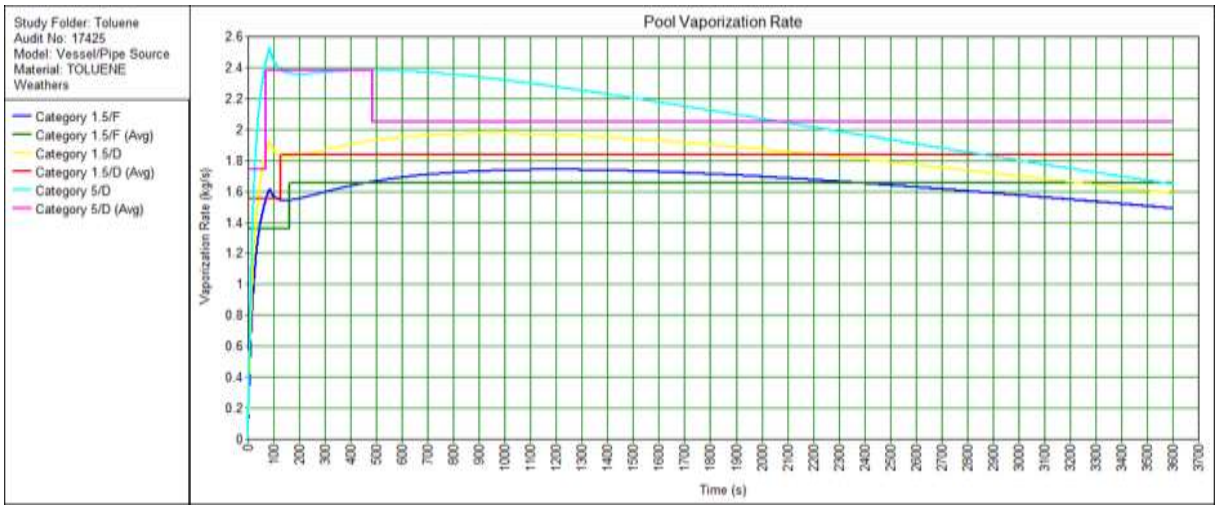
This scenario considers release of Toluene from Storage Tank:

Catastrophic Rupture		
Input Data		
Stored quantity - 20 MT		
Molecular weight -92.14		
Wind speed – 3.14 m/s		
Density (Air) – 860 kg/m^3		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**
4	90.85	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	39.15	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	--	This level of radiation is assumed to give 100% fatality as outlined above.
Fireball Scenario		
Fireball Radius: 10.547 m		
Fireball intensity of Heat Radiation (KW/m^2) – 149.074		
Fireball rate of Energy release (KJ/Sec)- 107389		
Fireball total energy released (KJ)- 185056		
Fireball duration (Sec) – 1.72334		
Radiation Level (KW/m^2)	**Distance in meter**	**Injury Type**
4	266.07	Pain after 20secs.
12.5	119.35	1st degree Burn
37.5	--	100% Fatal

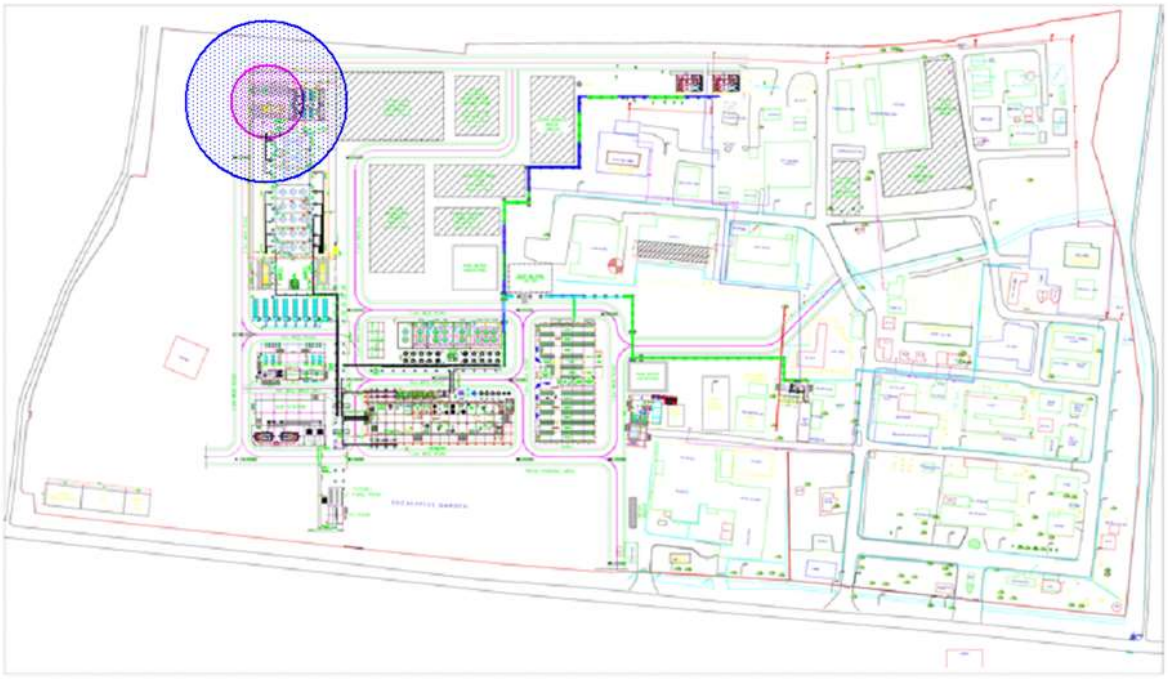
Graphs:


Study Folder: Toluene
Audit No: 17425
Model: Vessel/Pipe Source
Material: TOLUENE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 6001 ppm
Weathers
Category 1.5/F @ 34.19 s
Category 1.5/D @ 28.19 s
Category 5/D @ 6.595 s
Cloud Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: Toluene
Audit No: 17425
Model: Vessel/Pipe Source
Material: TOLUENE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 6001 ppm
Weathers
Category 1.5/F (1666.72 m2)
Category 1.5/D (1656.86 m2)
Category 5/D (587.393 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)

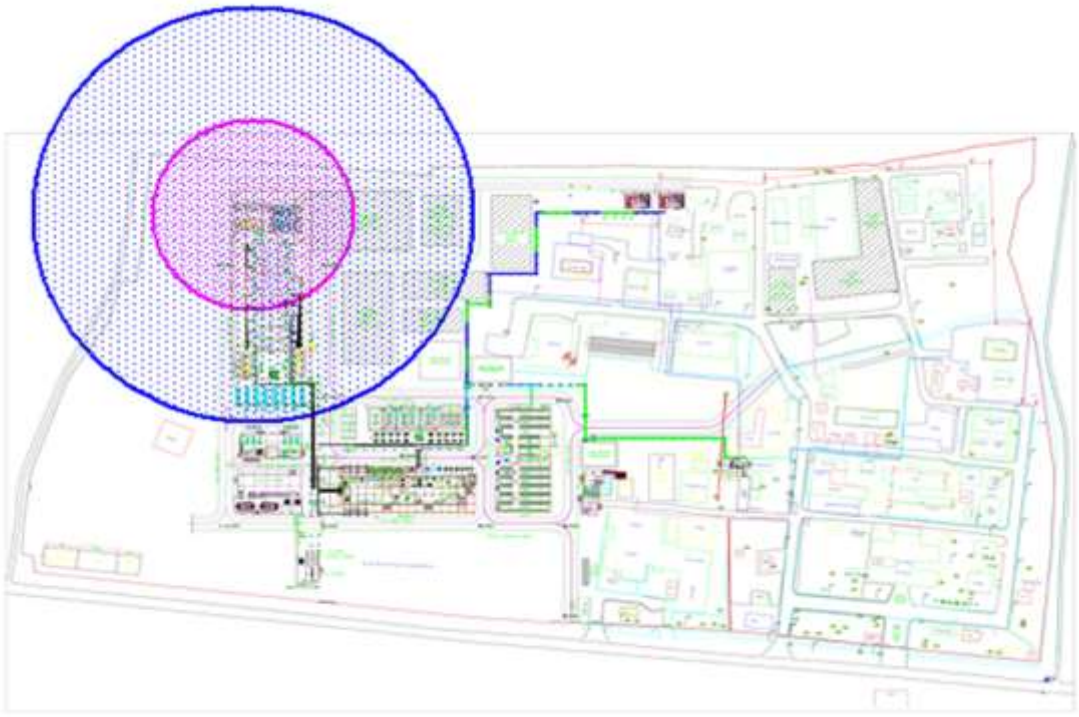

Study Folder: Toluene
Audit No: 17425
Model: Vessel/Pipe Source
Material: TOLUENE
Weathers
Category 1.5/F
Category 1.5/F (Avg)
Category 1.5/D
Category 1.5/D (Avg)
Category 5/D
Category 5/D (Avg)
Pool Vaporization Rate
Vaporization Rate (kg/s)
Time (s)

Pool Fire Scenario



Blue – 4 KW/m^2
Pink – 12.5 KW/m^2

Fireball Scenario



Blue– 4 KW/m^2

Pink – 12.5 KW/m^2

Storage & Handling

- Use PPE, including gloves, safety goggles, face shield, coveralls and boots depending on the type of handling task.
- Practice good housekeeping when storing, loading and transferring inventory.
- Wash hands after handling toluene and similar substances.
- Ground and bond containers while dispensing and filling materials.
- Keep containers closed when not in use.
- Ensure labels are readable.
- Monitor data of employee exposure.

Safety Precaution:

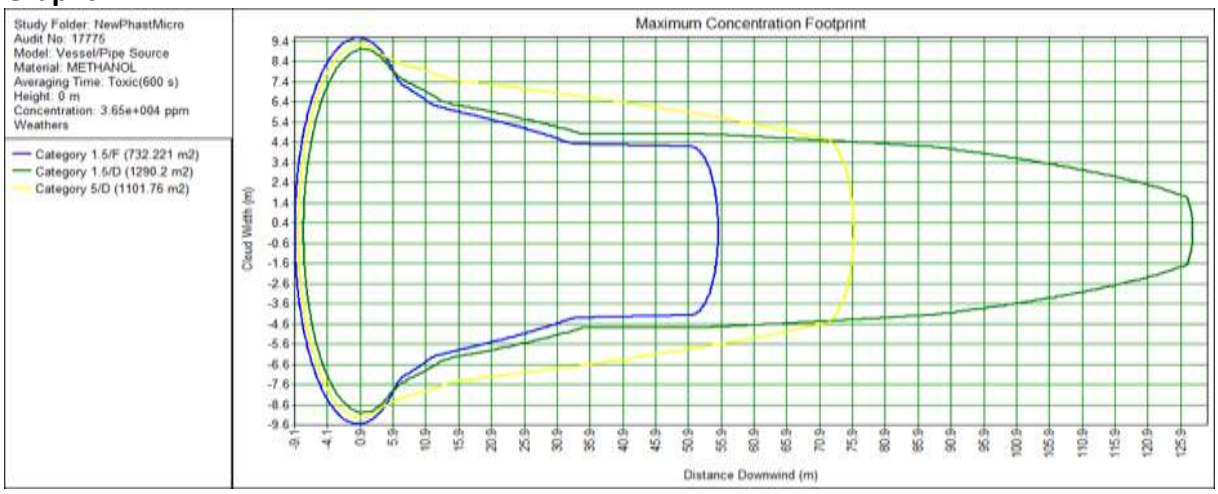
- Flame proof pumping and other equipments are provided.
- Transfer done in close process,
- Double static earthling and jumper clips are provided on flanges,
- Hydrant system and fire extinguishers are provided.
- Automatic sprinklers are provided.
- Tanker unloading procedure are made and followed.
- Adequate dyke wall (non-combustible) is provided.
- Combustible Gas Detection system, Fire (Foam / Powder) extinguisher, Foam monitors is provided.
- Nitrogen blanketing system is provided.
- Area is covered with hard barricading for restricted person access.

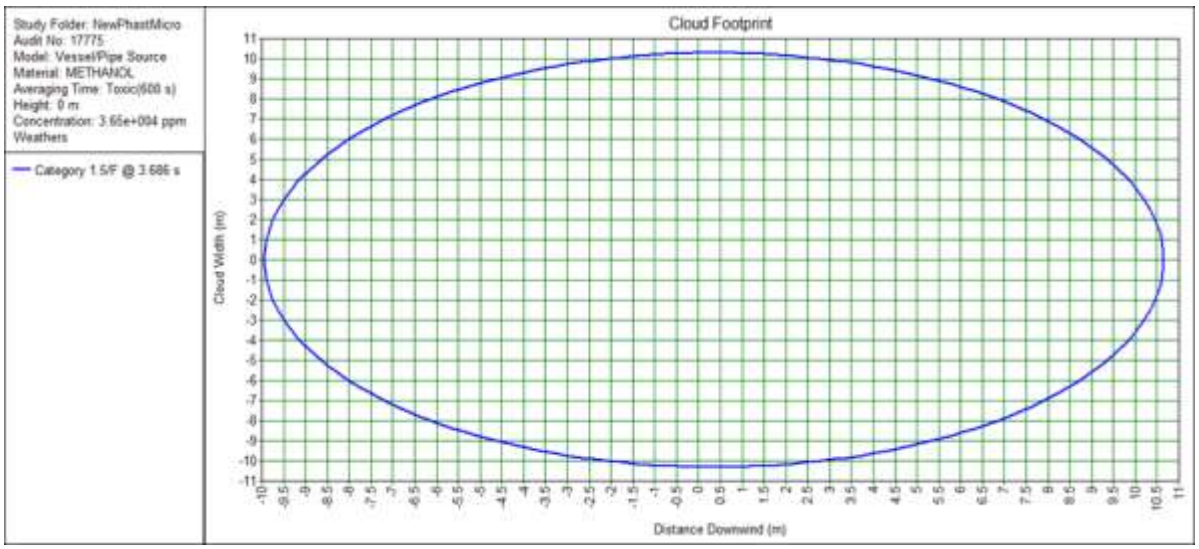
Scenario 2: Release of Methanol

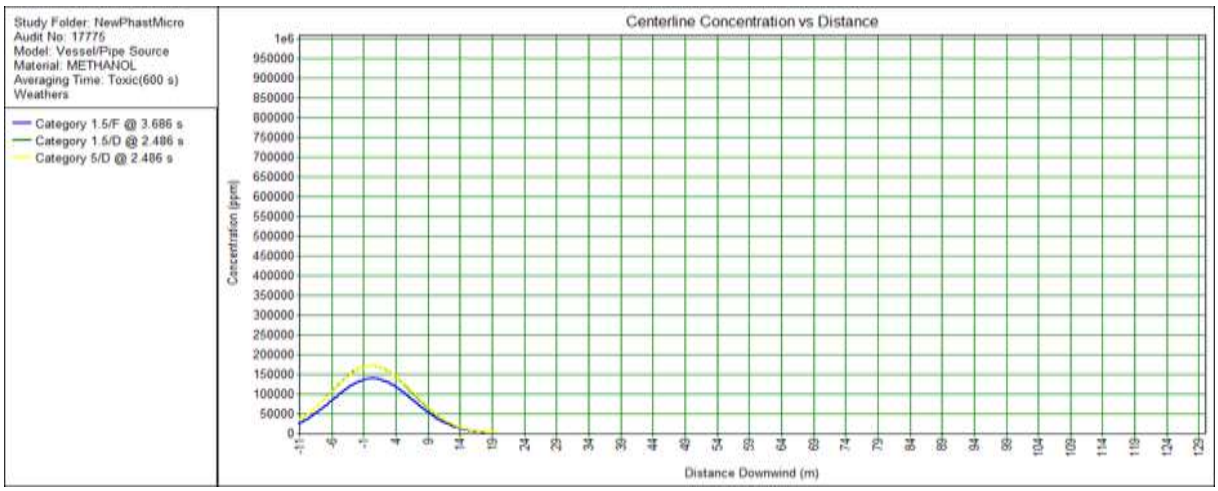
This scenario considers release of Methanol from Storage Tank:

Catastrophic Rupture		
Input Data		
Stored quantity - 50 MT		
Molecular weight -33.05		
Wind speed – 3.14 m/s		
Density (Air) –0. 791 g/cm^3		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**
4	154	This level is sufficient to cause personnel if unable to reach co within 20s; however, blistering of the skin (second degree bur is likely; 0: lethality
12.5	100	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	63	This level of radiation is assumed to give 100% fatality as outlined above.
Fireball Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Injury Type**
4	172	Pain after 20secs.
12.5	--	--
37.5	--	--

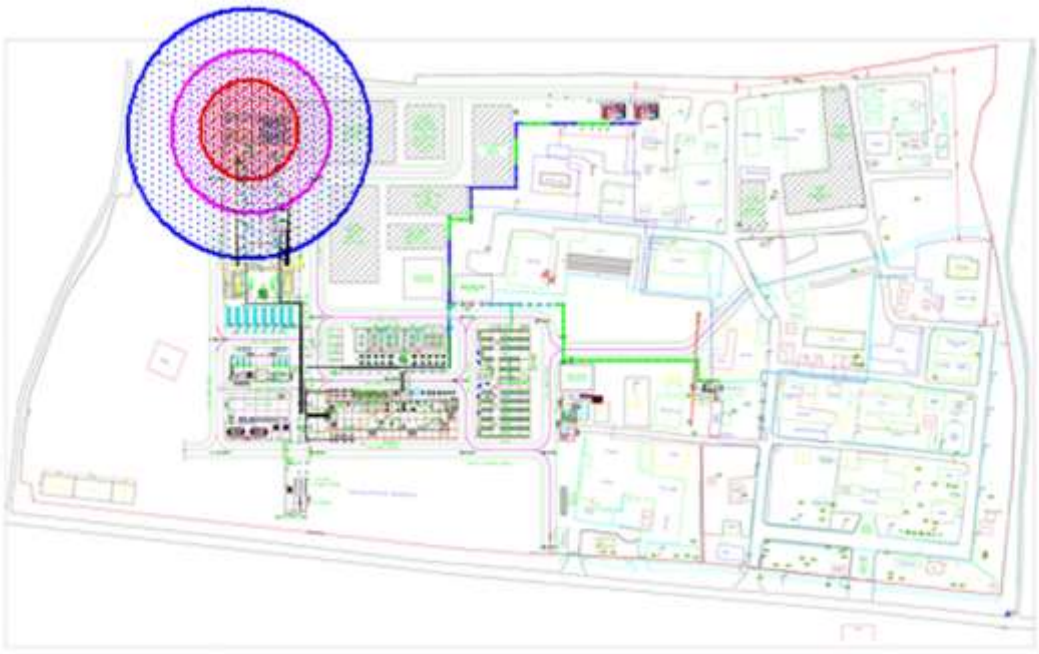
Graphs:


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: METHANOL
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 3.65e+004 ppm
Weathers
Category 1.5/F (732.221 m2)
Category 1.5/D (1290.2 m2)
Category 5/D (1101.76 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: METHANOL
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 3.65e+004 ppm
Weathers
Category 1.5/F @ 3.686 s
Cloud Footprint
Cloud Width (m)
Distance Downwind (m)

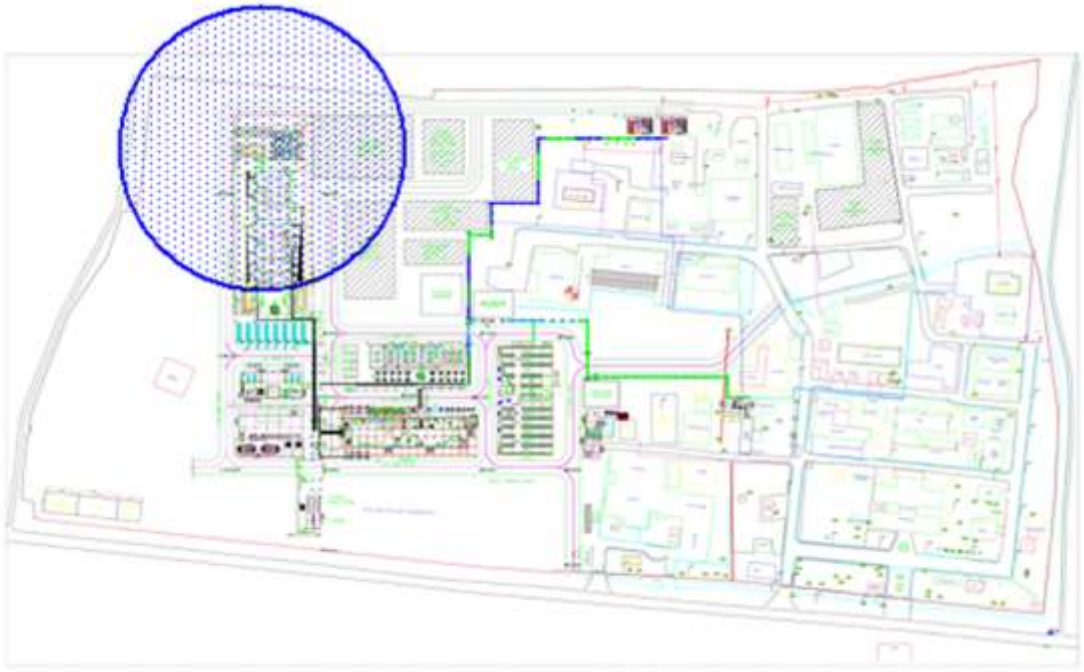

Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: METHANOL
Averaging Time: Toxic(600 s)
Weathers
Category 1.5/F @ 3.686 s
Category 1.5/D @ 2.486 s
Category 5/D @ 2.486 s
Centerline Concentration vs Distance
Concentration (ppm)
Distance Downwind (m)

Pool Fire Scenario:



Blue – 4 KW/m^2
Pink– 12.5 KW/m^2
Red – 37.5 KW/m^2

Fireball Scenario:



Blue – 4 KW/m^2

Storage & Handling

- Permanently installed fire-extinguishing equipment provided in large storage facilities.
- Water cannons are generally installed in storage tank farms to cool steel constructions and neighbouring tanks in the event of fire.
- Large tanks have permanently installed piping systems for alcohol-resistant fire-extinguishing foams.

Safety Precaution:

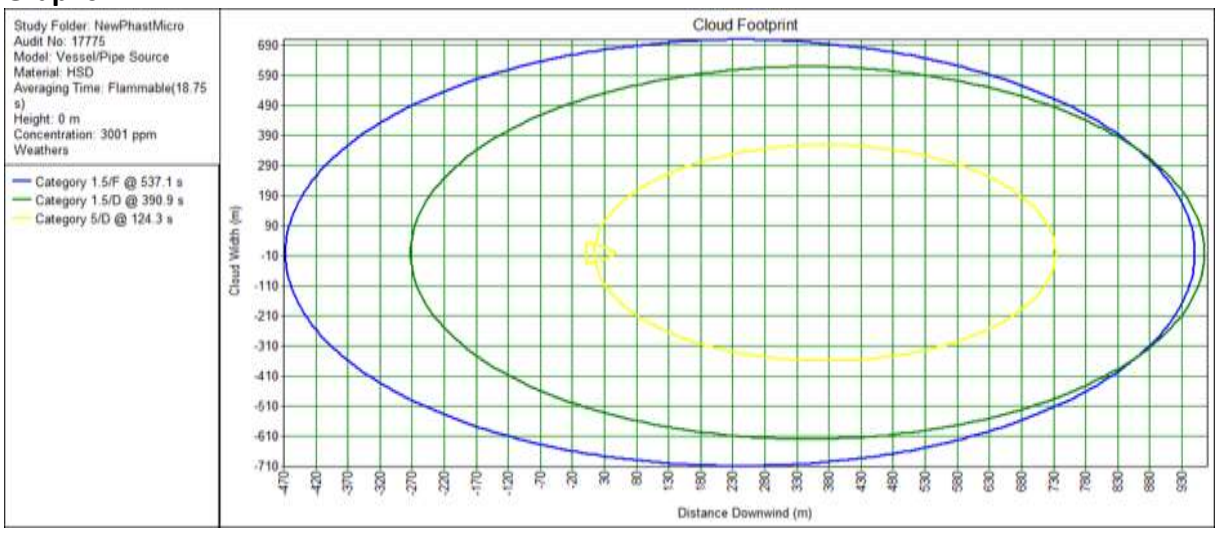
- Flame proof pumping and other equipments are provided.
- Transfer done in close process,
- Double static earthling and jumper clips are provided on flanges,
- Hydrant system and fire extinguishers are provided.
- Automatic sprinklers are provided.
- Tanker unloading procedure are made and followed.
- Adequate dyke wall (non-combustible) is provided.
- Combustible Gas Detection system, Fire (Foam / Powder) extinguisher, Foam monitors is provided.
- Nitrogen blanketing system is provided.
- Area is covered with hard barricading for restricted person asses.

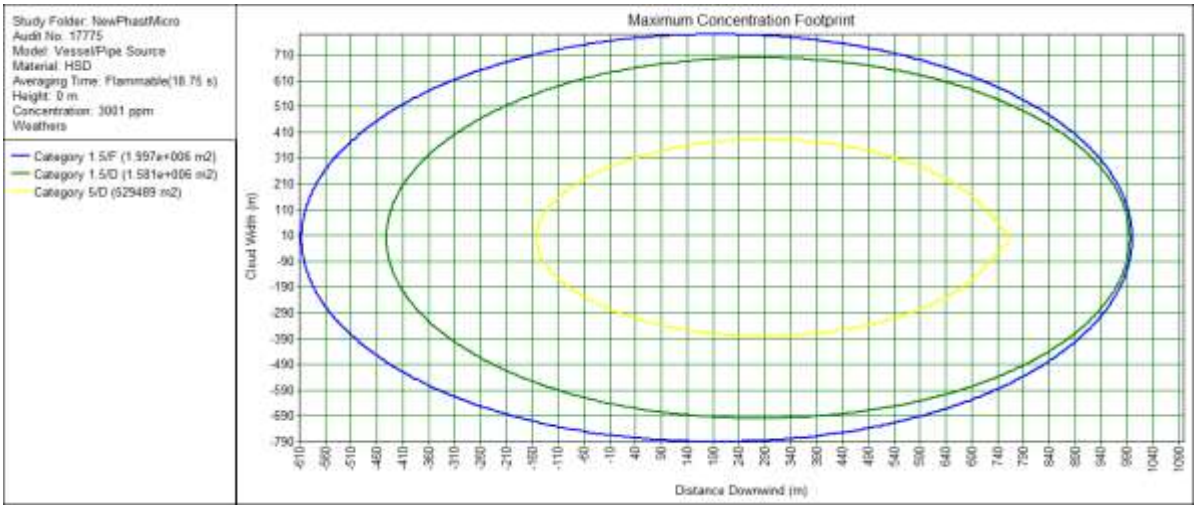
Scenario 3: Release of Diesel

This scenario considers release of Diesel from Storage Tank:

Catastrophic Rupture		
Input Data		
Stored quantity - 35 KL		
Molecular weight -106.16		
Wind speed – 3.14 m/s		
Density (Air) – 861 kg/m^3		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**
4	92	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	45	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	Not Reached	This level of radiation is assumed to give 100% fatality as outlined above.
Results indicate:		
Maximum Pool Radius-43.61m		

Graphs:





Storage & Handling

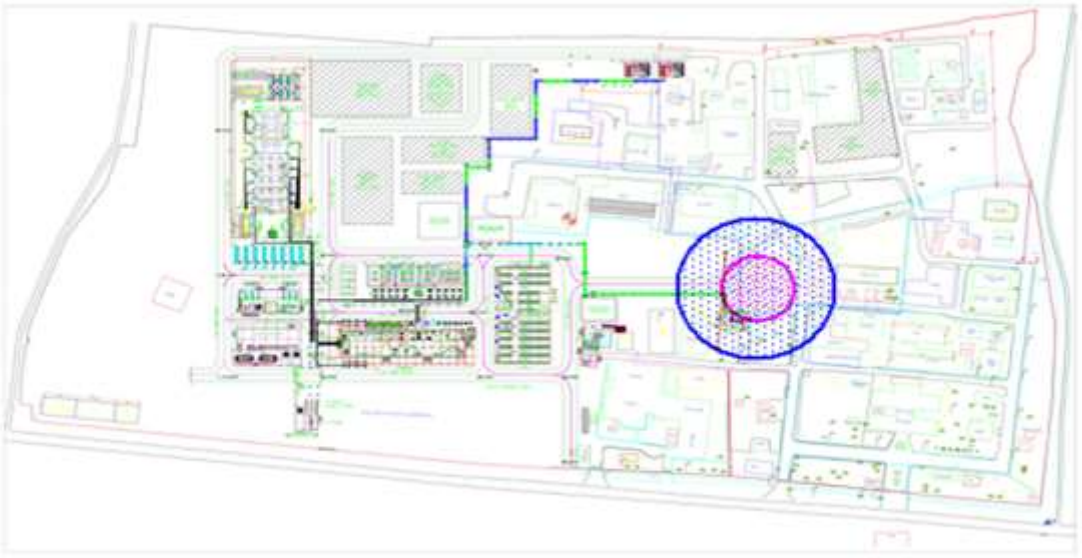
- Tanks designed and intended for aboveground use shall not be used as underground tanks.
- Tanks shall rest on firm, level ground or on foundations made of concrete, masonry, piling, or steel. Tanks shall be designed and built in accordance with recognized engineering standards for the material of construction being used.
- Storage tanks and their accessories shall be inspected and maintained according to manufacturer's guidelines or applicable standards.
- Every tank shall have an emergency relief venting device to relieve excessive internal pressure caused by an exposure fire.
- To prevent against accidental spills, single-wall tanks shall be protected by a diking system designed to hold the total tank capacity. An alternative to a diking system would be the use of a double-wall tank.
- Tank venting systems shall be provided with sufficient capacity to prevent blowback of vapor or liquid at the fill opening while the tank is being filled.

Safety Precaution

- Using a tank that is designated for outdoor use and has an Underwriters Listed (UL) stamp.
- Tanks that are designated to handle flammable liquids.
- Utilizing a tank that can handle several weeks to a month's worth of fuel.
- By limiting the fill ups, you reduce the risk of a spill. Keep in mind that you should not fill a tank over 95 percent capacity to allow for expansion.
- Open flames and smoking shall not be permitted in the area.
- The tanks should be installed in an east-west orientation to reduce the amount of solar radiation the tank receives.

- The tank should be marked with the name of the fuel contents and a sign with "FLAMMABLE–KEEP FIRE AND FLAME AWAY." The words should be at least six inches in height and be in a bright red color.
- "NO SMOKING" signs should also be conspicuously exhibited from various angles of approach.
- Class B type fire extinguishers should be mounted in easy to access locations.
- Do not place tanks where ignition sources such as welding and cutting torches are likely to be used.
- Tank saddles (either concrete or steel) are required by law unless tanks in contact with the ground are protected against corrosion.
- Everyone who works on or around the equipment or the fuel storage locations should be trained to identify and eliminate risks.
- Adequate dyke wall is provided.

Pool Fire Scenario:



Blue – 4 KW/m^2
Pink– 12.5 KW/m^2

Scenario 4: Release of Hydrochloric Acid

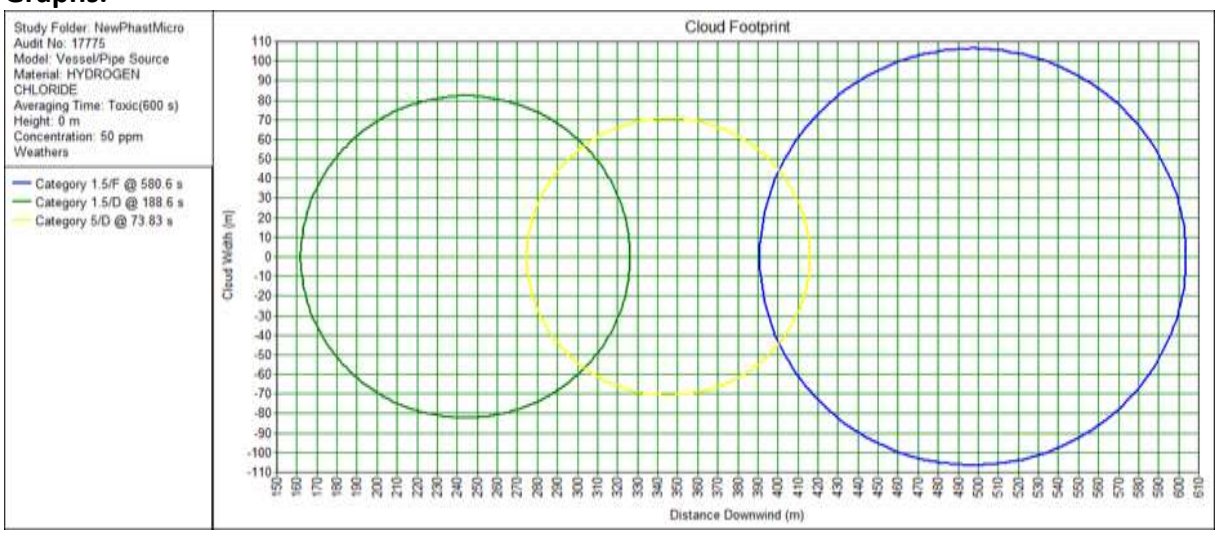
Spill Pool evaporation modules for HCl Storage Tank catastrophic failure

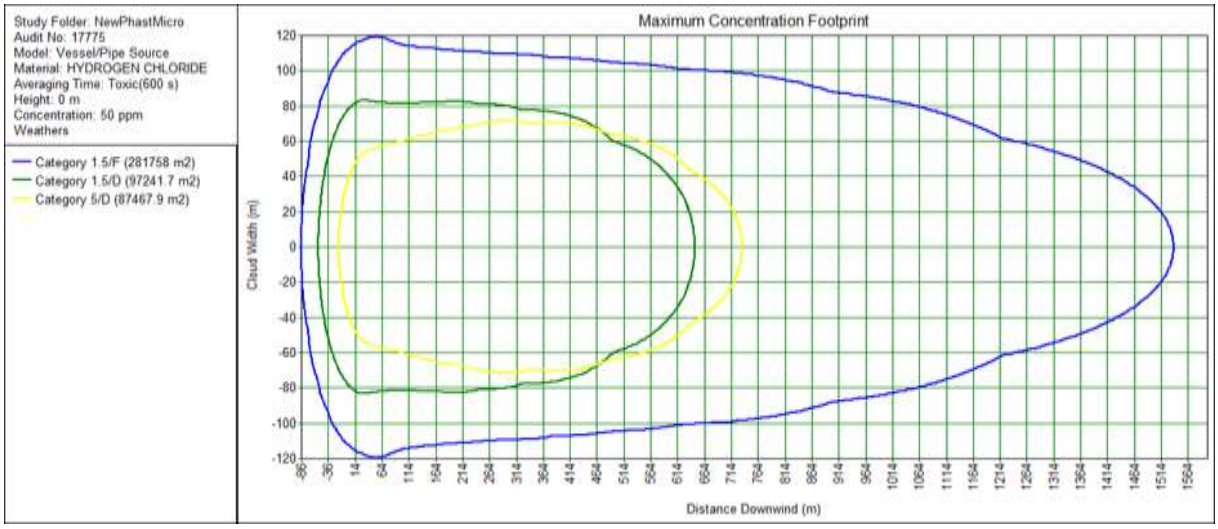
Catastrophic Rupture	
Input Data	
Stored quantity - 30 KL	
Molecular weight -36.46	
Wind speed – 3.14 m/s	
Density (Air) – 1180 kg/m^3	
Results indicate	
IDLH – 50 ppm	1123.5 meter

Spill Pool evaporation modules for HCl Storage Tank catastrophic failure

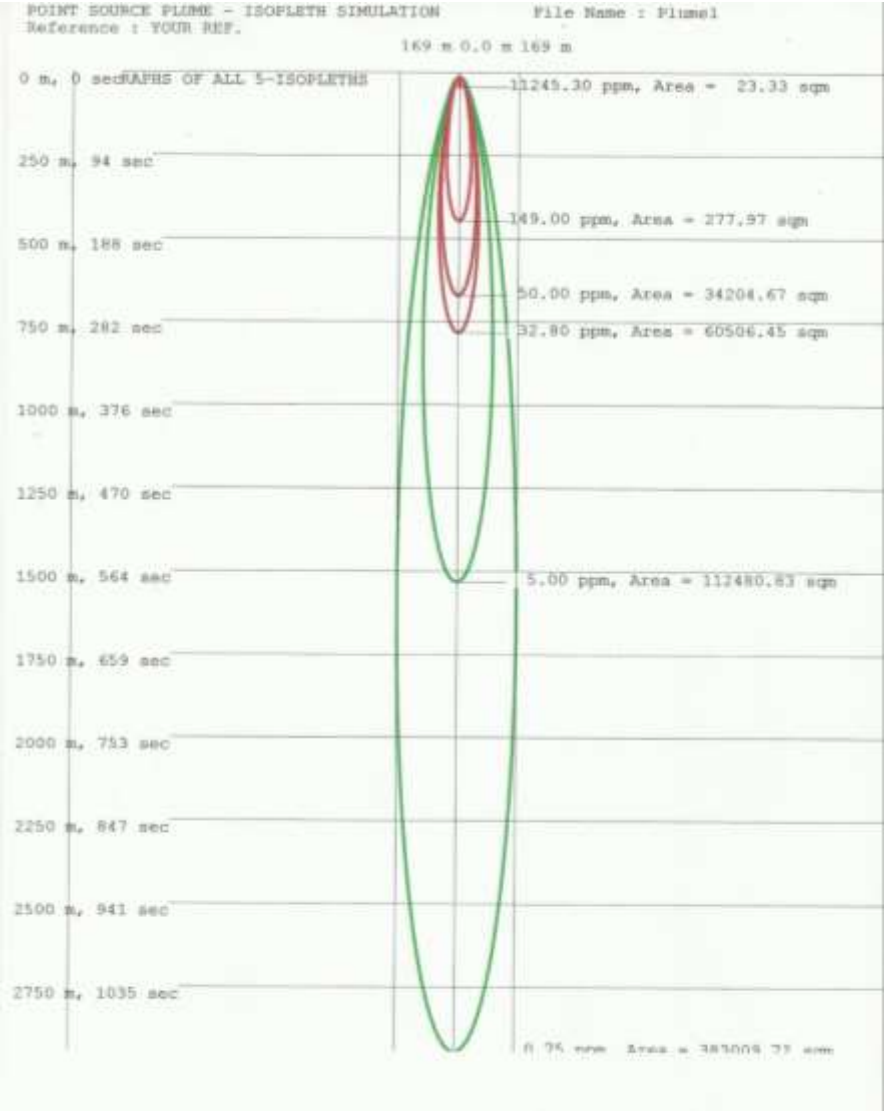
Catastrophic Rupture	
Input Data	
Stored quantity – 15 KL	
Molecular weight -36.46	
Wind speed – 3.14 m/s	
Density (Air) – 1180 kg/m^3	
Results indicate	
IDLH – 50ppm	556.94 meter

Graphs:




Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: HYDROGEN CHLORIDE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 50 ppm
Weathers
Category 1.5/F (281758 m2)
Category 1.5/D (97241.7 m2)
Category 5/D (87467.9 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)

Isopleth:


POINT SOURCE PLUME - ISOPLETH SIMULATION
File Name : Plume1
Reference : YOUR REF.
169 m 0.0 m 169 m
0 m, 0 secGRAPHS OF ALL 5-ISOPLETHS
11245.30 ppm, Area = 23.33 sqm
250 m, 94 sec
149.00 ppm, Area = 277.97 sqm
500 m, 188 sec
50.00 ppm, Area = 34204.67 sqm
750 m, 282 sec
32.80 ppm, Area = 60506.45 sqm
1000 m, 376 sec
1250 m, 470 sec
1500 m, 564 sec
5.00 ppm, Area = 112480.83 sqm
1750 m, 659 sec
2000 m, 753 sec
2250 m, 847 sec
2500 m, 941 sec
2750 m, 1035 sec

Measures to be taken to prevent such accident

- Priority will be given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.
- Security person checks License, TREM CARD, Fire extinguisher condition, required PPEs as per SOP laid down.
- Store officer will take sample as per sampling SOP from sampling point.
- After approval of QC department unloading procedure is allowed be started.

Following precautions will be adopted during unloading

- Wheel stopper is provided to Tanker loading at unloading platform.
- Tanker unloading procedure is followed according to check list and implemented.
- Flexible hose connection is done at TL outlet line and checked for no leakage.
- The quantity remaining in the hose pipeline is drained to a small container, which will be subsequently transferred to the main storage tank thus ensuring complete closed conditions for transfer from road tanker.
- All Tanker loading valves will be closed.

Following precautions will be adopted Storage of such chemicals

- Storage tank is stored away from the process plant.
- Tanker unloading procedure is prepared and implemented.
- Caution note and emergency handling procedure is displayed at unloading area and trained all operators.
- NFPA label is provided.
- Required PPEs like full body protection PVC apron, Hand gloves, gumboot, Respiratory mask etc. is provided to operator.
- Neutralizing agent is kept ready for tackle any emergency spillage.
- Safety shower, eye wash with quenching unit is provided in acid storage area.
- Material is handled in close condition in pipe line.
- Dyke wall is provided to all storage tanks, collection pit with valve provision.
- Drain valve is provided.
- Level gauge is provided on all storage tanks.
- Safety permit for loading unloading of hazardous material is prepared and implemented.
- TREM CARD is provided to all transporters and trained for transportation Emergency of Hazardous chemicals.
- Fire hydrant system with jockey pump as per TAC norms is installed.

Mitigation measures to control Emergency:

- Safety Shower and eye wash is provided away from the tank and unloading station.
- Sand bags/ buckets is provided near tank area.
- Neutralizing medium (Lime and dry sand) is kept ready near tank farm.
- Emergency siren and wind sock is provided.

- Tele Communication system and mobile phone is used in case of emergency situations for communication.
- First Aid Boxes and Occupational health center is made at site.
- Emergency organization and team is prepared.
- Full body protection suite and other PPEs will be kept ready in ECC at site.
- Emergency team is prepared and trained for scenario base emergency. Like Toxic control team, Fire control team, First aid team, communication and general administration team, Medical team etc.

EMERGENCY RESPONSE

SPILL OR LEAK

· Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
· Stop leak if you can do it without risk.
· Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.
· Keep combustibles (wood, paper, oil, etc.) away from spilled material.

Small Spill

· Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
· Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
· Prevent entry into waterways, sewers, basements or confined areas.

Scenario 5: Release of Sulfuric Acid

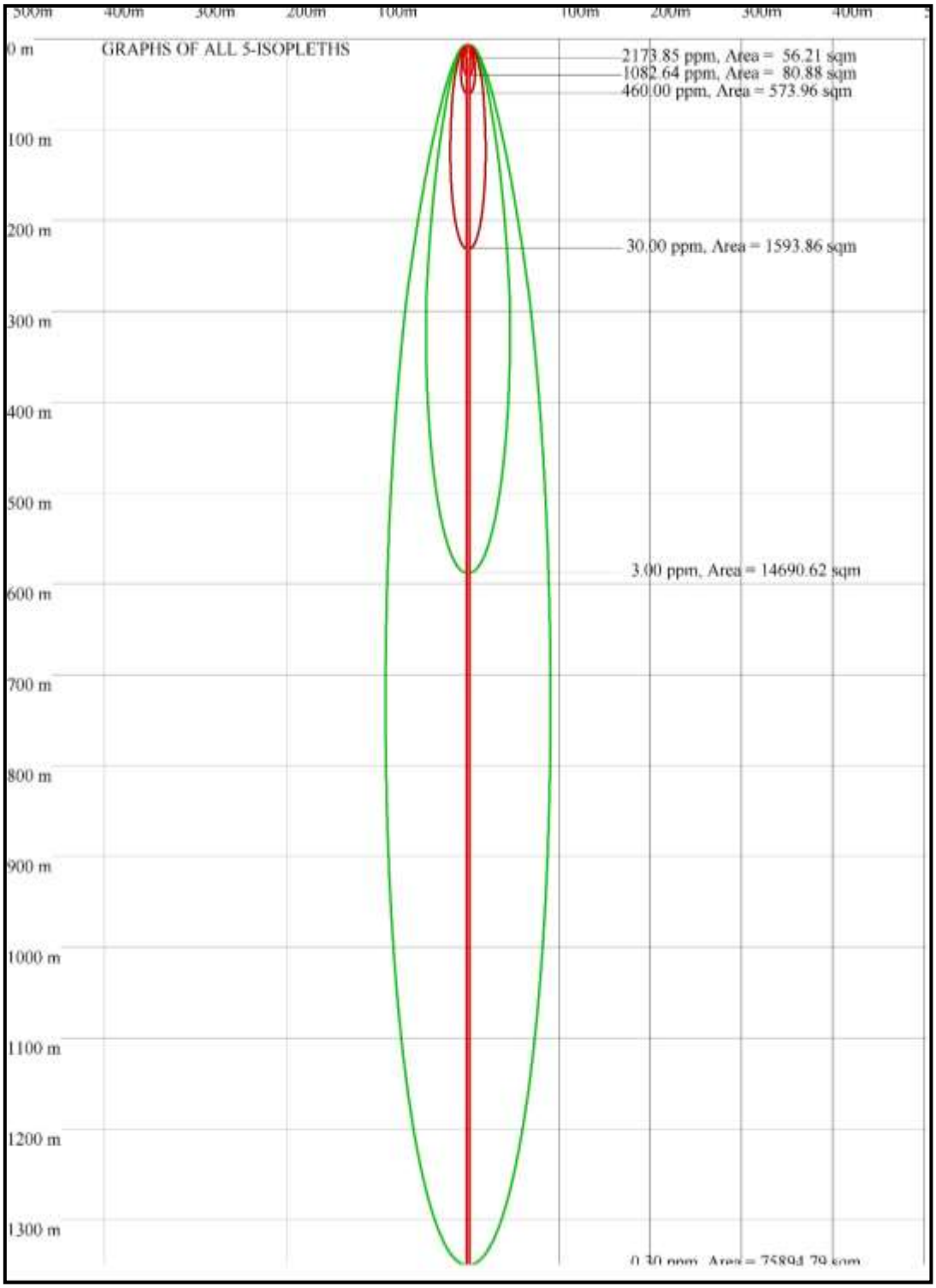
Spill Pool evaporation module for Sulphuric Acid Storage Tank catastrophic failure

Input Data		
Stored quantity -50 MT		
Molecular weight - 98.08		
Wind Speed – 3.14 m/s		
Failure Mode: Catastrophic failure of 4" bottom nozzle and loss of containment		
Density (Air) – 1840 kg/m^3		
Release rate: 1000 g/s		
Results indicate		
Input Data		**Results of Computations**
		End point (meter)
LC50 Human	460 ppm (1460 mg/m^3)	59.85
IDLH value	3.0ppm (15mg/m^3)	587.63
TLV value	0.2 ppm (1mg/m^3)	1349.6

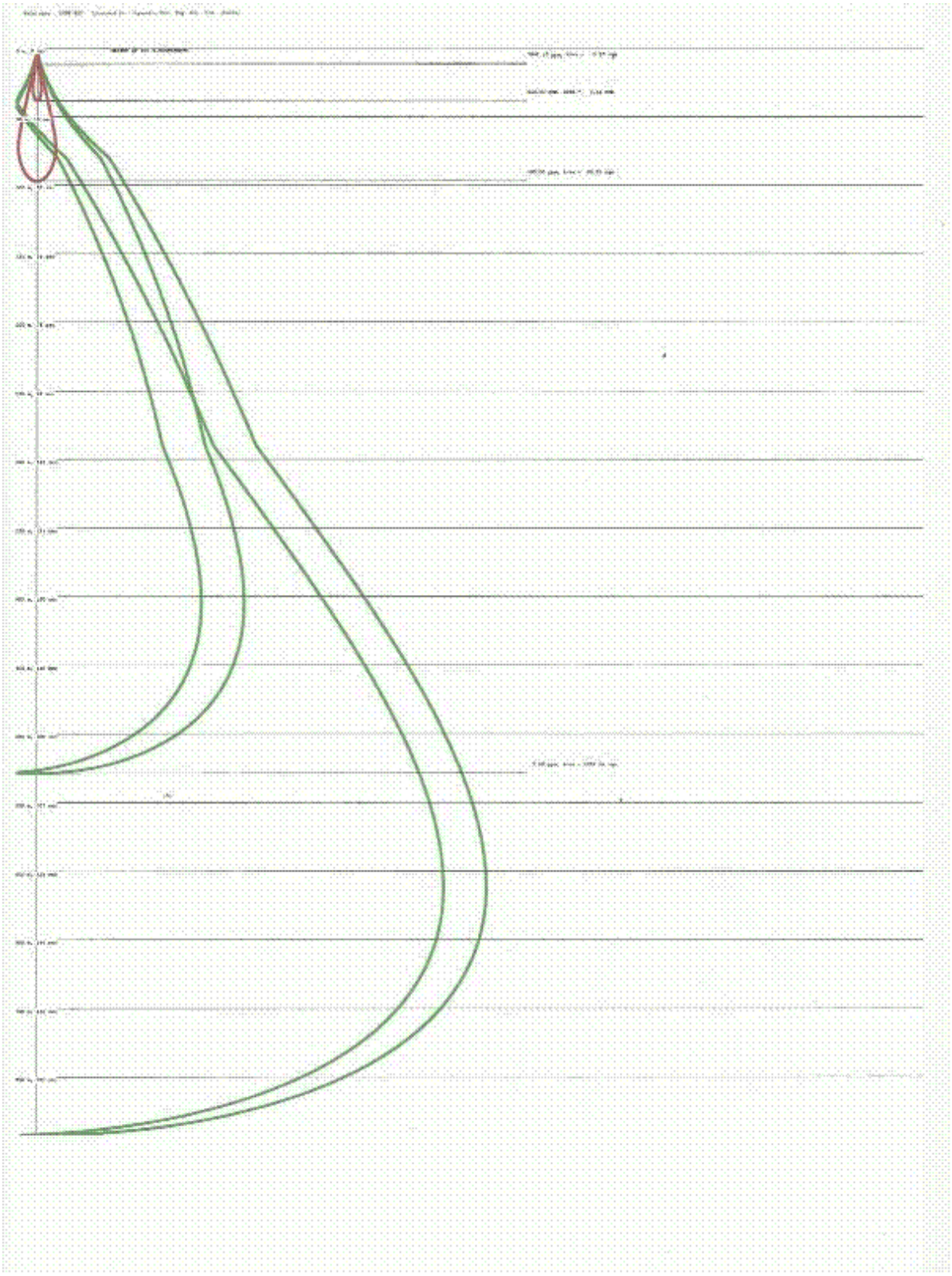
Result:

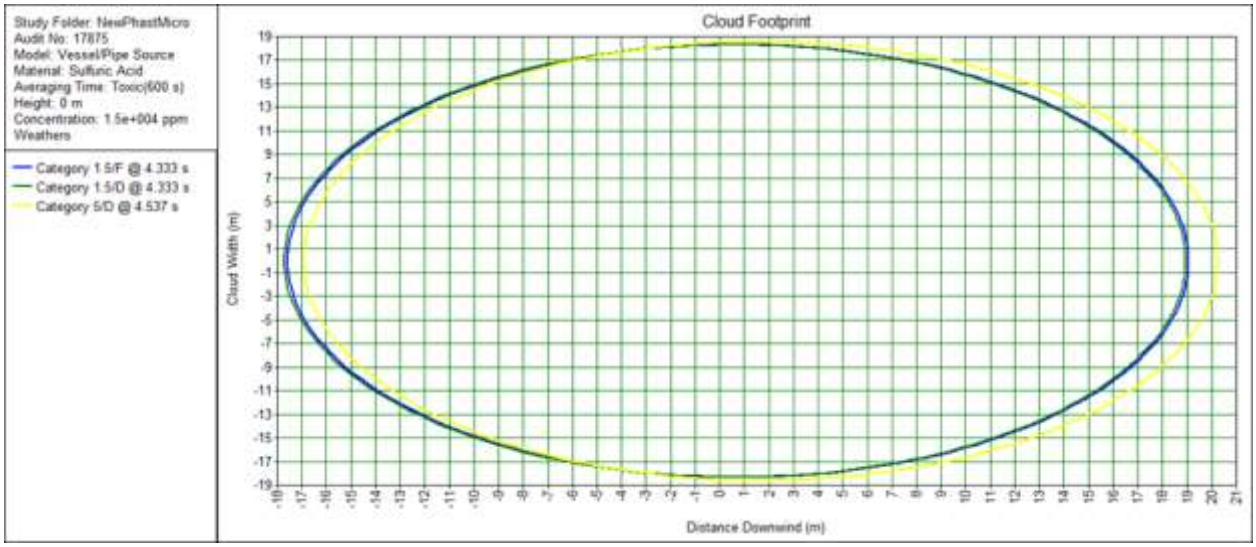
- LC_{50} HUMAN (460 ppm) area up to 59 meter, IDLH (Immediate danger to life and health) concentration area up to 587.63 meter and TWA (0.2 ppm) area up to 1349.6 meter. Therefore 587.63 meter area in wind direction is considered as evacuation area.

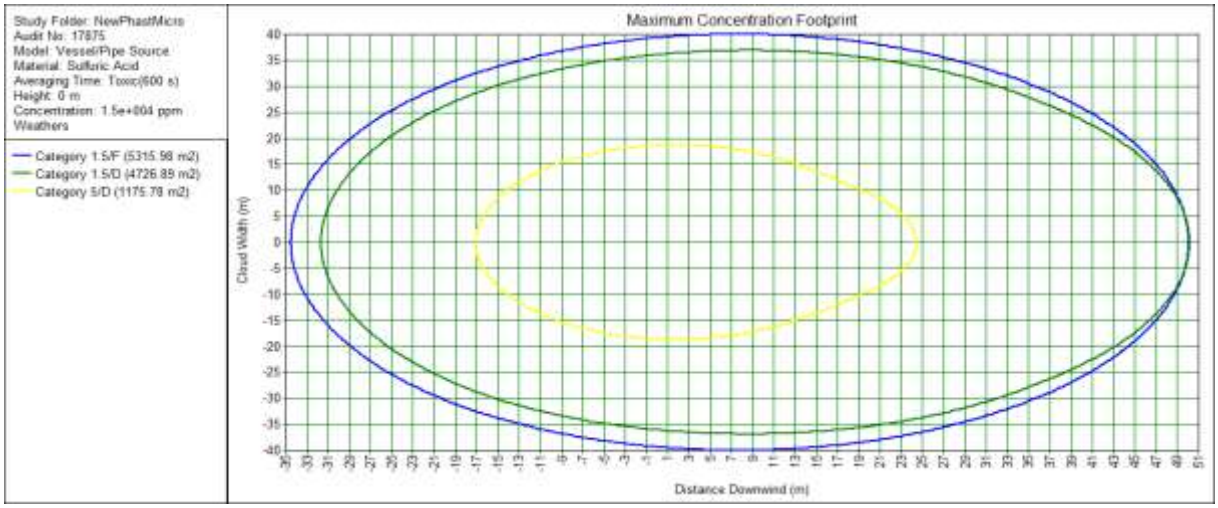
Isopleth:


500m
400m
300m
200m
100m
100m
200m
300m
400m
0 m
GRAPHS OF ALL 5-ISOPLETHS
2173.85 ppm, Area = 56.21 sqm
1082.64 ppm, Area = 80.88 sqm
460.00 ppm, Area = 573.96 sqm
30.00 ppm, Area = 1593.86 sqm
3.00 ppm, Area = 14690.62 sqm
100 m
200 m
300 m
400 m
500 m
600 m
700 m
800 m
900 m
1000 m
1100 m
1200 m
1300 m

Graph:




Study Folder: NewPhastMicro
Audit No: 17875
Model: Vessel/Pipe Source
Material: Sulfuric Acid
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 1.5e+004 ppm
Weathers
Category 1.5/F @ 4.333 s
Category 1.5/D @ 4.333 s
Category 5/D @ 4.537 s
Cloud Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17875
Model: Vessel/Pipe Source
Material: Sulfuric Acid
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 1.5e+004 ppm
Weathers
Category 1.5/F (5315.98 m2)
Category 1.5/D (4726.89 m2)
Category 5/D (1175.78 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)

MITIGATION MEASURES FOR SULPHURIC ACID LEAKAGE:

- Isolate the source if possible without risk.
- If leakage is small, dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.
- Absorb with DRY earth, sand or other non-combustible material.
- Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift.
- Prevent entry into sewers, basements or confined areas.
- Neutralize the residue with a dilute solution of sodium carbonate.

PREVENTIVE MEASURES TO AVOID SULPHURIC ACID LEAKAGE:

- A dyke will be provided to accommodate the full quantity in tank.
- Periodic testing of storage tank will be done by competent person.
- Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective TLVs. Storage tank vent is connected to scrubber system.
- Flange guard provided to prevent splash of material.
- Level interlock
- Keep container dry. Never add water to this product.
- In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label.
- Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture.
- Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.
- While handling always use face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent.
- Ensure that eyewash stations and safety showers are proximal to the work-station location.

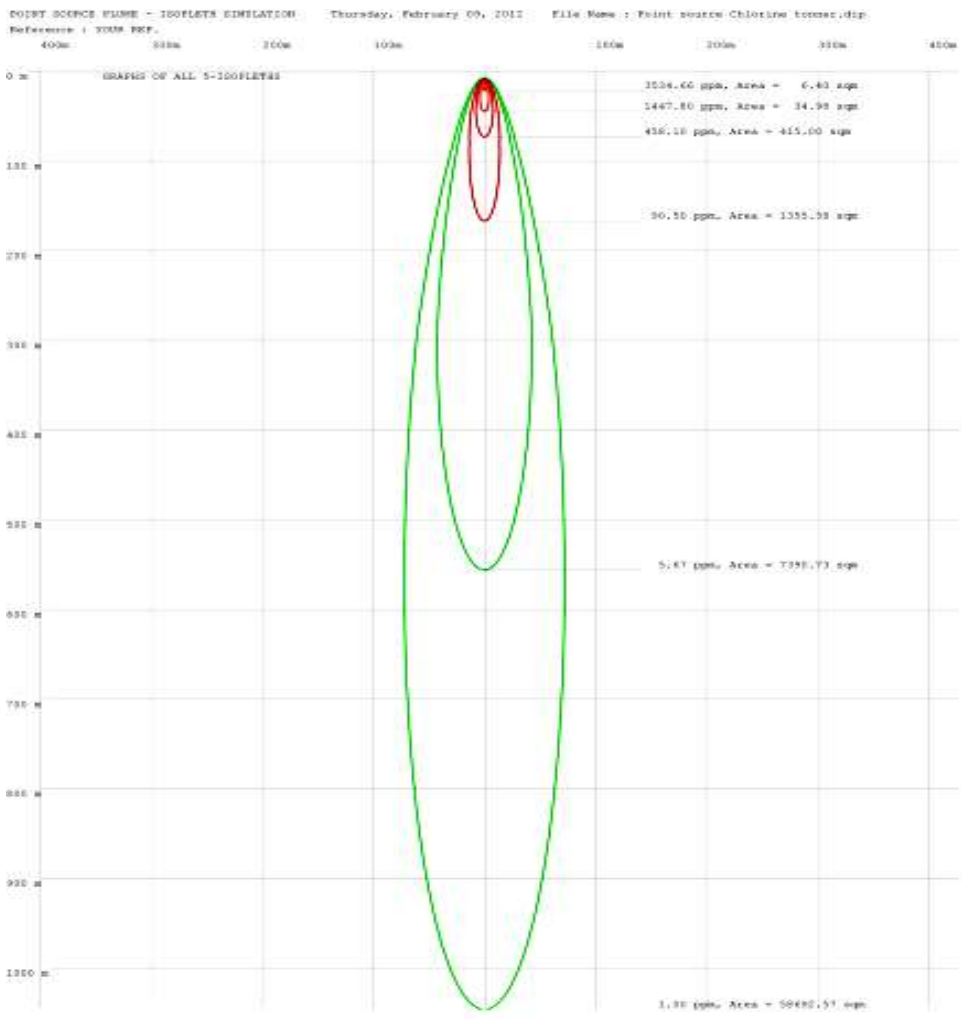
Scenario 6: Release of Caustic lye

Scenario of Caustic lye is not applicable. As the no results found during the Assessment of Caustic lye.

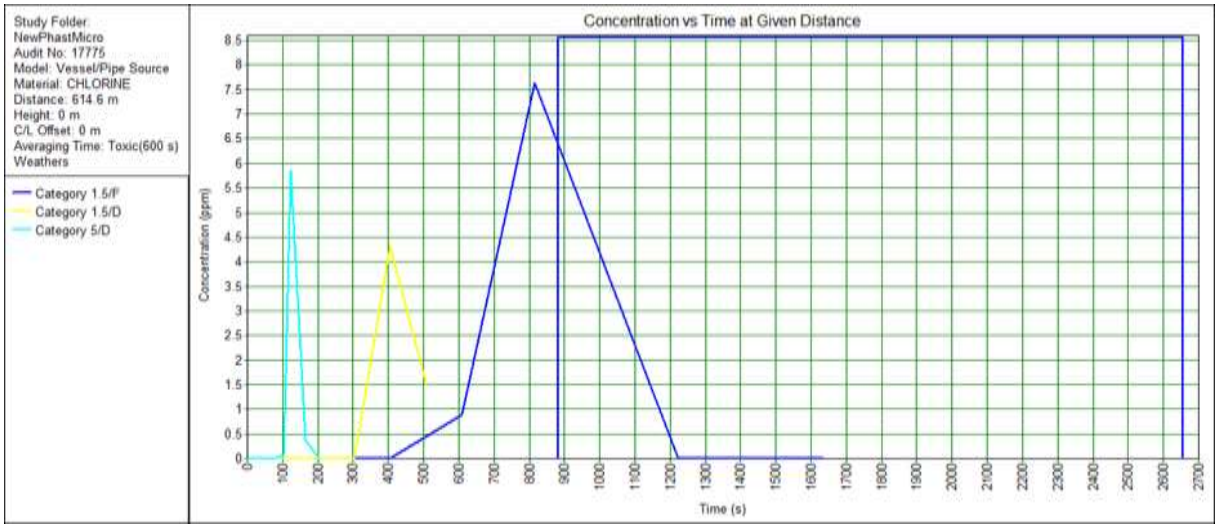
Scenario 7: Release of Chlorine

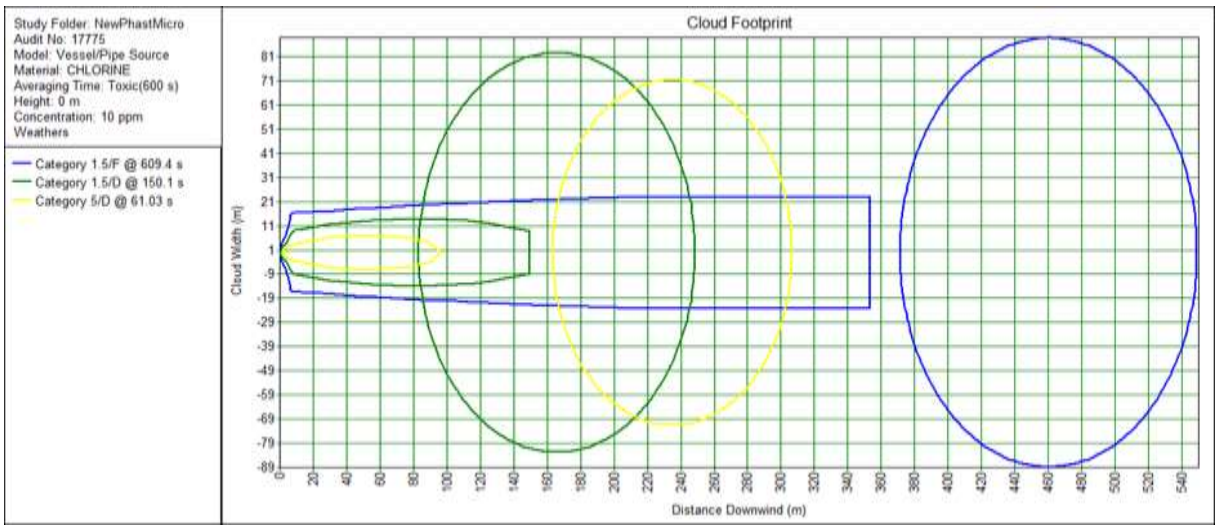
Input Data		
Stored quantity	0.05 MT	
Rate of release	718 gram/sec	
Molecular weight	70.9	
Density (Air)	2.49 kg/m^3	
Hazard Level	**Concentration (PPM)**	**Ground level distance (Meter)**
Distance to Concentration Results		
IDLH	10 (ACGIH)	882.19
STEL 900 Sec	1.00 (OSHA)	1629.23

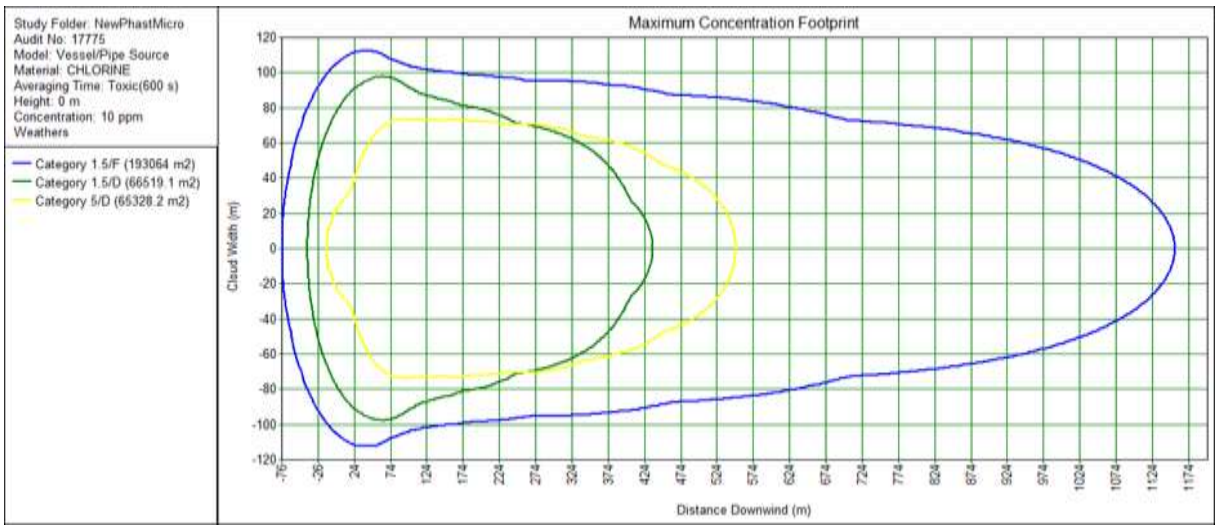
Isopleth:



Graphs:


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: CHLORINE
Distance: 614.6 m
Height: 0 m
C/L Offset: 0 m
Averaging Time: Toxic(600 s)
Weathers
Category 1.5/F
Category 1.5/D
Category 5/D
Concentration vs Time at Given Distance
Concentration (ppm)
Time (s)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: CHLORINE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 10 ppm
Weathers
Category 1.5/F @ 609.4 s
Category 1.5/D @ 150.1 s
Category 5/D @ 61.03 s
Cloud Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: CHLORINE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 10 ppm
Weathers
Category 1.5/F (193064 m2)
Category 1.5/D (66519.1 m2)
Category 5/D (65328.2 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)

Handling and Precaution of Chlorine:

- Designate area for handling Chlorine and clearly label all containers.
- Prohibit eating, drinking, smoking and in room where Chlorine is handled.
- Provide proper instruction and supervision to workers responsible for chlorine equipment.
- Handle Chlorine compounds that are potentially volatile or in powder form in ventilated enclosures.
- If enhanced containment is necessary, handle volatile compounds in closed systems vented through suitable traps.
- Never store combustible or flammable materials near chlorine containers.
- Never allow any liquid or moisture to enter the chlorine container. Never apply heat directly to a chlorine container.
- Never attempt to weld an “empty” chlorine pipe line without purging it with air first.
- Install safety showers and eye wash stations near chlorine equipment.
- Never spray water on leaking containers; it can make the leak worse.
- When entering an equipment area, take shallow breaths until you are sure that there is not a chlorine gas leak.
- Rely upon chlorination equipment for direct disposal of chlorine gas.
- On completing an operation, secure all Chlorine, remove and dispose of protective clothing and coverings, monitor and decontaminate self and surfaces, wash hands and monitor them again.
- Emergency chlorine kit with SCBA is available.
- Cylinders are connected with Chlorine Hood with blower (scrubbing system).
- Emergency valve shutdown is provided

Mitigation Measures in Case of Chlorine Leakage:

EVACUATE THE AREA IN DOWN WIND DIRECTION: Evacuate area in down wind direction up to 300 meters.

- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use Chlorine Emergency Kit to attend the leak.
- Absorb the fumes through Chlorine Hood with blower.

Preventive Measures to Avoid Such Emergency:

- Chlorine Emergency Kit will be procured and kept ready at chlorine shed.
- Chlorine Hood with blower will be provided with scrubbing arrangement.
- SCBA sets will be kept ready at chlorine handling area.
- Safety Shower and eye wash will be provided in Chlorine shed area.
- Chlorine absorption system will be provided. In case of chlorine leakage in chlorine shed it will be suck through blower and it will be scrubbed in Caustic scrubber.
- Emergency siren and wind sock will be provided.

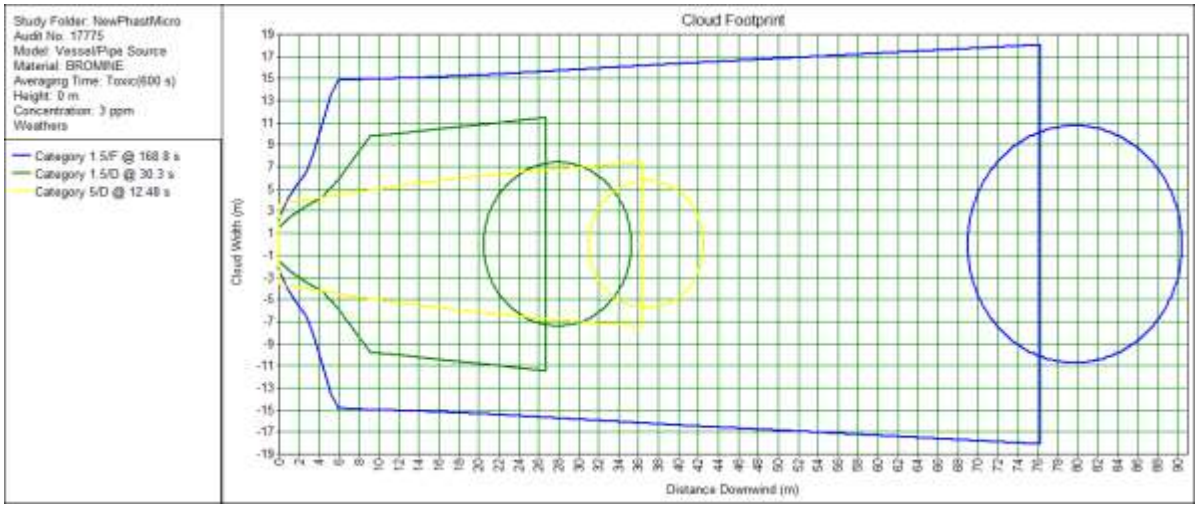
- Tele Communication system will be with walky talky, no mobile phone will be used in case of emergency situations for communication.
- First Aid Boxes and Occupational health center will be made at site.
- Emergency organization and team will be prepared as per on site-Off site emergency planning.
- Full body protection suite and other PPEs will be kept ready in ECC at site.
- Emergency team will be prepared and trained for scenario base emergency. Like Toxic control team, Fire control team, First aid team, Communication and general administration team, medical team etc.

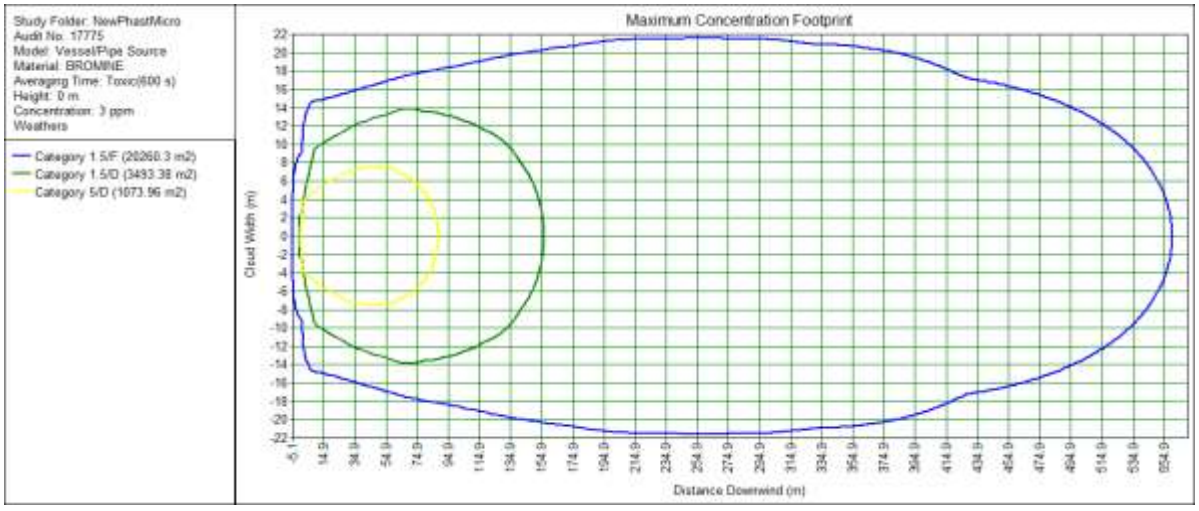
Scenario 8: Release of Bromine

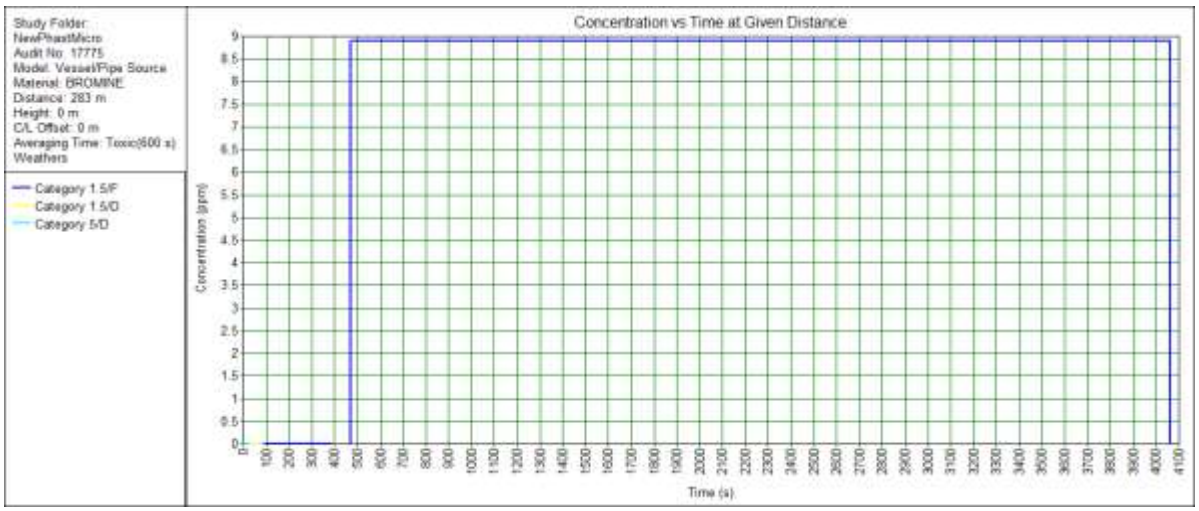
A release from the Bromine Bottle;

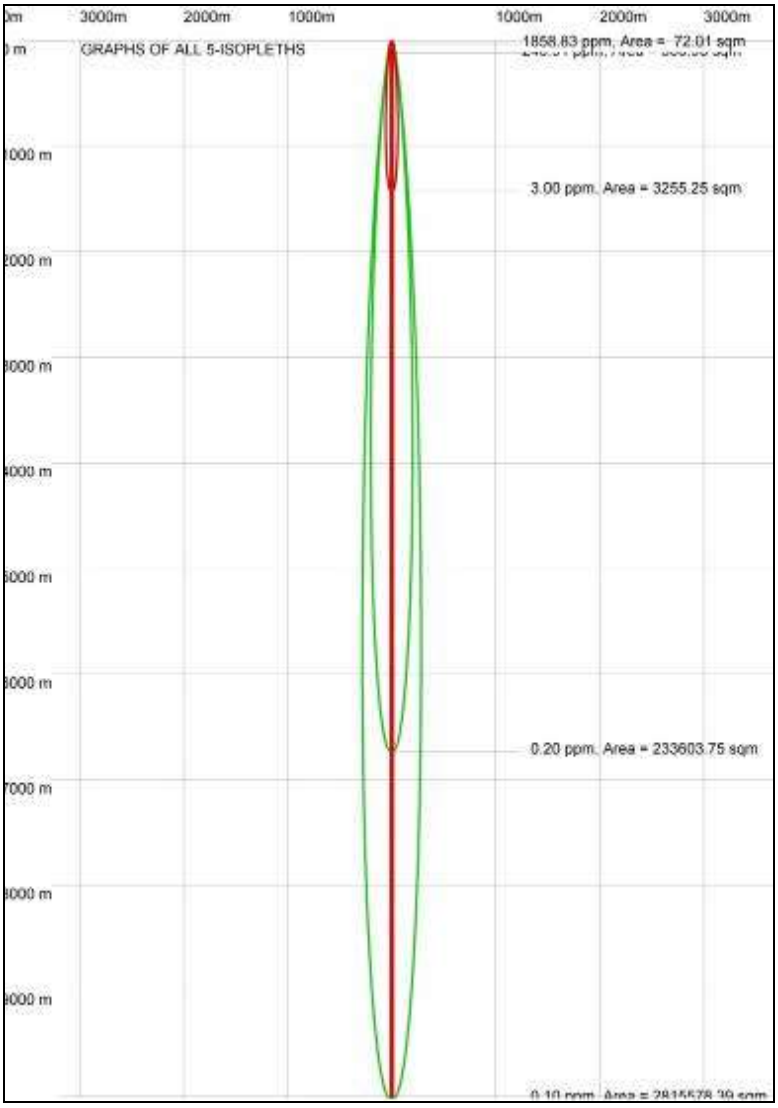
Catastrophic Rupture	
Input Data	
Stored quantity - 0.05MT	
Molecular weight -159.82	
Wind speed – 3.14 m/s	
Density (Air) – 2980 kg/m^3	
Results indicate	
Maximum Pool Radius	1.010 m
Input Data	**Distance to Concentration Results**
	End point (meter)
IDLH – 3 ppm	495.58
STEL 900 Sec	541.67

Graphs:




Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: BROMINE
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 3 ppm
Weathers
Category 1.5/F (20260.3 m2)
Category 1.5/D (3493.38 m2)
Category 5/D (1073.96 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: BROMINE
Distance: 283 m
Height: 0 m
C/L Offset: 0 m
Averaging Time: Toxic(600 s)
Weathers
Category 1.5/F
Category 1.5/D
Category 5/D
Concentration vs Time at Given Distance
Concentration (ppm)
Time (s)


3000m
2000m
1000m
1000m
2000m
3000m
GRAPHS OF ALL 5-ISOPLETHS
1858.83 ppm, Area = 72.01 sqm
3.00 ppm, Area = 3255.25 sqm
0.20 ppm, Area = 233603.75 sqm

Preventative / Mitigation Measures:

Storage & Handling: Protect against physical damage. Store in cool dry area, out of direct sunlight. Separate from combustible, organic or other readily oxidizable materials. Keep above 20F to prevent freezing but avoid heating above atmospheric temperatures as vapor pressure increase could rupture container. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

Firefighting: Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.

Following Personal Protective Equipments are to be made compulsory when handling Bromine

- American National Standards Institute (ANSI) always approved chemical safety goggles when handling Br_2.
- Use a full-face shield over eyewear.
- Full body protection PVC suite
- Eyewash fountains should be located in areas where bromine is handled, used or stored.
- When in danger of contact with liquid bromine, wear an approved chemical resistant suit.
- Leather or other non-woven ANSI approved steel-toed shoes or Gum boot
- Protective rubber boots should be worn over shoes for extra protection.
- Have NIOSH approved respirators and self-contained breathing apparatus available.
- Gloves: 100% Nitrile rubber gloves or Neoprene gloves

Safety Practices in the Work Area

We will inform our all employees of the potential hazards of contact with bromine and train them in appropriate first-aid procedures.

Bromine handling areas will be clearly marked and restricted to qualified, trained personnel only.

Ventilation

We will maintain bromine vapor concentration in the work area to less than 0.1 ppm with adequate exhaust hoods, ventilation systems and scrubbers. Analyze air for proper control.

Transfer or repackage bromine only in a controlled, closed environment.

Exhaust ventilating systems will be used in enclosed areas where bromine is handled.

Containers and Storage

- Bromine will be stored in dry and cool place and well-ventilated area.

Neutralization in Case of Spillage Leakage

- Neutralization with sodium Bisulfite requires 3 moles of sodium hydroxide: 1 mole sodium Bisulfite: 1 mole bromine.
- Neutralization with sodium sulfite requires 2 moles sodium hydroxide: 1 mole sodium sulfite: 1 mole bromine.
- The weights and volumes specified include a 10% excess of sodium hydroxide and sodium bisulfate or sodium sulfite.

Emergency Procedures

- In case of bromine emergencies, follow recommended first aid and emergency response procedures adopted

Transportation Emergencies

- In emergency situations resulting from vehicle accidents:
- Notify the local police, fire departments, emergency responders and the carrier.
- Isolate the area.
- Any person not dressed in proper protective clothing and not using a NIOSH approved self-contained breathing apparatus should be kept a safe distance away.
- Call to the supplier
- Seek immediate medical assistance for those injured and follow recommended first aid procedures.

Leaking Containers

- When handling a leaking bottle personal protective clothing, goggles and NIOSH approved self-contained breathing equipment must be worn.
- Clear contaminated area of non-essential personnel and send them to assembly point.
- Maintain a slight ammonia atmosphere throughout the clean-up. Carefully release anhydrous ammonia gas to neutralize bromine vapor. The ammonia gas will convert bromine to white ammonium bromide “Smoke.”
- Do not allow liquid bromine and liquid ammonia to combine; a violent reaction will occur. Ammonia (16 to 25% by volume) can form an explosive mixture with air. Pour hypo solution*, lime and water slurry or soda ash solution over the spill. Hypo-bromine reactions produce hydrobromic acid.
- Dry sodium thiosulphate and liquid bromine produce a violent reaction; do not mix them.
- Using cold water, wash neutralized bromine into a sump for transfer to an approved waste disposal facility where the waste can be processed.
- Ventilate the area to remove the ammonium bromide and any bromine fumes. Scrub the floors and equipment with soap and water.

First Aid Procedure

Immediate medical assistance is required if bromine is swallowed, inhaled, or has contacted the eyes or skin.

If bromine has been ingested, do not give anything by mouth. Seek medical attention immediately. Do not induce vomiting.

If bromine has been inhaled, move the exposed person to a well-ventilated area. Seek medical attention immediately. The victim should be placed in a comfortable sitting or partly reclining position. The exposed individual should avoid exertion.

If vomiting occurs, turn the patient on his side to avoid choking. Keep the patient warm. If the patient is coughing and showing signs of respiratory distress, properly trained personnel should administer oxygen.

For skin contact, the affected area must be flooded immediately with large amounts of clean water from a safety shower or other appropriate source of flowing water. Seek medical attention immediately. All contaminated clothing, including shoes, should be removed as quickly as possible while the victim is under the shower. Washing should be continued for a minimum of 30 minutes. If possible, continue to wash the affected area during transport to medical facilities. (Extended wash times of two hours or more have proven beneficial.)

If bromine liquid or vapor contacts the eyes, they must be irrigated immediately with large amounts of running water. Eye wash stations are preferable for irrigation. If one is not available, a hose, water source with a liberal, gentle flow may be utilized. The eyelids must be held apart during irrigation to ensure contact of water with all accessible tissues of the eyes and lids. Eyes should be washed continuously for a minimum of 30 minutes. If possible, continue flushing the eyes while transporting the employee to a physician. In all cases of bromine injury, obtain immediate medical attention. Provide emergency personnel with information about all materials used by the person and provide appropriate information about bromine and first aid procedures.

Scenario 9: Release of Hydrogen

CATASTROPHIC RUPTURE FOR HYDROGEN		
SCENARIO: UNCONFINED FIREBALL		
Input Data		
Stored quantity		120 m3
Wind speed		3.14 m/s
Gas Density		67 kg/m^3
Incident Intensity of Heat Radiation (IHR) at ground level KW /m^2	**IHR- Isopleths Distance (Meters)**	**Effect**
37.5	9.0	Damage to process equipment. 100 % Fatal in 1 Min. 1 % fatal in 10 sec.
12.5	28.0	Min. to ignite wood (with flame contact). 1 % fatal in 1 min. 1st deg. burn in 10 sec.
4.0	53.9	Pain after 20 secs. Blistering unlikely.

Fireball Scenario



Blue – 4 KW/m^2

Pink – 12.5 KW/m^2
Red – 37.5 KW/m^2

Hydrogen Process Safety:

- 3time Nitrogen purge into reactor to clean the reactor. Then charge material and hydrogen in reactor.
- Pressure of Hydrogen – 2 kg/cm^2.
- Auto damping system will be installed, in case power failure.
- Oxygen Detector will be installed.

SPECIAL PRECAUTIONS FOR HANDLING HYDROGEN:

- CCE approved premises with door having locking arrangement provided.
- Protect cylinders against physical damage.
- Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight.
- Do not allow area where cylinders are stored to exceed 52°C (125°F).
- Isolate from oxidizers such as oxygen, chlorine, or fluorine.
- Use a check valve or trap in the discharge line to prevent hazardous backflow.
- Post “No Smoking or Open Flame” signs in storage and use areas.
- Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over.
- Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting.
- Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof.
- Flammable high-pressure gas.
- Use only in a closed system.
- Use piping and equipment adequately designed to withstand pressures and temperatures to be encountered.
- Gas can cause rapid suffocation due to oxygen deficiency.
- Never work on a pressurized system.
- If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak.
- Never place a compressed gas cylinder where it may become part of an electrical circuit.
- Apron, Hand gloves, gumboot, goggles & helmet provided.
- ISI Portable fire extinguisher & Hydrant line is provided as per TAC norms.
- Flame proof fitting provided & Sufficient Nos. of SBA sets & 2 No. of Air line mask.

Following safety Measures will be taken while storage & handling of Hydrogen gas:

Measures to be taken to prevent such accident: for H2 Rack Handling

- Hydrogen Cylinder rack will be parked in barricaded Separate area
- FLP Electrical Installation provide near storage area
- Vehicle allowed with Spark Arrestor
- No Smoking / Hot work allowed
- Trained staff
- Special Vehicle with Trained Operating staff for H2 Rack
- PPE Warned
- Spark proof tools used
- Safety shower, eye wash with quenching unit will be provided in handling / storage area.

For H_2 Cylinders

- Cylinder
- Separate Isolated Cylinder manifold
- H2 cylinder stand with Chain link supporting
- Trained Operator
- Flameproof Electrical Installation
- Spark proof Spanner set
- Earthing, Grounding and Bonding on the Pipeline
- Well Supported fixed Line
- Flameproof Electrical Installation
- Trained Operator
- N2 Blanketing before batch charging
- Double Safety Relief Valve with Rupture Disc
- H2 Vent with Steam sparger and N2 Blanketing
- Well tested, inspected and well-maintained Reactor
- Proper Ventilation in the area.

SOP for Handling Hydrogen Gas

1. Design Requirements

- Hydrogenation Reactor, Manifold, piping systems are to be designed, fabricated and tested in accordance with IS 2825. Pressure relief devices are to be provided to prevent over pressure where this can occur as per the same standard. Relief devices and vents are to be routed away to a safe location.

2. Location & Buildings

- Hydrogenation system is to be physically and structurally isolated from operations. Buildings in which hydrogen systems are installed shall be of single storey construction, be designed for the purpose and be well ventilated especially at high points.

Storage area and safety system for handling of Hydrogen Gas:

1. Hydrogen gas will be received at plant through
2. Cylinder manifold truck. Hydrogen gas is directly consumed from for process Cylinder manifold truck
3. DCS base operational plant
4. FLP type area will be provided.
5. Total enclosed process system.
6. Instrument & Plant Air System.
7. Nitrogen blanketing in Autoclave reactor.
8. Safety valve and Rupture disc provided on reactor.
9. Cooling Chilling and power alternative arrangement have been made on reactor.
10. Hydrogen and Nitrogen header will be installed away from the autoclave reactor.
11. PRV station with shut off valve, safety valve provision will be made for hydrogenation reaction safety.
12. Before Hydrogen Gas charging in to reactor and after completion of reaction Nitrogen flushing will be done.
13. Flame arrestor will be provided on vent line of reactor.
14. Safe Catalyst charging method will be adopted.
15. SOP will be prepared and operators will be trained for the same.
16. Rector vent extended outside the process area and flame arrestor provided on vent line.
17. Dumping vessel arrangement will be made.
18. Online Hydrogen detecting system is installed
19. Water sprinkler system is provided
20. Process is control by DCS with all interlock system.

Scenario 10: Release of Ammonia

Catastrophic Rupture		
Input Data		
Stored quantity - 0.1 MT		
Molecular weight - 17.031 g/mol		
Wind speed – 3.14 m/s		
Density (Air) – 0.73 kg/m³		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**
4	8.3	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	4.1	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	Not Reached	--
Fireball Scenario		
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**
4	7.8	Pain after 20secs.
12.5	Not Reached	--
37.5	Not Reached	--

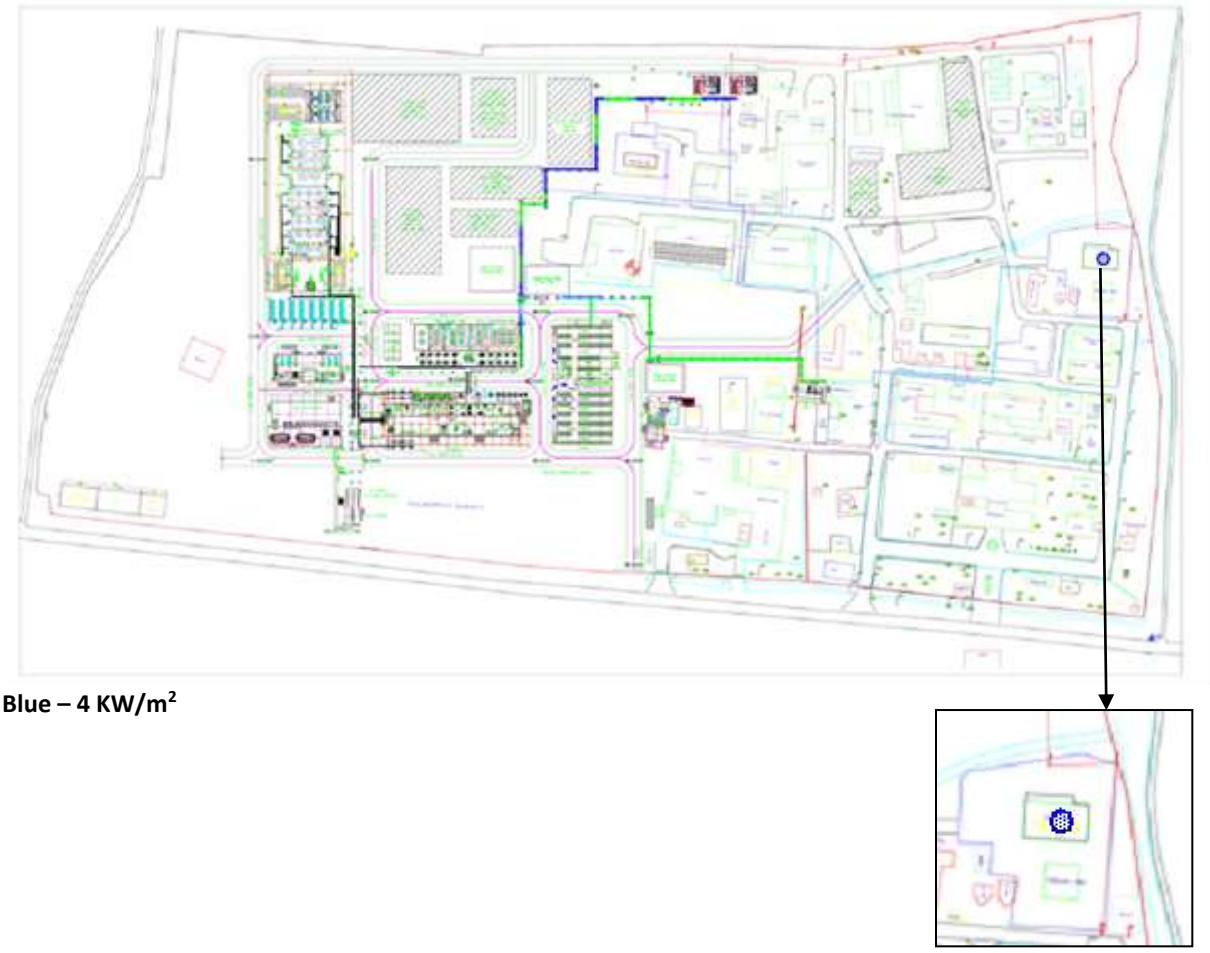
Pool Fire Scenario



Blue – 4 KW/m^2
Pink – 12.5 KW/m^2

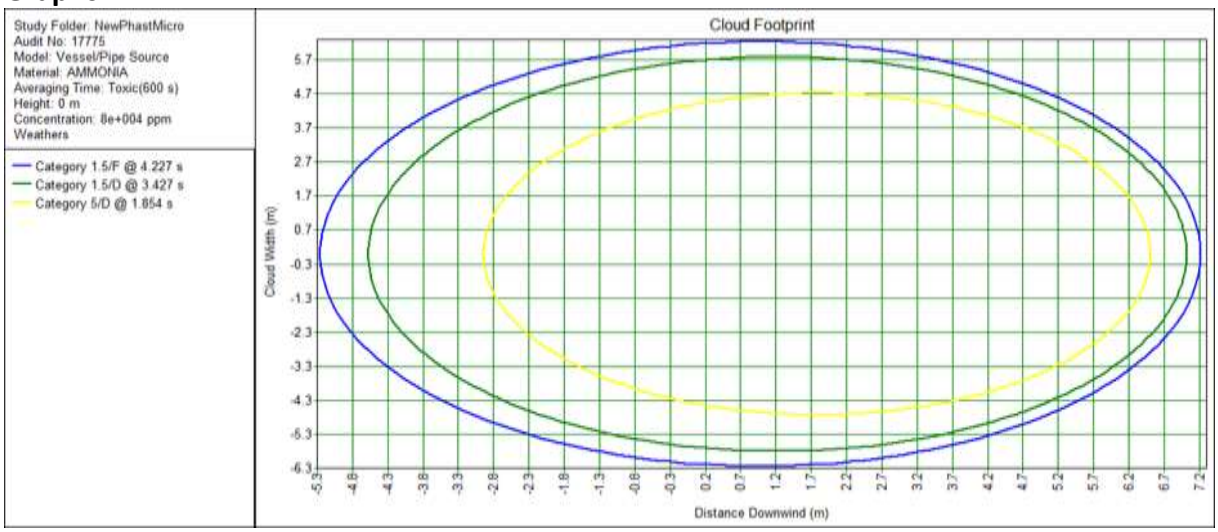


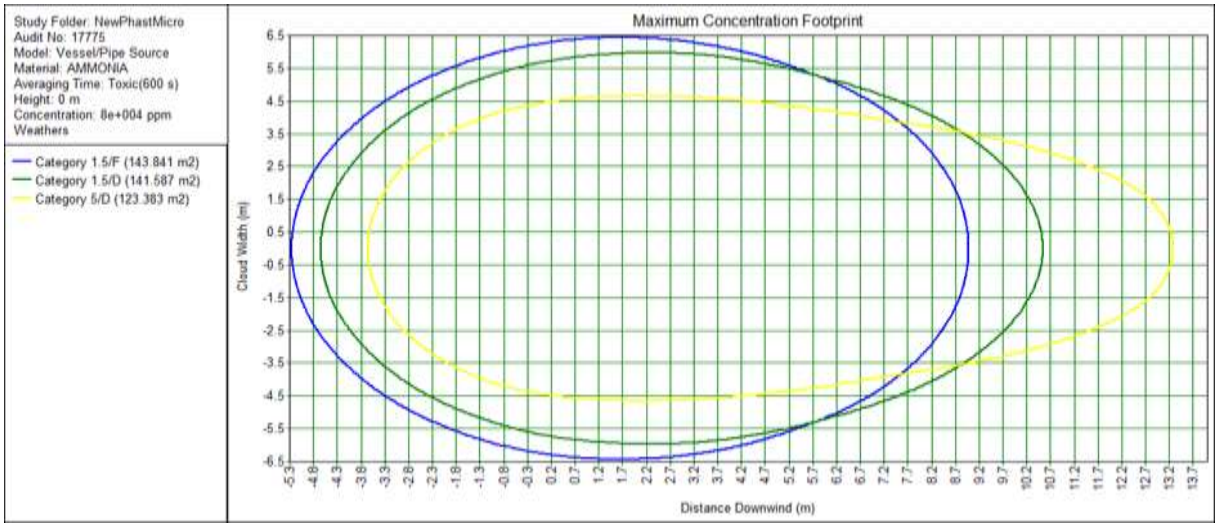
Fireball scenario

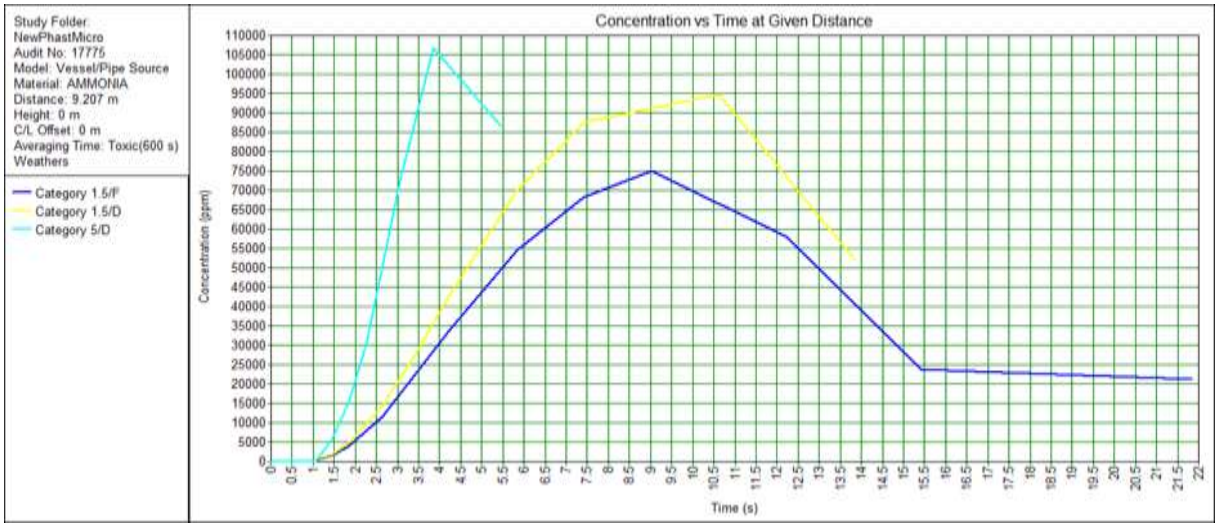


Blue – 4 KW/m^2

Graphs:


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: AMMONIA
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 8e+004 ppm
Weathers
Category 1.5/F @ 4.227 s
Category 1.5/D @ 3.427 s
Category 5/D @ 1.654 s
Cloud Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: AMMONIA
Averaging Time: Toxic(600 s)
Height: 0 m
Concentration: 8e+004 ppm
Weathers
Category 1.5/F (143.841 m2)
Category 1.5/D (141.587 m2)
Category 5/D (123.383 m2)
Maximum Concentration Footprint
Cloud Width (m)
Distance Downwind (m)


Study Folder: NewPhastMicro
Audit No: 17775
Model: Vessel/Pipe Source
Material: AMMONIA
Distance: 9.207 m
Height: 0 m
C/L Offset: 0 m
Averaging Time: Toxic(600 s)
Weathers
Category 1.5/F
Category 1.5/D
Category 5/D
Concentration vs Time at Given Distance
Concentration (ppm)
Time (s)

Storage & Handling:

- Designing of layout of area with due consideration of adequate natural or mechanical ventilation.
- Use of properly selected material for construction of plant and equipment for handling of ammonia.
- Preventive maintenance of all equipment in proper working condition.
- Avoid contact of ammonia with certain other chemicals, including mercury, chlorine iodine, bromine, calcium, silver oxide and hypo chloride.
- The building protected with automatic sprinklers, vapour tight electric equipment, good natural ventilation, good floor drainage and adequate exposition venting.
- Water sprinkler system will be provided.

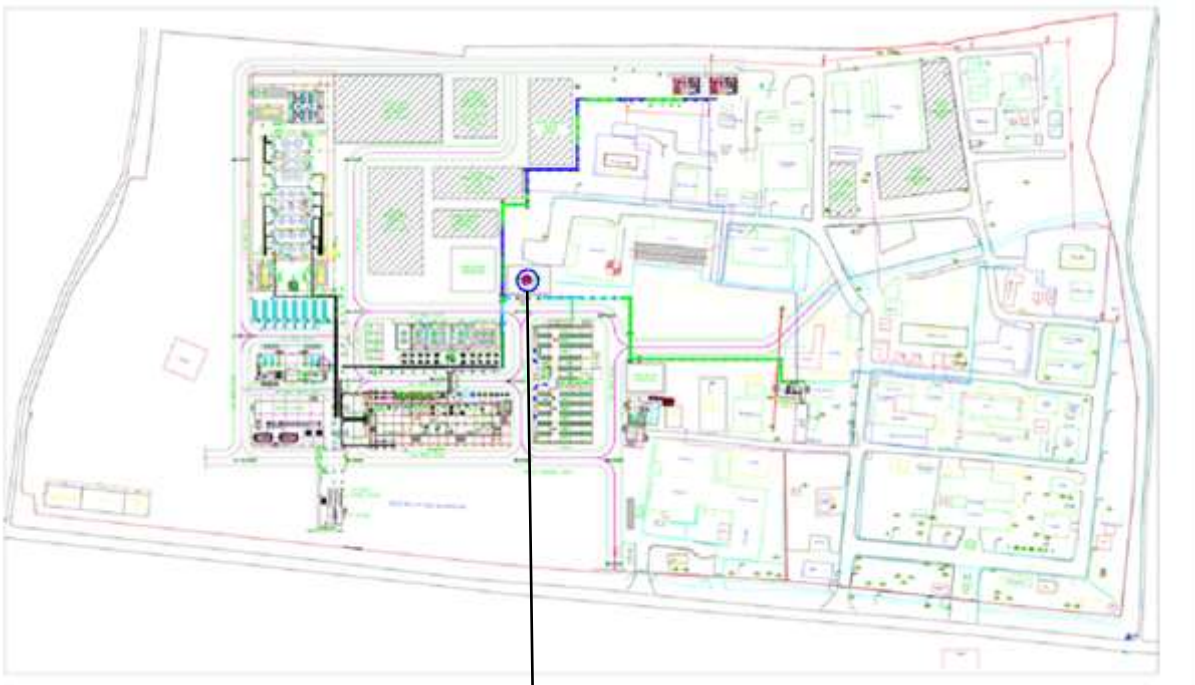
Safety Precaution

- Evacuate personnel to a safe area.
- Appropriate self-contained breathing apparatus may be required.
- Approach suspected leak area with caution. Remove all sources of ignition. if safe to do so. Reverse flow into cylinder may cause rupture. Reduce gas with fog or fine water spray. Stop flow of product if safe to do so.
- Ventilate area or move container to a well-ventilated area.
- Flammable gas may spread from leak. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.
- Water sprinkler system to be activated for dilute the ammonia.

Scenario 10: Release of Ethylene Oxide

Catastrophic Rupture		
Input Data		
Stored quantity - 0.03 MT		
Molecular weight – 44.05 g/mol		
Wind speed – 3.14 m/s		
Density (Air) – 882 kg/m³		
Results indicate		
Pool Fire Scenario		
Radiation Level (KW/m²)	**Distance in meter**	**Effect**
4	9.09	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality
12.5	5.37	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.
37.5	2.9	This level of radiation is assumed to give 100% fatality as outlined above.
Fireball Scenario		
Radiation Level (KW/m²)	**Distance in meter**	**Effect**
4	13.23	Pain after 20secs.
12.5	Not Reached	--
37.5	Not Reached	--

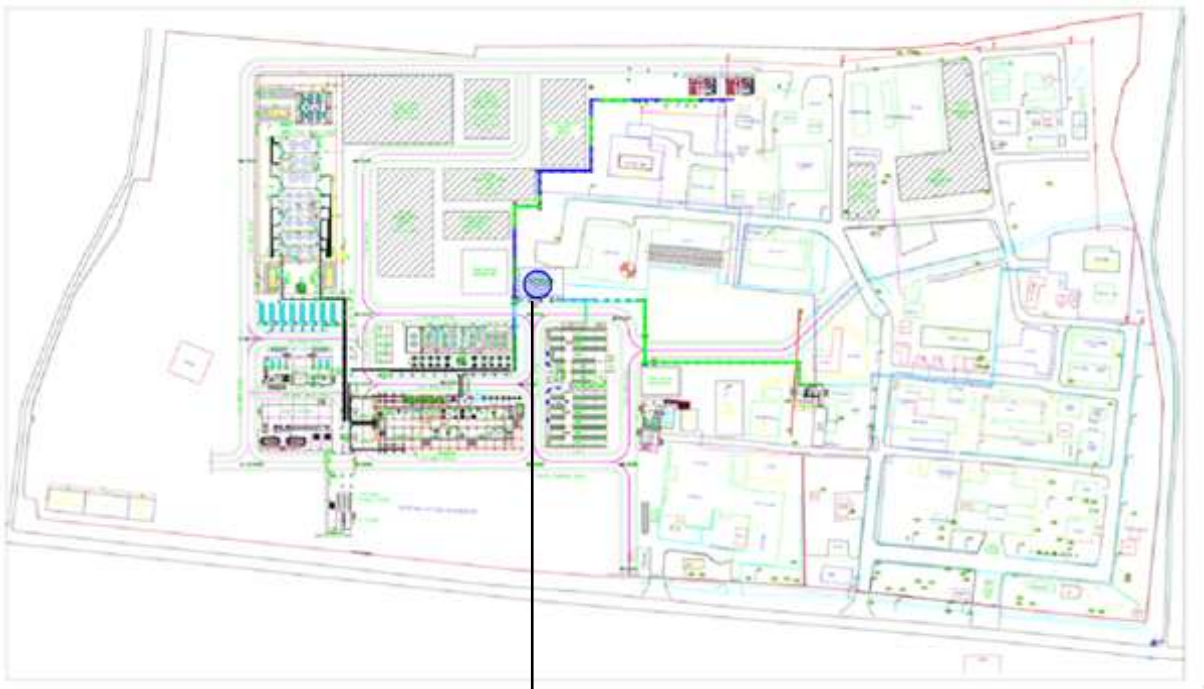
Pool Fire Scenario



Blue – 4 KW/m^2
Pink – 12.5 KW/m^2
Red – 37.5 KW/m^2



Fireball Scenario



Blue – 4 KW/m^2



Scenario 12: Unconfined Pool Fire Simulations for Drum Storage Area

Catastrophic Rupture			
Input Data			
Stored quantity - 65 MT			
Wind speed – 3.14 m/s			
Density (Air) – 0.867 g/cm^3			
Results indicate			
Pool Fire Scenario			
Radiation Level (KW/m^2)	**Distance in meter**	**Effect**	
4	57.72	This level is sufficient to cause personnel if unable to reach cover within 20s; however blistering of the skin (second degree burn) is likely; 0: lethality	
12.5	29.3	This level will cause extreme pain within 20 seconds and movement to a safer place is instinctive. This level indicates around 6% fatality for 20 seconds exposure.	
37.5	14.12	This level of radiation is assumed to give 100% fatality as outlined above.	
Fire Ball Scenario			
Radiation Level (KW/m^2)		**Distance in meter**	**Injury Type**
4		62.76	Pain after 20secs.
12.5		37.16	1st degree Burn
37.50		14.33	100% Fatal

Pool Fire Scenario:



Blue – 4 KW/m^2
Pink – 12.5 KW/m^2
Red – 37.5 KW/m^2

Fire Ball Scenario:



Blue – 4 KW/m^2
Pink – 12.5 KW/m^2
Red – 37.5 KW/m^2

Storing and Handling of Drums

- The Occupational Safety and Health Administration has comprehensive rules and guidelines for the handling of hazardous materials such as chemical drums. Chemical drums are containing materials that are toxic, radioactive, corrosive, and explosive. In handling them, personnel should use the proper equipment, techniques, and protection
- Keep separate hazardous chemicals like Toxic, Flammable, corrosive etc.
- For filling from drums, special filling stations are also being used
- In order to absorb spills as quickly as possible, suitable absorbents also are provided.
- Flexible shut-off barriers or duct covers also serve to prevent environmental damage caused by the release of hazardous liquids.
- Sufficient amount of sand/soil are kept to control any spillage.
- Flame proof fitting provided.
- Eye washer cum shower are provided near storage area.
- Spark arrester are installed on all vehicles inside the premises.
- SCBA set, Canister mask and airline mask is provided.
- Earthing are provided.
- Vent line dipped in water are provided.

Safety Precautions of Solvent (Drum):

- Ventilate thoroughly prior to entry.
- Disconnect connecting pipelines.
- Prior to entry, take air samples to prove the absence of flammable or other hazardous vapors and to demonstrate that adequate levels of oxygen exist.
- Equip the entry team with appropriate respiratory protection, protective clothing, safety harnesses, and ropes.
- Equip a safety observer with appropriate respiratory protection, protective clothing, a safety harness, and ropes. Establish lifeline signals prior to entry so that the worker and safety observer can communicate by tugs on the rope.
- Have an additional person available in the immediate vicinity to assist the safety observer if needed.
- Instruct the safety observer not to enter the space until additional personnel are on scene.

7.7.1 RISK ASSESSMENT SUMMARY

- From the Risk Assessment studies conducted, it would be observed that by and large, the risks are confined almost within the factory boundary walls.
- Based on these studies company has been proposed to plan its facility sitting as well as location of operator cabin, open area, etc.

- Company has to increase awareness programme in the surrounding vicinity and educate people for safe evacuation at the time of toxic release.
- Induction safety course to be prepared and trained all new employees before starting duties in plant.
- A HAZOP study to be carried out for all product plant and storage facilities.

7.8 DISASTER MANAGEMENT PLAN

Company has developed the emergency management system to tackle the emergency situation, apart from its emergency management system. The detail of disaster management system is discussed in the following section.

7.8.1 DEFIING THE NATURE OF EMERGENCY

Various definitions on different analogy used on On-site & Off-site Emergency Plan are as follows:

- **Accident:** An accident may be defined as "an undesirable and unplanned event with or without or major damage consequence of life and /or property.
- **Major Accident:** It is a sudden, unexpected, unplanned event resulting from uncontrolled developments during an industrial activity, which causes or has the potential to cause, death or hospitalization to a number of people, damage to environment, evacuation of local population or any combination of above effects.
- **Emergency:** This can be defined as any situation, which presents a threat to safety of person's or/and property. It may require outside help also.
- **Major Emergency:** Occurring at a work is one that may affect several departments within and/or may cause serious injuries, loss of life, extensive damage to properly or serious disruption outside the works. It will require the use of outside resources to handle it effectively.
- **Disaster:** Disaster is a sudden calamitous event, bringing great damage, loss or destruction.
- **Hazards:** Hazard may be defined as "the potential of an accident". Hazard exists in man and the system of materials and machines.
- **Chemical Hazards:** It is a hazard due to chemical(s) (including its storage, process, handling, etc.) and it is realized by fire, explosion, toxicity, corrosively, radiation, etc.
- **Risk:** Risk may be defined as the combination of consequence and probability or likelihood of an accident being caused in a given man, material– machine system.
- **On-Site Emergency plan:** It deals with measures to prevent and control emergencies within the factory and not affecting outside public or environment.
- **Off-Site Emergency plan:** It deals with measures to prevent and control emergencies affecting public and the environment outside the premises.

7.8.2 OBJECTIVES OF EMERGENCY MANAGEMENT SYSTEM

The objectives of the emergency management system are summarized as under.

- Identifying the hazard and its cause.
- Reducing vulnerability and potential losses of hazard.
- Assessing, reviewing and controlling the risk.
- To plan mode of proper communication and actions to be followed in the event of emergency.
- To keep all necessary information with respect to hazard/accident control and emergency contacts in one document for easy and speedy reference.
- To inform employees, general public and the authorities about the hazards/risk if any and the role to be played by them in the event of emergency.
- To control and contain the accident.
- To effect rescue and treatment of casualties.
- To inform and help relatives of casualties.
- To secure rehabilitation of affected area and restore normalcy.
- To provide information to media and government agencies.
- To preserve record, equipment etc. for investigating cause of emergency.
- To be ready for "mutual aid" if need arises to help neighboring units.

7.8.3 CLASSIFICATION OF EMERGENCY

The Level of Emergency can be classified in three Categories, which is given in **Table 7.5.**

TABLE 7.5

EMERGENCY TYPES

CLASSIFICATION	DESCRIPTION	CAUSES	APPLICABILITY
Level – 1	The leakage or emergency, which is confinable within the plant/area.	Small pipe/valve rupture or similar leakages that do not affect outside premises. Release of toxic chemicals for short duration. Small fire in the plant.	Applicable
Level – 2	The emergency, which is confinable within the factory premises.	Leakage of toxic chemicals for long duration. Medium scale explosion confined to the factory premises. Medium scale fire inside the factory premises.	Applicable

Level – 3	The emergency, which is not confinable within the factory premises and general public in the vicinity are likely to be affected.	Heavy / Profuse leakage of toxic / flammable gases for a long duration. Explosion of high magnitude affecting the adjacent area.	Applicable

7.9 DETAILS OF THE SEPARATE ISOLATED STORAGE AREA FOR FLAMMABLE CHEMICALS. DETAILS OF FLAME PROOF ELECTRICAL FITTINGS, DCP EXTINGUISHERS AND OTHER SAFETY MEASURES PROPOSED. DETAILED FIRE CONTROL PLAN FOR FLAMMABLE SUBSTANCES AND PROCESSES SHOWING HYDRANT PIPELINE NETWORK, PROVISION OF DG SETS, FIRE PUMPS, JOCKEY PUMP, TOXIC GAS DETECTORS ETC.

Fire Prevention Measures

- Smoking, ignition, ignition sources etc. are strictly prohibited within the premises. A very strict control is exercised in this regard at all times.
- All the tanks, equipment etc. are properly earthed and maintained at all times. The earth resistance values are regularly checked and kept within the permissible range.
- At the time of filling of storage tanks and road tankers, special care is exercised to avoid spillage.
- When a storage tank is filled, the tank's level is closely monitored.
- All filling operations are surveyed frequently for possible leaks that may pose a fire hazard.
- Reliable flow meters are provided, wherever required, to prevent overflow.
- The pipelines are inspected periodically.
- Free falling of the product into exercised to avoid overflow, spillage, leakage etc of the products.
- All operations in the installation are done only during general shift hours.
- The well-established color codes are followed for pipelines in the Installation.
- A strict gate entry procedure is formulated and followed. Entry of unauthorized persons is strictly prohibited.
- The road tanker is minimized to the extent possible to avoid static charge build up. The tankers are also earthed to bleed away static charges formed.
- Security watch is provided around tank farm area.
- The persons looking after the various operations are trained and experienced.
- All the staff in the installation are trained in fire fighting and monthly fire drills are carried out.
- Degreasing / Deseeding is done regularly within the licensed areas.
- All sorts of combustible materials are removed from the premises promptly.
- Work permit system is strictly followed. Critical jobs like hot jobs are carried out only after taking abundant safety precautions under the supervision of competent personnel authorized.
- All the incidents like fire are reported through prescribed formats and investigated. The causes are identified and remedial steps are promptly formulated and implemented.
- Dyke drain valves are kept normally closed. They are opened only to remove water from the dyked areas.

- Drain valves, sampling valves etc are plugged, capped or blinded. Utmost care is
- Proper concrete/tar roads are laid all around the facilities/areas for easy accessibilities. Roads, accessibilities etc. are free and unobstructed everywhere.
- All the facilities in the Installation are well laid and also maintained.
- The fire fighting arrangements are well designed, laid and maintained.
- Good housekeeping is maintained throughout the Installation.

FIRE FIGHTING FACILITIES (EXISTING)

- Following are the fire fighting facility provided.
- Storage yard, warehouse, peripheral areas and equipment and production areas are provided with fire hydrants and fire fighting extinguishers.
- The entire fire protection system has been installed as per Tariff Advisory Committee (TAC) norms.
- Two Fire Water storage tanks have a total holding capacity of 1200 M^3. This is an exclusive fire protection water storage facility. Fire hydrant pumps with external and captive power supply are provided.
- Fire water supply lines are laid above ground with Fire Hydrants outlet points:

Single Hydrants	40 Nos
Fire escape hydrants	04 No
Fire brigade inlet	02 No
Double Hydrants	6 Nos.
Water Monitor	12 Nos.
Sprinkler system for tank farm	2 System
Dry Raiser for ware house in AEP	1 System

- Apart from firewater pumps, jockey pump has been provided to pressurize the header and keep the system at 7 kg. /cm^2 pressure.
- Apart from fire hydrant system a separate sprinkler system is provided for bulk storage tanks for Solvents.

Fire Hydrant Pump Details:-

1. Electric driven Pump : 1 nos.
   a) Make : Kirloskar Brothers Ltd.,
   b) Model : DB100/26
   c) Rated Capacity : 171 m^3
   d) Total dynamic head at rated capacity : 70 mtrs.

2. Diesel Driven Pump
   a. Make : Kirloskar bros ltd
   b. Rated capacity : 171 m^3/hr
   c. Discharge Head : 70 mts
   d. RPM : 1800

3. Pressurization Pump**:**
   a) Make : Kirloskar Brothers Ltd.,
   b) Model : DB 32/26
   c) Rated Capacity : 10 M^3/hr.
   d) Total dynamic head at rated capacity : 70 mtrs.

Details of Extinguishers:

S.NO	TYPE	CAPACITY	TOTAL
1.	DCP TROLLEY	100kg	2
2.	DCP TROLLEY	50kg	2
3.	DCP	5kg	72
4.	DCP	20 kg	20
5	CO2	6.5 kg.	11
6.	CO2	4.5 kg	77
7.	CO2	2.0 kg	25
8.	A.F.F.F	9 litres	25
9.	A.F.F.F	50litres	7
10.	A.F.F.F. trolley	200 litres	3

1. Sensors:

a. 10 smoke detectors with audible alarm are installed at various strategic locations in the production unit to alert the workstation peoples.

b. Online pH meters are installed to monitors the scrubbing fluid pH.

c. Online cyanide detectors with audible alarm are installed in scrubbing system to detect the cyanide content in the vent gas to atmosphere.

d. Portable HCN detectors

e. HCN detecting strip

2. Medium velocity spray system is installed in the bulk solvent storage area to protect the bulk solvent storage tanks safeguard from fire hazard.

3. Following areas are covered under flameproof electrical accessories:

   a. Phyto and Organic production unit

b. Solvent Tank farm area

c. FO and HSD tank farm area

Each hydrant point is provided with one hose box or hose cabinet with two fire hoses and a nozzle. Self-contained breathing apparatus / air breathing apparatus are used during fire fighting and for controlling toxic release in the Production area.

Free face gas masks exclusively for each type of gas, acidic, organic, chloride and ammonia, are provided for normal use and for emergency handling.

Breathing Apparatus Details

Self contained breathing apparatus are positioned in the following areas in addition to the online air breathing apparatus.

S.No	Location
1	Emergency Control Room (East)
2	Emergency Control Room (West)
3	Mechanical Room (North)
4	Mechanical Room(South)
5	AEP-PLC Room (Entrance)
6	AEP - PLC Room (Inside)
7	AEP Ground Floor (West)
8	AEP Ground Floor (East)
9	AEP Ist Floor (West)
10	AEP Ist Floor (East)
11	AEP 2nd Floor (West)
12	Plant 2C (Entrance)
13	R&D ground floor
14	Trolley type Air cylinder (SCBA)-AEP
15	4 nos spare in Safety Stores

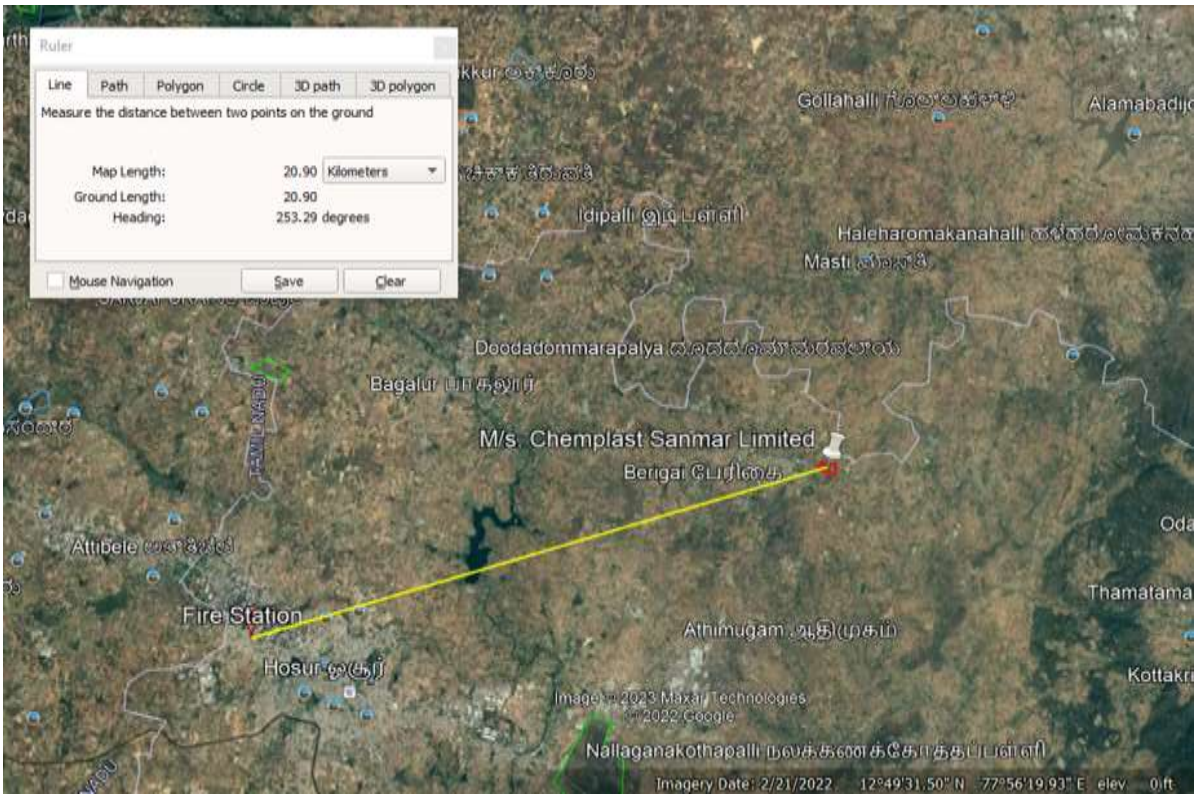
FIRE FIGHTING FACILITIES (PROPOSED)

ABC Fire Extinguishers - 30 Nos,
CO_2 Fire Extinguisher - 35 Nos ,
Foam Extinguishers - 20 Nos.
Hose reel - 15 Nos.
Foam tank -5 Nos.

FIRE ALARM SYSTEM: Automatic fire detection & alarm system consists of Fire Detectors, Addressable MCP & Hooters Beam Detectors (Ware House) are placed at strategic locations

and connected by cable to central control panel at ECC with repeater panel at DCS Control Room.

Fig. 7.4 - LOCATION OF FIRE NEAREST STATION



FIRE LOAD CALCULATION

1	Name & Address of factory	:	**M/s. Chemplast Sanmar Limited**	
			S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.	
2	Phone Number	:		
3	Name of Occupier	:	Mr. Ramkumar Shankar	
4	Total Floor of the factory	:	2 Floors (Plant-4) Ground+ 4 Floors (MPB)	
5	Detail of Combustible Area (In sq. Meter)			
a)	Total Floor Area	:	**6765**	M^2
b)	Open Space Area in which Combustible Material stored	:	1209	M^2
c)	Area having more than 15	:	1444	M^2

	meter Height			
d)	Area having Wooden material	:	0	M^2
	Total (a + b + c + d)	:	9418	M^2
6	$\frac{a + b + c + d}{20}$	:	470.9	L/Min
7	Total Requirement of Water (based on area in sr. no-6)	:	28254	Ltrs/hr
8	Current Water storage Capacity for fire hydrant (Proposed)	:	1200000	Ltrs
	Underground Tank + overhead tank + On ground Tank	:	Overhead Tank (1200000)	Ltrs
9	In case of Fire, Arrangement for water to be used in fire fighting			
a)	Is Hydrant Line available? If Yes give dimension of Pipe.	:	4inch, 8 inch	
b)	Which type of arrangement are available for Supply water on ground or upper floor i.e. Pipe line and it's Diameter (c.m.); Give detail	:	Riser points available 4 Inch pipeline	
c)	Are Fire Water Pump Available or Not? Give detail	:	Fire water pump house consist of Existing: 1 Electrical Main Pump, 1 Diesel operated pump, 1 Jockey(Booster) Pump Proposed: 1 Electrical Main Pump (410 cu.m / hr), 1 Diesel operated pump (410 cu.m / hr) , 1 Jockey(Booster) Pump (10.8 cu.m / hr)	
10	If the Value of Sr. 6 is more than 550, then requirement of trailer Pump is applicable. If it applicable then what is the arrangement for the Same. Give detail	:	NA	

11	How many water buckets required?	:	NA	
12	How Many 9 Litres water type Extinguisher required?(Water Bucket/6)		NA	
13	Requirement of 5 Kg CO2 Type Fire Extinguisher for Class - E fire. Floor wise (1 for every 15 m length)	:	NA	
	Total requirement of Fire extinguishers (5 Kg ABC).	:	NA	
14	Extinguisher details			
	Type		**Existing**	
	ABC (5.0 kg)	:	ABC Fire Extinguishers	25 Nos
	CO2 (4.5 kg)	:	CO_2 Fire Extinguishers	88 Nos
	SAND BUCKET	:	Sand bucket	60 Nos
	FOAM (9 ltr)	:	Foam Extinguishers	30 Nos.
	DCP (5 kg)	:	DCP Fire Extinguishers	92 Nos
	Fire Proximity Suit	:	2 Nos	
	Total	:	235 Nos	
15	Additional Fire Extinguisher Required	:	ABC Fire Extinguishers -30 Nos, CO_2 Fire Extinguisher-35 Nos , Foam Extinguishers- 20 Nos., Hose reel 15 Nos, Foam tank -5 Nos	
16	Emergency Fire Exit provided to Each Floor? Ladder Provided to Each floor?	:	Emergency Exit available with stair access in all floor	
17	Arrangement for Fire warning. i.e. Hooter / Ele. Bell / Other	:	Fire Alarm facility available in all floor	
18	Water Sprinkler Provided?	:	Water Sprinkler system available at tank farm and Warehouse building	

7.10 ON-SITE EMERGENCY PLAN

7.10.1 GENERAL

The emergency is an undesirable occurrence of events of such magnitude and nature that adversely affect business, cause loss of human lives and property as well as damage to the environment. Industrial units are vulnerable to various kinds of natural and man-made emergencies. Examples of Natural disasters are flood, cyclone, earthquake, lightening etc. and manmade disasters are major fire, explosion, sudden heavy leakage of toxic/flammable gases, building collapse, human errors, vehicle crash, sabotage, etc. It is impossible to forecast the time and nature of emergency, which might strike the unit. In spite of the fact that every industry is expected to take steps to assess, minimize and, wherever feasible, eliminate risks, accidents may still occur. Risks can only be minimized; it can never be totally eliminated. However, an effective emergency plan helps to minimize the losses in terms of human lives, plant assets and environmental damage and to resume the working condition as soon as possible. In all these steps speed is the essence. Controlling the emergency will require prompt action by the operating staff, the staff of various agencies, emergency teams and the outsiders when called for. Minimizing the effect on people may be achieved by prompt communication, rescue, evacuation etc., if the situation so warrant.

7.10.2 STATUTORY REQUIREMENT

The provisions for preparing the on-site emergency plan are explained below:

THE FACTORIES ACT, 1950:

The Tamil Nadu Factories Rules 1950 providing that every occupier, who has control of an industrial activity pertaining to hazardous chemicals shall furnish the On-Site Emergency Plan detailing how major accidents shall be dealt with along with explaining specific responsibilities and actions by various persons.

THE ENVIRONMENT (PROTECTION) ACT-1986:

Rule 13(1) under the Manufacture, Storage and Import of Hazardous Chemicals Rule 1989 (amended 1994), rules framed under The Environment (protection) Act-1986, indicates that the occupier shall prepare and keep up-to-date an on-site emergency plan containing details specified in schedule II and detailing responsibilities and actions by different person and agencies.

CHEMICAL ACCIDENTS (EMERGENCY PLANNING, PREPAREDNESS AND RESPONSE) RULE 1996.

Under these rules, framed under The Environment (Protection) Act-1986, the state government has constituted a Local Crisis Group & District Crisis Group to deal with major chemical accidents and to provide expert guidance for handling chemical accidents. Further provision is made that the Major Accident Hazard units have to prepare the on-site

emergency plan and submit the plan to the crisis groups. The local emergency plan will dovetail with the District off-site emergency plan.

7.10.3 PREPAREDNESS OF ON–SITE EMERGENCY PLAN

The On-site Emergency Plan describes planning, preparation and training for on-site action in the event of emergency. For On-Site Emergency Plan Advance planning and proper training of each employee into the emergency function is very essential to make emergency control measure more effective. It is not possible to eliminate emergency but is definitely possible to control them. The scope of onsite emergency plan is to prepare for activate the emergency time activities, to controlled and contained within the shortest time if emergency arise after failure of our pre-emergency control measures. Following stage activities are considering for the purpose, as they are co-related and provide better points for emergency preparedness.

7.10.4 EMERGENCY TIME ACTIVITIES

It is not possible to include and discuss every action, which should be taken first during emergency. It is also not possible to describe entire actions on emergency situation. The basic principle of handling emergency, that may be relied upon, who have the knowledge and experience to assess the situation and give direction as per the objectives as quickly as possible. However, the aim is to control the situation by safest way in a limited time within existing available resources. Further, it should be handle with such a care that minimum loss of life, property and environment. In short, the objective of the plan should be successfully
complied with.

7.10.5 EMERGENCY FACILITIES

1. Medical Facility and setup:

Well-equipped occupational health center is located near the Emergency Control Room and a full time medical officer from Tie Up Hospital in Hosur is in charge of the Occupational Health Center. Dedicated Ambulance is kept ready near the Occupational Health Centre and the driver cum mechanic is available round the clock.

AMBULANCE FACILITIES:

Single patient transporting facility

2.Emergency Control Room (ECR) with alternative:

Security office room has been identified as ECR.

Phytochemical plant Security gate as alternate ECR.

3.Telephone Communication:

We have an EPABX setup, and there are 40 lines for common and 5 direct line. The incoming is operated through the board.

4.First Person to be contacted in case of Emergency:

Emergency Control room From External - 04344 243005 – From Intercom 2205

5.Site Meteorological data:

(i)	**Minimum Temperature**	**: 14^0C**
(ii)	**Maximum Temperature**	**: 36^0C**
(iii)	**Average rainfall**	**: 822.3 mm.**
(iv)	**Weather Conditions**	**:**
		: Wind Speed: 12 to 19 km/hr
		: Stability Class: C
	Humidity	**: Dec to May-65 to 75%**
		June to Nov.-80 to 85%

Major Industries: There is no factory around 10 km of the plant surrounding.

7.10.6 IDENTIFICATION AND ASSESSMENT OF HAZARDS

1.Identification of the type of emergency: -

1.1 Types of Emergencies Possible:

a. Fire.
b. Explosive
c. Chemical Spill & Toxic gas release.
d. Confined space incidents
e. Transport related incidents (involving H_2 truck, acid / alkali trucks, FG goods truck etc.,)
f. Natural calamity
g. Bomb threat

1.2 Categories of Emergencies:

a) The type of emergencies, which are restricted to one sector of the plant and which can be controlled by the manpower and facilities available in the section.
b) The type of emergencies though originating from a section, which cannot be controlled by the section. These may require shutting down of the entire plant and may require activation of On-Site Emergency Plan. However, the magnitude of emergency is restricted to plant premises.
c) The type of emergencies, originating from the plant and whose impact spills outside the plant, fall under a Category wherein there will be a requirement of both On-site and Off-site Emergency plans. Incidents due to natural phenomena may have its impact over the surrounding requiring activation of Off-site plan.

1.3 Identification of the Category:

The type of emergency identified in SSC fall under category 2.2 and can be handled with the available manpower and facilities within the plant.

The quantity of chemicals handled is below threshold level.

Risk Analysis study brings out the fact that while there can be emergencies with impact limited to plant area there will be no impact over the surroundings.

In view of the location, which is dry, with average rainfall, normal wind velocity and lying in non-seismic zone there is no possibility for an extraordinary situation with offsite potential.

2. Design for safety: -

The plant is built as per the guidelines of Factories Act 1948. Essentially the process involving chemical reactions like alkylation, hydrogenation, oxidation etc. followed by layer separation, filtration, distillation and packing. Critical reactions like hydrogenation under high pressure is carried out in small reactors.

Design consideration is given to important facilities like control room, amenity handling and access routes so as to reduce concentration of people in hazardous areas.

All the blocks are laid with adequate means of escape from all sides and for firefighting. Location of each operating block is laid in such a way that any untoward incident will be localized and shall not impact the surrounding area.

All the chemicals handled in bulk and drums are high boiling and stable liquids stored under normal temperature and pressure.

Chemical storage yard is at the rear side of the plant and stored under recommended conditions and storage is licensed under Explosives Rules and regulations. Open air storage in closed vessels with impermeable flooring and thus ensure prevention of pollution.

To control reaction rate and maintain reaction temperature chilled water and brine solution circulation facility is provided. This automatically checks uncontrolled runaway reactions.

Reactors are provided with rupture disk for release of pressure and the released gas is collected in blurb tank otherwise called as abnormal release tanks, for proper disposal.

Pressure relief valves are also provided with connections leading to blurb tank for collection. There is also facility for release through scrubbers with detector and alarm facility at the outlet set at TLV level for critical gases.

Control panel is provided with audio visual indications and high and very high alarms.
All pressure vessels are fabricated as per relevant Indian Standards. Bulk storage tanks have been designed with earthing, bonding and dyke facility towards localizing the spill and prevent movement to surroundings.

All the manufacturing and storage areas are covered under Electrical classification and the equipment provided are of Explosion proof type suitable for zone-2.

Electricity Act & Rules guidelines are followed for design of electrical equipment and earthing.
Static protection is done through proper line sizing, earthing, and provision of jumper and prevention of freefall.

All the chemicals are stored under shed and drums are stored at elevated location with facility for spill collection and transfer of spill to safe place.

Safe operating procedures are provided for all operations and maintenance and the concerned are trained for efficient performance.

Considering the reaction potential of hydrogenation reaction the hydrogenators are designed with all the safety measures.

Temperature, pressure and flow is checked through continuous online indication and recording facility.

Drainage:
The site is provided with drainage facilities adequate for all emergency water usage and provided with interceptor chambers designed to exclude storm water drains and main sewer system.

Water Supply:
Firewater source is from groundwater for make up. Firewater tank holding is used exclusively for emergency purpose only. Capacity 1200M^3

3. Storage Hazards & Controls: -

The storage is mostly class A, B & C chemicals requiring atmospheric storage facility. Class-A chemicals with high inventory requiring regular usage is held as bulk storage, though it is held in small volume.

Chemicals used in small quantity are held in sealed drums. Bulk storage tanks are held above ground and built as per Petroleum Act & rules and storage is approved by Chief Controller of Explosives, Nagpur. Electrical equipment used in solvent storage area is of Explosion proof type.

Bulk storages are dyked and the capacity of dyke has more than the required volume to hold the entire quantity stored in the event of a spill. Bonding, earthing and proper pipeline design ensures static precaution.

The dyke flooring within which storage tanks are held is provided with concrete to ensure proper spill control and prevent earth permeation. Level gauges are provided to have proper control on level and counter checked by dip rod check.

A security guard takes rounds around the tank farm area at regular intervals to ensure detection of unsafe conditions or spill.

Drum storage yard is held in an elevated place and has a roof to prevent direct sunlight and heat. Elevated facility facilitates draining of leaks, if any, for which collection and transfer facility is available.

Acidic materials are stored in non-corrosive FRP tanks with spill control facility and the locations of the tanks are at a distance from other areas to prevent corrosion. The entire area has non-corrosive acid proof tiles and flooring.
Cylinders holding Hydrogen and Ammonia are stored as per Gas cylinder rules and away from each other to prevent any reaction hazards. Special precautions are taken for handling cylinders to avoid unsafe situation.

Small quantity of Furnace oil and diesel are held in MS tanks and the installations are approved by CCE, Nagpur. Bund walls of adequate capacity, level measurement facility, bonding and earthing and impermeable flooring are the other facilities provided.

4.Process Reactor Hazards and controls:-

Process reactors are designed to withstand the maximum allowable working pressure. To take care of high pressures developed rupture disks and relief valves have been provided leading to blurb tanks.
Reactors for critical services are sized in pilot scale level, so that it will have no impact on other areas. Pressure gauge, temperature gauge and flow meters are provided and continuously monitored through indication and recording and also provided with

alarms for deviation. Pressure vessels and reactors are tested and certified by Factory Inspectorate.

5. Records and Past incidents: -

There had been no fire or explosion or toxic release in the past ten years and since the quantities handled are small and the care taken to handle and store chemicals being high there had been no event or incident relating to fire or release.

6. Identification of Hazard and Failure Scenarios: -

While past records have been quite encouraging with respect to fire, explosion or toxic release a theoretical approach to probable events and a maximum credible analysis through a Risk Analysis study identify the following areas for risk control.

- Bulk storage tank failure and pool fire
- Hydrogenation section of plant.
- Drum storage and handling areas of the plant (this would be practically all over the plant area).
- Release of gases due to scrubber failure
- Solvent fire or explosion in phyto area.

Risk Analysis Report has considered the above-identified areas for consequence analysis and the results are listed below.

7.Summary of Consequence Analysis

Scenario	Vapour Cloud Explosion		Thermal Radiation			Toxicity level in IDLH value in ppm	Distance in m
	0.3 bar	0.1 bar	37.5 Kw/m^2	12.5 Kw/m^2	4Kw/ m^2		
Hydrogenation reaction explosion	37	18	-	-	-		
Methanol release	22	38	-	-	-		
Storage tank collapse- HSD –	-	-	-	18	30		

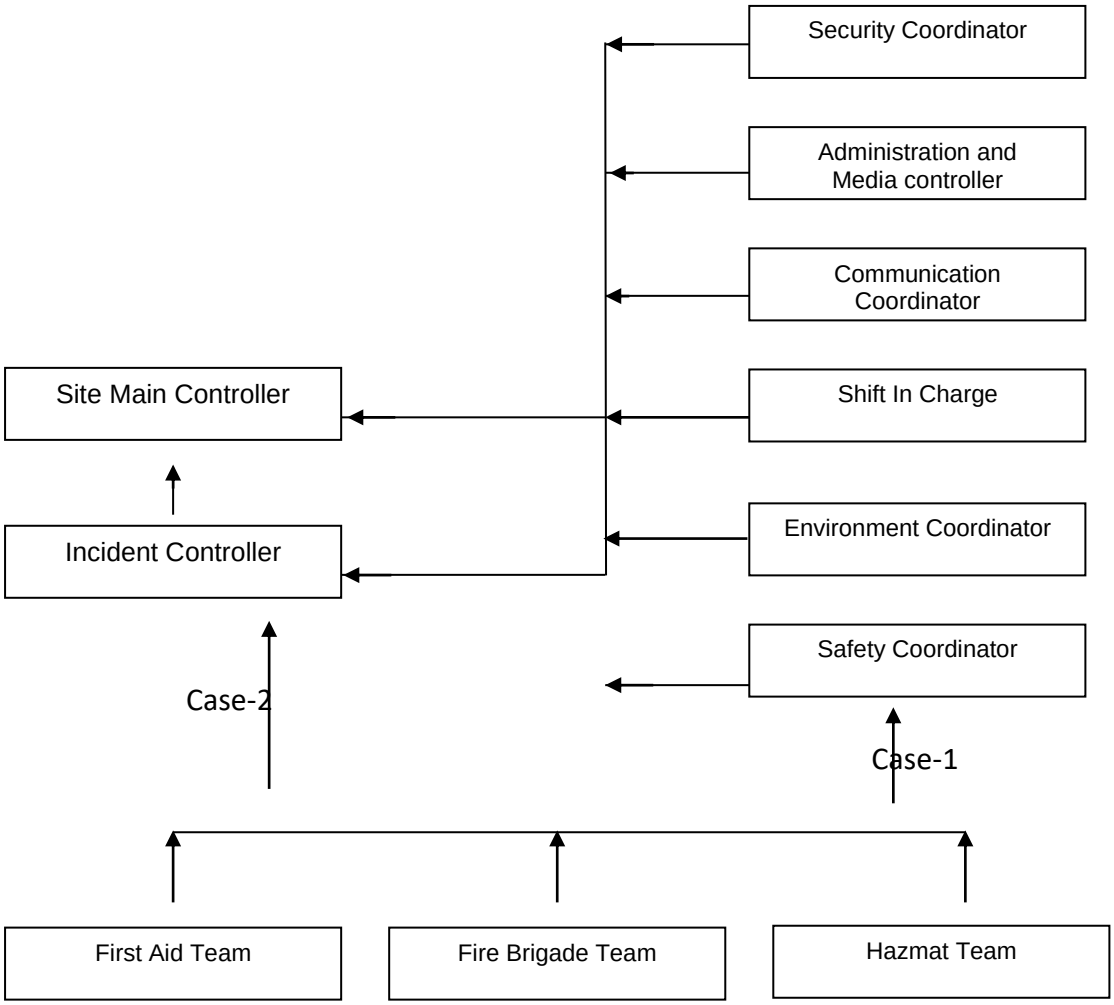
Pool fire							
Toluene tank truck collapse	-	-	-	5.8	23		
Drum leakage: Acetyl chloride leak	-	-	-	-	-	125	70
Scrubber failure & Release of chemicals: a. HCL b. Methyl Mercaptan c. Ammonia d. Hydrogen cyanide	- - -	- - -	- - -	- - -	- - -	50 150 300 50	50 70 not exceeded 35

8. Fire Prevention Measures and Fire Fighting facilities details are mentioned 7.9

7.10.7 EMERGENCY ORGANISATION AND RESPONSIBILITIES

The Procedure outlined in this chapter is to be followed in the event of an emergency such as fire and explosion during manufacturing activity and operational matrix for handling Emergency is given in below picture

OPERATIONAL MATRIX FOR EMERGENCY HANDLING



Note:

Case-1: First Aid, Fire Brigade and Hazmat Team will report to Safety coordinator.

Case-2: In absence of Safety coordinator, First Aid, Fire Brigade and Hazmat Team will report to Incident controller (Shift in charge).

Key Persons to combat emergency are nominated with specific responsibilities for making the best use of resources available and handling any emergency in an orderly manner without confusion. Such key personnel include site main controller and Incident controller who are responsible for leading the emergency team.

Other key personnel and essential workers play their respective limited role so that the main objective is met in controlling emergency and mitigating the sufferings.

All such key personnel with their alternates will be available in all shifts and on call on off-duty.

1. Responsibility of Key Personnel: -

Site Main Controller: Factory In-charge /Head operation

Site Main Controller has overall responsibility for directing operations and calling outside help from Emergency control centre. Security Room will be the Emergency Control Centre. He will assume full responsibility for initiating action to meet the emergency.
He will

- Relieve the Incident controller from overall responsibility.
- Exercise direct operational control over areas other than the one affected.
- Inform higher management about the incident and keep them posted with further development.
- Mobilize all manpower and resources through various sources.
- Exercise direct operational control of those parts of works outside the affected area.
- Direct the safe close down and evacuation of plant in consultation with the Incident Controller and key personnel. If necessary arrange for evacuation of neighboring population.
- Control the traffic movement within the Factory.
- Arrange for a chronological record of the emergency to be maintained.
- Issue authorized statements to the news media, and inform Corporate Office.
- Ensure that proper consideration is given to the preservation of evidences. Arrange for photographs / video.
- Liaise with Factory Inspectorate, Pollution Control Boards, Senior Police Officials, fire brigade and Medical Services.
- Ensure that the key Personnel are called in.
- Ensure that casualties receive medical attention.

- Issue authorized statements to news media and ensure that evidence is preserved for inquiries to be conducted by statutory authorities
- Revoke emergency and establish regular operation of safe areas.
- Ensure tally of head count and rescue of missing personnel.

Incident Controller : Respective Plant in charges

Alternate : Shift in-charge-Production

Incident controller reports to the Site Main Controller. He is responsible for the overall planning and control of defined emergencies. His primary duty is to take charge at the scene of the accident.

Till Site Main Controller takes control of the Emergency Control Room, Incident Controller will take decision involving the operation of other plants including the area under emergency.

Once Site Main Controller takes charge, Incident Controller will mainly handle the emergency and the area or section where emergency has overtaken. All other operations will be under the control of Site Main Controller.

On hearing of an emergency he will rush to the scene of the occurrence and take over from the shift charge. He will assess the situation and if emergency exists or likely to exist he will inform Site Main Controller, shift in charges, Supervisors and other section heads.

He will

- Assess the scale of emergency and check whether major emergency exists.
- Give instructions for emergency siren. Direct all operations within the affected area.
- Ensure that all the Key Personnel are called in.
- Secure safety of personnel and minimize damage.
- Provide advice and information to the fire brigade.
- Direct rescue and fire fighting operations.
- Ensure that all non-essential workers and staff of the affected area are moved to the assembly points.
- Search the area for casualty.
- Report on all significant developments to the Site main Controller.
- Have regard to the need of evidence so as to facilitate enquiry into the causes for the accidents.

Communicate all persons involved in fire fighting and other shift officers on restoration of normalcy.

Responsibilities of Safety Coordinator : Safety in charge .

Alternate : Asst.Safety in-charge.

The Safety Coordinator reports to the incident Controller and coordinates with the members of emergency response team & appraises the Site main controller on the emergency response form time to time.

The Safety Coordinator coordinates the activities of Fire Brigade, Hazmat Team and First aid Medical Team. Also ensures that adequate emergency response equipment is available in the plant. The Safety Coordinator may stop any activity that endangers emergency response personnel. He will be responsible for fire brigade and toxic gas control activities.

Responsibilities:

- **Respond to all plant emergencies.**
- **Evaluate and provide the Emergency Response Equipment.**
- **Ensure that all Emergency Response activity is carried out in a safe manner and assist the Incident Controller in dictating the Emergency Response.**
- **Maintain inventory of spill control equipment to handle emergency.**
- **Ensure that all emergency equipment is restored to a state of readiness after the emergency is called off.**
- **Organize PPE required for emergency area.**
- **Assist incident controller in fire fighting operation.**
- **Arrange for additional extinguishers.**

Prevent spread of fire by isolation of areas and equipment and materials.

Responsibilities of Administration and Media Controller : Admin in-charge .

Alternate \ : Officer – Admin.

- The Administration/Media Controller reports to the Site Main Controller coordinates with the members of emergency response team to tackle the emergencies.
- Establish media contact if required.
- Contact outside emergency responders as & when required.
- Notify Custom Manufactured Chemicals Divn Limited, top management and corporate affairs department & appraise of the situation.
- Inform local Hospitals
- Advice Ambulance services and local hospitals to keep them prepared for treating injured.
- Call for trained fist aiders for handling large number of casualties.
- Arrange to send injured for specialized treatment.
- Arrangement transport for injured either through accompany vehicle or outside ambulance.

- Arrange for monitory resources for medical facilities under the instructions of site controller.

Organize refreshment/catering facility if the emergency is prolonged.

Communication Coordinator : HR In charge
Alternate : Officer – HR.

Communication coordinator will handle all communications and he will act as one point source for receiving and transferring communication.
He will take his instructions from the Site Controller and respond to Administration Controller.
Upon hearing emergency he will take up his role as Communication Coordinator and locate himself at the Emergency centre.
He will

- Inform company doctor regarding the nature of emergency to receive casualties for offering appropriate treatment.
- Inform security to keep ambulance and other vehicles to handle emergency.
- Inform fire brigade for fire fighting.
- Establish contact with Incident controller to know the situation inside emergency area and transfer the details to site controller.
- Maintain log of Incidents.
- Check the Head count at assembly point with attendance and report to site controller and Incident controller about tally & figures.

Responsibilities of Operations Officer: Shift In-charge organic

The Operations Officer will normally be the Shift in-charge at that time emergency. Once the emergency is declared shift in charge will take care of plant area other than the area under emergency and ensure normalcy.

He will report to Incident Controller during emergency and take instructions for controlling the activities associated with non-emergency operating plants.

When the Emergency Situation arises after office hours/holidays, the shift in charge will do the role of Incident Controller till the arrival of Site Main Controller/Incident Controller. Trained First aid, Fire fighting and Hazmat team is available round the clock and they report to Incident controller (Shift incharge)
Responsibilities:

- Will depute asst. shift incharge in the Emergency control centre during emergency after office hours.
- Maintain communication with the Site Main Controller through security.
- Recommend emergency shutdown and or evacuation of plant personnel of non-affected areas.
- Ensure that emergency does not spread to normally operating areas.

Responsibilities of Environment Coordinator : Environment in-charge
Alternate : Asst. Environment incharge

- The Environment Coordinator reports to the Incident Controller and coordinates with the members of emergency response team to tackle emergencies.
- The Environmental Coordinator, assesses the environmental impact of the incident, advises the Incident Controller in spill control and mitigation, and contacts outside Environmental agencies as & when required.
- Assess environmental impact of any release to the environment, which includes analytical monitoring as required.
- File follow-up reports with environmental agencies.

Responsibilities of Security Coordinator : Head Guard
Alternate : Asst Head Guard-Security

The Security Coordinator reports to the Site Main Controller and coordinates with the members of emergency response team to tackle the emergencies.

- Respond to all plant emergencies.
- Control all incoming and outgoing traffic.
- Block all non-essential entry into plant.
- Take head counts during emergencies.
- To keep control of the employees assembled near the gate.
- Prevent employees and others approaching the area of accident.

Responsibilities of First Aid and Rescue Team:

When there is a Medical Emergency the employees of the affected area informs the Emergency control centre for getting assistance.
The medial team will be informed by the security about which area is affected & will proceed to the affected area.

- They report to the Safety Coordinator/Incident Controller at the time of medical emergency.
- Medical Team provided First aid to injured personnel.
- Bring the injured to the Medical Centre for first aid.
- Medical team is trained on First Aid.
- Evacuation of persons from emergency area to assembling points.
- They will coordinate with the External medical personnel as & when required during the emergency.

Medical team members will have their identification badges.31 no.s of employees are trained first aider.

Responsibilities of Fire Brigade:

- The Fire Brigade team works under the direction of the Safety Coordinators/Site main controller.

- The Fire Brigade shall respond to all fire emergencies as & when called, be prepared to extinguish all fires, prevent the spread of fire and prevent the damage caused by a fire.
- The Fire Brigade will fight the incipient fire inside or outside of an enclosed structure or building & has to perform full-fledged fire fighting in the open area only.
- When there is a fire alarm signal, the Fire Brigade members will call the Security Dept & get the details about which area is affected & proceed to the fire scene from an upwind direction.

Members of the Fire Brigade will have their identification badges. 34 no.s of employees are trained for fire fighting.

Responsibilities of Hazardous Materials Team: (HAZMAT TEAM)

When there is leak or spill of hazardous substances the employee of the affected area informs the Emergency control centre (security office) for getting assistance.

The HAZMAT members will be informed by the security about which area is affected & will proceed to the affected area. HAZMAT Team members handle and control leak or spills of hazardous substances.

HATMAT Team members coordinate with the Safety Coordinator or Incident Controller tackling the emergency. Also, the HAZMAT members will be in regular contact with the Incident Controller/Environmental Coordinator & appraise of the emergency so that proper monitoring can be done during the incident/post incident. HAZMAT members will have their identification badges. 24 no.s of employees are trained for rescue for hazardous

In case, if the emergency is after office hours/holidays the Security in-charge will inform the Key personnel immediately. chemical.

Responsibilities of Essential Worker:

A task force of essential trained workers is available to implement the instructions of Incident controller. Such workmen, on emergency will take permission from the departmental head and join the task force to fight emergency.

- Fire fighting as per instructions of safety officer, as part of Fire Brigade.
- Shutting down and making it safe.
- Safe transfer of material, urgent repairing or replacement.
- Provision of emergency power, lighting, equipment, material etc.
- Search, evacuation, rescue & welfare.
- First aid and medical help.
- Manning assembly points.
- To act as messengers wherever called for.

General Guidelines: -

- On hearing the fire alarm all the workstation in charges of the plant should carryout the following:
- Identified emergency brigade will go to the area of emergency.
- Stop all feed and ensure smooth stoppage of all production units.
- Stop all loading and unloading operations and keep transport vehicles in, as is where is condition without blocking emergency passage. Before leaving the vehicle transport drivers must leave the key in the vehicle and then move to assembly point.
- Under all circumstances, whenever an emergency is suspected, Hydrogen supply from cylinder will be isolated and the truck should be safely moved to the nearest safe spot. Ensure Nitrogen supply and power availability.
- Plant restart will be done only after hearing all clear siren and getting clearance from Site Controller. Head of production department will personally visit plant for restart of the plant.
- Restart of each plant will be through personal inspection and clearance from Incident Controller to respective plant Head.

Notification and Documentation: -

Notification to Statutory Authorities:

Depending on the scale & type of emergency, the appropriate statutory authorities will be informed in the appropriate formats by the Factory in-charge, at the immediate opportunity.

Documentation:

The person first witnessing the accident/incident will inform the Shift in charge. The Accident/Incident will be reported in FOR/FIC/001 & submitted to the SHE department. The Accident/Incident is investigated, the probable root cause will be identified & necessary corrective & preventive action will be taken.

ASSEMBLY POINTS: -

There are four Assembly Points. The locations are as follows:

Assembly point 1	Near Security office
Assembly point 2	Near Stores
Assembly point 3	Near Phyto entrance
Assembly point 4	Near Plant 4

7.10.8 EMERGENCY CONTROL ROOM: -MAIN SECURTY OFFICE.

ALTERNATE EMERGENCY CONTROL ROOM: – NEAR PHYTO SECURITY OFFICE.

Security Office will be the Emergency Control Centre for any major emergency. It is the place from which the operation to handle the emergency are directed and coordinated. It will be attended by the Site Main Controller, key personnel and Senior Officers of Fire and rescue department, Police, Factory Inspectorate, District Authorities and Emergency Services.

The Centre is equipped to receive and transmit information and direction from and to the Incident Controller and areas of the Works as well as outside. Emergency contact no is 205

The established Emergency control room contains the following equipment/information:

- Self contained breathing apparatus
- Onsite Emergency plan, which contains safe shut down procedures, Information Emergency team members etc.
- Emergency contact numbers.
- Important contact numbers of government offices.
- Topo sketch showing the adjoining facilities.
- Site plan showing Entry & exit, Emergency assembly points, safety shower
- Location Fire hydrants points and portable fire extinguishers, Occupational health
  centre and Emergency Control Room etc.

Additional layout of the plant which may be required to mark up during the emergency to show:

- Areas affected or endangered.
- Deployment of Emergency vehicles.
- Particular problem areas.
- Areas evacuated.
- Other relevant information
- Nominal roll of employees.
- List of key personnel addresses and telephone numbers.
- Emergency Preparedness plan.
- Material safety data sheets of various chemicals used.
- Details of various manufacturing processes.

7.10.9 COMMUNICATION SYSTEM

The communication system is crucial factor in handling an emergency. For the purpose of onsite emergency plan, the plant has a quick and effective communication.

a) Inside the factory.
b) To key personnel outside normal working hours.
c) To the outside Emergency services and Authorities and
d) To neighboring Factories and Public in vicinity.

The facility available for communication in the plant area is through Telephone& walky talky.
Office and Residential Telephones provided by the company, Intercom facility within plant area.
The communication system beginning with raising the alarm, declaring the major emergency and procedure to make it known to others is explained below in brief.

1.Raising the Alarm: -

When there is an emergency, the personnel working inside the plant will be notified by emergency alarm (Fire alarm / Toxic gas alarm). The activating buttons for the alarm system are located at:

Siren: 1-Near pilot plant.
Siren: 2-Phytochemical Plant.
Siren: 3-Plant 4
Siren: 4-Organic

An individual who has discovered an unusual situation should inform Shift In-charge, who in turn will take a decision whether to communicate to seniors or declare emergency by activating the siren, depending upon the contingency.

- **Fire alarm- (30 seconds-5 seconds-30 seconds)**
- **Toxic gas alarm- (30 seconds-5 seconds-30 seconds-5 seconds-30 seconds)**
- **All Clear (Continuous siren for 1 minute)**

In addition to the alarm, the emergency to be announced through the Public Announcement System to alert all the personnel inside the plant and to summon the ERT members of the respective plant to begin the initial fire fighting measure.
The siren will alert key elements and essential workers who will proceed to the accident site and initiate emergency response actions.
The alarm system is connected to the UPS system so even during power failure the alarm can be activated.
If an individual attempting to report an emergency is unable to activate the emergency alarm, or if the emergency alarm is not working, he can use the intercom facility, which is nearest to him.
The security in–charge who sits in the ECR will inform the plant personnel through intercom & Walky talky & Public Announcement system.If there is power failure immediately alternate power is restored through generators. Internal telephones & Walky talky are available throughout the factory, which serves as the major source of communication.

The siren is checked every Monday afternoon for its reach and performance. Short sirens followed by gap are kept on to indicate an emergency situation. When the emergency is cleared as per procedure long siren is activated to indicate end of emergency and return of normalcy.

1. Declaring On-site emergency: -

Since declaration of emergency is a critical decision it calls for clearance from Site Main Controller or Incident Controller or their alternates.

But declaration of emergency is an important and timely decision requiring quick action without loss of time.

1.Telephone Messages: -

After hearing the emergency alarm and emergency declaration, the person attending the telephone will play an important role. He will be very precise, sharp, attentive and quick in receiving and noting the message and then for immediate subsequent action of further communication.

List of telephone numbers are displayed in main gate.

LIST OF EMERGENCY CONTACT NUMBERS

Sl.no	Name	Designation	Intercom nos.	Mobile no
1	Dr. Krishna Kumar Rangachari	ED	2232 8569	9790961476
2	G.Sankara subramanian	Business Manager	2232 8625	9944941237
3	VSV Rajan	Corporate Safety Head	8545	9941419300
4	Guru srimanikandaraja	CSL Safety Head	5508	9840420750
5	Yogeeswara Basappa Gowda	Plant Head	2211	8940650999
6	P. Prabaharan	Production In charge	2220	98419 16772
7	K. Soundararajan	Production In charge	2240	98947 37249
8	R.Kumar	Safety In charge	2217	9994468779
9	M.Saravanan	Security & Admin In charge	2216	990061942
10	R.Jayakumar	Environment In charge	2238	9994564380
11	N.Rajesh	Stores In charge	2222	9750427987
12	G.Harisha	HR In charge	2208	9790098556
13	R. Sabarigiri	Mechanical In charge	2224	95510 57001
14	B.Prabakaran	Electrical In charge	2219	9489966500
15	P.Arun Prasath	Instrument In charge	2202	99429 37427
16	John Sundar Chellappa	QC & QA In charge	2228	98948 55245

17	Dr. Mahendranath Rao	R& D Head	2234	9945181726
18	Venkata Sravanth Poruri	Technical Service	2244	7350825900
19	Manivannan	Project Incharge	2245	9842629115
20	Magalingam	Production In charge	2230	7708122965
21	K.G.Ganesan	Quality Incharge	2212	8940448941
22	Venkatesa Perumal	Project Dy.Incharge	2319	9962662929
23	Main Gate	Security In charge	2205 & 2229	9384832788 & 04344 253005
24	Mr.M.Meganathan	OHC-Doctor	2299	7598340640

LIST OF STATUTORY AUTHROITIES WITH CONTACT NUMBERS

Statutory Authorities	Place	Contact Nos.
Fire station	Hosur	(04344) 276699
Police station	Berigai	(04344) 253521
Police station	Bagalur	(04344) 254121
Deputy Superintendent of Police	Hosur	(04344) 222624
Deputy Chief Inspector of Factories	Hosur	(04344) 274347
District Environmental Engineer, TNPCB	Hosur	(04344) 278922
Sub Collector	Hosur	(04344) 222622
District Collector	Krishnagiri	(04342) 230561 / 230562
District Superintendent of Police	Krishnagiri	(04342) 239700
Taluk Office	Hosur	(04344) 222493
Tamil Nadu Electricity Board	Berigai	(04344) 253879
Tamil Nadu Electricity Board	Bagalur	(04344) 254230

1.Communication on possible Emergency: -

Inside the factory to workers:

All workmen are kept informed through dissemination of hazard information, storage details, safe handling procedures and role of workmen during emergency.

a. To Key personnel outside normal working hours:

Generally the key personnel and essential workers will be available in all shifts or on short call. But due to some reasons, if some are not available or not on duty and are outside and if their help is required, their updated lists are kept in the Emergency Control Centre from which the call-in will be made.

The names are listed in order of priority. Communicators are told to call-in the personnel in the order given. On making contact, the communicator will give a short prearranged message to the effect that an Emergency has been declared at works. Those contacted will not try to elicit further information at this stage, thereby delaying other calls.

b. To outside emergency services & Authorities:

The emergency will be communicated to authorities such as Police, Factory Inspectorate and Pollution Control Board for information and their involvement.

Since the levels of chemicals handled are small in volume off site emergencies are not possible and hence the information will be the statutory intimation and will not require their participation or help.

c. To neighboring Firms and Public:

Since no Off-site emergency or spill of on-site is contemplated such an exercise is not called for. However the emergency siren will work as a communicative for under standing the existence of emergency inside the plant.

5. Post-Emergency Activities / Recovery:

- Incident Controller will inspect the affected area and other operating sections.
- Only after clearance from Incident Controller, Plants will be started, one by one.
- Incident Controller will ensure proper functioning of utilities before clearing restart of the plant.
- The affected area will be started only after total study, enquiry and incorporation of correction. It necessary statutory clearance will be obtained.
- Post emergency activities comprise of the steps to be taken after the emergency had been controlled. The actions involved are
    - Collection of records.
    - Conducting enquiries and concluding preventive measures.
    - Making insurance claims.
    - Preparation of enquiry reports and suggestion scheme.
    - Implementation of enquiry reports and recommendations.

- Rehabilitate the affected persons within and outside the premises.
- To restart the plant.
- Administrative Controller will follow up with hospitals on treatment of injured.

7.10.10 EMERGENCY RESPONSE PLAN / ACTION ON SITE

1. FIRST RESPONSE: -

Copy of Plant Layout marking the hazardous areas in the plant is enclosed as Annexure-V.

Any employee noticing fire or toxic release will shout for help and to attract attention. Shift in charge will be informed through telephone or walky talky regarding location of emergency. Shift in charge officer, depending upon the nature, will declare emergency and activate suitable alarm.

Any employee/person noticing the fire will shout 'Fire' 'Fire' to attract attention of others, shift incharge will be informed through phone or walky talky regarding fire and the location. He will rush to the site and arrange for controlling the fire. Meanwhile he will organize communication through phone or walky talky to the security office regarding emergency and location. He will inform security to blow the fire siren.

- On hearing the fire siren the nominated Incident Controller will take over from the shift incharge and execute the responsibilities of Incident controller.
- Site Controller viz Manager of the Plant will proceed to the Emergency Control Room and call assistance from key elements.
- Safety Officer/Fire fighting coordinator or alternate will proceed to location and start fire-fighting activity.
- Communication coordinator will proceed to the Telephone section and take over the function of receiving and transferring messages.
- Administration coordinator will wait for instructions from Site Main Controller.
- Security Coordinator will take charge of entry operations at the gate and prevent movement of Transport vehicles inside the plant. Soon after hearing the siren main gate will be kept open for free movement of vehicles.
- Ambulance Van will be kept ready for emergency movement of injured.
- Company Medical Officer will reach his first aid centre and prepare the dispensary for receiving affected persons. He will take instructions from site main controller for necessary emergency action.
- Security Officer will ensure that roads inside plant are not blocked and free space is available for movement of vehicles.

2. Fire Brigade Team: -

The team members to go into action such as: -

1. Rush to the spot of the fire with all available fire extinguishers and try to put out the fire at the earliest.

2. Stop all other activities and concentrate only on fire fighting and prevention of spread of fire.
3. As other members rush to the scene of fire tell them about the nature of emergency and inform about the extinguisher to be used.
4. All the combat activities will have clearance from Fire Fighting coordinator, the team to report to Fire fighting coordinator.

3. First Aid/Rescue Team:-

The assigned operations are such as: -

1. Inform Site Controller through communication coordination about the situation available at emergency spot.
2. Ensure that transport trucks are moved away and do not block the escape routes.
3. Bring stretchers from the dispensary and move the injured to the dispensary.
4. Help company medical officer and work as per his instructions.

4. What should not be done: -

1. Do not take unnecessary risk.
2. Do not run in panic.
3. Do not argue or discuss in the scene of fire.
4. Do not operate extinguishers if you do not have proper training.
5. Take instructions and act as per instructions of Incident Controller.
6. Only authorized team / persons will carry out respective role.

5. First Response Common to All: -

- If you notice the fire first try to extinguish the fire or take immediate steps called for
- and shout “Fire” “Fire” and take the help of others. Shift Officer should be contacted
- immediately.

- The employees shall observe the windsocks, move crosswind to the nearest
- assembly point in case of Fire / Toxic gas alarm.

- All the personnel other than the Emergency response team personnel are to report to the nearest assembly point:
  - Assembly point 1 - In front of Emergency control room.
  - Assembly point 2 – Alternate Assembly point in Phyto plant

- A head count shall be performed to account for all personnel.
- The most senior SSC employee, present at each assembly point, will take charge of making a head count for that location.
- They will report the results to the Emergency control room.
- The total head count will include the persons handling emergency situations (this includes Site main controller, Shift in charge, Safety Coordinator, Environment Coordinator, and Emergency Response Team (Fire Brigade team, Hazmat team, First Aid Team) The total headcount should match the gate entry record of the personnel.

- All visitors and contractors shall follow directions given by the SSC representative during the time of emergency. The SSC Representatives shall direct visitors and contractors to the nearest safe assembly point.
- Contractors and visitors should not leave the plant site until a Head Count has been completed.
- When the Fire alarm / Toxic gas alarm is activated all the work permits shall come to a stand still.
- The employees shall observe the windsocks, move crosswind to the nearest safe assembly point.
- Finally, when the emergency is brought under control, **"All Clear"** alarm will be signaled out by the Site main controller. **The "all clear" alarm will be a continuous alarm for 60seconds.**

Process shutdown:

When the alarm is activated, depending on the type of emergency, the shift in charge will order for shutting down the process.
Emergency shutdown procedures are product specific as these depend on the type of raw materials used and the process.
All operating personnel shall follow the standard emergency shutdown procedure as per the BMR and report to the nearest Assembly points.

Total Plant Evacuation:

The Site main controller will consult with the members of Emergency response team to decide total evacuation of plant if the situation warranted.

The Plant Evacuation Exit points are located at

- Evacuation Exit point 1 - Front Gate near Main Security Office.
- Evacuation Exit point 2- Gate in Phytochemical Plant

6. Procedures in the event of a Fire: -

1. The person, who first notices the fire, if he is confident on the nature of fire, shall try to extinguish with the appropriate portable extinguisher, which is near to the fire scene.
2. If the situation is beyond his control he will activate the emergency fire alarm & simultaneously information is passed on to the ECR.
3. When the fire alarm signal is heard, the Fire Brigade members will rush to the fire scene & respond to the emergency.
4. The Emergency Response Team will provide necessary help to the Fire Brigade both internal & external as per the requirement.
5. If the fire fighting operation is prolonged for a longer period, Site main controller will arrange additional resource for water.

6.1 Procedure in the event of Hydrogen related Fire:

Hydrogen will burn with a pale blue, almost invisible flame.
Hydrogen fires will have the flame characteristic of a torch or jet and will originate at the point where the hydrogen is discharging.

Procedure:

1. Shut off the flow of Hydrogen supply by closing the valve in the main header located in the Hydrogen shed.
2. If the fire is of small nature use CO_2 / DCP fire extinguishers to extinguish the fire.
3. Cool the surrounding equipment / environment in the event of a hydrogen fire.
4. If the fire is of serious nature follow the normal procedure as described above.

6.2. Procedure for fire fighting in tank farm area:

1. **The first person to come across the fire shall activate the emergency fire alarm & simultaneously inform ECR.**
2. **Immediately the Fire Brigade team will rush to the spot & will respond to the emergency.**
3. **The tanks which are not under fire will be cooled by water spray / sprinklers.**
4. **The barrels stored in the storage shed will be cooled by water spray to avoid any mishap.**
5. **If required the Site main controller will order for emergency shut down of all the processes in the plant.**
6. **Based on the nature and extent of fire, Site main controller will requisition assistance from Tamil Nadu Fire & Rescue services.**

7. **Chemical Spill & Toxic Gas release: -**

7.1 Procedures for Major Spills & Toxic Gas release:
The spill or toxic release may happen due to abnormal working conditions, dangerous occurrences, human error, and dangerous chemical reaction involving toxic chemicals & hazardous chemicals

The primary concern in the event of a major spill / toxic gas release are:

- Protecting the environment.
- Protecting the employees and people in neighboring communities.
- Stop, contain the leak or spill and clean up.
- Determine the extent and material involved in the leak or spill and mitigate the damage caused to the people environment and the assets.

Procedure

1. When there is a major spill the employee who first saw the spill will inform the Emergency control room.

2. Processes will be shut down as required to stop any atmospheric releases; this will be carried out as per the emergency shut down procedure as described in the BMR.
3. Primarily, the spread of the spill will be controlled by the HAZMAT team in the facility by constructing make shift dikes of dirt and / or absorbent material (including granular absorbent, spill pads,)
4. Closing valves, blocking lines, and / or sealing openings as needed, shall control spills.
5. Air monitoring will be conducted as & when required to evaluate the environment and determine chemical concentrations.
6. Clean-up of the area will continue by use of absorbent material, or other appropriate methods, until all of the spilled material has been removed.
7. If there is a possibility of spill escaping into adjacent waterways, control will be accomplished by making barricade or by other methods, which will contain or divert the material for collection.
8. All the above procedures will be carried out only with necessary PPE.
9. If necessary, the Site main controller will obtain external resources to fully contain the spill or toxic gas release.
10. The Site main controller will call the emergency off & initiate action to mitigate the damage caused.

7.2 Procedure for toxic gas release:

1. When there is toxic gas release in the process area / scrubber.
2. The workstation in-charge will activate the Toxic gas alarm & simultaneously informs ECR about the toxic gas release.
3. The workstation in-charge involved in that operation will wear appropriate PPE such as nose mask, air breathing apparatus or self-contained breathing apparatus (SCBA) & control the situation
4. The HAZMAT team members when they hear the toxic gas alarm will rush to the affected area with SCBA to control the release.
5. Simultaneously, HAZMAT team will also search out for any persons who are trapped inside the affected area.
6. If anyone is found in an unconscious stage, the affected person will be shifted out immediately to the near by hospital for treatment.
7. When the release is controlled, the HAZMAT team will carry out atmospheric monitoring. If everything is normal, the message will be passed on to the ECR.
8. All the above procedures will be carried out only after wearing necessary PPE.
9. HAZMAT team will be in regular contact with the ECR & appraise of the situation to the Site main controller.
10. The Site main controller will call the emergency off & initiate action to mitigate the damage caused.

7.3 Possible Toxic gas releases in the plant:

1. Hydrogen cyanide gas emission from the scrubber.
2. Ammonia.
3. HCL vapours. (This is not toxic but corrosive in nature.)

The procedure for handling the above abnormal releases is as follows: -

7.3.1 Procedure for handling Hydrogen Cyanide Emission from the scrubber:

The HCN online detector is installed in the Scrubber & Reactor area, if Hydrogen Cyanide emission is **above 5 ppm** then there will be an audible alarm in the Shift in charge station.

1. The workstation in-charge will wear the air breathing apparatus / SCBA.
2. Steam, reactant dosing in the reaction involving cyanation will be stopped automatically through PLC interlock.
3. If acidic reaction media is suspected as the cause for the emission, addition of sodium hydroxide solution from the emergency dosing tank, which is kept ready for mitigating emergency situation.
4. If the scrubber fails the agitator will be stopped, in addition to closing the steam valve and dosing valve.
5. If higher temperature is suspected cooling water will be circulated in the jacket
6. HCN level in the atmospheric air will be checked using Drager tube by standing around 50 mts. away from the scrubber. If the HCN content is more than **5 ppm** and if it is not reducing further, the Site main controller will take action for evacuating the people.
7. All the above procedures will be carried out **only after wearing necessary PPE.**

7.3.2 Procedure for handling Ammonia gas emission from the Scrubber / Reactor:

1. The workstation in-charge will immediately wear Air-breathing apparatus / Respirator for Ammonia handling.
2. Identify the cause for gas emission.
3. If the gas emission is from the reactor or from the pipeline, agitation will be stopped to control the progress of reaction.
4. Circulation of coolant (Chilled brine / chilled water) in the reactor jacket will be continued.
5. If the gas emission is from the scrubber due to scrubber failure, change over of scrubber and scrubbing solution line will be done.
6. Alternatively, the raw water will be allowed to flow in the scrubber.
7. Level of ammonia in the atmosphere will be checked by using Drager tube in the wind direction within the radius of about 50 m away from the scrubber. If the ammonia concentration is more than 5 **ppm** and if it is not reducing further, the Site main controller will take further action for evacuating the people in the area.
8. The above procedures will be carried out only after wearing necessary PPE.

7.3.3 Procedure for handling Hydrogen chloride (HCl) gas emission from the Scrubber / Reactor:

1. The workstation in-charge will wear SCBA / air breathing apparatus / respirator for the Acid vapours.
2. Identify the cause for emission.
3. If the gas emission is from the reactor or from the pipeline, agitation will be stopped to control the progress of reaction.

4. Circulation of coolant (Chilled brine / chilled water) in the reactor jacket will be continued.
5. If the gas emission is from the scrubber due to scrubber failure, change over of scrubber and scrubbing solution line will be done.
6. Alternatively the sodium hydroxide solution will be allowed to flow in the scrubber.
7. Level HCl in the atmosphere will be checked by using Drager tube in the wind direction within the radius of about 50 m away from scrubber. If the HCl concentration is more than **5 ppm** and if it is not reducing further, the Site main controller will take further action for evacuating the people in that area.
8. The above procedures will be carried out only after wearing necessary PPE**.**

8. Response to Medical Emergencies: -

Procedure for handling Medical Emergencies:

1. The first person to come across a grievous medical emergency shall inform ECR.
2. The ECR will immediately inform the Medical Team.
3. The medical team will rush to the emergency scene & administer first-aid.
4. All the responders attending on the medical emergency shall protect themselves from contact with the body fluids of the injured persons.
5. If the medical emergency is of serious nature & if External medical responders have to attend on it, then the medical team member attending on the emergency will contact the ECR for arranging the external responders.

9. End of Emergency: -

After the emergency comes under control, Incident controller along with safety coordinator will go around all the areas and confirm total control of the situation. Communication coordinator will check for head count and tally of employees and organize further efforts through Incident Controller for search of missing persons. After ensuring tally of Head count and confirming control of emergency Incident controller will communicate end of emergency to site coordinator who in turn will inform security to go on long-siren to declare “End of Emergency”. Plant start-up will be done stage by stage after taking separate clearance for each plant from Incident controller.

7.10.11 NATURAL CALAMITIES AND BOMB THREATS

1 Natural Hazards like floods, Earthquakes etc.

In view of the high elevation of the plant compared to the surroundings flooding cannot take place and has a tendency for quick draining towards the water stream. There had been no incidence of flooding or severe earthquake in the last five decades history of the plant. However the following precautions are considered as a matter of abundant preparation.

If no advance warning is received, employees are to seek shelter in the administration / amenities building basement, ground level interior rooms and rest room. If this is not possible, employees should seek safety under a table or heavy piece of equipment that offers protection from falling debris.

If a high wind warning is issued in TV or Radio, personnel should be assigned to monitor weather conditions and report on threatening conditions.

When a warning issued by TV (meaning that a high wind has actually been sighted in the area) the following steps to be taken immediately:

a. Personnel in the plant will be notified through PA/Paging system
b. Emergency brigade will be placed on alert
c. Plant personnel are to seek shelter in the (administration / amenities building basement, ground level interior rooms and rest room)
d. All non essential utilities should be shut off

After the passing of a high wind, personnel should inspect their areas for damage. If the plant was struck, emergency brigade personnel will bring rescue, first-aid and damage control activities. Damage assessment, cleanup and restoration and other activities should follow.

Lightning:

The purpose of this section is to outline activities to be taken and following lightning to protect employees and to continue vital operations.

Employee Safety:

During these emergencies, all personnel will evacuate from buildings and proceed to safer areas. The shift in charge should contact operators by page phone for a report on employee safety and a condition of plant facilities and equipment. The emergency brigade should begin rescue, first aid and damage control activities.

Emergency Shutdown:

As soon as possible, emergency shutdown procedures should be implemented, including,

a. Closing of batches
b. Shutdown of Power
c. Close main inflow gate and assess damage.

In case of vent fire during lightning isolate vent or supply inert gas and after fire is extinguished isolate vent.
It is preferable to have flash back arresters on process vents where fire probability exists.
Tall structures, vents and chimneys are protected against lightning as per code.

2 Bomb Threats

Regarding emergency arising out of bombs or bomb threats the person receiving the call should inform Emergency Site main controller (Plant in charge) or his alternate.

- Person noticing an object that could be a bomb, should bring it to the notice of the nearest available officer.
- The officer should observe the same from a distance and raise an alarm to declare an emergency.
- Officer should cordon off the area, nobody should be authorized to go near the object.
- Police control room and fire station should be informed by Plant Manager.
- On arrival of the police and fire personnel, they should be allowed entry in the cordoned off area.
- After the bomb is diffused or found to be a hoax, clear siren should be given by watchman at gate number one.

The key persons associated with bomb threats will consist of

1. Emergency Site Main Controller or Alternate
2. Inspector or Station-in-charge of nearest Police Stations
3. District Fire Officer, Krishnagiri
4. District Superintendent of Police, Krishnagiri
5. District Collector, Krishnagiri
6. District Medical Officer, Krishnagiri

Responsibility of Site Main Controller:

- Collect detailed information from the person receiving the first call on bomb threat.
- Soon after receipt of bomb threat inform all members of Bomb Threat Evaluation Committee, mainly Police Control Room, Fire station and District collector.
- The first responder should be informed to be available for further clarification.
- Close down all operations except utilities like cooling water circulation to ensure safety of the plant.

Responsibility of Plant Security Officer – Security:

- Cordoning off the affected area
- Stop movement of vehicles
- Assist bomb search teams
- Collect intelligence and surveillance.

Search team will be through external experts from Police department. They will carry the following in working condition:

a. Metal Detector
b. Search mirror
c. Emergency Lights
d. Flash Lights
e. Tools
f. Marking facility

Snifter dogs may be employed at the discretion of Police authorities, but taking into consideration toxic hazard.
It bombs threat is confirmed or suspected evacuation should be carried out leaving minimum number of persons for assistance and located in safe area.

3 .Evacuation Procedure:

1. Employees should be calm and walkout to designated place in orderly manner.
2. Follow instructions from guides regarding the route to be followed.
3. Remain in the Assembly or safe area till further instructions.

Follow the rule of 'Taking away the employees and not taking away the bomb'.

All clear signal:
All clean siren is to be communicated once the bomb is diffused or the threat is proved as hoax, subject to clearance from Plant authorities. After the siren the routine procedure for restart with clearance from all levels should be followed before startup of the plant.

4. Recovery Process

Introduction:-
Towards re-establishing normal operations at the earliest after an emergency the following procedure will be followed.

The section is divided into six parts:

1. Reconstruction of the accident scenario
2. Incident investigation
3. Establishing a recovery team
4. Damage Assessment
5. Clean-up and restoration
6. Post-Emergency and Recovery Reporting

After the major emergency has been cleared the scene needs reconstruction with the help of persons who were associated with the scenario.

Incident Investigation:-

To investigate the cause of the emergency and to prevent recurrence the incident requires through investigation. The investigation team should immediately seal off the incident scene and commence its investigation to minimize the loss of any physical evidence. The investigation of the scene should include photographing the area, identifying equipment from fragments and note unusual items

Written or recorded statements are to be taken from all operators involved, potential witnesses and others who might have pertinent knowledge about the incident.

Report: -

A final report will be prepared giving details about the basic reason for the accident and will work as a failure report covering equipment, maintenance, procedure, training, human error etc.

Recovery Team: -

In order to facilitate the restoration of normal operations of the company after an emergency, a team is to be constituted by Chief Executive to manage recovery activities, including damage assessment. As a general rule, however, individuals representing Maintenance, Production, Safety, Quality Control, Accounts, Engineering etc., will be involved.

The recovery team is responsible for damage assessment, clean-up and salvage operations and the restoration of normal operations. A primary function of the recovery team will be to assess the damage to structures, equipment and materials.

5. Clean-up and Restoration Operations:-

As soon as incident investigations are completed and restoration plans have been made, clean-up and restoration activities will commence.

Damaged Equipment:-

Prior to restoration of normal operations, all affected equipments are to be tested and checked according to procedures established.

6.Post-Emergency Recovery Reports:-

The Plant- in-charge will hold review sessions with emergency response personnel to evaluate.

1. The adequacy of emergency response procedures.
2. The adequacy of the investigation of the cause of the incident.
3. Summaries the post-emergency activities.

7.10.12 TRAINING, REHEARSAL AND RECORDS

1. NEED OF TRAINING & REHEARSAL

Training is important in order to –

- Teach worker's how to handle chemicals safely, how to act as a runner/messenger, how to use PPE, how to start and shut down the plant, how to carry out emergency repairs etc.
- Teach one to be a safe and alert worker.

Rehearsal is essential for -

- Explaining and making key personnel and essential workers aware of their role in case of an emergency.
- Testing the emergency procedure, emergency arrangements and ability of all involved with it to grasp the procedure and implement the same.
- Testing the effectiveness of communication system including the alternative arrangement in case of failure.

- Testing the speed of mobilization of resources, search, rescue and treatment of casualties, emergency isolation and shut down.
- Detecting the shortcomings in the emergency plan and incorporating remedial measures.
- Allowing professional emergency services to test their parts of the plan and testing co-ordination.
- Building confidence in workers which is helpful in facing real situations.

Training will be given to regular employees and contract personnel also. Effective and latest teaching aids will be used to train workers and supervisory staff. Such training courses will be conducted once in a year and co-ordination with offsite personnel shall be sought during such training. Records will be maintained for training.

7.11 OFF-SITE EMERGENCY PLAN

7.11.1 Need of the Site Emergency Plan

Depending upon the wind direction and velocity of the effects of accident in factory may spread to outside its premises. To avert major disaster, it is essential to seek guidance/assistance of statutory authorities, police and health department. The movement of traffic may have to be restricted. Required information will be given to the authority and consultation will be sought for remedial measures.

A purpose of the off-site emergency plan is:

- To provide the local/district authorities, police, fire, brigade, doctors, surrounding industries and public the basic information of risk and environmental impact assessment and appraise them of the consequences and the protection/prevention measures and to seek their help to communicate with public in case of major emergency.
- To assist district authorities for preparing the off-site emergency plan for district or particular area and to organize rehearsals from time to time and initiate corrective actions on experience.

7.11.2 Structure of the Off-Site Emergency Plan

Available with concerned authorities.

7.11.3 Role of the Factory Management

The site main controller will provide a copy of action plan to the statutory authorities in order to facilitate preparedness of district/area off-site emergency plan.

7.11.4 Role of Emergency Co-ordination Office (ECO):

He will be a senior police or fire officer co-ordination with site main controller. He will utilize emergency control centre.

7.11.5 Role of Local Authority

Preparation of Off Site Plan lies with local authorities. An emergency planning officer (EPO) works to obtain relevant information for preparing basis for the plan and ensures that all that organization involved in offsite emergency and to know their role and responsibilities.

7.11.6 Role of Fire Authorities:

The fire authorities will take over the site responsibility from incident controller after arrival. They will be familiarized with site of flammable materials, water and foam applies points, fire-fighting equipment.

7.11.7 Role of the Police and Evacuation Authorities:

Senior Police Officer designed, as emergency co-ordination officer shall take over all control of an emergency. The duties include protection of life, property and control of traffic movement. Their functions include controlling standards, evacuating public and identifying dead and dealing with casualties and informing relatives of dead or injured. There may be separate authorities/agencies to carry out evacuation and transportation work. Evacuation depends upon the nature of accident, in case of fire only neighbouring localities shall be alerted. Whole areas have to be evacuated in case of toxic release.

7.11.8 Role of Health Authorities

After assessing the extent of effect caused to a person the health authorities will treat them.

7.11.9 Role of Mutual Aid Agencies

Various types of mutual aid available from the surrounding factories and other agencies will be utilized.

7.11.10 Role of Factory Inspectorate

In the event of an accident, the Factory Inspector will assist the District Emergency Authority for information and helping in getting Neighbouring Industries/mutual aid from surrounding factories. In the aftermath, Factory Inspector may wish to ensure that the affected areas are rehabilitated safely.

7.12 OCCUPATIONAL HEALTH HAZARD AND SAFETY PROGRAM FOR THE PROJECT

Occupational Health is eventually a branch of preventive medicine which examines the relationship between work and health and effects of work on the health of the worker. Occupational health service is operated to achieve the statutory declared aim of occupational health by medical and technical measures. Its role is mainly preventive and to give first aid and emergency treatment. It is certainly useful in early detection of any occupational or non-occupational disease or any man-adjustment of the man-job relationship.

- The Occupational health center (OHC) will be declared as Emergency communication center (ECC) which is near the administrative building and out of reach all the hazardous area. Its internal telephone contacts will be provided.

- Occupational health surveillance of the workers are done on a regular basis and records maintained as per the Factories Act in Form No. 32.
- Medical checkup of each employee and workers carry out yearly basis.
- ECC is facilitated with,

(1) External telephone line,
(2) The list of contact details of key personnel and list of internal Telephone numbers
(3) List of external emergency services contact telephone numbers.
(4) Site plan of the factory and Plot plan showing surrounding areas.
(5) List of Fire Fighters and First Aider.
(6) Copy of On-site Emergency Plan.

Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.

One time investment for Occupational safety	**In lakhs**
Hydrant system, smoke detector & Sprinkler and Fire fighting devices	200
Process control, censor, interlock,guard and other instrumentation for safety	3000
Emergency shower, SCBA,ECC,gas detector	100
Total	**3300**

Annual plan for occupation Heath and safety	**In lakhs/Annum**
Employee periodical medical check-up	27
OHC operating cost	24
Ambulance	12
Personal protective equipments	34
Training and awareness	5
Total	**102**

7.12.1 OCCUPATIONAL HEALTH AND SAFETY PROGRAM:

1. Medical examinations: Pre-employment, periodic and others
2. Supervision of the working environment industrial hygiene, safety, job analysis and adaptation of the job to the worker in good working conditions.
3. Advice to management and worker.
4. Health education and training.
5. Health statistics.
6. Medical treatment-first aid, emergency and ambulatory treatment.

7. Health counseling-individual.
8. Nutrition.
9. Research in occupational health.
10. Co-operation with other services in the undertaking.
11. Collaboration with external services.

Other purposes of industrial medical services are:

I) Identifying the Hazards

II) Preventing or minimizing the Hazards

III) Curative treatment in case of exposure

IV) Determining the Compensation for damages

The working personnel shall be given the following appropriate **personnel protective equipments**.

- Industrial Safety Helmet;
- Face shield
- Welders equipment for eye and face protection;
- Ear muffs;
- Self contained breathing apparatus;
- Leather apron;
- Aluminized fiber glass fix proximity suit with hood and gloves;
- Boiler suit;
- Safety belt/line man's safety belt;
- Leather hand gloves;
- Acid/Alkali proof rubberized hand gloves;
- Canvas cum leather hand gloves with leather palm;
- Electrically tested electrical resistance hand gloves; and
- Industrial safety shoes with steel toe.

EXPECTED OCCUPATIONAL HEALTH HAZARDS & SAFETY

- Physical Hazards: Noise, Heat, Dust
- Chemical Hazards: Corrosive, Toxic Substances, Irritants, Carcinogens, Chemical emissions
- Psychological hazards resulting from stress and strain
- Hazards associated with the non-application of ergonomic principles, for example badly designed machinery, mechanical devices and tools used by workers, improper seating and workstation design, or poorly designed work practices

EXPECTED CHEMICAL HAZARDS IN WORK ENVIRONMENT

NAME OF CHEMICAL	HEALTH HAZARD DUE TO EXPOSURE TO THESE CHEMICALS
Acrylonitrile	Causes skin irritation May cause an allergic skin reaction Causes serious eye damage May cause respiratory irritation May cause cancer Suspected of damaging fertility or the unborn child Toxic if swallowed, in contact with skin or if inhaled
Acetic Acid	Causes severe skin burns and eye damage
Ammonia Gas	Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. Harmful if inhaled. Causes severe skin burns and eye damage.
Acetonitrile	Causes serious eye irritation Harmful if swallowed, in contact with skin or if inhaled
Acetone	Avoid breathing dust/fume/gas/mist/vapours/spray. Causes serious eye irritation May cause drowsiness or dizziness
Acetyl Chloride	Vapor irritates mucous membranes. Ingestion of liquid or contact with eyes or skin causes severe irritation.
Aluminum chloride	Causes severe skin burns and eye damage, May cause respiratory irritation
Ammonium carbonate	Inhalation causes irritation of nose and throat. Ingestion may cause gastric irritation. Contact with eyes or skin causes irritation
Ammonium Chloride	Inhalation of fumes irritates respiratory passages. Ingestion irritates mouth and stomach. Fumes are irritating to eyes. Contact with skin may cause irritation.
Caustic Soda	Causes severe burns of eyes, skin, and mucous membranes
Cyano acetic acid	Contact irritates eyes and may irritate skin.
Chloroform	It is classified as moderately toxic. Probable oral lethal dose for humans is 0.5 to 5 g/kg (between 1 ounce and 1 pint) for a 150 lb. person. The mean lethal dose is probably near 1 fluid ounce (44 g). It is a human suspected carcinogen. Also, it is a central nervous system depressant and a gastrointestinal irritant. It has caused rapid death attributable to cardiac arrest and delayed death from liver and kidney damage.
Cyclohexanone	Inhalation of vapors from hot material can cause narcosis. The liquid may cause dermatitis.

Formic Acid	Liquid causes skin and eye burns. Vapors are irritating and painful to breath. Vapor exposure may cause nausea and vomiting.
Hexane	INHALATION causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. ASPIRATION causes severe lung irritation, coughing, pulmonary edema; excitement followed by depression. INGESTION causes nausea, vomiting, swelling of abdomen, headache, depression.
Hydro chloric acid	Causes severe skin burns and eye damage May cause respiratory irritation
Isopropyl Alcohol	Vapors cause mild irritation of eyes and upper respiratory tract; high concentrations may be anesthetic. Liquid irritates eyes and may cause injury; harmless to skin; if ingested causes drunkenness and vomiting.
Hydrogen gas	Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases.
Methanol	Exposure to excessive vapor causes eye irritation, head- ache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50,000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage.
Potassium Hydroxide Flakes	Causes severe burns of eyes, skin, and mucous membranes.
Phenol	Toxic if swallowed, Harmful if swallowed, Toxic in contact with skin Harmful in contact with skin Causes severe skin burns and eye damage Causes serious eye damage Causes serious eye irritation Toxic if inhaled Harmful if inhaled May cause genetic defects Suspected of causing genetic defects May damage fertility or the unborn child Causes damage to organs Causes damage to organs through prolonged or repeated exposure May cause damage to organs through prolonged or repeated exposure
Sodium Cyanide	Super toxic; probable oral lethal dose in humans is less than 5 mg/kg or a taste (less than 7 drops) for a 70 kg (150 lb.) person. Sodium cyanide is poisonous and may be fatal if inhaled, swallowed or

	absorbed through the skin. Contact with sodium cyanide may cause burns to skin and eyes. Individuals with chronic diseases of the kidneys, respiratory tract, skin, or thyroid are at greater risk of developing toxic cyanide effects.
Sulphuric acid	Causes severe skin burns and eye damage May cause respiratory irritation
Ethylene oxide	It can cause death. Lowest inhalation concentration causing toxic effects is 12500 ppm/10 seconds. It is a strong skin irritant. Neurological disorders and even death have been reported.
Thionyl Chloride	CORROSIVE and/or TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death. Fire will produce irritating, corrosive and/or toxic gases. Reaction with water may generate much heat that will increase the concentration of fumes in the air. Contact with molten substance may cause severe burns to skin and eyes. Runoff from fire control or dilution water may cause environmental contamination.
Toluene	Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
Chlorine Gas	Poisonous; may be fatal if inhaled. Contact may cause burns to skin and eyes. Bronchitis or chronic lung conditions.
Bromine	Inhalation exposure to 11-23 mg/m3 produces severe choking. 30-60 mg/m3 is extremely dangerous. 200 mg/m3 is fatal in a short time. Vapors can cause acute as well as chronic poisoning. It has cumulative properties. It is irritating to the eyes and respiratory tract. Poisoning is due to the corrosive action on the gastrointestinal tract. Nervous, circulatory and renal disturbances occur after ingestion. Ingestion of liquid can cause death due to circulatory collapse and asphyxiation from swelling of the respiratory tract. The lowest oral lethal dose reported for humans is 14 mg/kg. The lowest lethal inhalation concentration reported for humans is 1000 ppm.
Nitric acid	TOXIC; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death. Reaction with water or moist air may release toxic, corrosive or flammable gases. Reaction with water may generate much heat that will increase the concentration of fumes in the air. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause

	environmental contamination

List of Occupational Hazards, Control Measures and Review

S.No	Location	Occupational Hazard	Control Measures	Test Done	Remark
1	Boiler	Heat	Proper Breaks, Insulation of steam line& Apron, Rotation of shift, Separate monitoring room & Water facility	Audiometric Test	--
2	Compressor	Noise &Vibration	Proper Breaks, Ear plug/Ear Muff, Rotation of shift & medical testing, Silencer, Vibration pad, Vibration monitoring & proper PM	Audiometric Test	--
3	Charging of powder material-AEP & Organic	Dust	Dust collection system, Online Breathing apparatus or Dust cartridge, Industrial Dust monitoring at work place, PPE	Pulmonary Function Test(PFT)	--
4	Charging of Acidic/Organic material-AEP & Organic	Irritation, Fumes	Scrubbing system, Room scrubber , Mask with cartridge, monitoring at work place	Pulmonary Function Test(PFT)	--
5	MEE	Noise & Biological	Proper PPE & Rotation of shift, Ear plug/Ear Muff, Rotation of shift & medical testing,	Blood test, Audiometric Test	--

7.12.2 PERIODIC MEDICAL EXAMINATION

It is proposed that client ensure that…

(1) Workers employed are medically examined by a qualified medical practitioner/Factory Medical Officer, in the following manner:

(a) Once in a period of 6 months, to ascertain physical fitness of the person to do the Particular job;

(b) Once in a period of 6 months, to ascertain the health status of all the workers in respect of occupational health hazards to which they are exposed and in cases where in the opinion of the Factory Medical Officer it is necessary to do so at a shorter interval in respect of any workers;

(c) In periodic and pre-medical examinations, various parameters are checked. Viz., LIVER FUNCRION TESTS, Chest X-rays, Audiometry, Spirometry, Vision testing (Far& Near vision, color vision and any other ocular defect) ECG and other parameters as found are necessary as per the opinion of Factory Medical officer.

(2) No person employed for the first time without a certificate of granted by the Factory Medical Officer.

7.12.3 EMP FOR THE OCCUPATIONAL SAFETY & HEALTH HAZARDS SO THAT SUCH EXPOSURE CAN BE KEPT WITHIN PERMISSIBLE EXPOSURE LEVEL (PEL)/THRESHOLD LEVEL VALUE (TLV) SO AS TO PROTECT HEALTH OF WORKERS.

Mitigation Measures for OSH: It is proposed to formulate and implement a structure for Occupational Safety and Health with following aims…

- To keep air-borne concentration of toxic and hazardous chemicals below PEL and TLV.
- Protect general health of workers likely to be exposed to such chemicals
- Providing training, guidelines, resources and facilities to concerned department for occupational health hazards.
- It is proposed that this EMP be formulated on the guidelines issued by Bureau of Indian Standards on OH&S Management Systems: IS 18001:2000 Occupational Health and Safety Management Systems
- Proposed EMP will be incorporated in Standard Operating Procedure also.

The proposed EMP also include measure to keep air-born concentration of toxic and hazardous chemicals below its PEL and TLV, like…

- Leak Surveys
- Separate storage for toxic chemicals
- Exhaust Ventilation
- Proper illumination
- Close processes to avoid spills and exposures
- Automation of process operations to hazards of manual handling of chemicals

- Supply of proper PPEs like Air mask, Berating canisters, SCBA sets, On-line breathing apparatus at the places where there is possibility of presence of toxic chemicals
- Decontamination procedure for empty drums and carboys.
- Regular maintenance program for pumps, equipment, instruments handling toxic and corrosive chemicals
- Training to persons handling toxic and corrosive chemicals

7.12.4 ARRANGEMENTS FOR ENSURING HEALTH & SAFETY OF WORKERS ENGAGED IN HANDLING OF TOXIC MATERIALS

- The top management is committed towards safety & employees' well-being is the numerous no and safety always takes precedence over production.
- Each and every process assessed with safety tools like HAZOP, JSA, PSSR, JRA etc.
- Emergency Response Team formed and mock drills are conducted regularly.
- Appropriate engineering controls are provided to prevent any mishap.
- Scheduled preventive maintenance are carried out in the plant including that of safety equipment.
- Standard Operating Procedures are provided to workers to ensure that all the work is done in a safe manner.
- Signage's are provided wherever required, instructing them to use PPEs and other safety equipment.
- MSDS are displayed at strategic locations. PPE matrix, Brief SOPs and chemical compatibility charts shall be displayed at prominent locations.
- Contract workmen are imparted induction training, Safety training on process and Health & safety awareness on a regular basis.
- Well established permit to work system are in place.
- All incidents including near misses are Investigated and learning's shared with all relevant personals.
- All employees undergo pre-employment& periodical medical check-up ensuring their well-being.
- Workplace monitoring are carried out to ensure there are no adverse health effect on workers.

7.12.5 WORKPLACE MONITORING PLAN

- It is proposed that a Workplace Monitoring Plan to be prepared & implemented in consultation with FMO and industrial hygienists.
- Each workplace must be evaluated to identify potential hazards from toxic substances or harmful physical agents. Air-borne concentration of toxic chemicals will be measured and record will be kept.
- The current state-of-the-art exposure measurement model is as follows: For purposes of measuring worker exposure across a single shift it is sufficient to place a reasonably

accurate exposure measuring device on the worker, within the worker's breathing zone, and have it operate for nearly the full shift. Client will propose to study the exposure data when the plant is operative.

- Permanent changes to workplace procedures or work location to be done if it is found necessary on the basis of findings from workplace Monitoring Plan.

7.12.6 HEALTH EVALUATION OF WORKERS

M/s. Chemplast Samar Limited committed towards the Health and Safety of workers and provided a facility of pre-medical and regular medical check-up of employees for detecting any kind of adverse effect on the health of employee due to the chemical or work place condition and will provide opportunity to improve the working condition. The workers exposed to fugitive emission provided with some protective devices like dust mask to prevent respiratory disorders. The workers exposed to higher noise level is provided with ear muffs/ ear plugs. The protective devices are provided to the employees who are exposed to any kind of hazard. Proper handling of the materials and the maintenance of Material Safety Data Sheet (MSDS) are following to ensure safety within the plant area. A regular monitoring of the Occupational Health and Safety will reduce the chances of accidents hence all the records of job-related accidents and illness shall be maintained as per the requirements of factory act.

Workers are checked for physical fitness with special reference to the possible health hazards likely to be presented where he/she is being expected to work before being employed for that purpose.

Tests carried out:

1)Physical test

2)General Examination like Temp., Pulse, Pressure, Haemoglobin/Total W.B.C/ Platelet/others

3)Microscopic Examination

4) Systematic Examination

5) Vision Testing

6) Blood Glucose analysis

7) Haemogram Profile

Occupational health surveillance of the employees is done on a regular basis and records maintained as per rule 62N of the Tamil nadu Factories rules,1950.

Medical checkup of each employee and workers carry out yearly basis.

Annual Health Report of Employee:

CHEMPLAST SANMAR LIMITED
CUSTOM MANUFACTURED CHEMICALS DIVN- BERIGAI.

(Periodical Medical Examination as per Rule 62N of Tamil Nadu Factories Rules, 1950

Name	: M. Karthik	Designation	: I. Engg (Trainee)
Father's Name	: P.V. Murugaj	Date of Joining	: 16. May. 2019
Date of Birth	: 08.01.2001	Nature of Job	:
Marital Status / Children	: UN married	Identification Marks	: mole a Right hand
Department	: Material maintenance	Employee/Contractor	:

Details of Examination	19/01/2022 - 18/6/ Date of Examination		
Present History	No Complaints	No complaints	
Relevant Past History	ND Relevant HO	Nil	
Family History	ND Significant HO.	Nil	
Height in cm	168	169	
Weight in Kg	66.	65	
Pulse rate / Min	76/mm	97. 96%. Spo2	
Blood Pressure	110/70	120/70	
Chest in cm - Expiration /Inspiration	93/98.	93/98	
Respiratory System Chest	BAEE NVBEP	BREE. NVBEP	
Blood			
Hemoglobin			
Total Count			
Differential Count			
Platlet Count			
ESR			
Random Blood Sugar			
Serum Bilirubin (Direct, Indirect & Total)			
SGOT, SGPT			
Gamma Glutamyl Transferase			
Alkaline Phosphatase (Alk/P)			
Total Cholestrol			
Triglycerides			
Creatinine			
Blood Urea Nitrogen			
Uric Acid			
Eyes -CV/AV/NV			
Urine : Routine			
Skin	Normal	Normal	
Musculoskeletal system	NAD.	NAD	
BMI	23.4.	23.9	
Other issues			
Relevant Investigations, if required			
Sign of the Medical Officer	19/01/22		

Dr. B. SATHIYA SEELAN, MBBS.
Reg. No. 141119
Registered Medical Practitioner

Dr. S. MURALI MBBS.
Reg No 157145
Registered Medical Practitioner

SANMAR SPECIALITY CHEMICALS
DIVISION OF CHEMPLAST SANMAR LIMITED - BERIGAI.

(Periodical Medical Examination as per Rule 62N of Tamil Nadu Factories Rules, 1950

Name	: M. Karthik.	Designation	: J. Engg (Trainee).
Father's Name	: P.V. Muniraj	Date of Joining	: 16-May-2019.
Date of Birth	: 08/01/2001.	Nature of Job	:
Marital Status / Children	: Unmarried.	Identification Marks	: Mole at Right hand.
Department	: Mechanical Maintenance.	Employee/ Contractor	: Employee.

Details of Examination	Date of Examination			
	10/01/2020	17/06/2020	07/01/2021	22.06.2021
Present History	c/o Cold x 3days.	No Complaints	No Complaints	No complaints
Relevant Past History	NIL	Not relevant	Not Relevant	Not relevant
Family History	Mother x EYE HTN	Mother x EYE HTN	Mother EYE HTN	Mother HTN x EYE
Height in cm	163 cms	164 cms	164 cms	166 cm.
Weight in Kg	62 kg	61 kg.	63 kgs	66 kg.
Pulse rate / Min	89/mins	82 BPM	97/97/min	91/min 97%
Blood Pressure	110/70 MM Hg	110/70 mmHg	110/70 MM Hg	110/70 mmHg
Chest in cm - Expiration /Inspiration	87/94 cms	86/90 cms	85/89/cms	86/90 cm
Respiratory System Chest	B/L AEE, NVBS ✓	B/L AEE, NVBS ✓	B/L AEE, NVBS ✓	B/L AE ✓ NVBS ✓
Blood				
Hemoglobin				
Total Count				
Differential Count				
Platlet Count				
ESR				
Random Blood Sugar				
Serum Bilirubin (Direct, Indirect & Total)				
SGOT, SGPT				
Gamma Glutamyl Transferase				
Alkaine Phosphatase (ALKP)				
Total Cholestrol				
Triglycerides				
Creatinine				
Blood Urea Nitrogen				
Uric Acid				
Eyes -CV/AV/NV				
Urine : Routine				Microscopic Normal NIL complaint
Skin	(N)	Normal	Normal	Normal
Relevant Investigations, if required	BMI - (N)	BMI - (N)	BMI - (N)	BMI - (N)
Sign of the Medical Officer	Dr. K.S. DEEPAN MBBS., TNMC Reg. No. 127616 Registered Medical Practitioner	Dr. K.S. DEEPAN MBBS., TNMC Reg. No. 127616 Registered Medical Practitioner	Dr. K.S. DEEPAN MBBS., TNMC Reg. No. 127616 Registered Medical Practitioner	Dr. C. ARTHIVEL MBBS., Reg.No. 120591 REGISTERED MEDICAL PRACTITIONER (TN)

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45

MEDICAL RECORD

NABH

Name: Mr. Karthick Muniraj

Age / Sex: 21 yrs / Male

E.NO: MK47

Date of Medical Examination: 20.01.2022

Company: Chemplast Sanmar Ltd, Custom Manufactured Chemical Divn, Berigai.

MEDICAL EXAMINATION

1 . Physical Examination:

a. BP - 120/80 mm of Hg

b. Pulse - 82 b/mt

c. Spo2 - 97

d. Vision - Right: 6/6 Left: 6/6 Colour: Normal

2. Respiratory System: - NVBS +

3. Cardiovascular system: - S1, S2 Heard, No murmurs

4. Abdominal Examinations: - Soft

5. ENT - Nil

6. Specific Ailment - Nil

7. IMPRESSION: - Certified that the above **Medical Examinee is Medically Fit**

Signature of the medical examiner

Dr. [illegible] ALIA
Reg. No. [illegible]23
Medical Officer

*This is a medical form which cannot be used for other purpose.

A Unit of Vijay Sai Healthcare Hosur Pvt. Ltd.,
#76 R, Old Bangalore Road, HOSUR - 635 109
T +91 4344 320 888 / 310 000

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www.vijayhospital.in E-mail : vijayhospital.lab@gmail.com

LABORATORY REPORT

Name	: Mr KARTHICK MUNIRAJ	**Bill No**	: BILL-OP-105655
UHID	: VJH-147345	**Collected On**	: 20-01-2022 10:11 PM
Age/Sex	: (21 Y / Male)	**Reported On**	: 24-01-2022 10:11 PM
Lab No	: LAB-OP-20357		
Consultant	: Dr.Rajeshkumar(HBTL) .		
Specimen	: BLOOD / SERUM / URINE		

Test Name	Result	H/L	Units	Reference Range
	HAEMATOLOGY			
COMPLETE BLOOD COUNT				
RBC	4.80		x10^6/uL	4.6 - 6.0
HB	13.1		g/dL	13.0 - 17.0
PCV	40.5		%	40 - 54
MCV	83.0		fL	80 - 100
MCH	26.8		pg	26 - 32
MCHC	32.5		%	32 - 36
PLATELETS	261		x10^3/uL	150 - 450
TOTAL LEUCOCYTE COUNT	6.00		x10^3/uL	4.5 - 11.5
NEUTROPHILS	43.0 *	(L)	%	50 - 70
LYMPHOCYTES	49.0 *	(H)	%	18 - 42
MONOCYTES	5.2		%	2.0 - 11.0
EOSINOPHIL	2.0		%	1.0 - 8.0
BASOPHIL	0.8		%	0.0 -2.0
ERYTHROCYTE SEDIMENTATION RATE (ESR)				
ESR	13		mm/hr	5 - 25
	BIO CHEMISTRY			
RANDOM BLOOD SUGAR (RBS)				
RBS	84.0		mg/dL	80 - 140 mg/dL
BLOOD UREA NITROGEN (BUN)				
BUN	10.0		mg/dL	Adults (18-60 years) 6-20 mg/dL

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www.vijayhospital.in E-mail : vijayhospital.lab@gmail.com

LABORATORY REPORT

Name	: Mr KARTHICK MUNIRAJ		
UHID	: VJH-147345		
Age/Sex	: (21 Y / Male)	**Bill No**	: BILL-OP-105655
Lab No	: LAB-OP-20357	**Collected On**	: 20-01-2022 10:11 PM
Consultant	: Dr.Rajeshkumar(HBTL) .	**Reported On**	: 24-01-2022 10:11 PM
Specimen	: BLOOD / SERUM / URINE		

Test Name	Result	H/L	Units	Reference Range
CREATININE-SERUM				
CREATININE	0.84		mg/dL	Males (0.70 - 1.20 mg/dL)
URIC ACID - SERUM				
URIC ACID	4.7		mg/dl	3.4 - 7.0 mg/dL
SGOT				
SGOT/AST	18.0		IU/L	< 40 U/L
SGPT				
SGPT/ALT	19.0		IU/L	< 41 U/L
TOTAL CHOLESTEROL				
TOTAL CHOLESTEROL	165.0		mg/dL	< 200 mg/dL
GAMMA GLUTAMYL TRANSPEPTIDASE (GGT)				
GAMMA GT	13.0		U/L	8.0 - 61.0 U/L
BILIRUBIN SERUM - TOTAL/DIRECT/INDIRECT				
BILIRUBIN TOTAL	0.36		mg/dL	0.3 - 1.2 mg/dL
Method: (COLORIMETRIC DIAZO METHOD ? COBAS C311)				
BILIRUBIN DIRECT	0.16		mg/dL	0.0 - 0.3 mg/dL
Method: (DIAZO METHOD ? COBAS C311)				
BILIRUBIN INDIRECT	0.20		mg/dL	0.2 - 0.7
TRIGLYCERIDES - SERUM				
TRIGLYCERIDES	81.0		mg/dL	< 150 mg/dL
ALKALINE PHOSPHATASE				
Alkaline Phosphatase	66.0		IU/L	40 - 129 IU/L

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LABORATORY REPORT

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UHID	: VJH-147345	**Bill No**	: BILL-OP-105655
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Consultant	: Dr.Rajeshkumar(HBTL) .		
Specimen	: BLOOD / SERUM / URINE		

Test Name	Result	H/L	Units	Reference Range
	CLINICAL PATHOLOGY			
COMPLETE URINE EXAMINATION				
VOLUME	**25 ML**			
COLOUR	**PALE YELLOW**			
APPEARANCE	**SLIGHTLY TURBID**			
PH	6.0			4.6 - 8.0
SPECIFIC GRAVITY	1.010			1.003 - 1.030
GLUCOSE	**NIL**			
PROTEIN	**NIL**			
BLOOD	**NIL**			
KETONE BODIES	**NIL**			
BILE SALT	**NEGATIVE**			
BILE PIGMENT	**NEGATIVE**			
UROBILINOGEN	**NEGATIVE**			
NITRATE	**NEGATIVE**			
PUS CELLS	2 - 4			1 - 2 Cells/hpf
EPITHELIAL CELLS	1- 2			0 - 2/hpf
RBC's	0- 2			0 - 2 RBC's/hpf
CAST	**NIL**			
CRYSTALS	**NIL**			
BACTERIA	**NIL**			
OTHERS	**NIL**			

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LABORATORY REPORT

Shabdha
Speech and Hearing Care Clinic

55

© 9003627115, 9789279747

Pure Tone Audiometry

Name: Mr. Karthick Muniraj
Age/Gender: 21 yrs / M
C/o: Hearing Screening

Date: 20/01/2022
Informant: Self

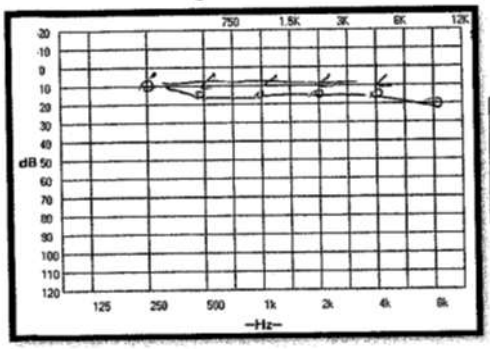
Tuning fork tests:

Rinne:
Right Ear:
Left Ear: } nre

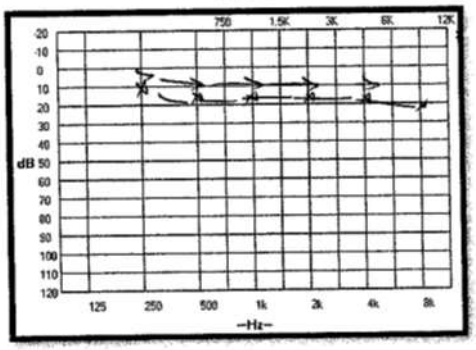
Weber: R ↑ L

Audiogram

Right Ear



Left Ear



Note:

Pure Tone Average	
Right Ear	15 dBHL
Left ear	15 dBHL

Audiometric Weber		
500 Hz	R ↑	L
1000 Hz		
2000 Hz		

Diagnosis:
Right Ear:
Left Ear: } Hearing – Normal limits

Recommendations:

•

—

Krishnaa.M., B.A.S.L.P
Audiologist & Speech-Language Pathologist
Psychotherapist, Early Interventionist & CI Rehabilitationist
RCI CRR No: A53166

Services Offered

Hearing Evaluation for children / adults · Middle Ear Evaluation · New born Hearing Screening
Speech & Language Therapy · Special Education · Psychological Intervention · BERA · Hearing Aids

Consultation Available @ Bagalur Road - Hosur, Krishnagiri, & Chandapura

There was not found any abnormality of any employees and workers. All employees and workers are found fit.
Occupational health surveillance program is undertaken as regular exercise for all employees specifically for those engaged in handling substances.
Medical records of each employee are maintained separately.

7.13 SAFETY PLAN

Safety of both men and materials during construction and operation phases is of concern. Safety plan shall be prepared and implemented in the project activity. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in the plant is possible due to collapse of structures and fire/explosion etc.

- The project would formulate safety policy keeping in view the safety requirement during construction, operation, maintenance phases, with the following regulations:
- To allocate sufficient resources to maintain safe and healthy conditions of work;
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
- To ensure that adequate safety instructions are given to all employees;
- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use;
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge;
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
- To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
- To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action;
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
- To publish/notify regulations, instructions and notices in the common language of employees;

- To prepare separate safety rules for each type of occupation/processes involved in a plant; and
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipment's, work places and operations.

7.14 HEALTH AND SAFETY MONITORING PLAN

The health of all employees shall be periodically monitored for early detection of any ailment due to exposure to heat and noise.

7.15 TRAINING, REHERASAL & RECORDS

7.15.1 NEED OF TRAINNING & REHEARASAL

Training is important in order to –

- Teach worker's how to handle chemicals safely, how to act as a runner/messenger, how to use PPE, how to start and shut down the plant, how to carry out emergency repairs etc.
- Teach one to be a safe and alert worker.

Rehearsal is essential for -

- Explaining and making key personnel and essential workers aware of their role in case of an emergency.
- Testing the emergency procedure, emergency arrangements and ability of all involved with it to grasp the procedure and implement the same.
- Testing the effectiveness of communication system including the alternative arrangement in case of failure.
- Testing the speed of mobilization of resources, search, rescue and treatment of casualties, emergency isolation and shut down.
- Detecting the shortcomings in the emergency plan and incorporating remedial measures.
- Allowing professional emergency services to test their parts of the plan and testing co-ordination.
- Building confidence in workers which is helpful in facing real situations.

Training shall be given to regular employees and contract personnel also. Effective and latest teaching aids will be used to train workers and supervisory staff. Such training courses shall be conducted once in a year and co-ordination with offsite personnel shall be sought during such training. Records will be maintained for training.

7.15.2 RECORDS AND UPDATING THE PLAN

All records of On-Site and Off-Site Emergency Plan and modifications by experience and suggestion, the rehearsals and conclusions of such plans and the enquiries shall be well maintained and preserved. The necessary data bank shall be also maintained for the utility of industries and others. New information and the deficiencies identified during the rehearsal is reviewed and incorporated in the document for continual updating of the plan and such information shall be communicated to the concerned authorities.

7.16 CHECKLIST IN THE FORM OF DO'S & DON'TS OF PREVENTIVE MAINTENANCE, STRENGTHENING OF HSE, MANUFACTURING UTILITY STAFF FOR SAFETY RELATED MEASURES.

Do's:

- Store used oil at proper place as per plant guidelines.
- Use lubricating oil carefully to avoid spillage on ground.
- Use lubricating oil as per requirement.
- Use minimum amount of water wherever it is required as per plant guidelines.
- Waste disposal system for all plants should be separate.
- Avoid spillage of liquid, hand gloves, cotton waste on road, which will cause pollution. Recycle or dispose that material.
- Use cleaning equipment carefully. (i.e. cotton waste, oil & chemicals)
- Place all the equipments (i.e. Fire Hose, Rubber Pipe and Chisel) at proper place.
- Handling of chemicals should be as per plant guidelines to avoid undesired chemical reaction.
- Safety training and correct use of PPE's must for all the employees.
- Environment guidelines should follow during cleaning of vessels, Tank, channels etc.
- Follow shift in charge's instructions during loading or unloading of chemicals.
- In case of fire or any accident, immediately inform responsible person.
- In case of emergency, follow the site emergency procedure.
- Area of work during excavation, lifting work and any hot work shall be cordoned with warning tags of "work in progress", "no entry" etc.

- Switch off lights and computers when not in use.
- Shut the water cock properly when not in use.
- Always follow safety rule during the plant operation.

Do's during shut down:

- All equipment, vessels, lines where hot work is envisaged shall be purged, flushed thoroughly and positively isolated. Similar precautions should be taken for vessel entry also.
- Back flow of materials from sewers, drains should be avoided by proper isolations.
- In case of confined space entry and other cleaning jobs etc. which are to be carried out by the concern department trained person, confined space permit should be followed for all vessel entry issued by shift in charge by authorization of production head and plant operation head. This permit should be renewed by incoming shift in charge during every shift.
- Hoist, Platform, cages used for lifting persons or to send persons inside vessels by such means must be of sound construction with wire ropes slings, etc. to avoid failure.
- All steam, condensate, hot water connections should be made tight with clamps.
- Nitrogen hazard should be kept in mind. All nitrogen sources should be positively isolated from vessels/confined spaces to avoid oxygen deficiency where vessel entry is required.
- All underground sewers shall be flushed, protected from sparks.
- Full PPEs like PVC suits, gum boots, face shield & other required shall be used while draining, flushing and other reclaiming activities to avoid burn, poisoning etc.
- Wet asbestos cloth/metallic plate should be used to collect flying sparks.
- Water, steam flushing, nitrogen blanketing shall be continued where spontaneous combustion takes place. Precautions should be taken for pyrophoric nature of material.
- Temporary electrical connections, cords, boards and other electrical fixtures should be of sound material to prevent electrical shock.
- Oil spillage in the pit of oil slope tank should be cleaned with water/sand.
- Proper approach like aluminium ladder should be provided to reach to the platforms of scaffolding and ladder must be tied.
- All clumps of scaffolding should be tightened properly and planks should be tied at both ends and supported at proper distances along span to avoid sagging and failure.

- Always use safety belt while working at height of more than 2 meters and ensure tieing the life line of safety belt with firm support.
- Ensure area cordoning for hot work, X-ray, excavation, hazard material temporary storage.
- Ensure proper tagging of valves, switches etc to prevent its use.
- Ensure proper guidance to workman and make him aware about local area hazards before start of the job.
- All welding machines should be provided with power isolation switch of suitable rating.
- Portable electrical appliances/tools earthing should be in good working condition. Insulation portion should be free from damages.
- All electrical cables should be joints free and connection taken by using three pin plugs.
- While inserting fuse all care should be taken so that no one touches conductor to avoid the shock to the persons.
- During hydro jetting work workers should wear hand gloves, safety helmet goggles and PVC suit.

Don'ts:

- Do not use fire hydrant water for washing/bath purpose.
- Do not use water for cleaning purpose, use broomstick if possible.
- Do not wash or clean trolley, tractor or trucks which are used for chemical/fertilizer's transportation. Wash them at proper place.
- Smoking & carrying matchbox, cigarettes, lighter, bidis etc. are prohibited.
- Photography & carrying cameras/Mobile phones are strictly prohibited in all areas.
- Do not spill liquid or chemicals in open atmosphere.
- The use of Radio Active Source within the plant shall not be allowed without obtaining valid permission/work permit and intimation in the form of a circular to all plant persons shall be given in advance.
- Unauthorized entry of plant is strictly prohibited.

Don'ts during shut down:

- Do not use gasket or other blinds as it can fail during job. All blinds should be metallic.
- No toxic/corrosive/irritating materials should remain plants or sections where hot work is to be carried out.
- No hot work should be permitted near sewers till areas have been cleaned flushed properly.
- No hot work irrespective of place of area shall be done without valid permit.

- No combustible material shall be there in flare line for taking up of flare line job. Isolations shall be ensured.

7.17 DETAILS ON VARIOUS SOP

LIST OF ENVIRONMENT, HEALTH & SAFETY RELATED PROCEDURES
TITLE
EHS
Sop For Treatment Of Concentrated Effluent
Sop For Treatment Of Lean Effluent
Sop For Handling And Disposal Of Waste
Sop For Packaging, Labeling & Transport Of Hazardous Waste
Sop For Operation Of Reverse Osmosis Plant
Sop For Operation Of Multiple Effect Evaporator Plant
Standard operating procedure for method of analysis of effluent.
Standard operating procedure for chemical treatment of RO feed water.
Standard Operating Procedure For Operation Of Agitated Thin Film Dryer
Standard Operating Procedure For Operation Of Sewage Treatment Plant
Standard Operating Procedure for Imparting First Aid
Standard Operating Procedure for Maintaining Overall Safety Including On-site Emergency.
Standard Operating procedure for General Do's and Dont's
Standard Operating Procedure for Operation of Fire protection system
Standard Operating Procedure for Noise Level Survey
Standard Operating Procedure for work inside Confined Space
Standard Operating Procedure for Carrying out Hot work
Standard Operating Procedure for Working at Height
Standard Operating Procedure for Incident Reporting Investigation
Standard Operating Procedure for Safety Committee
Standard Operating Procedure for LOTO Master Key Requisition
Standard Operating Procedure for Role and Responsibilities of Safety Stewards
Standard Operating Procedure for Identification of Personal Productive Equipments and it's Usage

Standard Operating Procedure for Operation of Occupational Health Center (OHC)
SOP for Transport Emergency Plan
Standard Operating Procedure for Hazard Identification and Risk assessment and Job safety analysis
Standard Operating Procedure Vehicle movement inside plan
Standard Operating Procedure General Plant safety rules
Standard Operating Procedure for Occupational Health Programme
Standard Operating Procedure for Acrophobia Test for Height Worker
PLANT
SOP for Manufacture of Synthetic Organic Chemicals
SOP for Planning Production
SOP for Planning Raw Material and Packing Material
SOP Product Identification and Traceability
SOP for Blending and Packing of Liquid Product
SOP for Labeling of Process Material and Finished Product
SOP for Autoclave Cleaning
SOP for Utility Changing Over In a Reactor Jacket
SOP for Operating The Oil Vacuum Pump (OVP)
SOP for Operating Water Ring Vacuum Pump (WRP)
SOP for Reactors Cleaning - GLR, SSR And Distillation
SOP for Solid- Liquid Filtration Using a NF, CFG And ANF
SOP for Transferring A Liquid Product Into A Reactor Or Vessel Using Air Pump And Vacuum
SOP for Drying Operations In TD/FBD/RPVD/RCVD
SOP for Operating The Steam Jet Ejector
SOP for Blending And Packing Of Solid Product
SOP for Cleaning Of Accessories Equipments
SOP for Qualifying The Reactor And Pressure Vessel
SOP for Receiving Of The Batch Manufacturing Records
SOP for Recycling Of Packing Material
SOP for Handling Work-In-Process Material
SOP for Prevention Of Mix Up And Contamination
SOP for Assigning Lot Numbers And Batch Numbers To The Products
SOP for Cleaning And Disposal Of Empty Containers
SOP for Rodent Control
SOP for Maintaining Health And Hygiene In Manufacturing Area
SOP for Emergency Shutdown
SOP for Sodium Cyanide Charging In To a SS Reactor And Disposal Of Empty Drums
SOP for Material Weighing In Weigh Balance
SOP for Operation Of Glass Condenser
SOP for Dry Vacuum Pump Operation
SOP for Bag Lifting Centrifuge Machine – CFG-5 and CFG-6

SOP for Bromine Charging Into A Glass Lined Reactor
SOP for AU-2 Seal [Plan-54] Operation
SOP for Operating the PLC-Plant-4
SOP for sodium cyanide charging system
SOP for sodium cyanide cleaning system
SOP for Cleaning of Process Area
SOP for Plant Start-up after Long Term Shutdown
SOP for Plant Shutdown
Standard Operating Procedure for Gowning and De-Gowning Procedure in Organic plant Centrifuge room
Standard Operating Procedure for Gowning and De-Gowning Procedure in Organic plant Blending and Packing room
Standard Operating Procedure for Unloading of Liquid product into Drums from Reactor or Vessel using hose pipes
Standard Operating Procedure for Candle Filter Operation
Standard Operating Procedure for maintaining Equipment Log book
Standard Operating Procedure for Operation of Reactor
Standard Operating Procedure for Post campaign of equipment and its accessories.
Standard Operating Procedure for Double cone blender and Blending in RCVD
Standard Operating Procedure for Handling of Hydrogen gas cylinders
HR
Standard Operating Procedure for Safety Related Training
Standard Operating Procedure for Training validation
Standard Operating Procedure for Re-training
Standard Operating Procedure for Planning of Training for the New Recruits
Standard Operating Procedure for Planning of Training for all the Employees
Standard Operating Procedure for Evaluation of Training Effectiveness

7.18 PROCESS SAFETY

- Safety measures will be adopted from the design stage.
- Safety Valve and pressure gauge will be provided on reactor and its jacket (if jacket is provided).
- Utility like Chilling, cooling, vacuum, steaming and its alternative will be provided to control reaction parameters in a safe manner.
- Free Fall of any flammable material in the vessel will be avoided.
- Static earthing provision will be made at design stage to all solvent handling equipments, reactors, vessels & powder handling equipments.
- Any reaction upsets will be confined to the reaction vessel itself.
- All emergency valves and switches and emergency handling facilities will be easily assessable.

- Further all the vessels will be examined periodically by a recognized competent person under the Tamil nadu Factory Rules.
- All the vessels and equipments will be earthed appropriately and protected against Static Electricity. Also for draining in drums proper earthing facilities will be provided.
- Materials will be transferred by pumping through pipeline or by vacuum from drums.
- All solvents and flammable material storage tanks will be stored away from the process plant and required quantity of material will be charge in reactor by pump or by N2 pressure transfer.
- Jump over clamp will be provided on all solvent handling pipeline flanges.
- Caution note, safety posters, stickers, periodic training & Updation in safety and emergency preparedness plan will be displayed and conducted.
- Flame proof light fittings will be installed in the plant.
- All the Plant Personnel will be provided with Personal Protection
- Equipment's to protect against any adverse health effect during operations, leakage, spillages or splash. PPE like Helmets, Safety Shoes, Safety
- Glasses, Acid-Alkali Proof Gloves etc. will be provided to the employees.
- All employees will be given and updated in Safety aspects through periodic training in safety.
- Material Safety Data Sheets of Raw Materials & Products will be readily available that the shop floor

7.18.1 FOR HAZARDOUS STORAGE FARM

- Farm will be constructed as per explosive department requirement and separation distance will be maintained.
- Tanks shall be located and marked in designated area of hazardous chemical storage.
- Static earthing provision will be made for road tanker as well as storage tank.
- Tanks of proper MOC will be selected.
- Flame arrestor with breather valve will be provided on vent line.
- Road tanker unloading procedure will be prepared and implemented.
- Fire load calculation will be done and as per fire load Hydrant System will be provided as per NFPA std. and Fire extinguishers will be provided as per fire load calculation.
- Spark arrestor will be provided to all vehicles in side premises.
- Flame proof type equipment's and lighting will be provided.
- Lightening arrestor will be provided on the top of chimney.
- Trained and experience operator will be employed for tank farm area.
- NFPA label (hazard identification) capacity and content will be displayed on storage tank.
- Solvents will be transferred by pump only in plant area and day tank will be provided. Overflow line will be return to the storage tank or Pump On-Off switch will be provided near day tank in plant.

- Jumpers will be provided on solvent handling pipe line flanges.
- Flexible SS hose will be used for road tanker unloading purpose and other temperature connection.
- All tanks shall be uniformly tagged.
- Level indicator shall be provided in tanks.
- Dyke will be provided.
- Industrial type electric fittings shall be provided.
- Adequate fire-fighting equipment's will be provided.
- Anti corrosive paint shall be done.
- Safety instruction board will be displayed.

7.18.2 FOR DRUM/CARBOY STORAGE AREA

Some chemicals will be received at plant in drums/Carboys by closed containers and stored in a drum/Carboy storage area.

- FLP type light fittings will be provided.
- Proper ventilation will be provided in go down.
- Proper label and identification board /stickers will be provided in the storage area.
- Conductive drum pallets will be provided.
- Drum handling trolley / stackers/fork lift will be used for drum handling.
- Separate dispensing room with local exhaust and static earthing provision will be made.
- Materials will be stored as per its compatibility study and separate area will be made for flammable, corrosive and toxic chemical drums storage.
- Smoking and other spark, flame generating item will be banned from the Gate.

7.18.3 TRANSPORTATION

- Road tanker unloading procedure will be in place and will be implemented for safe unloading of road tanker.
- Static earthing provision will be made for tanker unloading.
- Earthed Flexible Steel hose will be used for solvent unloading from the road tanker.
- Fixed pipelines with pumps will be provided for solvent transfer up to Day tanks/reactors.
- Double mechanical seal type pumps will be installed.
- NRV provision will be made on all pump discharge line.

CHAPTER - 8
PROJECT BENEFITS

8.1 BACKGROUND

M/s. Chemplast Sanmar Limited, Proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) manufacturing in existing unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

8.2 IMPROVEMENTS IN THE PHYSICAL INFRASTRUCTURE

There will be increase in some small scale businesses like tea stall, catering services/ hotels, grocery, sweet marts, cycle shop etc. in study area.

8.3 IMPROVEMENTS IN THE SOCIAL INFRASTRUCTURE

Following are the improvement which may occur due to proposed project;

- There will be no land acquisition, no Loss of livelihood to local communities as proposed project is in existing site area.
- There will be No Displacement of people because the proposed project is in existing site area.
- Use of existing skills in the region for minor developments, required for the proposed project
- Increased transportation and handling requirements, that could benefit the local economy
- Increased taxes to the State and Central Governments, which would add to the public good consequently, the project would have beneficial impacts on the socio-economic conditions of the study area and the Region.

8.4 EXPORT

Majority of the products will be used for international market and some products will be used in domestic market depending on the market. Chemplast Sanmar Limited is a premier company that exports and imports goods from countries including China, France, Japan and Switzerland and host of other countries. Depending on the international demand of products we shall explore the possibility of exporting the products.

8.5 EMPLOYMENT GENERATION

The Chemplast Sanmar Group employs a diverse and competent workforce. A conducive and invigorating work atmosphere provides employees opportunities for growth and excellence. As project will have considerable employment & trade opportunities with the commencement of the production activities. This will increase the employment opportunity. Employment would be as per prevailing norms of state government for skilled and unskilled people for the proposed project. Approximately 1350 people [Existing: 350 people + proposed: 1000 people] will be employed.

The project will benefit the people living in the neighboring villages by giving preference to them in relation to direct employment associated with the various project activities. Construction and operation phase of the proposed project will involve a certain number of laborers. There is a possibility that local people for construction phase as well as a number of local skilled and unskilled people will be engaged in the employment which will improve the existing employment scenario of the region.

There will direct employment generation as per following details:

During project phase:
Permanent employment: 40
Temporary employment: 350 to 500

During operation phase:
Permanent employment: 350
Temporary employment: 800

Total Employment: 1200 to 1400

However, indirect employment is likely to be about 1000 persons.
Enhanced direct employment for technical/administrative works and indirect employment opportunities for transporters of raw materials and finished goods;

Business opportunities for local people as there will be scope of hiring vehicle like tractors & trucks, etc..

8.6 SOCIO-ECONOMIC DEVELOPMENTAL ACTIVITIES

As per CER Notification vide file no. 22-65/2017-IA.III Dated 1st May, 2018. If Project cost is between > 1000 Crores to ≤ 10000 Crores, then Company has to Spend 0.25% of the total capital project cost i.e. 5.00 Crores under CER Activity and CSR will be carried out by the company in the surrounding villages over the period of years. This fund will be administered by a local area development committee in accordance with the orders of the appropriate Government. This fund will be used for the creation of infrastructure and overall economic development of the project area. Such activities are stated as below:

Action plan for the CER activity are as follows:

S. No.	CER activity
1	Desilting of lakes and increasing the depth; improving beautification of surrounding pond (7 Nos)
2	Tree plantation at schools and villages
3	Installing of Solar Light and panels in the villages to promote green energy
4	Afforestation programmes: Joining hand with Tamil Nadu Forest department and develop the Sanmar forest with fencing
5	Rainwater Harvesting in schools and villages

Details of CSR Projects for Financial Year 2021-22

S.No	Location /Area	Description of CSR
1	Berigai Panchayat office	Issued Covid-19 Kit PP Suits - 50Nos Disinfection Spray Machine- 1 No and Hypo Solution-100L
2	Shoolagiri & Berigai PHC	PC and Printer
3	B-Kurubarapalli Panchayat	Provided Bore well for common drinking water
4	Berigai PHC	Polio Camp organized
5	Berigai Panchayat	Constructed OHT (Over Head Tank) for storage and supply of drinking water

Details of CSR Projects for Financial Year 2022-2023

S.No	Location /Area	Description of CSR
1	B.Singiripalli	Temple compound wall painting work
2	Barigai police station	Provided the entrance gate
3	Suligunta Village	Panchayat union preliminary school painting work
4	B.Kuruparapalli village	Panchayat union preliminary School Road revamping work
5	Kurubarapalli	Constructed Bus stop
6	Sikkanapalli	Constructed Bus stop

8.7 CONCLUSION

It can be concluded that the proposed project is beneficial in the interest of common person, the society, the state and as the country as a whole. The benefits can be summarized as below:

- Substantial Socio-economic benefits;
- Good Techno-commercial viability;
- Employment to the semi-skilled and unskilled workmen located around the project site during operation phase;
- Infrastructure facilities will be improved due to the proposed expansion.
- The proposed project will provide quality product at lower cost to the users.
- To generate local employment.
- These products also have export potential. Hence, possibility of earning foreign exchange.
- There should be positive impact on the socio-economic condition of the area in terms of direct and indirect employment due to the proposed project.

CHAPTER - 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 ENVIRONMENTAL COST BENEFIT ANALYSIS

As per EIA Notification 2006, this Chapter of the 'Environmental Cost Benefit Analysis' is applicable only if it is recommended at the Scoping stage. As per the standard ToR issued by MoEF&CC, New Delhi vide File No. IA-J-11011/104/2021-IA-II(I) dated 10.12.2022. The environmental cost benefit analysis is not recommended during scoping stage. Hence, environmental cost benefit analysis was not carried out.

CHAPTER - 10
ENVIRONMENTAL MANAGEMENT PLAN

10.1 BACKGROUND

Environmental Management Plan is required to ensure sustainable development in the area surrounding the proposed project. EMP consists of the set of mitigation, management, monitoring and institutional measures to be taken during implementation and operation phase to eliminate adverse environmental impacts or reduce them to acceptable levels. The environmental management plan shall address the components of the environment affected during construction and operation of the plant and by the different activities forming part of the processes of the proposed plant. Mitigation measures at the source level and an overall Management Plan at the site level are elicited so as to preserve the surrounding environment. The EMP is herein outlined after taking into account the various Acts, Rules and Regulations /Standards concerned with the environmental management.

10.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

- To treat and dispose off all the pollutants viz. liquid, gaseous and solid waste so as to meet statutory requirements (Relevant Pollution Control Acts) with appropriate technology.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote green-belt development.
- To reduce fire and accident hazards.
- Budgeting and allocation of funds for the environment management system.
- To adopt cleaner production technology and waste minimization programs.
- Identification of mitigating strategies, such as prevention and control, for each environmental component, as well as a restoration and resettlement strategy.

The Environment Management area handled by a Qualified Manager with adequate training and experience in operation of ETP and management of other pollution control measures. He will be assisted by a Qualified Executive and three operator (in each shift) to run ETP and other pollution control system. All the necessary controls w.r.t. management of Liquid/ Hazardous/ Gaseous pollutants will be exercised. All the necessary controls w.r.t. management of Liquid / Hazardous / Gaseous pollutants will be exercised. For all liquid effluents, full-fledged effluent treatment plant consisting of primary treatment will be installed to ensure adequate treatment prior to discharge.

Process stacks will be equipped at safe height with scrubbers where required to ensure emissions within prescribed limits. DG sets will be provided with acoustic enclosure and stack.

To handle hazardous waste as per Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 of Environment Protection Act, 1986. Hazardous waste will be disposed off at the secured land fill facility available in the nearby vicinity.

- Fixed gas detection system (VOC, HCN and Hcl) will be installed in the workplace area.
- Work place health monitoring will be carried out regularly through continuous monitoring systems and periodic checking.
- Ambient air quality will be monitored on monthly basis.
- 33% of green belt will be maintained inside and outside the premises by planting local species of trees.
- R&D team will work for continuous improvement in process to reduce Pollution Load & moving towards adopting cleaner production technology.

10.3 ENVIRONMENTAL MANAGEMENT CELL

Apart from having an environmental management plan, it is also necessary to have a permanent organizational set up charged with the task of ensuring effective implementation. In this effect, **M/s. Chemplast Sanmar Limited** will assign responsibilities to officers from various disciplines to co-ordinate the activities concerned with management and implementation of environment control measures.

An organogram of Environment management cell is shown in in Chapter 6. This department shall undertake the monitoring of environment pollution level by measuring stack emissions, Ambient air quality, water and effluent quality, Noise level, etc. either departmentally or by appointing external agency whenever necessary.

M/s. Chemplast Sanmar Limited shall carry out the regular monitoring in future as well as ensure that pollution is limited below prescribed limits and shall take corrective action by providing new pollution control equipment if required. In case the monitored results of environment pollution are found to exceed the prescribed limits, remedial actions are taken through the concerned plant authorities. The actual operation and maintenance of pollution control equipment of each department is under respective department heads.

The environmental department shall also look after preparation and submission of Water Cess Return, Environmental statement, and Consolidated Consent & Authorization application/ renewal under water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, Ambient Air Quality as per NAAQS Standards, 2009 and Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 under Environment Protection Act, 1986.

10.4 ENVIRONMENT MANAGEMENT PLAN

The Environment Management plan is meant for mitigation/ management of the adverse impacts and the strengthening positive impacts during proposed project. Environment Management Plan is tabulated in Table: -10.1

TABLE - 10.1

ENVIRONMENT MANAGEMENT PLAN

CONSTRUCTION STAGE POTENTIAL IMPACTS & MITIGATION MEASURES

Environmental Components	Sources of Impact	Mitigative Measure
Water Environment	Construction activity & abstraction of water for construction requirement and sanitation for workers.	➢ Company has provided the sanitation facility for workers and domestic wastewater treated in STP and will reuse for gardening purpose.
Air Environment	There will be generation of dust & vehicular emission due to transportation of construction machineries and raw materials	➢ At frequent interval water sprinkling is done on the roads and work zone areas to reduce the fugitive dust. ➢ Vehicles having PUC certificates only be allowed to transport materials and equipment's at project site.
	Construction equipment and machineries	➢ Construction equipment shall be maintained and serviced regularly such that the gaseous emissions from this equipment are maintained within the design specifications
	Dust generation due to site preparation	➢ Unit has store raw materials stored in silos or in covered areas to prevent dust pollution and other fugitive emissions. ➢ Dust masks are provided to the workers.
Noise Environment	Noise generation during construction work	➢ If possible, provide noise protection devices like earmuffs, ear plug to worker, Rotation of work to minimize exposure.
	Noise generation from vehicular movement for transportation of construction material and waste	➢ Well maintained vehicles and properly designed equipment are used. ➢ Restrict movement of vehicle between 10 p.m. to 6 a.m. if possible.

	Condition of equipment and machineries during construction work	➢ All machineries to be used for construction purpose will be of highest standard of reputed make and compliance of noise pollution control norms
Land Environment	Generation of Debris due to Excavation and paving of site	➢ Debris reused in filling low lying area
	Soil degradation due to spillage/leakage of oil & grease.	➢ Designated construction area for prevention of oil & grease getting mixed with soil. ➢ Construction of RCC roads and pavements to avoid soil contamination due to spillage/leakage of oil & grease.
	Generation of scraps due to construction activity	➢ Sold to scrap vendors
Green belt Development	There shall be positive impact of greenbelt development as it will act natural barrier for dust emissions.	➢ Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises. ➢ Good greenery is maintained in and around the site by planting various types of local tress.
Hazardous/Solid Waste	Wastes generated due to spillage/leakage, handling and disposal of construction wastes and other wastes.	➢ Construction waste categorized in to recyclable and non-recyclable and stored separately. ➢ Recyclable construction waste sent for recycling and non-recyclable waste will be sent to authorize dealers for disposal. ➢ Other wastes disposed off adequately.

Ecology and Biodiversity	The habitual activities of the birds and butterflies species will be affected.	➢ Idle vehicles to be shut off when it not in use. ➢ Speed limit of vehicles maintained. ➢ Loud horn in the vehicles are not be allowed.
	Noise from construction will create stress on animals and disturb their daily activities	➢ Acoustic enclose provided to construction machineries and equipments. ➢ Preference to be given that maximum construction activities are carried out during day time only.
Other Risk and Hazards	Chances of accident during transportation of material	➢ All transportation within the working area carried out directly under the supervision and control of the management. ➢ Speed limit of vehicles maintained. ➢ Banksman to be available for all heavy vehicles. ➢ Driver competency to be ensured and adequate training to be provided
	Fall from height, cut injury and fall injury during construction activities.	➢ Height work protection to be followed all height work. i.e. Ensured Full body harness to be used by all height work employees. Handrails to be provided for all working platforms. Safety net to be provided ➢ Escape ladders are providing in case of emergency ➢ Vehicles are strictly not allowing to work too close to excavated areas ➢ Safe construction practices are followed under supervisor‘s inspection. ➢ PPEs are provided to workers for safety against potential risk. ➢ All portable power equipment to be inspected and certificated by authority person on periodical interval. ➢ "No-Guard No-Work to be followed for all equipment

OPERATION STAGE POTENTIAL IMPACTS & MITIGATIVE MEASURES

Environmental Components	Sources of Impact	Mitigative Measure
Water Environment	Chances of contamination of surface water due to generation of Low COD effluent from process and utility effluent.	➢ Low COD effluent will be treated through the conventional wastewater treatment system and the pass-through RO system. ➢ Operating by ZLD plant
	Chances of contamination of surface water due to generation of High COD stream	➢ Neutralized concentrate effluent and rejects from RO will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility).
	Chances of contamination of ground water due to waste stream generated from spillage, leakages, vessel washing, used container washing etc.	➢ The spilled/ leaked material should be collected and diluted as per required properties of the leaked material. ➢ The diluted material is collected/ stored separately/treated in ETP and then sent to MEE.
Air Environment	Generation of flue gas emission likes SPM, SO2 and NOx from diesel operated vehicles and machineries.	➢ Valid PUC Certified vehicles used for transportation of material and equipment.
	Fugitive dust generation due to vehicle movement for transportation of raw material and finished goods.	➢ Plot premises is well developed with concrete roads.
	Generation of Fugitive emission and VOC due to vaporization of raw material and product handling.	➢ The raw materials are stored in closed containers and handled through closed system to avoid the handling losses.

	Generation of SPM, SO_2, NOx from flue gas emission sources like Boiler, TFH and D.G. Set.	➢ Company is using Furnace Oil & Diesel for existing Boiler, Thermic Fluid Heater & D.G.Sets. ➢ After expansion, Company will use Briquettes/ Furnace Oil & HSD as fuel for proposed Boiler, TFH, & D.G.Sets. ➢ Mechanical Dust collector & Stack is provided to control flue gas emission. ➢ After expansion, Company will provide Mechanical Dust collector or ESP with water scrubber & Stack to control flue gas emission.
	Emissions from production processes	➢ Company has installed adequate Wet Alkali Scrubber & Wet scrubber with stack systems to control process gas emission. ➢ All the process equipment will be connected to the scrubbers and equipment where solvents distilled are provided with condensers and after coolers and the receivers are connected to the scrubber. The scrubbers are circulated with appropriate scrubbing solution like caustic, hypochlorite, water etc. The pH indicator and pressure switches are provided to ensure quality of scrubbing liquid for effective scrubbing.
	Emissions from materials handling storage or transport.	➢ All liquid raw materials shall be procured in tankers / Barrels / Carboys and shall be transferred through a closed circuit pipe lines. ➢ Solid raw material charged through closed system into reactors and the dust collection hopper shall be connected to a bag filter and ID fan.
	Chances of odour from septic tank/ETP processing area and waste storage area may cause nuisance	➢ Working areas are kept clean and maintained.
Land	Proposed expansion	--

Environment	project will not be distinct as there will be no major changes in the present land use of the site. In existing most of the development has already been matured. Hence, any additional impact on land environment will be insignificant.	
Noise Environment	Increase noise level due to Operation of equipment and machineries	➢ Noise emissions kept to a minimum by regular maintenance of machineries. ➢ Regular oiling, lubrication and maintenance of the equipment carried out to minimize noise generation. ➢ Noise generating equipments to be isolated from operating area with adequate enclosure ➢ Workers/ Operators working near to high noise generating machinery to be provided with ear mufflers/ ear plug
	Noise generation from pumps and blowers at ETP	➢ Preventive maintenance of pumps and blowers done periodically
Socio-Economic	Overall growth & development of area, increased employment, improvement in infrastructure and growth of downstream industries	Positive impact on the Socio-Economic of the country & region: ➢ The budget for CER approx. Rs.5.0 Crore i.e 0.25 % of proposed expansion project cost should be allotted for development of locals and surrounding villages.

Ecology and Biodiversity	Impact due to emission on surrounding flora and fauna	➢ Transportation of products and raw material avoided in the early morning and evening. ➢ Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises.
	The impact on terrestrial ecology will be due to emission of pollutants like PM10, OM2.5, NOx and SO2.	➢ Mechanical Dust collector or ESP with water scrubber & Stack will be provided for the Boiler, TFH and DG sets to to control flue gas emission.
Other Risks & Hazards	Chances of vehicle collision due to vehicle failure.	➢ Well trained and licensed driver hire for transportation of raw material and final product.
	Tilting of moving vehicle due to overloading.	➢ Transport vehicles are properly examined before transportation. ➢ Concern officer ensure for loading will be done as per vehicle capacity.
	Chances of fatal incident, severe injury and loss of property due to explosion of boiler and thermic fluid heater.	➢ All critical chemical storage, process, and equipment are properly safety study carried out and implement the all safety precautions. ➢ Dedicated safety department is available to advise and implement the safety precaution in all level.

	Chances of accident to workers due to spillage, leakage of hazardous chemicals during handling	➢ Trained Competent person is involved the handling of hazardous chemical ➢ All hazardous chemicals storage area followed by layer of protection ➢ Closed loop handling system is used for hazardous chemicals handling ➢ Adequate PPE's are provided to workers for handling hazardous chemical. ➢ Safety interlock system, sensor and safety alarm system is installed all hazardous chemicals storage
	Corrosion and leaching due to spillage and leakage of hazardous chemicals during handling.	➢ Closed loop handling system is used for hazardous chemicals handling ➢ Standard operating procedure is prepared and be strictly followed by workers. ➢ Periodically scheduled preventive maintenance is carried by concern department for all hazardous chemicals handling equipments. ➢ Periodical inspection and replacement of equipment is followed
	Occupational health hazard to workers work with hazardous chemicals	➢ All the employees will be eligible for pre-employment medical check-up. Employees will be expected to complete their mandatory check-up in an approved hospital before joining to the organization. ➢ Periodical medical examination will be carried out as per Factories Act and Rules for employees ➢ Occupational Health Centre is established at site and Doctor will be available on daily basis. Medical records of employees made available with the doctor. ➢ Products and raw material handled, stored and transported as per manufacture, storage and import of hazardous chemical rules, 1989. ➢ The training for awareness of MSDS provided.

	Risk of fire/explosion within product/raw material storage area	➢ All chemicals are stored as per compatibility. ➢ A additional full-fledge fire hydrant system with ring main will be provided and designed as per TAC (Tariff Advisory committee) regulations. ➢ A full-fledged fire hydrant system with ring main is provided and designed as per TAC (Tariff Advisory committee) regulations. The system is automatic and pressurized system. It is kept automatically under pressure with the help of a jockey pump. One electrical driven pump works as the main pump with a diesel driven pump as standby. A dedicated water reservoir for fire protection is provided with two-fire water storage of total capacity 1200 KL. 21 no. of emergency 'manual call point' and 43 no. of smoke detector was installed around the factory. Sprinkler system provided for Flammable bulk storage and unloading areas. Apart from fixed fire fighting system, portable fire extinguishers are provided at various locations of the plant so that in the incipient stage itself fires can be handled and extinguished.
Green belt Development	There shall be positive impact of greenbelt development as it will act natural barrier for dust emissions.	➢ Regular water sprinkling and maintenance of greenbelt.
	Improvement in soil quality due to binding of top soil materials due to root structure.	➢ Maintenance of Greenbelt will be done regularly.

10.4.1 WATER ENVIRONMENT

Water requirement will meet through the CGWA and WRD. However, record of water consumption for different usages should be maintained.

The following measures would be taken to minimize the water usage in the operational phase:

- ✓ Endeavor to reduce the actual process water consumption by way of improvement in operation of processing units.
- ✓ Water conservation practice shall be done by recycling of treated water. The Effluent water will be completely recycled in Plant to reduce the fresh water demand.
- ✓ Water saving by shower head flow controls, spray taps and faucet aerators and photo-sensitive taps.
- ✓ Exploring other options of reusing the treated effluent besides fire water make up and cooling tower makeup
- ✓ The treated domestic water will be reuse for gardening purpose to reduce fresh water demand.
- ✓ Air cooled condenser will be used in production process in place of conventional cooling tower. It will save approximately 100 KL per day of water.

10.4.1.1 WATER CONSERVATION AND RECHARGING

Water Conservation:

- Water conservation measures will be taken to optimize the fresh water requirement and record of water consumption shall be maintained for each usage in future.
- Aware employees/workers to avoid wasting water during operation phase.
- Taps shall be closed when not in use.
- Explore **3 R's** for conservation viz, **Re-use, Reduce and Re-cycle**.

Recharging (Rain Water Harvesting System):

Unit will harvest rainwater from the rooftop of the buildings. Rain water harvesting is under process.





10.4.2 AIR ENVIRONMENT

10.4.2.1 Odor Control Measures

The chemicals used or manufactured related to the proposed project do not release any disagreeable odor. However, if any spillage or leakages of such chemicals are taken place then following material handling procedures is being followed to reduce the Odour and release of chemical vapors in atmosphere.

- All liquid raw materials charged into Reactors with pumps or under gravity through closed pipes.
- Suction Hoods placed near the Man-holes & Charging funnels of Reactors & Filters so that chemical vapors and dust do not escape into the Plant & surroundings, when the man-hole covers are opened for inspection or charging of RM.
- All storage tanks of low boiling chemicals provided with Conservation Vents.
- Vent lines of Dosing vessels shall be connected back to the vents of storage tanks to prevent contaminated air release during material transfer.
- All pumps handling hazardous chemicals provided with mechanical seals to prevent fugitive emission.
- Wherever possible magnetic coupled pumps are used.
- Any spillage from drums etc. absorbed with saw dust / soda ash and moped clean.
- The contaminated absorbent are safely dispose off along with hazardous waste.

Spill control measures

The accidental spill of chemicals is handled in a systematic manner to reduce the odor.

1. The area where the chemical spillage can take place is covered with appropriate adsorbent material like soda ash, saw dust or even an earth using all necessary Personal Protective equipment (PPE).
2. Contaminated area is then cleaned with soap and water and the water used is transferred to ETP.
3. Masking agents (e.g. PIION, ECOPEARL) spray is then used to reduce the impact of lingering odors.

10.4.3 NOISE ENVIRONMENT

The sound pressure level generated by a noise source decreases with increasing distance from the source due to wave divergence. The propagation and attenuation of noise pressure wave is dependent on many parameters amongst which, the medium of travel and the ambient conditions are the most significant parameters. In order to minimize adverse impact on the noise environment, due attention shall be given for implementing noise control measures. Comprehensive measures shall be taken at design stage for noise from proposed unit.

10.4.4 LAND ENVIRONMENT

- During the site clearing, excavated earth shall be stored in stockpiles and covered with plastic/tarpaulin sheets or stored in a closed room and reused for landscape development along the corridor.
- To avoid water logging, gradient of the area will be maintained during leveling.

- The construction material and diesel /oil to be used for various construction activities will be stored in designated storage yards to reduce the spills into unwarranted areas.
- Segregation, collection, storage and disposal of waste material generated during the construction phase to minimize its impact on soil quality.
- The construction debris as well as debris from demolition work will be utilized within the site for leveling purpose and base course preparation of internal roads.

10.4.4.1 HAZARDOUS WASTE MANAGEMENT

Storage of Hazardous Waste:

- Hazardous waste shall not be stored for a period more than 90 days. And shall maintain records and make them available for inspection.
- Store at a designated Onsite-secured area with impervious floor that affords protection from sun & rain fall, spreading of leachate, mixing of wastes etc.
- Wherever feasible, the hazardous waste will be explored for co-processing to use it as raw material / energy source in cement & allied industries.

Transportation of Hazardous Waste:

- Properly packed & labeled waste transport through dedicated vehicle to a captive facility/ authorized TSDF facility.

10.5 SOCIO-ECONOMIC ENVIRONMENT

- The activities of the proposed expansion in the production capacity will produce some improvements in the socio-economic levels in the study area.
- The unit will generate the local employment for the proposed project.
- Better literacy rates are possible due to assumed better economic conditions of the people.
- Project will lead to development of ancillary industries and an overall economic growth of nearby towns to supplement the population of the area.
- Project proponent will ensure to connect even last people with the infrastructural facility like educational, health, road etc in the locality.
- Other needs and social-economic aspects of local inhabitants will be dealt with CSR activities & CER activities in the region.
- The existing plant activities have already provided employment to persons of different skills and trades.

10.6 ECOLOGICAL ENVIRONMENT

The baseline flora and fauna has been referred in Chapter-3. There is no protected area, important or sensitive species within 15 kms from the proposed project boundary. There are no significant aquatic bodies & no forest land involved within the study area. The treated effluents will not be discharged into any surface water streams. Hence, no impact is envisaged from the proposed expansion project on aquatic bodies.

33% of greenbelt is already developed around the periphery of the projects site which will have positive impact since it will support various Faunal & Floral diversity. It helps in purifying the air and reduces noise pollution. Greenbelt will increase the aesthetic value of the site and increase employment. Hence, the propose expansion project will create positive impact on EB environment by increasing the green area of the region.

10.7 IDENTIFICATION OF RECYCLE/REUSE, CLEANER PRODUCTION AND CO-PROCESSING OPTION OF HAZARDOUS WASTE

- It is recommended to analyze each hazardous waste periodically and maintain records.
- Check the calorific value of the ETP Sludge and process waste and then explore possibilities of Co-Processing in Cement Industry as alternative fuel or raw materials. Waste materials used for co-processing are referred to as alternative fuels and raw materials (AFR).
    1. Reduce water consumption by proper housekeeping, utilizing low-flow, drip or micro-spray irrigation systems and technologies that reduce water loss.
    2. Repairing leaks to pipes, glands, seals and gaskets can significantly saves energy costs and water conservation.
    3. Recycle of product wash water in this process i.e. Second wash water will be re-used as first wash in the subsequent batch to reduce fresh water consumption.

10.8 GREEN BELT DEVELOPMENT

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33 %) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises.

Trees species are planted at plant in line with trees species recommended in CPCB's guidelines for developing Greenbelts.

Existing tree plantation is approx. 16250 nos. of trees, we have observed 94% survival rate of these trees. So considering 94% survival rate, we shall plant 4% extra trees to complete the greenbelt plantation. 16250 nos. of trees + 1000 nos. of trees (i.e. 4% Extra) = 17250 nos. of trees

GREEN BELT DEVELOPMENT PLAN

YEAR	NO. OF TREES	COST INCURED
Till-2022	16250	1,13,75,000/-
2022-2023	1000	7,00,000/-
TOTAL	**17250**	**1,20,75,000/-**

Cost of Maintenance of Green Belt: - Rs. 10, 50, 000/- Per Annum

GREENBELT DEVELOPED WITHIN THE PLANT PREMISES




agiri Main Road
SH226
SH17C
Krishnagiri Main Road

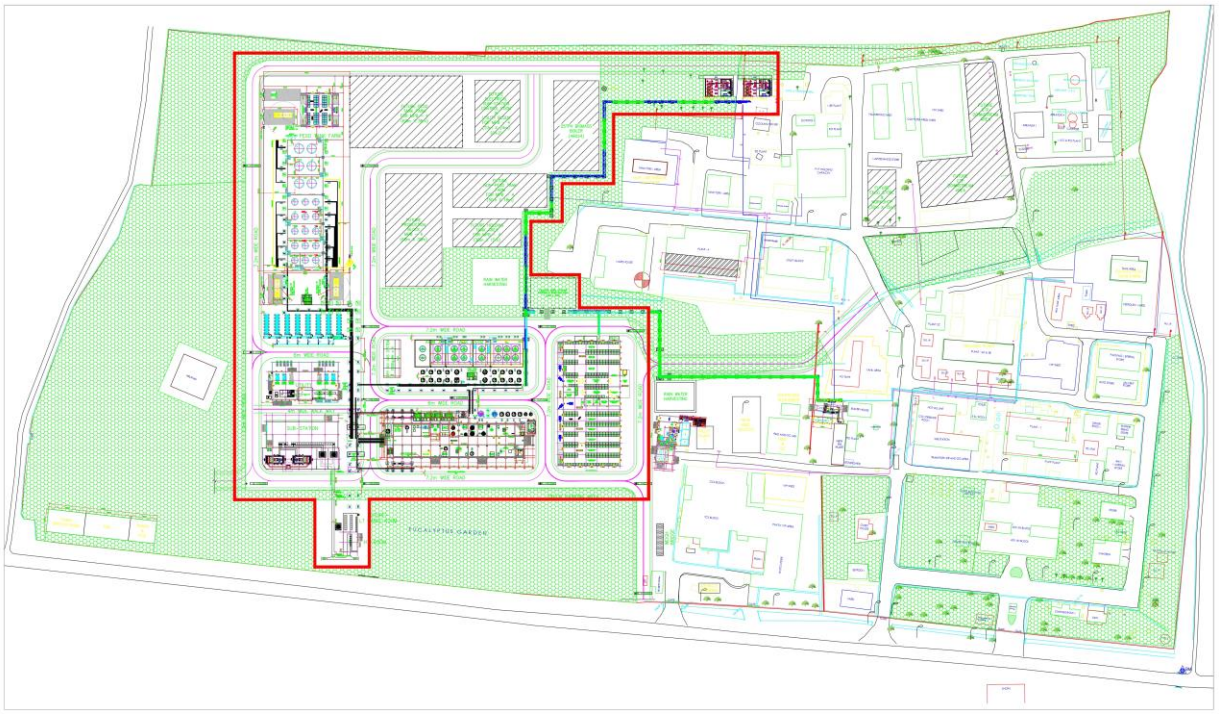








LIST OF PLANTS AND AREA COVERED FOR THE GREENBELT ALONG WITH PLANT LAYOUT



S.No.	Area	No of Trees (existing)	Species Name
1	North Side boundary	2750	1. Neem 2. Silver Oak 3. Pongamia 4. Gulmohur 5. Spathodia 6. Ashoka 7. Banyan 8. Bamboo 9. Peapal
2	West side boundary	2620	
3	South side boundary	2930	
4	East side boundary	3570	
5	Process Plant area	4380	
	Total Number of trees	16250	

10.9 MEASURES FOR CONSERVATION OF ENERGY

M/s. Chemplast Sanmar Limited, has adopted various measures for energy conservation:

- Company is going with 100% of LED lightings over the plant, it's better than other by, they are brighter, require lesser energy to function and Last longer.
  - LED lamps consume 20% energy for heating
  - Metal halide lamps consume 75% energy
- Energy efficient machineries used during operation phase.
- Installation of economizer & high efficiency burner on steam boilers.
- Company has tried to utilize renewable sources of energy for conservation of non-renewable sources of energy.
- Enough care taken to prevent/minimize energy losses at each stage.
- Energy audit is used as a tool for monitoring purpose.
- External lights are control through timers for auto on/off function based on timings.
- The cable size is selected so as to minimize the power losses.
- The power factor improvement capacitors provided individually for AC loads.
- Using water cooled chillers, variable frequency drives for secondary pumps and building management system for HVAC equipments with non-CFC and non-HCFC based refrigerants.
- Installation of insulation over the steam line to reduce the heat loss.
- All rotating equipment are provided with variable frequency drive
- Steam condensate shall be recovered and reused.
- Boiler blow down are controlled by automatic system to save heat up losses.
- Batch processes are monitored stringently for heating and cooling operations so that there is minimum loss of energy and material by way of temperature, pressure and flow controls.

10.10 SKILLED AND TRAINED MANPOWER

Employment would be as per prevailing norms of state government for skilled and trained people for the project. **M/s. Chemplast Sanmar Limited** has 1350 people [Existing: 350 people + proposed: 1000 people] of employment based on qualification and requirement. In addition to direct employment, indirect employment shall generate ancillary business to some extent for the local population.

10.11 CAPITAL COST FOR ENVIRONMENTAL MANGEMENT

Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.

Environment Issue/ Component	Component	Capital Cost of EMP (In lacs)	Recurring Cost of EMP (In lacs)
Hazardous waste generation & disposal	Cost of TSDF/CHWIF membership letter, Construction of Hazardous waste storage yard,Cost for TSDF disposal & Cost for incineration disposal	175	6400
Effluent generation and treatment	Cost of RO,Construction Cost of MEE,Construction cost of ETP	6500	2200
Details of Air Emission	Cost of dust collector during construction,Cost of ESP with bag filter, Cost of stack installation, Cost of scrubber, Cost of LADR, Cost of maintenance of APCM System	4000	12
Plantation	Cost of tree plantation & Cost of maintenance	20	10
Monitoring of Environmental parameters	Cost of monitoring of various environmental parameters	--	20
Noise	--	3.2	3
Occupational Health and safety precaution	Cost of PPE, Oxygen cylinder, & Antidote(OHC), Imparting safety, training to employees, Cost of safety measures	50	10
Fire & Safety	Cost of Fire Hydrant System, Cost of fire extinguisher & Cost of fire proximity suites	600	10
CER Activity		500	--
Total		**11848.2**	**8665**

10.12 SOLVENT MANAGEMENT PLAN

Solvent management will be carried out as follows:

- Chillier water circulation is provided for primary condenser and chilled brine circulation for secondary condenser is provided to condensate solvent vapours and reduces solvent losses. Solvent recovery.
- Double stage condensers are used for solvent recovery system
- Reactor and solvent handling pump have mechanical seals to prevent leakages.
- Automatic process control and interlocking system is provided for solvent recovery system.
- Continuous VOC monitoring system is provided in solvent storage area.
- The condensers will provided with sufficient HTA and residence time so as to achieve more than 97% recovery.
- Vent trap is provided with cooling and scrubbing system for solvent recovery system
- Solvents will store in a separate space specified with all safety measures.
- Proper earthing provided in all the electrical equipment wherever solvent handling is done.
- Entire plant is flame proof. The solvent storage tanks will be provided with breather valve to prevent losses.
- All the solvent storage tanks are connected with vent condensers with chilled brine circulation.

Coolant to be used

Primary Condensers	Chiller Water
Secondary Condensers	Chilled Brine up to -5^{0}C
Vent Condensers	Chilled Brine up to -10^{0}C

FIGURE-10.1

FLOW DIAGRAM OF SOLVENT MANAGEMENT SYSTEM

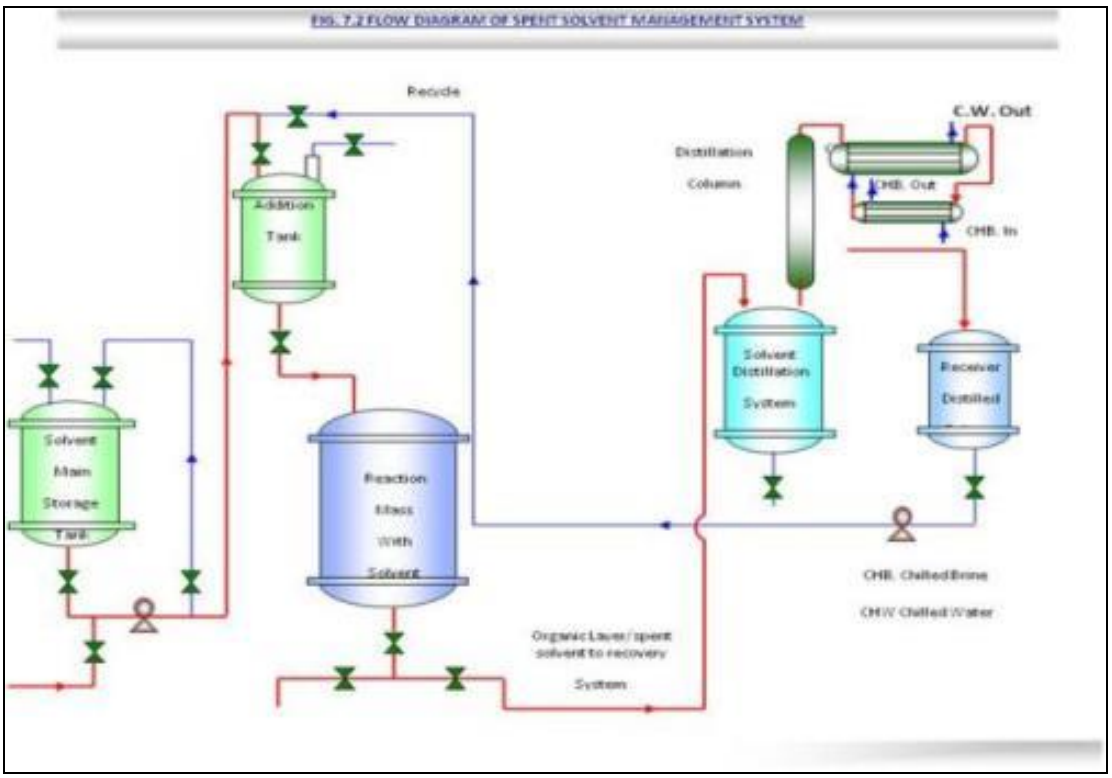


TABLE-10.2

SOLVENT RECOVERY

Solvent	Input (TPA)	Recovery (TPA)	Loss	% Recovery	% spent solvent recovery
Toluene	20000	16000	4000	80.0	20.0
TBA(Tert-butyl alcohol)	9900	6940	2960	70.1	29.9
MCB(Mono Chloro Benzene)	13600	13200	400	97.1	2.9
MTBE(Methyl Tert-Butyl Ether)	21200	20700	500	97.6	2.4
ODCB(Ortho Di-Chloro Benzene)	28000	27000	1000	96.4	3.6
Methanol	20000	16400	3600	82.0	18.0
Benzene	2000	1800	200	90.0	10.0

10.12.1 LEAK DETECTION AND REPAIR (LDAR) PROGRAM

Periodic preventive maintenance and inspection is done for all the equipments by the in-house Engineering team and LDAR study carried yearly once by NABL External lab and its report submitted to TNPCB, Hosur.

- Leak Free Pumps for Transfer of Solvents
- MSW Gaskets in Solvent Pipelines to Prevent Leakage from flanges
- Minimum Number of Flanges, Joints and Valves in Pipelines.
- To Eliminate Chances of Leakages from glands of pumps, mechanical seal will be provided at all solvent pumps.
- All the rotating equipments like pumps will be installed with mechanical seals to arrest any sort of emissions.
- Condenser and scrubber post reactor with cooling arrangement
- Enclosures to chemical storage area, collection of emission from loading of raw materials in particular solvents through hoods and ducts by induced draft, and control by scrubber / dust collector to be ensured.
- In case the small spillage or leakage observed, by using absorbent collect the spilled material and send to ETP.
- If the spillage is of inflammable liquid, switch off all the power supply in the area to prevent electric spark.
- During LDAR study, leak identified parts are red tagged and action will be taken to arrest the leakage. After rectification of the leak, again VOC will be monitored and ensured there is no leakage.

MONITORING OF SOLVENT LOSSES

- In warding, storage and consumption of solvents in various products shall be measured through level transmitters and load cells weighing systems respectively. The quantity at each stage shall be reconciled periodically to arrive at losses.
- Periodic monitoring of work area will be carried out to check the fugitive emission.
- VOC Detectors will be installed at various places to detect leak.

PREVENTIVE MAINTENANCE TO PREVENT LEAKAGES

In order to prevent leakage from pump, seals, valves etc, preventive maintenance shall be carried out periodically as per plan. Regular maintenance of valves, pumps, flanges, joints and other equipment will be done to prevent leakages and thus minimizing the fugitive emissions of VOCS.

SR. NO	Component	Preventive Maintenance

		Schedule
1	Pump seals with visible liquid dripping	Daily
2	Valves/flanges	Quarterly
3	Compressor seals	Quarterly
4	Pressure relief devices	Yearly
5	Pipeline thickness testing	Yearly

IMMEDIATE REPAIR OF DEVICES IN CASE OF LEAKAGES

- A regular preventive maintenance schedule will be in place to replace or rectify all gaskets and joints etc to ensure no fugitive emissions shall take place.
- Plant shall also maintain adequate number of spares and consumables required to repair the leaking device
- Plant shall also have competent contractor team to handle leakages and can repair the same immediately
- Standby equipments like pumps, valves etc shall be kept basis the criticality and usage
- Plant shall also have access equipments like boom lift to handle leakages at height immediately

10.13 ACTION PLAN FOR TRANSPORTATION OF RAW MATERIALS AND PRODUCTS

1. Every material (FG and or Raw material) container is with TREM CARD, Material Safety Data Sheet.
2. Container marked with Emergency Information Panel (includes Correct Technical Name, Class Label, UN NO, HAZCHEM, Emergency Dial, Specialist advice etc).
3. Container or Tank thoroughly hydraulically tested and test certificate are available with driver.
4. Only trained driver having valid driving license are allowed to carry out transportation of material.
5. Driver is allowed with attendant to enter inside or going outside from the company.
6. Driver and attendant well trained on Driving rules, Chemical Properties, Emergency Preparedness (Communication, Leakage spillage handling, Use of PPE, First-aid, Fire fighting measures, Toxic release measures).
7. Container is certified for road worthiness, PUC certificate.
8. Vehicle is equipped with fire-fighting equipment, first aid box, Toolbox, Antidotes, PPEs and Emergency Exit.
9. Conditions of Valves and fittings should be checked at security gate and proper corrective action will be taken in case of any abnormality.

Transportation of all the raw material and products shall primarily by road only. The raw material and products received delivered in Tanks, MS/HDPE/FIBRE drums, and cylinders as well as through tankers & containers and stores at ambient temperature. All the storage tanks of hazardous flammable substance are located within premises in separate storage area i.e. solvent farm area at ambient temperature. Solvents are stored in cool and dry place with all precautionary process instrumentation and safety appliance.

Large area covered by well-designed warehouse, which is containing store office, raw material store, finished product stores etc. In case of any abnormality reported to site regarding road accident, company's emergency response team will reach at the site and take proper corrective action and information of such incident will be provided to local police station and other government authority as per situation.

10.14. DETAILS OF CARBON FOOTPRINT AND CARBON SEQUSTRATION STUDY

Scope 1 Emissions

Direct GHG emissions

a) Fossil fuel emissions:

Fuel type	Fuel consumption	Total emissions (kg CO2 /year)	Total emissions (t CO2 /year)
LPG	143737 liter/year	223811.445	223.811
Furnace Oil	35770000 kg/year	16847670	16847.67
Total Category 1 emissions (t CO2 eq. /year)			**17071.481**

b) Biogenic emissions

Fuel type	Fuel consumption	Total emissions (kg CO2 /year)	Total emissions (t CO2 /year)
Briquette	91250000 kg/year	1241000	1241
Total Category 1 emissions (t CO2 eq. /year)			**1241**

Note: As per IPCC guidelines, biogenic emissions are excluded from direct emissions.

Scope 2 Emissions

Indirect GHG emissions due to purchased electricity

Category	Consumption (kWh/ year)	Total emissions (kg CO2 /year)	Total emissions (t CO2 /year)
Electricity	98112000	69659520	69659.520

Total Category 2 emissions (t CO2 /year)	**69659.520**

Scope 3 Emissions

Raw material transportation

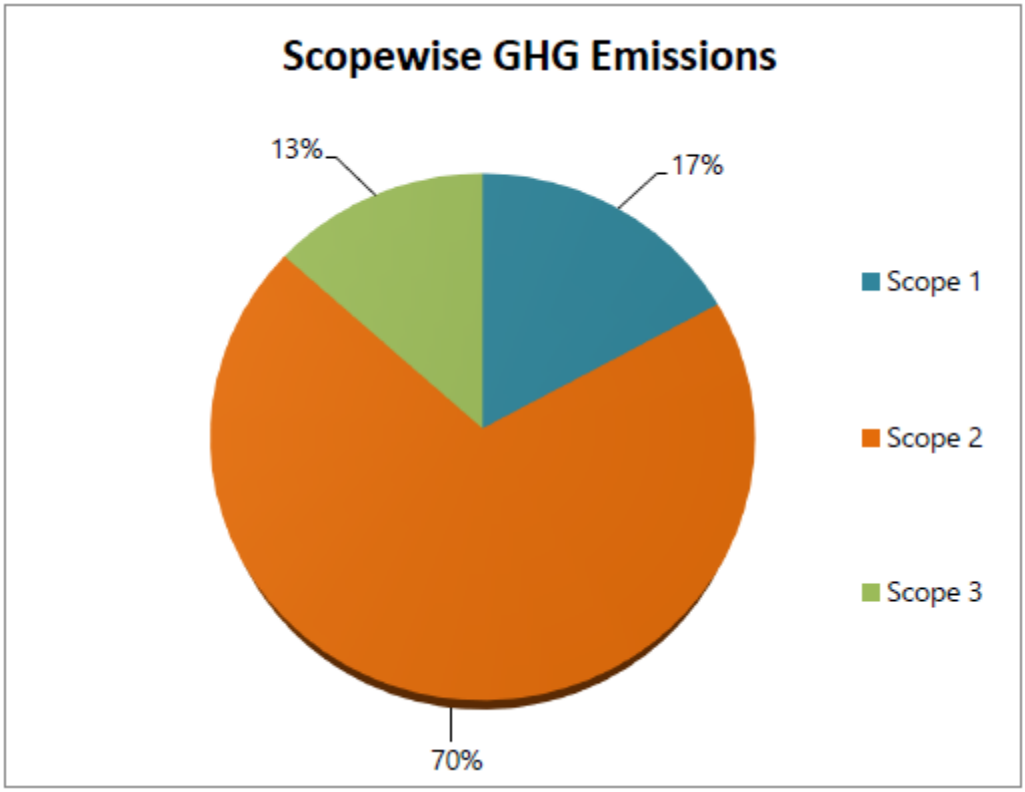
Material type	**Total emission (t CO2 /year)**
Raw materials Transportation	10457
Total emissions due to raw material transportation	**10457**

(b)Waste generation

Category	**Quantity (t/year)**	**Total emissions (t CO2 /year)**
Waste generated	130030	2768.85882
Emissions due to waste generation (t CO2 eq./year)		2768.85882

Category	**Emissions (t CO2 /year)**
Raw material Transportation	10457
Waste generated	2768.85882
Total Category 3 emissions (t CO2 eq. /year)	**13225.858**

Category	**Emissions (t CO2 /year)**
1	17071.481
2	69659.520
3	13225.858
Total Category 3 emissions (t CO2 eq. /year)	**99956.859**



The GHG reduction initiatives practiced is sequestration of carbon by tree plantation.

Carbon sequestration

Sr. no.	Common Name	Scientific Name
1.	Neem	*Azadirachta Indica*
2.	Silver Oak	*Grevillea robusta*
3.	Eucalyptus	Eucalyptus
4.	Pongamia	*Millettia*
5.	Gulmohor	*Delonix regia*
6.	Spathodia	*Spathodea campanulata*
7.	Ashoka	*Saraca asoca*
8.	Banyan	*Ficus benghalensis*
9.	Bamboo	*Bambusa*
10.	Peepal	*Ficus religiosa*
	Total	**17250**

The total carbon sequestered through trees (17250 trees) = **25791.892 t CO2 eq. /year**

Avoided emissions

Category	Quantity	Total emissions (t CO2 /year)
Rain water harvesting	1642 KL/year	0.246
Energy savings due to replacement by non-conventional light fittings and energy efficient motors	120000 kWh/ year	85.200

Total Avoided Emissions (t CO2 eq./year)	**85.446**

Total emissions reduction= carbon sequestration through tress + water conserved by rain water harvesting
Total emissions reduction= 25791.892 + 85.446 = **25877.338 t CO2 eq. /year**

Scope-wise Gross Emissions

Scope	Emissions (t CO2 eq./year)
1	17071.481
2	69659.520
3	13225.858
Total emissions (t CO2 eq. /year)	**99956.859**

Summarized Emissions Reduction

Total emissions reduction	25877.338 t CO2 eq. /year
Net emissions (gross emissions – emission reduction)	74079.521 t CO2 eq. /year
The emission reduction percentage	**25.888%**

Recommendations

1) More trees sequestering maximum carbon should be planted.

2) The use of renewable sources of electricity generation like solar plant, wind mill will help reduce the emissions.

3) Carbon footprint study should be done every year to track greenhouse gases emission and to set target of GHG gases reduction for next year

CHAPTER - 11
SUMMARY & CONLCUSION

11.1 INTRODUCTION

Chemplast Sanmar is over fifty years old and is a part of the SHL Chemicals Group, which in turn is a constituent of the Sanmar Group, one among the oldest and most prominent corporate groups in South India. It is a major manufacturer of Specialty Chemicals such as Specialty Paste PVC resin and Custom Manufactured Chemicals for agro-chemical, pharmaceutical and fine chemicals sector. The company also produces other chemicals such as Caustic Soda, Chlorochemicals, Hydrogen Peroxide, Refrigerant gas and Industrial Salt. The manufacturing facilities are located at Mettur, Berigai and Vedaranyam in Tamil Nadu and Karaikal in the Union Territory of Puducherry.

Chemplast Sanmar Limited, is a leading supplier of intermediates for global Agrochemical, Pharmaceutical and Fine Chemical innovators. These intermediates involve complex multi-step synthesis using unique chemistries.

The manufacturing facility is located at Berigai, Tamil Nadu.

Organic Chemicals

- Custom manufacturing of organic intermediates supplying into Pharmaceutical, Agrochemical and other fine chemical applications.
- Exclusive custom development and manufacturing of key intermediates
- Organic synthesis building blocks with capacity ranging from 100 kgs to 100's of MTPA

Phyto Chemicals

- Manufactures Active Pharmaceutical Ingredients (API) extracted from locally available biomass.
- Phyto Chemical APIs are sold globally to the Pharmaceutical industry.

11.2 PROJECT DESCRIPTION

M/s. Chemplast Sanmar Limited, Proposing expansion of Synthetic Organic Chemicals & Pesticide Specific Intermediates (From 1601.4 MT/Annum to 20031.4 MT/Annum) Manufacturing in Existing Unit at S.F No.5,7/1,2,3A,3B,8/1,2A,2B,9/1,2,3, 10/1,2,3A,3B,4,12/1A,1B,13/1,14/1A,2A, Suligunta Village, Berigai 635105. Shoolagiri Taluk, Krishnagiri District, Tamil Nadu, India.

For proposed expansion project; following assumptions have been considered:
The reason of applying in category A [5(b) & 5(f)] Environmental Clearance at MoEF & CC, New Delhi.

- Chemplast Sanmar Limited has proposed for the Pesticide Industrial Product [Sector-17; 5(b)],
- Unit is located outside Industrial estate, &
- Inter-state boundary was there within 10 Kms from the existing project site (i.e. Karnataka state boundary at 0.89 km from the project site)

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33%) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises. Total Requirement is 14000 KVA from State Electricity Department (13470 KVA-DG Set will be kept for emergency power back up). The Total water requirement is 1207.5 KL/Day. Out of that 207.5 KLD ground water for which NOC from CGWA/WRD available and remaining 1000 KLD applied to get from government water source. The total wastewater generation will be 705 KL/Day and will be segregated into two stream High COD Stream & Low COD stream. Solid/ hazardous wastes will be disposed as per Hazardous waste rules, 2016. Approximately 1350 people [Existing: 350 people + proposed: 1000 people] will be employed to local skilled and unskilled people based on qualification and requirement and preference will be given to local person for fulfilment of the manpower requirement.

11.3 PRODUCT AND CAPACITY

LIST OF PRODUCTS ALONG WITH THEIR PRODUCTION CAPACITY

S.No	PROPOSED PRODUCTS LIST FOR EC	CAS No.	LD50	As per Existing CTE (MTPA)	Additional (MTPA)	Total Proposed (MTPA)	Category
A	**PHYTO CHEMICALS**						
1	COLCHICINE	64-86-8	5.87 mg/kg	1.4	0	1.4	5(f)
2	THIOCOlCHICOSIDE	602-41-5	300 mg/kg				5(f)
B	**ORGANIC CHEMICALS**						
3	2-(1-CYLCOCHEXENY)LETHYLAMINE (CHEA)	3399-73-3	2.5 mg/kg	1600	18400	20000	5(f)
4	3-[1,3,3-TRIS-(2-CARBOXY-ETHYL)-2-OXO-CYCLOHEXYL]-PROPIONIC ACID (T4C)	5107-67-5	36 mg/kg				5(f)
5	SUBSTITUTED ARYL ALKYL AMINE	3625-06-7	1540 mg/kg				5(f)
6	2-AMINO-2-PHENYLBUTYRIC ACID SODIUM SALT /METHYL 2-(N,N-DIMETHYLAMINO)-2-PHENYLBUTYRATE (TR1600/TR1400)	94133-84-3 /39068-93-4	36 mg/kg				5(f)
7	4-CHOLO-BUTYL VERATRATE	69788-75-6	1540 mg/kg				5(f)

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8	4-(2-AMINOETHYL)-2-METHOXYPHENOL (AE PHENOL)	554-52-9	5000 mg/kg				5(f)
9	METHYL-2 PHENOXY ISOBUTYRATE	103-60-6	5000 mg/kg				5(f)
10	(4R)- 2- OXOOXAZOLIDINE - 4- CARBOXYLIC ACID (COX)	83841-00-3	5000 mg/kg				5(f)
11	4-t BUTYLPHENYLACETONITRILE	3288-99-1	236 mg/kg				5(f)
12	1-BROMO-3,5-DICHLOROBENZENE (DCBB)	19752-55-7	1070 mg/kg				5(f)
13	4-CHLORO-2-NITRO BENZOIC ACID	6280-88-2	71 mg/kg				5(f)
14	4-BROMO PHENYL PROPANOL (BPP)	25574-11-2	1020 mg/kg				5(f)
15	2-CHLORO-5-CHLOROMETHYL-1,3-THIAZOLE (CCMT)	105827-91-6	1020 mg/kg				5(f)
16	TETRACHLORO BUTYRIC ACID (TCBA)	97055-35-1	2940 mg/kg				5(f)
17	IONOPHOR	133338-85-9	88 mg/kg				5(f)
18	4-BROMO-2-FLUORO HYDROXY BIPHENYL (BFB)	41604-19-7	1540 mg/kg				5(f)
19	PARA METHYL PHENCYL CHLORIDE (PMPC)	2196-99-8	8750 mg/kg				5(f)
20	SODIUM 4-(2,4-DICHLOR M-TOLUOYL)-1,3-DI METHYL -5-PYRAZOLATE (MY710Na)	172343-40-7	8750 mg/kg				5(f)

21	2-TRIFLUOROMETHYL BENZENE SULFONAMIDE (TBSA)	1869-24-5	180 mg/kg				5(f)
22	METHYL CARBAZATE	6294-89-9	5000 mg/kg				5(f)
23	TETRALONE IMINE	79560-20-6	810 mg/kg				5(f)
24	4-[2(4-CHLORO-2,6-DIMETHYLPHENYL)ACETTYL] METHYLAMINO]-1-METHOXY-N-PHENYLPIPERIDIN-4-CARBOXAMIDE (DIAMIDE)	1644459-63-1	5000 mg/kg				5(f)
25	3(2,2,2-TRIFLUOROETOXY)2-PYRIDINE SULFONAMIDE SODIUM SALT (SULFONAMIDE)	227605-94-9	5000 mg/kg				5(f)
26	5-CHLORO-8-HYDROXY-QUINOLINE (CHQ)	130-16-5	5000 mg/kg				5(f)
27	PHENYLGUANIDINE CARBONATE (PGC)	14018-90-7	1000 mg/kg				5(f)
28	FE (III) ACETYL ACETANOATE	14024-18-1	1872 mg/kg				5(f)
29	MANGANESE(II)HEXACYANO MANGANATE(II)SODIUM SALT (ANODE)	Not available	1020 mg/kg				5(f)

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30	IRON(II)MANGANESE(II) HEXACYANOFERRATE(II) SODIUM SALT TETRADECAHYDRATE (CATHODE)	Not available	1020 mg/kg				5(f)
31	1-CHLORO-3-NITROBENZENE	121-73-3	1000 mg/kg	0			5(f)
32	2,4,6- TRICHLORO ANILINE	634-93-5	1000 mg/kg				5(f)
33	PIVALOYL CHLORIDE	3282-30-2	5000 mg/kg				5(f)
34	5-CHLORO VALEROYL CHLORIDE	1575-61-7	1000 mg/kg				5(f)
35	4-FLUORO PHENYL ACETIC ACID	405-50-5	5000 mg/kg				5(f)
36	4-BROMO FLUOROBENZENE	460-00-4	2700 mg/kg				5(f)
37	3-FLUOROTOLUENE	352-70-5	7000 mg /kg				5(f)
38	4-FLUOROTOLUENE	352-32-9	7000 mg /kg				5(f)
39	ORTHO NITRO ANISOLE	91-23-6	2000 mg/kg				5(f)
40	PARA NITRO ANISOLE	100-17-4	2300 mg/kg				5(f)
41	O-CHLORO P-NITRO TOLUENE	121-86-8	1400 mg/kg				5(f)
42	3-AMINO- 4- METHYL BENZOIC ACID METHYL ESTER	40872-87-5	1700 mg/kg				5(f)
43	3-AMINO 4-METHYL BENZOIC ACID ISOPROPYL ESTER	21447-47-2	2000 mg/kg				5(f)

44	5-AMINO-2-METHYL BENZENE SULPHONIC ACID PHENYL ESTER	1089339-15-0	1400 mg/kg				5(f)
45	(3-AMINOPHENYL) BENZENESULFONATE	26408-93-5	1400 mg/kg				5(f)
46	4 -AMINO BENZOIC ACID METHYL ESTER	619-45-4	1700 mg/kg				5(f)
47	2-FLUOROANISOLE	321-21-8	3700 mg/kg				5(f)
48	4-FLUOROANISOLE	459-60-9	3700 mg/kg				5(f)
49	2-PHENOXYETHYLAMINE	1758-46-9	800 mg/kg				5(f)
50	SPIROPIDION (TINIVION)	1229023-00-0	1000 mg/kg				5(b)
51	4-AMINO BENZAMIDE	2835-68-9	1500 mg/kg				5(f)
52	P-TOLUIDINE	106-49-0	1400 mg/kg				5(f)
53	M-ANISIDINE	536-90-3	1400 mg/kg				5(f)
54	4-CHLORO,2 AMINO PHENOL (4-CAP)	95-85-2	1400 mg/kg				5(f)
55	HYDROXY ESTER (HES)	27513-35-5	1400 mg/kg				5(f)
56	PARA CHLORO PHENYL GLYCINE (PCPG)	6212-33-5	1400 mg/kg				5(f)
57	DICHLOROFLUOROBROMO BENZENE (DCFBB)	17318-08-0	1400 mg/kg				5(f)
58	4-ACETYL-2-METHYL BENZOIC ACID (AMBA)	55860-35-0	1400 mg/kg				5(f)
C	**R&D PRODUCTS**						
	R&D and Pilot scale Products	--	--	00	30	30	--
	Total			**1601.4**	**18430**	**20031.4**	

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D	BY-PRODUCTS						
1	Dil. Hydrochloric Acid	--	--	1050	12090	13140	--
2	Dil. Sulphuric Acid	--	--	750	8630	9380	--
3	Dil. Acetic acid	--	--	00	22000	22000	--
4	Potassium salt	--	--	00	11400	11400	--

11.4 DESCRIPTION OF THE ENVIRONMENT

BASELINE ENVIRONMENTAL STATUS

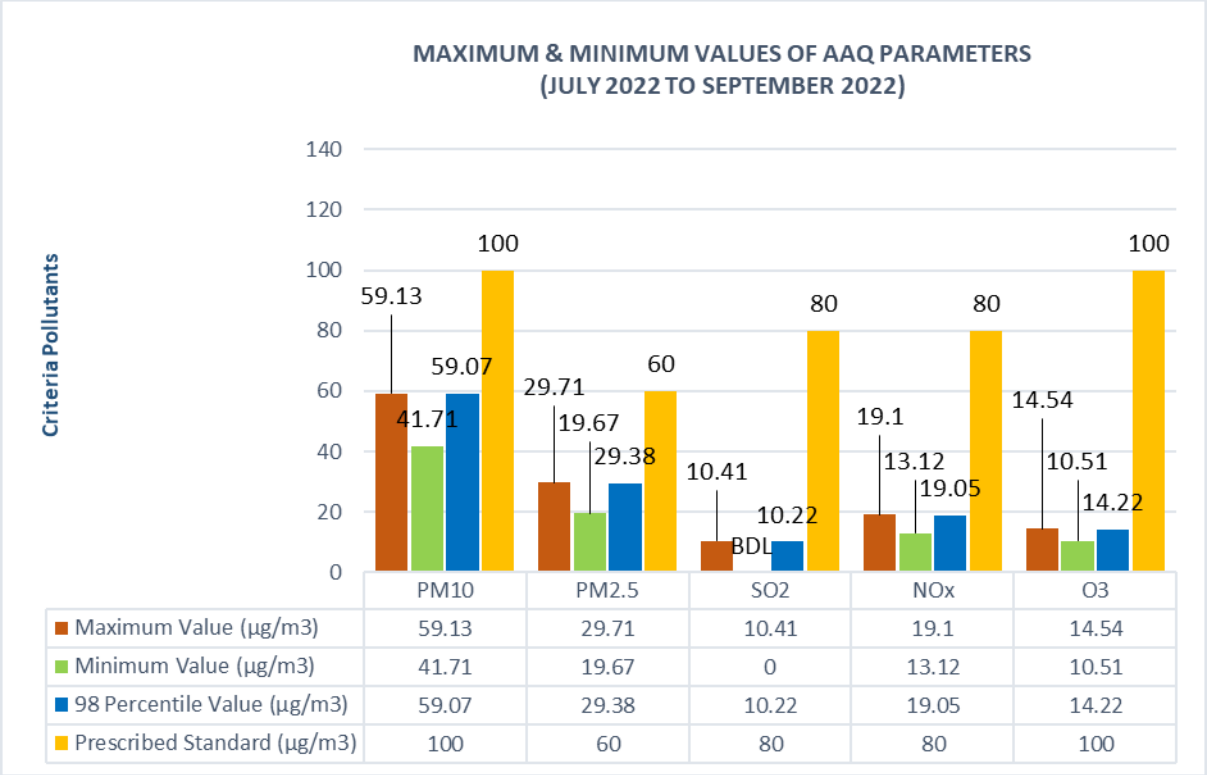
The baseline environmental quality has been assessed in the Pre-Monsoon Season, 2022 (1st July, 2022 to 30th September, 2022) in a study area of 10 km radial distance from the project site.

AIR ENVIRONMENT

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. The ambient air samples were collected and analyzed for Suspended Particulate Matter, Respirable Suspended Particulate Matter (RSPM-PM_{10}), Respirable Suspended Particulate Matter (RSPM-$PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen dioxide (NOx), Ammonia (NH_3), Ozone (O_3), Lead (Pb), Benzene (C_6H_6), Benzo (α) Pyrene (BaP), Hydro Carbon (HC), Arsenic (As), Nickel (Ni), & Carbon Monoxide (CO) were monitored at site and nearby villages for identification, prediction, evaluation and assessment of potential impact on ambient air environment.

SUMMARY

- During the study **SPM** concentration was observed in the range of 75.08 – 118.20 µg/m^3. Maximum concentration of **SPM** was found at **Project Site (118.20 µg/m^3)**.
- During the study **$PM_{10.0}$** concentration was observed in the range of 41.71 – 62.21 µg/m^3. Maximum concentration of **$PM_{10.0}$** was found at **Project Site (62.21 µg/m^3),** which is well within the standard limit.
- During the study **$PM_{2.5}$** concentration was observed in the range of 19.67 – 29.21 µg/m^3. Maximum concentration of **$PM_{2.5}$** was found at **Project Site (29.21µg/m^3)**, which is well within the standard limit.
- During the study **SO_2** concentration was observed in the range of BDL – 10.41 µg/m^3. Maximum concentration of **SO_2** was found at **Project Site & Suligunta (10.41 µg/m^3)**, which is well within the standard limit.
- During the study **NO_x** concentration was observed in the range of 13.12 – 19.10 µg/m^3. Maximum concentration of **NO_x** was found at **Suligunta (19.10 µg/m^3)**, which is well within the standard limit.
- During the study **O_3** concentration was observed in the range of 10.51 – 14.54 µg/m^3. Maximum concentration of **O_3** was found at **Suligunta (14.54 µg/m^3)**, which is well within the standard limit.



	PM10	PM2.5	SO2	NOx	O3
Maximum Value (µg/m3)	59.13	29.71	10.41	19.1	14.54
Minimum Value (µg/m3)	41.71	19.67	0	13.12	10.51
98 Percentile Value (µg/m3)	59.07	29.38	10.22	19.05	14.22
Prescribed Standard (µg/m3)	100	60	80	80	100

The PM10 and PM2.5 concentrations at all the AAQM locations were primarily caused by local phenomena including industrial & vehicular activities and natural dust getting air borne due to manmade activities and blowing wind. PM10 and PM2.5 concentrations were observed below stipulated standards of National Ambient Air Quality Standards (NAAQS) of CPCB for Residential & Other Area at all air quality monitoring locations during the monitoring period. Results of all parameters are found within limit. In Mahadevpuram, Anikarahalli & Kullur villages, SO_2 values wew found below detection limit of 5 µg/m3. These villages are free remote area and there is no source for SO_2 pollution.

WATER ENVIRONMENT

11 nos. of ground water and 2 nos. of surface water samples were collected from the study area. These samples were analyzed for physic-chemical parameters to ascertain the baseline status in the existing surface water and ground water bodies. Samples were collected during July, 2022 to September, 2022and analyzed as per the Standard Methods of Water.

BASELINE GROUND WATER QUALITY

- **pH** of Ground water samples varied from 7.22 to 7.63 Maximum **pH** was found at **Suggondahalli (7.63)** , which is well within the standard limit.
- **Total Dissolved Solids** was varied in range of 578 to 1012 mg/L. Maximum **Total Dissolved Solids** was found at **Mahadevapuram (1012 mg/L)**, which is well within the standard limit.
- **Total Suspended Solids** was found <2 mg/L.

- **DO** was varied in range of 5.4 to 5.7 mg/L. Maximum **DO** was found at **Kurubarapalli and Kullur (5.7 mg/L)**.
- **COD** was varied in range of <4 to 8 mg/L. Maximum **COD** was found at **Suligunta and Midithepalli (8 mg/L)**.
- **Total Hardness (as CaCO3)** was varied in the range of from 270 to 470 mg/L. Maximum **Total Hardness** was found at **Mahadevapuram (470 mg/L)**, which is well within the standard limit.
- **Total Alkalinity** was varied in the range of from 290 to 440 mg/L. **Total Alkalinity** was found at **Mahadevapuram (440 mg/L)**, which is well within the standard limit.
- **Chlorides** were varied in the range of 147 to 254 mg/L. Maximum **Chlorides** was found at **Mahadevapuram (254 mg/L)**, which is well within the standard limit.

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Desirable Limit	Maximum Permissible Limit
1.	pH	pH Scale	7.63	7.22	6.5-8.5	No Relaxation
2.	Total Dissolved Solids	mg/l	1012	578	500	2000
3.	Total Suspended Solids	mg/l	<2	<2	--	--
4.	Total Hardness	mg/l	470	270	200	600
5.	Fluoride	mg/l	0.63	0.36	1	1.5
6.	Chlorides	mg/l	254	147	250	1000
7.	Zinc	mg/l	0.14	0.03	5	15
8.	Total Alkalinity	mg/l	440	290	200	600

BASELINE SURFACE WATER QUALITY

- pH of Surface water samples varied from 7.81 to 8.07. Maximum **pH** was found at **Berigai Lake (8.07)**, which is well within the standard limit.
- DO was varied in range of 5.3 to 5.6 mg/L. Maximum **DO** was found at **Berigai Lake (5.6 mg/L)**.
- COD was varied in range of 21 to 24 mg/L. Maximum **COD** was found at **Pond near Gandlaalli Sri Thimmaraya Swamy Temple (24 mg/L)**.
- **BOD_3[27]** was varied in range of 3.3 to 3.6. Maximum **BOD_3[27]** was found at **Pond near Gandlaalli Sri Thimmaraya Swamy Temple (3.6 mg/L)**.

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value	Classification of inland water body
1.	pH	pH Scale	8.07	7.81	A

2.	DO	mg/l	5.6	5.3	A
3.	COD	mg/l	24	21	--
4.	BOD	mg/l	3.6	3.3	B
5.	Total Dissolved Solids	mg/l	424	356	--
6.	Total Suspended Solids	mg/l	6	4	--
7	Total Hardness	mg/l	180	130	--
8	Fluoride	mg/l	0.27	0.23	--
9	Chlorides	mg/l	127	96	--
10	Zinc	mg/l	0.16	0.14	--
11	Total Alkalinity	mg/l	160	152	--
12	Total Coliform	MPN/100ml	2	<2	--

INTERPRETATION:

Ground Water Quality: Based on comparison study with drinking water standards, it is interpreted that water samples collected from the villages should not be directly used in drinking but can be used in other domestic purposes like washing, bathing and irrigation. Ground water is fit for use as domestic purpose after basic filtration and disinfection treatment.

It can be observed that ground water qualities in terms of various desirable characteristics are found within the limits specified by IS 10500:2012.

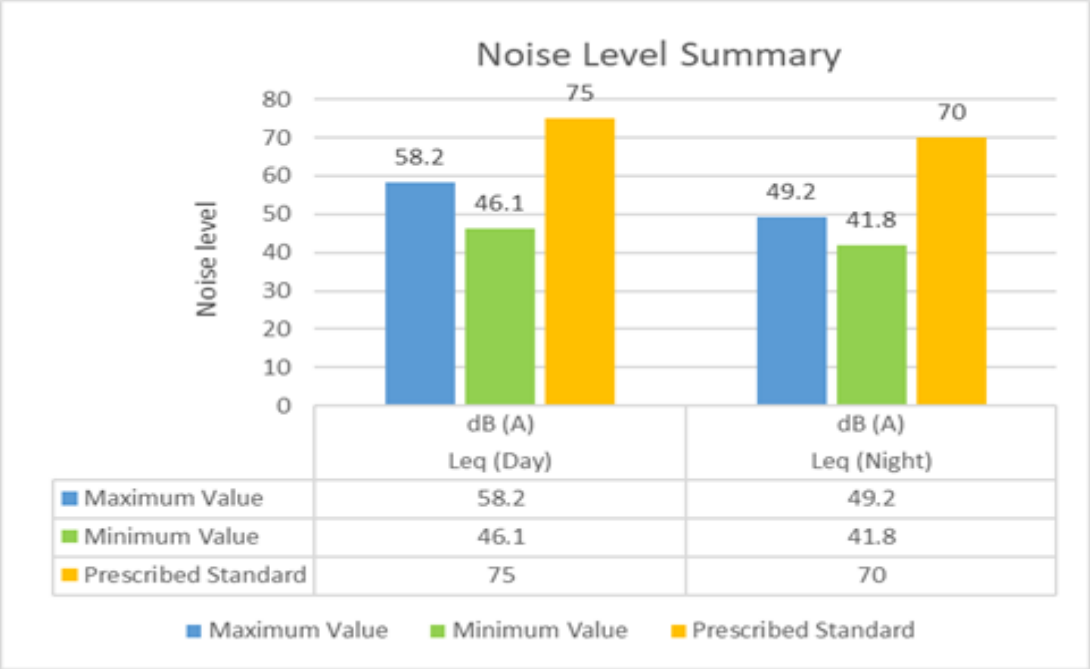
Surface Water Quality: There is one lake and one pond considered in the study area. However, these water is not used for domestic/industrial activities; as the raw water is available through pipelines of local authorities. These water sources cannot be utilized for drinking but the water of these pond & lake can be used in irrigation.

NOISE ENVIRONMENT

The noise monitoring was carried out at 11 locations in day time during (6 am to 9 pm) and at night time (9 pm to 6 am) in the study area covering all the areas i.e. industrial and residential as mentioned in Noise (Pollution and Control) Rules, 2000. Hourly Equivalent noise levels Leq (day) and Leq (night) were measured at each monitoring locations.

NOISE SUMMARY

During the study of noise monitoring level was observed during day time is the range of 46.1 - 58.2 dB (A) & during night time 41.8 – 49.2 dB (A). Maximum noise level in day time in night time was found at Project Site (58.2 dB (A)) & (49.2 dB (A)) respectively.



Based on noise level data obtained during the survey, Noise level varied at some place at different times due to fluctuations in traffic movements as well as in residential due to nearest Industrial / commercial and domestic activities going on in the study area. It is interpreted that noise levels of Project site and all villages are within the standard norms prescribed by MoEF&CC.

LAND ENVIRONMENT

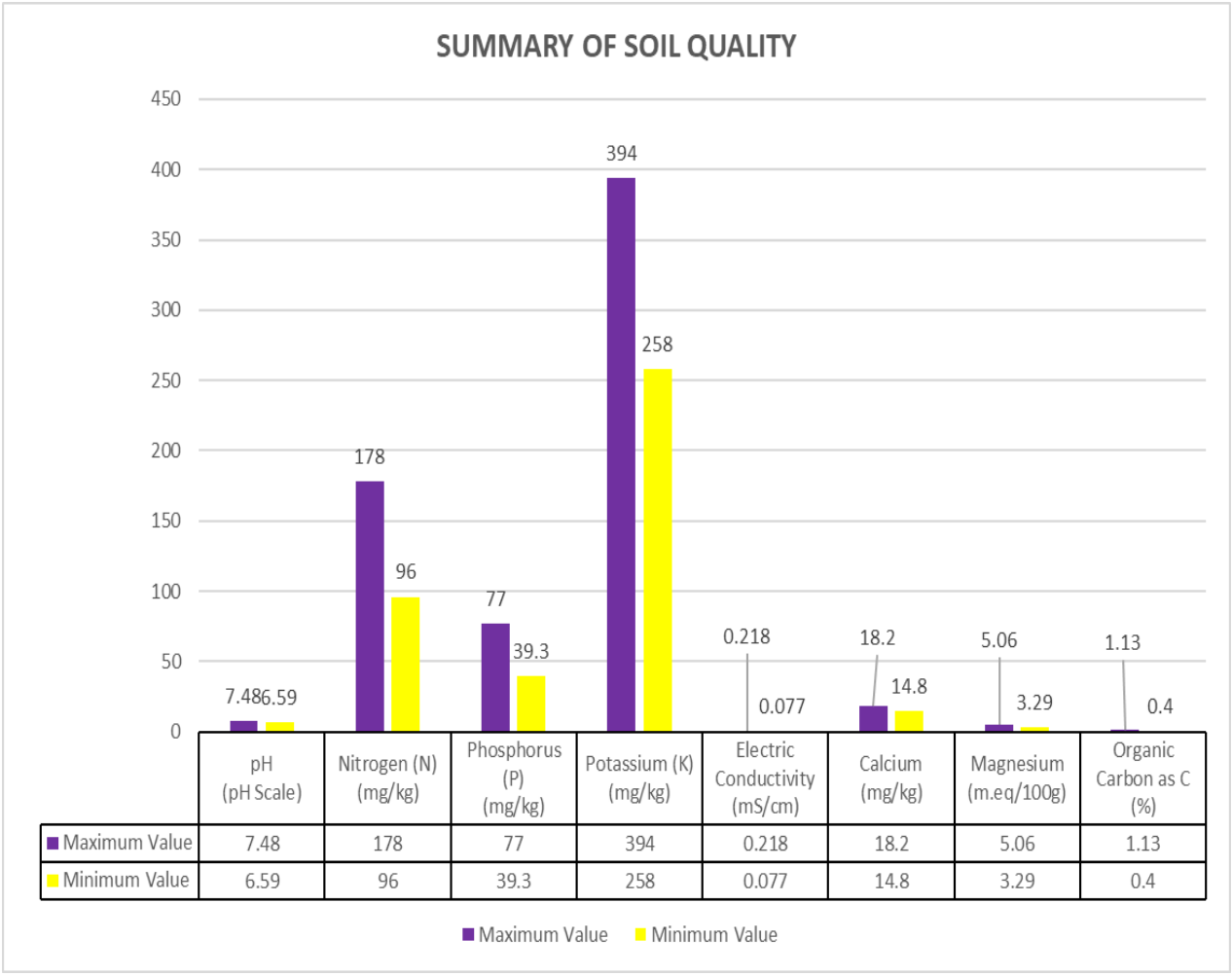
Soil samples were collected from eleven locations during 1st July, 2022 To 30th September, 2022 within the study area to assess its physico-chemical characteristics.

- **pH** of samples varied from **6.59 to 7.48.** Maximum pH was found at **Pannapalli (Menandoddi) (7.48).**
- **Nitrogen (N)** was varied in range of **96 to 178 mg/kg**. Maximum Nitrogen (N) was found at **Berigai (178 mg/kg).**
- **Phosphorus (P)** was varied in range of **39.3 to 77 mg/kg**. Maximum Phosphorus (P) was found at **Eluvapalli (77 mg/kg).**
- **Potassium (K)** was varied in range of **258 to 394 mg/kg**. Maximum Potassium (K) was found at **Eluvapalli (394 mg/kg).**
- **Electric Conductivity** was varied in range of **0.077 to 0.218 mS/cm**. Maximum Electric Conductivity was found at **Kurubarapalli (0.218 mS/cm).**
- Calcium of samples varied from **14.8-18.2 mg/kg**. Maximum Calcium was found at **Project Site (18.2 mg/kg).**

- Magnesium of samples varied from **3.29-5.06 m.eq/100g.** Maximum Magnesium was found at **Kullur (5.06 m.eq/100g).**
- Organic Carbon as C of samples varied from **0.40-1.13%.** Maximum Organic Carbon as C was found at **Kullur (1.13%).**

Based on the soil analysis report, the following can be concluded:

Sr. No.	Criteria Pollutants	Unit	Maximum Value	Minimum Value
1.	pH	pH Scale	7.48	6.59
2.	Nitrogen (N)	mg/Kg	178	96
3.	Phosphorus (P)	mg/Kg	77	39.3
4.	Potassium (K)	mg/Kg	394	258
5.	Electric Conductivity	mS/cm	0.218	0.077
6.	Calcium	mg/kg	18.2	14.8
7.	Magnesium	m.eq/100g	5.06	3.29
8.	Organic Carbon as C	%	1.13	0.40



11.5 WATER REQUIREMENT, WASTE WATER GENERATION AND TREATMENT

- The Total water requirement will be 1207 KL/Day. Out of that 207 KLD ground water for which NOC from CGWA available and remaining 1000 KLD applied to get from government water source.
- The total wastewater generation will be 705 KL/Day. Industrial process wastewater = 600 KL/Day + washing = 75 KL/Day + Boiler/cooling = 30 KL/Day).and will be segregated into two stream High COD Stream & Low COD stream.
  - **Low COD stream:** Low COD effluent (105 KL/Day) will be treated through the conventional wastewater treatment system and the pass through RO system.
  - **High TDS Stream:** Neutralized concentrate effluent (600 KL/Day) and rejects from RO (225 KL/Day) will be evaporated in multi effective evaporator (MEE). The treated wastewater will be totally recycled and the solid waste generated will be disposed to TSDF (Common disposal Facility).
  - Domestic wastewater (100 KL/Day) will send to STP and Reuse in domestic and gardening purpose after treatment.

11.6 AIR POLLUTION SOURCE AND CONTROL MANAGEMENT

FLUE GAS EMISSION RATE EMISSION FROM EACH UTILITY

SR. no.	Source of emission With Capacity	Stack Height (meter)	Name of the fuel	Quantity of Fuel MT/hr & MT/Day	Type of emissions i.e. Air Pollutants	APCM
EXISTING						
1	Boiler-1 (9 TPH)	40	Furnace Oil	8 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector ,Stack
2	D.G set (600 KVA	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
3	D.G set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
4	D.G set (750 KVA)	12	HSD	90lit/Hr	SOX,NOX,SPM,CO	Stack
5	DG (320 KVA)	9.8	HSD	40 lit/Hr	SOX,NOX,SPM,CO	Stack
6	D.G Set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
7	D.G Set (600 KVA)	12	HSD	80lit/Hr	SOX,NOX,SPM,CO	Stack
8	Thermic Fluid Heater 1 Lakh Kcal/Hr	9	HSD	20 lit/hr	SOX,NOX,SPM,CO	Stack
9	Thermic Fluid Heater 1 Lakh Kcal/Hr	9	HSD	20 lit/hr	SOX,NOX,SPM,CO	Stack
PROPOSED						

10	Boiler-1 (25 TPH)	40	Briquettes	125 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack & ESP with water scrubber
11	Boiler-1 (25 TPH)	40	Briquettes	125 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack & ESP with water scrubber
12	Boiler-1 (25 TPH)	40	Furnace Oil	45 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack
13	Boiler-1 (25 TPH)	40	Furnace Oil	45 MT/Day	SOX,NOX,SPM,CO	Mechanical Dust collector, Stack
14	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
15	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
16	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
17	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
18	DG set -2000KVA	30	HSD	400 lit/hr/ DG set	SOX,NOX,SPM,CO	Stack
19	Thermic Fluid Heater 2 Lakh Kcal/Hr	9	HSD	40 lit/hr	SOX,NOX,SPM,CO	Stack
20	Thermic Fluid Heater 2 Lakh Kcal/Hr	9	HSD	40 lit/hr	SOX,NOX,SPM,CO	Stack

(Note: In proposed expansion, initially company will install Briquettes Boiler-25 TPH. On continuation of the expansion phases, company will install either Briquettes / FO boiler based on the Briquettes resource availability)

DETAILS OF PROCESS VENT

Sr. no.	Source of emission	Type of emission	Stack/Vent Height (meter)	APCM
EXISTING				
1	Scrubber at Plant - I	SO_X,NO_X,CO	6.1	Wet Alkali Scrubber,Stack
2	Scrubber at Plant -II	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
3	Scrubber at Plant - II	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
4	Scrubber at Plant - II	SO_X,NO_X,CO	15	Wet Alkali Scrubber,Stack
5	Absorber at Plant - I	SO_X,NO_X,CO	4	Wet Alkali Scrubber,Stack
6	Scrubber at R & D plant	SO_X,NO_X,CO	12	Wet Alkali Scrubber,Stack
7	Phyto Plant Scrubber(Process)	SO_X,NO_X,CO	19	Wet Alkali Scrubber,Stack
8	Scrubber at Plant - II	SO_X,NO_X,CO	15	Wet Alkali Scrubber,Stack
9	Scrubber at Pilot Plant	SO_X,NO_X,CO	6.1	Wet Alkali Scrubber,Stack
10	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
11	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
12	Scrubber at plant IV	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
13	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
14	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
15	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
16	Scrubber at Plant - V	SO_X,NO_X,CO	17	Wet scrubber with stack
PROPOSED				
17	Scrubber -1	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
18	Scrubber -2	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
19	Scrubber -3	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
20	Scrubber -4	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
21	Scrubber -5	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
22	Scrubber -6	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
23	Scrubber -7	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
24	Scrubber -8	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
25	Scrubber -9	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
26	Scrubber -10	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
27	Scrubber -11	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
28	Scrubber -12	SO_X,NO_X,CO	17	Wet Alkali Scrubber,Stack
29	Scrubber -13	SO_X,NO_X,CO	17	Wet scrubber with stack
30	Scrubber -14	SO_X,NO_X,CO	17	Wet scrubber with stack
31	Scrubber -15	SO_X,NO_X,CO	17	Wet scrubber with stack
32	Scrubber -16	SO_X,NO_X,CO	17	Wet scrubber with stack
33	Scrubber -17	SO_X,NO_X,CO	17	Wet scrubber with stack
34	Scrubber -18	SO_X,NO_X,CO	17	Wet scrubber with stack
35	Scrubber -19	SO_X,NO_X,CO	17	Wet scrubber with stack
36	Scrubber -20	SO_X,NO_X,CO	17	Wet scrubber with stack

37	Scrubber -21	SO_X,NO_X,CO	17	Wet scrubber with stack
38	Scrubber -22	SO_X,NO_X,CO	17	Wet scrubber with stack
39	Scrubber -23	SO_X,NO_X,CO	17	Wet scrubber with stack
40	Scrubber -24	SO_X,NO_X,CO	17	Wet scrubber with stack
41	Scrubber -25	SO_X,NO_X,CO	17	Wet scrubber with stack

11.7 HAZARDOUS WASTE

11 Categories of Hazardous/Solid Wastes shall be generated from this Unit.

Sr. No	Name of Waste	Source of Generation	Cat No.	Existing Quantity (MT/Year)	Total Proposed Quantity (MT/Year)	Disposal Method
1.	Empty barrels/ containers/liners contaminated with hazardous chemicals /wastes	Storage & handling of Raw Materials	Sch-I/ 33.1	40	500	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
2.	Used / Spent Oil	Equipment & Machineries	Sch-I/ 5.1	10	200	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
3.	Chemical sludge from waste water treatment	In-house ETP & MEE	Sch-I/ 35.3	2500	43000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
4.	Spent solvents	Process	Sch-I/ 28.6	350	20000	Collection, Storage, Transportation, Decontamination & Disposal to TNPCB Authorized Recyclers (Recyclable)
5.	Distillation residues	Process	Sch-I/20.3	20	4000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.

6.	Contaminated aromatic, aliphatic or naphthenic solvents may fit for reuse		Sch-I/20.1	6	10000	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016
7.	Spent catalyst	Process	Sch-I/28.2	1	40	Collection, Storage, Transportation for Regeneration, Recovery and Reuse. (Recyclable)
8.	Contaminated cotton rags or other cleaning materials		Sch-I/ 33.2	2	40	Collection, Storage, Transportation & disposal to Common TSDF site by following protocol of Hazardous Waste Rule – 2016.
9.	Spent Carbon or Filter medium	Process	Sch-I/ 36.2	NA	4000	Collection, Storage, Transportation & disposal to Common TSDF site / Co-processor by following protocol of Hazardous Waste Rule – 2016.
10.	Process Residue and wastes	Process	Sch-I/ 28.1	NA	30000	Collection, Storage, Transportation & disposal to Co-processor by following protocol of Hazardous Waste Rule – 2016.
Non Hazardous waste						
11.	Fly Ash	Utility	--	--	18250	Collection, Storage, Transportation and sent for brick manufacturer and/or in cement industries.

11.8 GREEN BELT

Total 16.64 Hectares land area is available at site; out of this area about 5.34 Hectares (33%) area is covered as greenbelt. The company has planted total 16250 nos. of trees for green belt within the plant premises. Company will plant additional 1000 Nos. of trees (in 0.54 Hectares area) for green belt (3.33 %) within the plant premises.

11.9 POWER REQUIREMENTS & FUEL REQUIREMENT

Power Requirement:

Sr. No.	Description	Existing Requirement (KVA)	Proposed Requirement (KVA)	Total Requirement (KVA
1	State Electricity Department	2000	12000	14000
2	D.G. Set	3470	10000 (5 x 2000 kVA)	13470

Fuel Requirement:

Sl. No.	Type of Fuel	Existing (MT/day)	Proposed (MT/day)	Total (MT/day)
1	Furnace Oil	8	90	98
2	Briquettes	00	250	250
3	HSD	1.7	20.3	22
4	LPG	0.008	0.192	0.20

Note: DG Set will be kept for emergency power back up.

11.10 DETAILS OF HAZARDOUS CHEMICALS STORAGE

The detail of Hazardous Chemical Storage & Handling is as under…

Sr. No.	Name of the Material	Type of Hazard	Kind of Storage	Max. quantity to be stored (MT)	Storage condition i.e. temp., pressure	Tank Dimensions in (m)	Dyke Dimensions
1	Acrylonitrile	Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
2	Acetic Acid	corrosive	Carboys	1MT	25 TO 35 C	NA	Hx34cm Wx13cm
3	Ammonia Gas	toxic	Cylinder	0.1 MT	-20 to -60 C	NA	NA
4	Acetonitrile	Toxic &Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
5	Acetone	Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx38c Wx24cm
6	Acetyl Chloride	Corrosive	MS Drums	0.50 MT	25 TO 35 C	NA	Hx34cm

							Wx13cm
7	Aluminum chloride	Corrosive	Plastic Drums	0.50 MT	25 TO 35 C	NA	Hx34cm Wx13cm
8	Ammonium carbonate	Irritation	Bags	10 MT	25 TO 35 C	NA	NA
9	Ammonium Chloride	Irritation	Bags	0.25MT	25 TO 35 C	NA	Hx34cm Wx13cm
10	Caustic Soda	Severe Burns	Bags	10 MT	25 TO 35 C	NA	NA
11	Caustic soda lye	Severe Burns	Tank	23 MT	25 TO 35 C	Wx254 CM HX200 CM	WX500CM LX515CM HX80 CM
12	Cyano acetic acid	Severe Burns	Carboy	0.25MT	25 TO 35 C	NA	Hx34cm Wx13cm
13	Chloroform	Toxic &Fire	Plastic Drums	3 MT	25 TO 35 C	NA	Hx38cm Wx24cm
14	Cyclohexanone	Fire	MS Drums	4 MT	25 TO 35 c	NA	Hx38cm Wx24cm
15	Diesel	Fire	Tank	32 MT (35 KL and 15 KL capacity *Total 2 Nos tank)	25 TO 35 C	WX258CM HX 460 CM 2.HX420CM	WX500CM LX515 CM HX 80CM
16	Formic Acid	Irritation	Carboy	0.1 MT	25 TO 35 C	NA	Hx34cm Wx13cm
17	Hexane	Toxic &Fire	MS Drums	0.50 MT	25 TO 35 C	NA	Hx38cm Wx24cm
18	Hydro chloric	Corrosive	Tank	53 MT	25 TO 35 C	WX25	WX500CM

	acid			(30 KL capacity *2 Nos)		8CM HX 460 CM 2.HX4 20CM	LX515 CM HX 80CM
19	Isopropyl Alcohol	Toxic &Fire	MS Drums	1.8 MT	25 TO 35 C	NA	Hx34cm Wx13cm
20	Hydrogen gas	Extremely Flammable	Truck (Cylinder & manifold)	120 Cubic meter 3* 2 No of truck	25 TO 35 C	NA	NA
21	Methanol	Toxic &Fire	Tank	50 MT	25 TO 35 C	WX26 4CM HX400 CM	WX445CM LX590CM HX80CM
22	Potassium Hydroxide Flakes	Irritation	Bags	0.50 MT	25 TO 35 C	NA	NA
23	Phenol	Toxic &Fire	MS Drums	5 MT	25 TO 35 C	NA	Hx34cm Wx13cm
24	Sodium Cyanide	Highly Toxic	MS Drums	25.MT	25 TO 35 c	NA	NA
25	Sulphuric acid	Corrosive	Tank	50MT	25 TO 35 C	LX380 CM HX 250C M	LX1240CM WX560 CM HX60CM
26	Ethylene oxide	Flammable &Toxic	Cylinder	0.03 MT	25 °C ML- 0 °C	NA	NA
27	Thionyl Chloride	Corrosive	MS Drums	10 MT	25 TO 35 C	NA	Hx34cm Wx13cm

28	Toluene	Toxic &Fire	Tank	20 MT	25 TO 35 C	WX254CM HX300 CM	WX445CM LX590CM HX80CM
29	Chlorine Gas	Toxic	Cylinder	0.05 MT	-15 to -34 C at 11 kg/cm^2	NA	NA
30	Bromine	Toxic	Cylinder	0.05 MT	-30 to -60 C at 6 kg/cm^2	NA	NA
31	Nitric acid	Corrosive	Carboy	0.5 MT	25 TO 35 C	NA	Hx34cm Wx13cm

11.11 CAPITAL AND RECURRING COST EARMARKED FOR ENVIRONMENTAL PROTECTION MEASURES

Total capital investment for the project will be Rs. 2292.398 Crores [Existing: 292.398 Crore + Proposed: 2000 Crore]. Capital cost of air & water pollution control system and environmental monitoring equipments will be Rs. 118.482 Crores.

Environment Issue/ Component	Component	Capital Cost of EMP (In lacs)	Recurring Cost of EMP (In lacs)
Hazardous waste generation & disposal	Cost of TSDF/CHWIF membership letter, Construction of Hazardous waste storage yard,Cost for TSDF disposal & Cost for incineration disposal	175	6400
Effluent generation and treatment	Cost of RO,Construction Cost of MEE,Construction cost of ETP	6500	2200
Details of Air Emission	Cost of dust collector during construction,Cost of ESP with bag filter, Cost of stack installation, Cost of scrubber, Cost of LADR, Cost of maintenance of APCM System	4000	12
Plantation	Cost of tree plantation & Cost of maintenance	20	10
Monitoring of Environmental parameters	Cost of monitoring of various environmental parameters	--	20
Noise	--	3.2	3
Occupational Health and safety precaution	Cost of PPE, Oxygen cylinder, & Antidote(OHC), Imparting safety, training to employees, Cost of safety measures	50	10
Fire & Safety	Cost of Fire Hydrant System, Cost of fire extinguisher & Cost of fire proximity suites	600	10
CER Activity		500	--
Total		**11848.2**	**8665**

11.12 CONCLUSION

The EIA study of **M/s. Chemplast Sanmar Limited** has been carried out with respect to the Std. TORs awarded by MoEF&CC, Delhi. All the impacts likely to have an effect on the environment have been identified and efficient/adequate mitigation measures have been proposed for the same.

- The proposed expansion project will provide quality product at lower cost to the users.
- There should be positive impact on the socio-economic condition of the area in terms of direct and indirect employment due to the proposed expansion project.
- Country will save valuable foreign exchange as export of these products will be reduced by corresponding amount.

CHAPTER – 12

DISCLOSURE OF CONSULTANTS ENGAGED

Aqua-Air® Environmental Engineers Pvt. Ltd.

Environmental Consultants, Engineers &Turnkey Project Executors

NABET/QCI ACCREDITED EIA CONSULTANT

MoEFCC APPROVED LABORATORY

NABL ACCREDITED TESTING LABORATORY

ISO 9001:2015 Certified Company

ISO 45001:2018 Certified Company

M/S. AQUA – AIR ENVIRONMENTAL ENGINEERS PVT. LTD. 403, CENTER POINT, NR. KADIWALASCHOOL, RING ROAD, SURAT – 395002 (GUJ.) INDIA	TEL: +91 (261) 2460854/2461241 EMAIL: aquaair_surat@hotmail.com WEBSITE: WWW.AQUA-AIR.CO.IN

12.1 COMPANY PROFILE

Aqua-Air® Environmental Engineers Pvt. Ltd. is a Surat based company; one of the leading and multidiscipline Environmental Management Consulting & Engineering firms of the region.

Aqua-Air® Environmental Engineers Pvt. Ltd. was founded by Mr. Jayesh S. Patel & Mrs. Archana J. Patel on May 7, 2008 and Aqua-Air® Environmental Engineers Pvt. Ltd. was registered under the companies Act on May 7, 2008.

Office having 6,756 Sq. Ft. of area covering EC/EIA Department, R & D Centre (Environmental Laboratory), Consent (CTE &CC&A) Department, ETP/Project Department, Solar Department and Account Department, Library, Conference room and Administration Department, etc. with experienced and qualified staff to render services in the field of Environmental Management of various types of industries.

Aqua-Air® Environmental Engineers Pvt. Ltd. has a well-established track record in monitoring legislation and developing and implementing strategies for organizations that enable them to manage the impact of environmental issues on their business.

The company has built a reputation for delivering innovative and practical solutions to environment related business issues. These solutions help our clients to achieve successful business outcomes and make sustainable environment serving improvements within their business operations.

M/s. Aqua-Air® Environmental Engineers Pvt. Ltd. applied to get the recognition as Environmental Laboratory under Environment (Protection) Act, 1986 on June 12, 2019. Based on recommendations of the Expert Committee for recognition of Environmental Laboratories in its 63rd meeting held on 1st October, 2020, Ministry of Environment, Forest and Climate Change (MoEFCC) approved the recognition of M/s. Aqua-Air® Environmental Engineers Pvt. Ltd., considering the current validity of mandatory accreditation / certifications of the laboratory. This recognition is valid up to Dec. 3, 2023.

The company's work is spread all over India & Oman. Company have already prepared 693 Form-1, 609 EIA & EMP reports, 588 Risk Assessment & DMP reports, conducted 98 Public Hearings and obtained 622 Environmental Clearances so far that includes Mining of minerals including opencast / underground mining, Thermal power plants, Mineral beneficiation, Metallurgical industries (ferrous & non-ferrous), Cement Plants, Chlor-alkali industry, Soda ash Industry, Chemical fertilizers, Pesticides industry and pesticide specific intermediates (excluding formulations), Manmade fibers manufacturing, Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes), 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), Distilleries, Pulp and Paper Industry, Sugar Industry, Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes, Common hazardous waste treatment, storage and disposal facilities (TSDFs), Bio-medical waste treatment facilities, Common Effluent Treatment Plants (CETPs), Common Municipal Solid Waste Management Facility (CMSWMF), Building and construction projects & Townships and Area development projects.

Company's MoEFCC Approved Laboratory & NABL Accredited Testing Laboratory has conducted Environmental Monitoring & Analysis with Environmental Institute and Gujarat Pollution Control Board in Industrial Estates of Ankleshwar, Panoli & Jhagadia. The company have executed nos. of projects on turnkey or consulting basis such as M/s. BASF India Ltd. (Unit-2), Ankleshwar; M/s. BASF India Ltd., Manglore; M/s. Solvay Specialities India P. Ltd., Panoli; M/s Thermax Ltd. (New & Expansion), Dahej SEZ; M/s. Firmenich Aromatics India Pvt. Ltd., Daman; M/s. Glenmark Pharmaceutical Ltd., Ankleshwar; M/s. Glenmark Pharmaceutical Ltd., Goa; M/s. Glenmark Pharmaceutical Ltd., Taloja; M/s. Reva Proteins Ltd., Jhagadia; M/s. Vapi Products Ind. P. Ltd., Vapi; M/s. Colourtex Ind. Ltd., Vilayat; M/s. Gujarat Argo Infrastructure Mega Food Park Pvt. Ltd. (Individual unit & CETP), Mangrol; M/s. GSP Cropscience P. Ltd., Nandesari; M/s. Panoli Enviro Technology Ltd. (CETP), Panoli; M/s. Privi Organics India Ltd., Jhagadia; M/s. Halol Industries Environment & Infrastructure Ltd. (CETP), Halol GIDC; M/s. Parshwnath Pigment Ltd., Padra; M/s. M/s. Hindusthan M-I Swaco Ltd., Panoli; M/s. Hindusthan M-I Swaco Ltd., Dahej SEZ; M/s. Philips Glass India Ltd., Padra; M/s. Shree Kantha Vibhag Sahkari Khand Udyog Mandali Ltd., Olpad; M/s. Hemani Crop Care P. Ltd., Saykha; M/s. Ketul Chem P. Ltd., Saykha;

M/s. Xenon Chem LLP, Dahej; M/s. Sajjan India Ltd., Ankleshwar; M/s. Shree Parshwnath Colourants LLP, Saykha; etc.

12.2 ABOUT US

Aqua-Air® Environmental Engineers Pvt. Ltd. has registered office in one of the top five fastest growing cities of India – Surat. We are one of the most trusted and reliable environmental engineering and consultancy service providers. With complete hold in the related domain and proficiency, we execute our work all over India as well as in Oman.

In addition to engineering consultancy, we also execute turnkey projects for effluent treatment plants at the client's site.

Aqua-Air® Environmental Engineers Pvt. Ltd is:

- One of the leading companies in the region providing high quality services in environmental engineering and consulting to the best of client's satisfaction.
- Possess a well - developed design office with Computer Center and Laboratory -cum- R&D Center to carry out designing and analysis in the field of environmental engineering.
- Recognized as Schedule-II Environmental Auditor under the Environment Audit Scheme proposed by the Hon'ble High Court of Gujarat.
- Listed with Gujarat Pollution Control Board as Consultants and proposing to get enlisted with GPCB as Pollution Control Equipment Suppliers.
- Going to become a member of Consulting Engineers Association of India.
- Having well-developed library to render services in the field of environmental auditing, consulting, monitoring and analysis.

12.3 ACHIEVEMENTS

1. Registered under the companies Act on May 7, 2008.
2. Gujarat Pollution Control Board Recognized Schedule–II Environmental Auditor on March 29, 2023 & valid up to Dec. 31, 2024.
3. Certificate of ISO 9001:2008 received on Dec. 4, 2018 & Certificate is valid up to Dec. 03. 2024.

4. Import Export License received from Government of India on May 31, 2010.
5. Certificate of National Accreditation Board for Testing and Calibration Laboratories (NABL) received on May 27, 2020 & valid up to June 2, 2023.
6. Certificate of Registration of Trade Mark, Section 23 (2), Rule 62 (1) from Trade Marks Registry, Govt. of India on Jan. 18, 2011.
7. Certificate of Authorization as dealer in India received from Spectrum Technologies, Inc., USA on May 1, 2011.
8. Ministry of New and renewable Energy (MNRE) and Gujarat Energy Development Agency (GEDA) Channel Partner for grid connected Roof Top division.
9. Got registered with Ministry of Micro, Small & Medium Enterprises (MSME) (UAN: GJ22D0183036) on Dec. 5, 2017.
10. Got Certificate of ISO 45001:2018 on March 16, 2019 which is valid up to Nov. 23, 2024.
11. M/s. Aqua-Air® Environmental Engineers P. Ltd. have received NABET/QCI Accreditation on December 8, 2020 covering 14 Sectors. Then after M/s. Aqua-Air® Environmental Engineers P. Ltd. applied for Supplementary Assessment-1 for Additional Sectors and Functional Areas, for which Revised NABET/QCI Accreditation Certificate (Rev. 1) was issued on July 16, 2021 covering 23 Sectors. Then M/s. Aqua-Air® Environmental Engineers P. Ltd. again applied for Supplementary Assessment-2 for Additional Sectors, for which Revised NABET/QCI Accreditation Certificate (Rev. 2) was issued on April 1, 2022 covering 25 Sectors. Then after again applied for Supplementary Assessment-3 for Additional Sectors, for which Revised NABET/QCI Accreditation Certificate (Rev. 3) was issued on May 12, 2022 covering 28 Sectors. Certificate is valid up to Oct. 7, 2023. Then M/s. Aqua-Air® Environmental Engineers P. Ltd. applied for Surveillance Assessment (SA-1) as per NABET Scheme and for Additional Sectors, for which NABET/QCI Accreditation Certificate (SA 0196) was issued on April 08, 2023 covering 30 Sectors.

12.4 SERVICES PROVIDED

M/s. AQUA-AIR® ENVIRONMENTAL ENGINEERS PVT. LTD. offers following specialized services in Environmental Engineering, Water Supply Engineering and Civil Engineering.

4.1 TURN KEY/BOOT/BOO PROJECTS

4.1.1 ENVIRONMENTAL ENGINEERING

- Detailed design
- Construction
- Fabrication
- Piping
- Electrification
- Supply
- Erection
- Testing and Commissioning of Effluent Treatment Plants (ETPs)
- Sewage Treatment Plants (STPs)
- Water Treatment Plants (WTPs)
- Common Effluent Treatment Plants (CETPs)
- Recycling Plants (RPs)
- Zero Discharge Plants (ZDPs)
- Incineration System Plants (ISPs)
- Hazardous waste Storage areas (HWSAs)
- Secured/ Sanitary Landfill Facilities
- Bio–Medical Waste (BMW) Treatment Facilities on a turnkey or BOOT/BOO basis.

4.1.2 CIVIL ENGINEERING

Construction of

- Water Treatment Plan
- Sewage Treatment plant
- Industrial Wastewater Treatment plant
- Elevated Service Reservoirs (ESRs)
- Underground Reservoirs (UGRs)
- Sewage Pumping Stations, etc.

4.2 CONSULTING

4.2.1 ENVIRONMENTAL ENGINEERING

1. Complete study of the Pollution Problem in industries from wastes generation to disposal and providing necessary technical knowledge like–

- Know how including design
- Basic engineering, detailed engineering
- Water Treatment Plants (WTPs)
- Tender preparation for Effluent Treatment Plants (ETPs) for industrial wastewater
- Sewage Treatment Plants (STPs) for residential wastewater
- Common Effluent Treatment Plants (CETPs)
- Design of Pumping Station and Effluent
- Zero Discharge Plants (ZDPs)
- Recycling plants (RPs) for reuse of water up to maximum extent
- Incineration System Plants (ISPs) for various non-biodegradable or toxic industrial wastes
- Design of Hazardous waste Storage area and Secured/ Sanitary Landfill Facilities
- Design and Consultancy Services for Bio – Medical Waste Treatment Facilities.

Conveyance Pipeline for Effluent Collection System from Industrial Estate	▪ Design of Pumping Station and Marine Discharge Effluent Carrying Pipeline, including Surge (Water Hammer) Analysis and Surge Protection Devices.

2. Water Supply Distribution System

▪ Analysis ▪ Design	▪ Tender preparation

3. Laboratory Analysis of

▪ Ambient Air/Stack/Vent ▪ Water ▪ Sewage	▪ Industrial Waste Water ▪ Soil ▪ Industrial Sludge

4. Process Study

▪ Reduce the pollution at source	▪ Reuse/Recycle effluent

5. Pollution Control Facility

▪ Performance study of existing	▪ Suggesting scheme for the optimization of the facility

6. Environment Management

▪ Environmental Clearance from • MoEFCC, New Delhi • SEAC &SEIAA, Gandhinagar ▪ Environmental statements	▪ Environmental Impact Assessment Studies (EIAs) • Short term (Rapid) • Long term (Comprehensive) ▪ Environmental Auditing

7. Statutory Requirements under Factory Act

▪ Safety Audit ▪ On-site/ Off-site Emergency Plan	▪ HAZOP study

8. For Various Energy Conservation Schemes

▪ Energy Audit	▪ Design

9. Environmental Management System

▪ Preparing Adequacy Report	▪ Preparing Efficacy Report

10. Operation and Maintenance (O & M)

▪ Effluent Treatment Plants (ETPs) ▪ Sewage Treatment Plants (STPs)	▪ Water Treatment Plants (WTPs) ▪ Common Effluent Treatment Plants (CETPs)

11. Air Monitoring

▪ Ambient Air ▪ Vent	▪ Stack

12. Pollution Control

- Effluent Survey
- Environmental review of Pollution control equipment and systems
- Feasibility Studies
- Laboratory bench scale Treatability studies
- Pilot Plant studies, etc.

13. Consulting Service

- Consent to Establish (CTE)/NOC
- CTE for revised product mix
- Consolidated Consents & Authorization (CCA)
- Rule-9 Permission, etc.

14. As per requirements under Factory Act-1948 and Gujarat Factory Rules

- Monitoring
- Monitoring &Analysis of Work Area Environment
- Filling up Form-37

15. Technical Consultation &assistance to ensure and assure compete Environ-Legal compliance

- Required permits from statutory bodies
- Clearance
- Consents

4.3 EQUIPMENT DESIGN/MFG. / SUPPLY/COMMISSIOIN

4.3.1 ENVIRONMENTAL ENGINEERING

1. Design, manufacture and supply of Pollution Control Equipment such as

- Incinerators with scrubbers
- Autoclaves
- Hydro-claves
- Fixed Aerators
- Floating Aerators
- Submersible Aerators ($EOLO_2$)
- Submersible Mixers (RIO or BRIO)
- Cascade Aerators
- Clarifier mechanisms
- Agitators
- Clariflocculator
- Flocculator mechanism
- Flash mixes
- Oil skimmers
- MBR
- Dissolved Air Flotation (DAF) units
- Cyclone
- Scrubbers
- Bag Filters, Flume extraction systems
- API separator
- Vacuum drum filter
- Filter Press
- Solid Bowl Centrifuge
- Packaged sewage treatment plant
- Filtration system
- Reverse Osmosis
- DM plant
- Packaged water treatment plant
- Reacting Vessel
- MBBR

SCHEME FOR ACCREDITATION OF EIA CONSULTANT ORGANIZATIONS

NATIONAL ACCREDITATION BOARD FOR EDUCATION AND TRAINING

A 29

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(pdf) Surveillance Assessment (SA) (../FAQ(SA).pdf) Re-Accreditation (RA) (../FAQ(RA).pdf)

Accredited EIA Consultant Organisations (as on October 29, 2024)

aqua air | Search

Sl. No.	Name and Address EIA Consultant Organization	Scope of Accreditation				Downloads
		As per NABET Scheme			Project or Activity as per Schedule of MoEF&CC Notification dated September 14, 2006 and subsequent Amendments	
		Sector Number	Name of Sector	Category		
1	Aqua Air Environmental Engineers Pvt Ltd, Surat Address:403 Centre Point Nr. Kadiwala School, Ring Road, Surat Head Name:Mr. Jayeshkumar Somabhai Patel Head Designation:Chairman Managing Director Mobile Number:9904433995 Email:aqua_eia@yahoo.com Tel:02612460854 Remarks:Condition apply	1	Mining of minerals – including opencast and underground mining	B	1 (a) (i)	Certificate No.:NABET/EIA/2023/SA 0196_Rev.01 Validity:08/04/2024 Validity Extension Letter No.:QCI/NABET/ENV/ACO/24/3189 Extension Letter Validity:07-11-2024 UserName:ORG000995 Accreditation Date:05/10/2020 Category:A Human Resource
		2	Offshore and onshore oil and gas exploration, development & production	A	1 (b)	
		4	Thermal power plants	A	1 (d)	
		6	Coal Washeries	B	2(a)	
		7	Mineral beneficiation	B	2 (b)	
		8	Metallurgical industries (ferrous only)	A	3 (a)	
		9	Cement plants	B	3 (b)	
		10	Petroleum refining industry	A	4 (a)	
		13	Chlor- Alkali Industry	A	4 (d)	
		14	Soda ash Industry	A	4 (e)	
		16	Chemical fertilizers	A	5 (a)	
		17	Pesticides Industry and pesticide specific intermediates(excluding formulations)	A	5 (b)	
		18	Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)	A	5 (c)	
		19	Manmade fibers manufacturing	B	5 (d)	
		20	Petrochemical based processing (processes other than cracking & reformation and not covered under the complexes)	A	5 (e)	
		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)	
		22	Distilleries	A	5 (g)	
		33	Integrated paint industry	B	5(h)	
		24	Pulp & paper industry excluding manufacturing of paper from wastepaper and manufacture of paper from ready pulp without bleaching	B	5(i)	
		25	Sugar industry	B	5 (j)	
		27	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal	A	6 (a)	
		29	Airports	A	7 (a)	
		31	Industrial estates/ parks/ complexes/areas, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	A	7 (c)	
		32	Common hazardous waste treatment, storage and disposal facilities (TSDFs)	A	7 (d)	
		32 A	Bio-medical waste treatment facilities	B	7 (d a)	
		33	Ports, harbours, break waters and dredging	A	7 (e)	
		34	Highways	A	7 (h)	
		36	Common Effluent Treatment Plants (CETPs)	B	7 (h)	
		37	Common Municipal Solid Waste Management Facility (CMSWMF)	B	7 (i)	
		38	Building and construction projects	B	8 (a)	
		39	Townships and Area development projects	B	8 (b)	

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Appeal No. 33 of 2024 - Between S.P. Muthuraman Vs. The Union Of Inida, Rep. by the Secretary to Government, MOEFC and 4 others

1 message

Nataraj Rao Raghu & Sundaram Advocates <nrrandschennai@gmail.com> Tue, Nov 12, 2024 at 8:36 PM
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Dear Sir,

We represent M/s.Chemplast Sanmar Limited, the 5th Respondent in the aforesaid subject appeal. Kindly find enclosed scanned copy of the Counter Affidavit and the relevant documents filed in the aforesaid subject appeal. Please acknowledge receipt of the same.

Regards,
Karan Kothari
Counsel for the 5th Respondent,

VOLUME 1.pdf

VOLUME 2.pdf

VOLUME 3.pdf

For,
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BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, SOUTHERN ZONE, CHENNAI

Appeal No.33 of 2024 (SZ)

S.P. Muthuraman,
Tirunelveli

... Appellant

Vs.

The Union of India rep. by
the Secretary to Government,
Ministry of Environment, Forest
& Climate Change, New Delhi
& 4 others

... Respondents

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