TGV SRAAC LIMITED

SY. NO. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, GONDIPARLA VILLAGE, KURNOOL MANDAL AND DISTRICT, ANDHRA PRADESH

FINAL EIA REPORT

FOR

PROPOSED EXPANSION OF CHLOR-ALKALI AND SYNTHETIC ORGANIC CHEMICALS MANUFACTURING CAPACITY IN EXISITNG SITE AREA

1. ENVIRONMENTAL IMPACT ASSESSMENT
2. ENVIRONMENT MANAGEMENT PLAN
3. COMPLIANCE OF TERMS OF REFERENCE
4. ANNEXURES

TOR File No. J-11011/84/2016-IA-II(I)

Project No. 0823-13/21-01
August 2023

TGV SRAAC Limited
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SUBMITTED TO
MINISTRY OF ENVIRONMENT, FOREST, AND CLIMATE CHANGE
GOVERNMENT OF INDIA
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI

TGV SRAAC LIMITED

SY. NO. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, GONDIPARLA VILLAGE, KURNOOL MANDAL AND DISTRICT, ANDHRA PRADESH

ENVIRONMENAL IMPACT ASSESSMNT REPORT

Project No. 0823-13/21-01
August 2023

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सत्यमेव जयते

File No.: J-11011/84/2016-IA-II(I)
Government of India
Ministry of Environment, Forest and Climate Change
IA Division
****

Dated **15/03/2023**

To,

Jaswanth Reddy N
SREE RAYALASEEMA ALKALIES AND ALLIED CHEMICALS LIMITED
Sree Rayalaseema Alkalies and Allied Chemicals Limited Gondiparla Village Kurnool Mandal Dist AP 518004 , Gondiparla, KURNOOL, ANDHRA PRADESH, , 518004
sraaclab@rediffmail.com

Sub: Grant of Standard Terms of Reference (ToR) to the proposed Project under the EIA Notification 2006-and as amended thereof-regarding.

Sir, This is in reference to your application submitted to MoEF&CC vide proposal number IA/AP/IND3/421170/2023 dated 08/03/2023 for grant of Terms of Reference (ToR) to the project under the provision of the EIA Notification 2006-and as amended thereof.

2. The particulars of the proposal are as below :

(i) ToR Identification No.	TO23A1601AP5456286E
(ii) File No.	J-11011/84/2016-IA-II(I)
(iii) Clearance Type	Fresh TOR
(iv) Category	A
(v) Project/Activity Included Schedule No.	4(d) Chlor-alkali industry,5(f) Synthetic organic chemicals industry
(vi) Sector	Industrial Projects - 3
(vii) Name of Project	Expansion of Chlor-Alkali and Synthetic Organic Chemicals manufacturing unit at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Gondiparla village, Kurnool mandal and district, Andhra Pradesh by M/s. TGV SRAAC Limited.
(viii) Name of Company/Organization	SREE RAYALASEEMA ALKALIES AND ALLIED CHEMICALS LIMITED
(ix) Location of Project (District, State)	KURNOOL, ANDHRA PRADESH
(x) Issuing Authority	MoEF&CC
(xi) ToR Date	15/03/2023
(xii) Applicability of General Conditions	Yes

3. The **MoEF&CC** has examined the proposal in accordance with the Environment Impact Assessment (EIA) Notification, 2006 & further amendments thereto and after detailed examination hereby decided to grant Standard Terms of Reference to the instant proposal of **M/s.SREE RAYALASEEMA ALKALIES AND ALLIED CHEMICALS LIMITED** under the provisions of the aforementioned Notification.

4. The brief about products and by products as submitted by the Project proponent in Form-1 (Part A, B) and Standard Terms of Reference are annexed to this letter as Annexure (1).

5. The Ministry reserves the right to stipulate additional TORs, if found necessary.

6. The Standard Terms of Reference (ToR) to the aforementioned project is under provisions of EIA Notification, 2006 and as amended thereof. It does not tantamount to approvals/consent/permissions etc required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals /clearances under any other Acts/ Regulations or Statutes, as applicable, to the project.

7. The granted letter, all the documents submitted as a part of application viz. Form-1 Part A and Part B are available on PARIVESH portal which can be accessed by scanning the QR Code above.

Annexure 1

Details of Products & By-products

Name of the product /By-product	Product / By-product	Quantity / Capacity	Unit	Mode of Transport / Transmission	Remarks (eg. CAS number)
Caustic Soda Lye/ Flakes Or Potassium Hydroxide Lye/ Flakes on 100% Basis	Product	1020	Tons Per Day	Road	Expansion Phase I: 200 TPD and Phase II: 200 TPD (Total expansion proposed is 400 TPD) in addition to existing 1020 TPD
Liquid Chlorine	Product	600	Tons Per Day	Road	Salable Chlorine Phase I: 120 TPD and Phase II: 120 TPD (Total expansion proposed is 240 TPD) in addition to existing 600 TPD. Note: The total chlorine generation is 1253.4 (Existing: 900.4 TPD + Proposed: 353 TPD)
Methyl Chloride	Product	1.2	Tons Per Day	Road	Expansion Phase I: 0.24 TPD and Phase II: 0.24 TPD (Total expansion proposed is 0.48 TPD) in addition to existing 1.2 TPD
Methylene Chloride	Product	158	Tons Per Day	Road	Expansion Phase I: 31.6 TPD and Phase II: 31.6 TPD (Total expansion proposed is 63.2 TPD) in addition to existing 158 TPD
Chloroform	Product	79	Tons Per	Road	Expansion Phase I: 15.8 TPD and Phase II: 15.8 TPD (Total

Name of the product /By-product	Product / By-product	Quantity / Capacity	Unit	Mode of Transport / Transmission	Remarks (eg. CAS number)
			Day		expansion proposed is 31.6 TPD) in addition to existing 79 TPD
Chlorodifluoromethane (R22)	Product	10	Tons Per Day	Road	Expansion Phase I: 2 TPD and Phase II: 2 TPD (Total expansion proposed is 4 TPD) in addition to existing 10 TPD
Captive Power Plant (Coal based)	Product	76	Mega Watt (MW)	Substation	Captive Power Plant is proposed in Phase I only to cater power requirement in Phase II also.
Power generation Furnace Oil (Standby)	Product	31	Mega Watt (MW)	Substation	No expansion is Proposed
Oil and Fatty Acid Products (Non-EC Products)	Product	498	Tons Per Day	Road	Expansion Phase I: 99.5 TPD and Phase II: 99.5 TPD (Total expansion proposed is 199 TPD) in addition to existing 498 TPD
Hydrogen Gas	By-Product	285600	Nm3	Road	Expansion Phase I: 55996 Nm3 and Phase II: 55996 Nm3 (Total expansion proposed is 111992 Nm3) in addition to existing 285600 Nm3
Barium Sulphate	By-Product	10	Tons Per Day	Road	Dropped after expansion
Hydrochloric Acid (100%)	By-Product	368.27	Tons Per Day	Road	HCl (Chlor-Alkali (Existing: 313 TPD + Proposed: Phase I: 56.05 TPD + Phase II: 56.05 TPD) + Chloromethanes (Existing: 47 TPD + Proposed: Phase I: 9.4 TPD + Phase II: 9.4 TPD)+ Chlorodifluoromethane (Existing: 8.27 TPD + Proposed: Phase I: 1.65 TPD + Phase II: 1.65 TPD)
Sodium Hypochlorite (100% Cl2 basis)	By-Product	15	Tons Per Day	Road	Expansion Phase I: 3 TPD and Phase II: 3 TPD (Total expansion proposed is 6 TPD) in addition to existing 15 TPD
Potassium Carbonate	By-	50	Tons	Road	No expansion proposed

Name of the product /By-product	Product / By-product	Quantity / Capacity	Unit	Mode of Transport / Transmission	Remarks (eg. CAS number)
	Product		Per Day		
Sodium Sulphate	By-Product	10	Tons Per Day	Road	Expansion Phase I: 2 TPD and Phase II: 2 TPD (Total expansion proposed is 4 TPD) in addition to existing 10 TPD
Calcium Hypochlorite (100% Cl2 basis)	By-Product	10	Tons Per Day	Road	Dropped after expansion
Calcium Sulphate	By-Product	2	Tons Per Day	Road	Dropped after expansion
Carbon tetrachloride	By-Product	2	Tons Per Day	Road	Expansion Phase I: 2.4 TPD + Phase II: 2.4 TPD in addition to existing 2 TPD. Carbon Tetrachloride (CCl4) generated will be sold as a feed stock to Authorized users/excess will be incinerated. Certificate of registration from Ozone Cell, MoEF&CC vide letter no. ODS/CS/17/2(1)/2014-OC dated 25.11.2014

Standard Terms of Reference for conducting Environment Impact Assessment Study for Chlor-alkali industry and information to be included in EIA/EMP report

1. Executive Summary

S. No.	Terms of Reference
1.1	Executive Summary

2. Introduction

S. No.	Terms of Reference
2.1	Details of the EIA Consultant including NABET accreditation
2.2	Information about the project proponent

S. No.	Terms of Reference
2.3	Importance and benefits of the project

3. Project Description

S. No.	Terms of Reference
3.1	Cost of project and time of completion.
3.2	Products with capacities for the proposed project.
3.3	If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
3.4	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.
3.5	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.
3.6	List of raw materials required and their source along with mode of transportation.
3.7	Other chemicals and materials required with quantities and storage capacities
3.8	Details of Emission, effluents, hazardous waste generation and their management.
3.9	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
3.10	Details of boiler/gensets (including stacks/exhausts) and fuels to be used
3.11	Process description along with major equipment's and machineries, process flow sheet (quantitative) from raw materials to products to be provided
3.12	Hazard identification and details of proposed safety systems.
3.13	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

S. No.	Terms of Reference
	submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4. Site Details

S. No.	Terms of Reference
4.1	Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
4.2	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)
4.3	Details w.r.t. option analysis for selection of site
4.4	Co-ordinates (lat-long) of all four corners of the site.
4.5	Google map-Earth download of the project site.
4.6	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.
4.7	Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
4.8	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)
4.9	A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
4.10	Geological features and Geo-hydrological status of the study area shall be included.
4.11	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)
4.12	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.
4.13	R&R details in respect of land in line with state Government policy.

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

S. No.	Terms of Reference
5.1	Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)
5.2	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)
5.3	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
5.4	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 Wardenthereon
5.5	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
5.6	Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife
5.7	Recommendations and NOC from the concerned State/UT Coastal Zone Management Authority on CRZ angle

6. Environmental Status

S. No.	Terms of Reference
6.1	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.P • 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.
6.2	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.
6.3	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.
6.4	Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
6.5	Ground water monitoring at minimum at 8 locations shall be included.

S. No.	Terms of Reference
6.6	Noise levels monitoring at 8 locations within the study area.
6.7	Soil Characteristic as per CPCB guidelines.
6.8	Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
6.9	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.
6.10	Socio-economic status of the study area.

7. Environment Impact and Environment Management Plan

S. No.	Terms of Reference
7.1	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.
7.2	Water Quality Modelling – in case of discharge in water body
7.3	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.
7.4	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.
7.5	Details of stack emission and action plan for control of emissions to meet standards
7.6	Measures for fugitive emission control
7.7	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.
7.8	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
7.9	Action plan for the green belt development plan in 33 % area i.e. land with not less than 2,500 trees per ha.

S. No.	Terms of Reference
	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.
7.10	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.
7.11	Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.
7.12	Action plan for post-project environmental monitoring shall be submitted.
7.13	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.

8. Occupational health

S. No.	Terms of Reference
8.1	Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
8.2	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 preplacement 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.
8.3	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,
8.4	Annual report of health status of workers with special reference to Occupational Health and Safety.

9. Corporate Environment Policy

S. No.	Terms of Reference
9.1	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.
9.2	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.
9.3	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.

S. No.	Terms of Reference
9.4	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
9.5	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)

S. No.	Terms of Reference
10.1	Adequate funds, as per the Ministry's OM/Guidelines, shall be earmarked towards the Corporate Environmental Responsibility based on Public Hearing issues/socioeconomic 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.

11. Additional studies/Measures to be considered

S. No.	Terms of Reference
11.1	Provide latest and ecofriendly technology for product manufacturing.
11.2	Emphasize on Green chemistry/Clean Manufacturing
11.3	Provide CAS No. of products along with product list.
11.4	Provide details of amount of carbon sequestered in their unit through greenbelt/other modes, in case of expansion project.
11.5	Life structure and sustainability for carbon and water foot print.
11.6	Detailed pollution Load estimation.
11.7	Transportation of Hazardous substance, effluents etc shall be carriedout through authorized and GPS enable vehicles/Trucks only.
11.8	Category of Hazardous Wastes shall be mentioned in the EIA/EMP report and in presentation.
11.9	Details of greenhouse gases and emissions shall be provided.
11.10	Greenbelt shall be developed in the first year of the project and wind breaks shall be erected.
11.11	Study area map shall be overlapped with all the associated features.
11.12	Emphasize on green fuels.
11.13	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.

S. No.	Terms of Reference
11.14	Provide the Cost-Benefit analysis with respect to the environment due to the project.
11.15	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 analyzed and submitted for further appraisal of the EAC
11.16	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.
11.17	A tabular chart with index for point wise compliance of above TORs and its details needs to be submitted in the EIA/EMP Report.

12. Specific Conditions

S. No.	Terms of Reference
12.1	Details on demand of the product – chlorine and its associated products
12.2	Details on raw materials used in the production of chlorine (sodium chloride, potassium chloride, etc.), its storage and handling.
12.3	Details of proposed source-specific pollution control schemes (salt washing, filtration, cell ventilation as, chlorine handling and safety, etc.) and equipmentsto meet the national standards.
12.4	Detailed effluent treatment scheme including ssegregation for units adopting ‘Zero’ liquid discharge.
12.5	Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.
12.6	Details on products to rage and handling–chlorine, caustic soda, etc.
12.7	Details on tail gas treatment.
12.8	Details on requirement of energy and water alongwith its source and authorization from the concerned department.
12.9	Incase of modernization of existing mercury based chlor-alkali plants with membrane cell Process (MBCP) industries or new unit in the existing industry premises, remediation measures adopted to restore the environmental quality of the ground water, soil, crop, air, etc., are affected due to salinity and a detailed compliance to the prior environmental clearance/ consent conditions.
12.10	Details on ground water quality and surface water quality of near by water sources and other surface drains. The parameters of water quality may include Residual chlorine*, TDS*, alkalinity*, pH* &Mercury* (in water & sediment), etc. (*- As applicable)
12.11	Details on existing ambient air quality and expected, emissions for PM10, PM2.5, SO2*, NOx*,CO2*, CO*, Chlorine*, acid mist* etc., and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards. (*-As applicable))

S. No.	Terms of Reference
12.12	Specific programme to monitor safety and health protection of workers.
12.13	Risk assessment using advanced/latest models should also include leakages and location near to caustic soda plant & proposed measures for risk reduction
12.14	Details of the emergency preparedness plan for chlorine/ Hydrogen storage, handling and transportation and on- site and off- site disaster management plan.
12.15	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.

1.0 Introduction of the Project *(Terms of Reference No. 2(ii))*

M/s. TGV SRAAC Limited located at Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh obtained environmental clearance vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 01.05.2018 for expansion of Chlor-Alkali plant and synthetic organic chemicals manufacturing unit subsequently the unit obtained name change in EC dated 01.05.2018 vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 28.09.2021 in an area of 152.4 ha from the Ministry of Environment, Forest and Climate Change (MoEFCC). The unit obtained consent for establishment (CFE) for expansion vide order no. APPCB/ KNL/ KNL/ 231/ CFE/ HO/2008 dated 23.05.2018. The previous expansion was implemented in phased manner, accordingly the unit obtained consent for operation (CFO) for caustic expansion and chloromethanes separately. It may be noted that the entire capacity mentioned in previous EC dated 01.05.2018 is currently in operation. It is proposed to expand the manufacturing capacity chlor-alkali and chloromethanes by 40% of existing capacity in phased manner with a capital cost of Rs. 280 cores. The cost estimate for environment management is Rs. 10.85 crores with annual recurring expenditure of Rs. 10.66 crores.

The MoEFCC issued an office memorandum dt. 11.4.2022 detailing the guidelines for granting prior environmental clearance for expansion upto 50% vide 7 (ii) (a) of the EIA notification. The guidelines envisage issue of prior environmental clearance upto 40% of the capacity in 2 installments of 20% each, wherein the later expansion is allowed after satisfactory compliance of the environmental safe guard conditions issued initially. Accordingly Form I and prefeasibility reports were submitted to obtain terms for reference for preparation of environmental impact assessment report. The MoEFCC issued terms of reference vide letter no. F.No. J-11011/84/2016-IA II (I) dated 15.03.2023 as part of environmental clearance process.

M/s. TGV SRAAC Limited is conscious of its responsibility towards the society in minimizing the pollution load due to the proposed expansion and accordingly decided to carry out the Environmental Impact Assessment to identify the negative and positive impacts due to the project, and to delineate effective measures to control and mitigate the environmental pollution. M/s. TGV SRAAC Limited has appointed Team Labs and Consultants for the preparation of Environmental Impact Assessment report.

This report adopted the definition of Impact assessment given by international association of impact assessment as the "Process of identifying the future consequences of a current or proposed action." The "Impact" is the difference between what would happen with action and what would happen without (Ref: IAIA 2009). Accordingly, baseline data collection was initiated to establish the current environmental scenario, by collecting primary and secondary data, immediately after the receipt of work order. Reconnaissance survey of the region was carried out during November 2022, and various sampling locations to monitor environmental parameters have been identified. Subsequently, monitoring has commenced for collection of data on meteorology, ambient air quality, surface and ground water quality, soil characteristics, noise levels, flora and fauna at the specified locations during December 2022 -February 2023. The other studies such as socio-economic profile, land use pattern etc. are based on secondary data collected from various Government agencies and validated through primary surveys. The ambient air monitoring locations have been selected based on the initial air dispersion modeling carried out by using the meteorological data generated at India Meteorological Department (IMD).

Field team of M/s. Team Labs and Consultants worked in the study area during December 2022 -February 2023 and base line data for various environmental components i.e., air, water, soil, noise and flora and fauna and socio economic status of people was collected in a circular area of 10 km radius by taking the industry site as the center point, to assess the existing environmental status as per the guidelines specified by Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. This report presents the results of environmental impact assessment study along

with the environmental management plan, necessary to avoid or mitigate the observed environmental impacts due to the proposed expansion.

1.1 Product Profile *(Terms of Reference No. 3(ii)*

The manufacturing capacity proposed is presented in **Table 1.1.** Chronology of consents for previous expansion is presented in **Table 1.2.**

Table 1.1 Manufacturing Capacity

S. No.	Product Name	Unit	Capacity			
			Existing/ Permitted	Proposed		Total After Expansion
				Phase I	Phase II	
I. Chlor-Alkali Plant						
1	Caustic Soda Lye (Or) Flakes	TPD	1020	200	200	1420
	Potassium Hydroxide Lye (or) Flakes (100 % basis)	TPD				
2	Liquid Chlorine	TPD	600	120	120	840
II. Chloromethanes						
1	Methyl Chloride	TPD	1.2	0.24	0.24	1.68
2	Methylene Chloride	TPD	158	31.6	31.6	221.2
3	Chloroform	TPD	79	15.8	15.8	110.6
	Total – Chloromethanes		**238.2**	**47.64**	**47.64**	**333.48**
III. Chlorodifluoromethane						
1	Chlorodifluoromethane (R22)	TPD	10	2	2	14
IV. Captive Power Plant						
1	Captive Power Plant (Coal based)	MW	76	30	----	106
2	Power generation Furnace Oil#	MW	31		----	31
V. Castor Oil and Fatty Acid Plant						
1	Oil and Fatty Acid Products (Non-EC Products)	TPD	498	99.5	99.5	697
By-Products						
I. Chlor-Alkali Plant						
1	Hydrochloric Acid (100%)	TPD	313	56.05	56.05	425.1
2	Hydrogen Gas	Nm3	285600	55996	55996	397592
3	Sodium Hypochlorite (100% Cl_2 basis)	TPD	15	3	3	21
4	Barium Sulphate	TPD	10	----	----	----
5	Potassium Carbonate	TPD	50	----	----	50
6	Sodium Sulphate	TPD	10	2	2	14
7	Calcium Hypochlorite (100% Cl_2 basis)	TPD	10	----	----	----
8	Calcium Sulphate	TPD	2	----	----	----
II. Chloromethanes Plant						
1	Carbon tetrachloride*	TPD	12	2.4	2.4	16.8
2	Hydrochloric Acid (100 %)	TPD	47	9.4	9.4	65.8
III. Chlorodifluoromethane Plant						
1	Hydrochloric Acid (100 %)	TPD	8.27	1.65	1.65	11.57

** Carbon Tetrachloride (CCl4) generated will be sold as a feed stock to Authorized users/excess will be incinerated.*
 # Shall be kept as standby.

Table 1.2 Chronology of Previous Consents

Date of Issue	Description	Capacity Issued	Order No.	Valid till
01.04.2021	Consent for operation (CFO) for **Chlor-Alkali expansion, Co-generation Power plant (CPP) and Castor Oil and Fatty Acid Plant**	**Chlor-Alkali – 520 TPD** Liquid Chlorine – 300 TPD Captive Power Plant – 69.8 MW Oil and Fatty Acids – 471 TPD Hydrochloric Acid (100%) – 186TPD Hydrogen – 25,253 m^3/day	APPCB/KNL/KNL/16322/CFO & HWA/ HO/ 1987	28.02.2026
16.07.2021	Consent for operation (CFO) for **Chlor-Alkali expansion**	**Chlor-Alkali – 280 TPD** Liquid Chlorine – 217 TPD	APPCB/KNL/KNL/16332/CFO& HWA/ HO/2021	31.05.2026
16.09.2021	Consent for operation (CFO) for Chloromethanes	Chloromethanes – 125.05 TPD Captive Power Plant – 31 MW	APPCB/KNL/KNL/16332/CFO& HWA/ HO/2021	31.08.2026
06.05.2022	Consent for operation (CFO) for **Chlor-Alkali expansion**	**Chlor-Alkali – 220 TPD** Liquid Chlorine – 83 TPD Hydrochloric Acid (100%) – 92TPD Hydrogen Gas – 198747 m^3/day	1274022/APPCB/KNL/KNL/CFO&HWA/HO/2022	28.02.2026
29.07.2022	Consent for Establishment (CFE) for **Chloromethanes Change in Product Mix**	Chloromethanes – 250.2 TPD Captive Power Plant – 31 MW	266/APPCB/CFE/RO-NLR/HO/2021	29.07.2029
16.11.2022	Consent for operation (CFO) for **Chloromethanes Change in Product Mix**	Chloromethanes – 250.2 TPD Captive Power Plant – 31 MW	1473568/APPCB/KNL/KNL/CFO&HWA/HO/2022	31.08.2026
25.11.2014	Certificate of registration from Ozone Cell, MoEF&CC	Carbon tetrachloride (CCl_4) as Feed Stock	ODS/CS/17/2(1)/2014-OC	

1.2 Technology

Membrane technology which is environment friendly shall be adopted for Caustic soda manufacturing. The by-products are hydrogen and chlorine. Hydrochloric acid is manufactured using H_2 and Cl_2 (produced from cell house). The unit adopted Bipolar membrane technology for caustic manufacturing.

Chloromethanes (CMS) are manufactured by hydro chlorination of methanol in vapor phase in presence of catalyst followed by thermal chlorination of methyl chloride in vapor phase with chlorine and rectification, azeotrope separation and dehydration of the mixed products.

Power will be generated using steam turbine in cogeneration plant. Boiler of capacity 1 x 120 TPH @ 100 kg/cm^2(g) pressure will be installed to cater the steam requirement after expansion of unit. The electricity generated in the cogeneration plant will be used for captive consumption for plant operations.

1.3 Plant Location and Layout

The plant site is located at Sy. No. Sy. No. Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh in an area of 152.4 ha. The site is located at the intersection of 15^0 49′ 30″ (N) latitude and 78^0 4′ 30″ (E) longitude. The site elevation above mean sea level (MSL) is 300 m. The plant site is surrounded by open lands in east direction, Sree Rayalaseema Hi-Strength Hypo Limited (SRHHL) in north direction, Road connecting the NH-7 with Gondiparla village in the south and west directions. The nearest habitation from the plant is E. Tandrapadu village located at a distance of 0.5 km in northwest direction. The main approach road is NH-7 - Gondiparla village adjacent to the site in northwest direction. The nearest Town is Kurnool at a distance of 0.8 km in southwest direction, railway station is Kurnool located at a distance of 3.02 km in northwest direction and nearest airport is Kurnool located at a distance of 16.5 km in southeast direction. Tungabhadra River is flowing from northwest to southeast direction at a distance of 0.2 km in south direction. Interstate boundary between

Telangana and Andhra Pradesh is at a distance of 1.3 km in northeast direction. There are two reserve forests in the study area. Gadidmadugu RF at a distance of 5.5 km in east direction. Pullaiah RF at a distance of 9.3 km in southwest direction. There is no National Park, sanctuary, and critically polluted area within the impact area of 10 km surrounding the site.

1.3.1 Purpose of the Report

Prior environmental clearance is mandated for expansion upto 50% within existing premises for chlor-alkali and synthetic organic chemicals manufacturing activity under 7(ii)(a) of EIA Notification S.O. 1533, dated September 14, 2006 issued by Ministry of Environment, Forest, and Climate Change (MoEFCC), Government of India. Standard terms of reference for the environmental impact assessment studies were obtained from MoEFCC, vide letter no. F.No. J-11011/84/2016-IA II (I) dated 15.03.2023 as part of environmental clearance process.

1.4 Plant layout

The proposed expansion is within the existing site area of 152.4 ha. Location of unit is presented in **Fig 1.1** and plant battery limit layout and overall site layout is presented in **Fig 1.2** and **Fig 1.3** respectively. The Geo coordinates of the project site area are presented in **Table 1.3**.

Table 1.3 Geo-coordinates of the project site area

S.No	Latitude	Longitude	S.No	Latitude	Longitude
1	15°50′49.71"N	78°4′05.06"E	10	15°50′17.95"N	78°3′53.11"E
2	15°50′50.71"N	78°3′45.18"E	11	15°50′26.86"N	78°3′35.51"E
3	15°50′46.29"N	78°3′41.71"E	12	15°50′22.11"N	78°3′45.81"E
4	15°50′48.23"N	78°3′39.47"E	13	15°50′27.68"N	78°3′49.14"E
5	15°50′41.90"N	78°3′36.03"E	14	15°50′26.37"N	78°3′52.62"E
6	15°50′44.52"N	78°3′29.96"E	15	15°50′31.71"N	78°3′53.43"E
7	15°50′28.46"N	78°3′32.77"E	16	15°50′42.11"N	78°3′57.83"E
8	15°50′14.85"N	78°3′42.93"E	17	15°50′41.24"N	78°4′00.99"E
9	15°50′14.94"N	78°3′53.58"E			

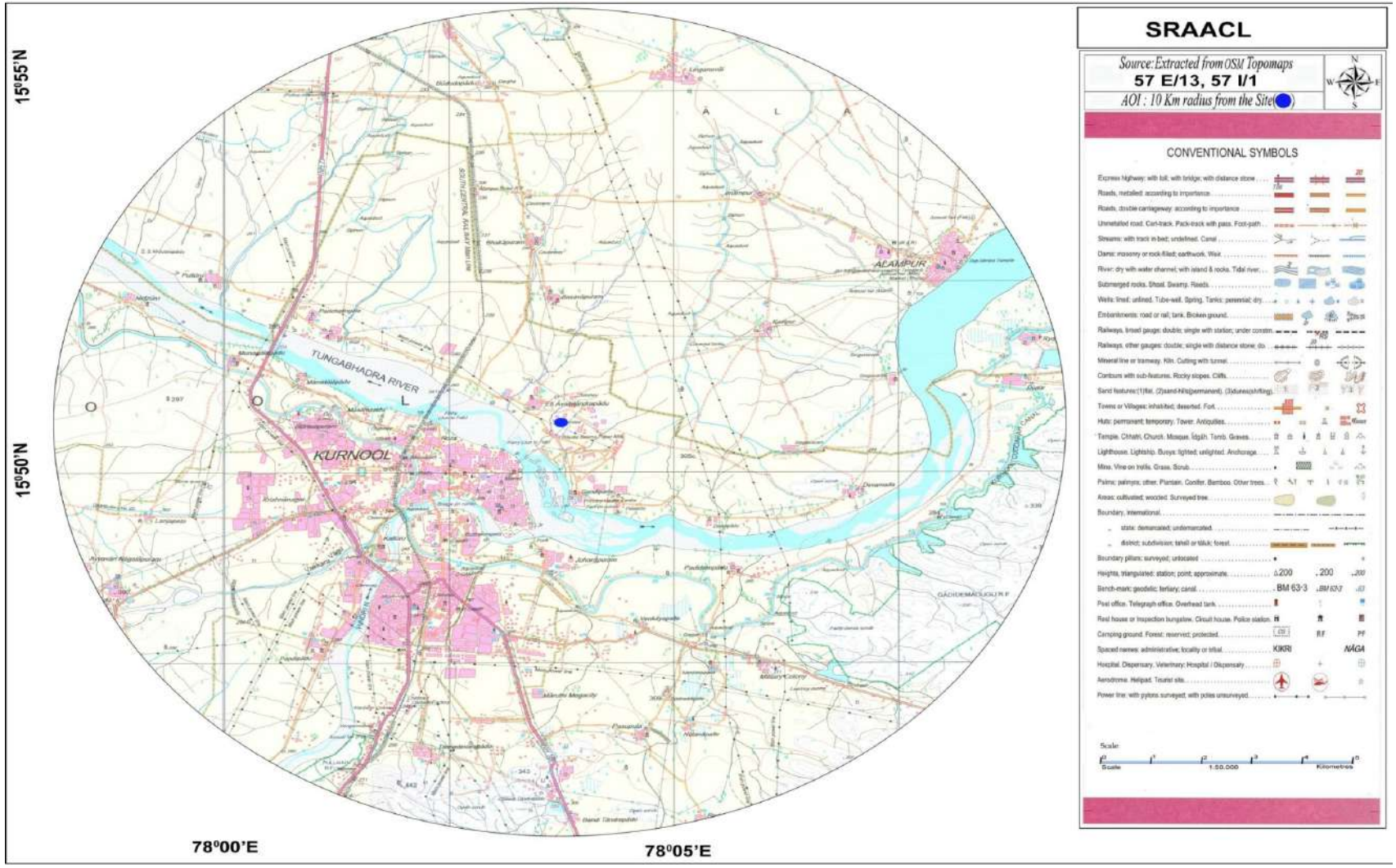
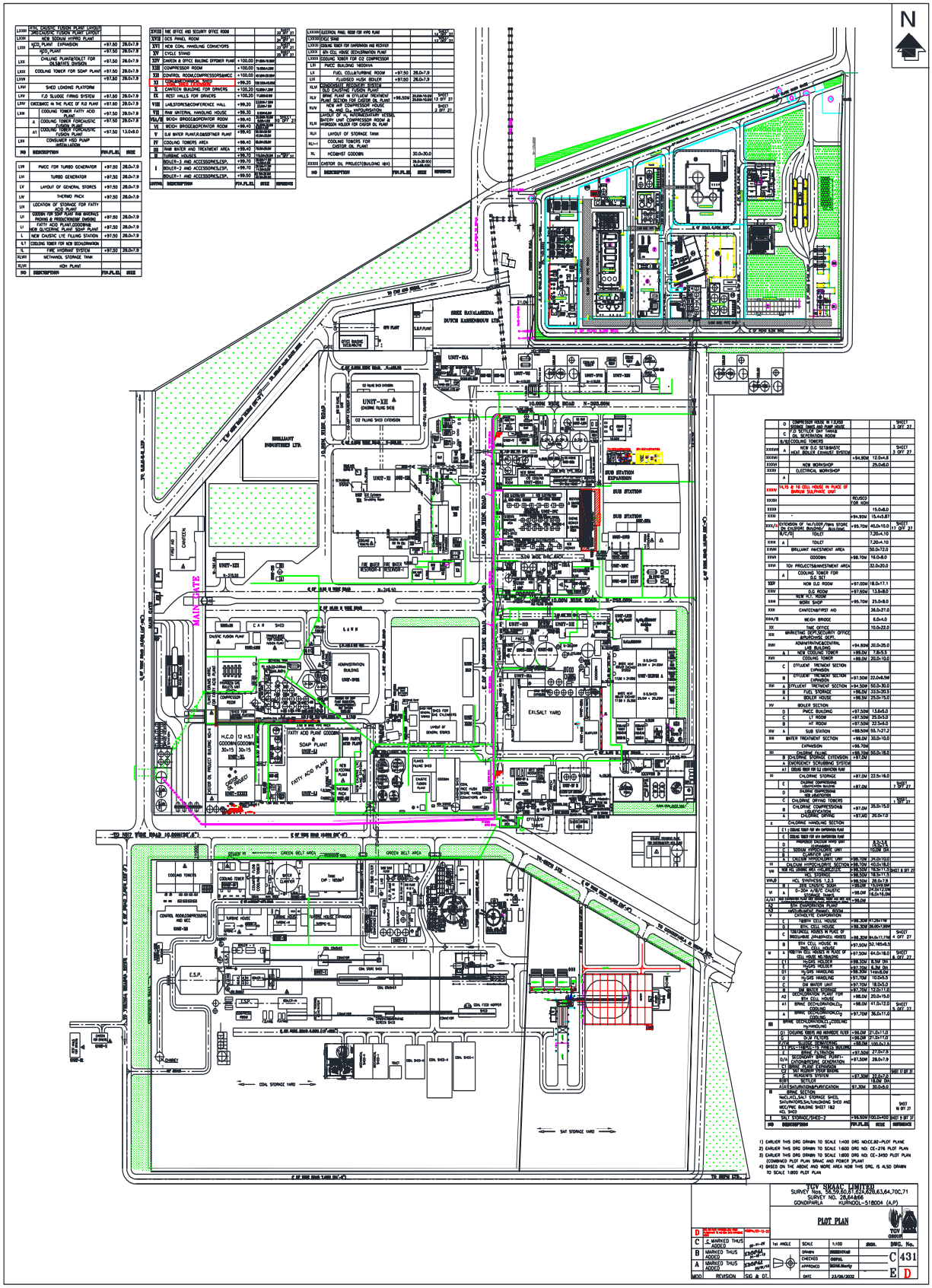


Fig 1.1 Location of TGV SRAAC Limited ***(Terms of Reference No. 4(ii))***


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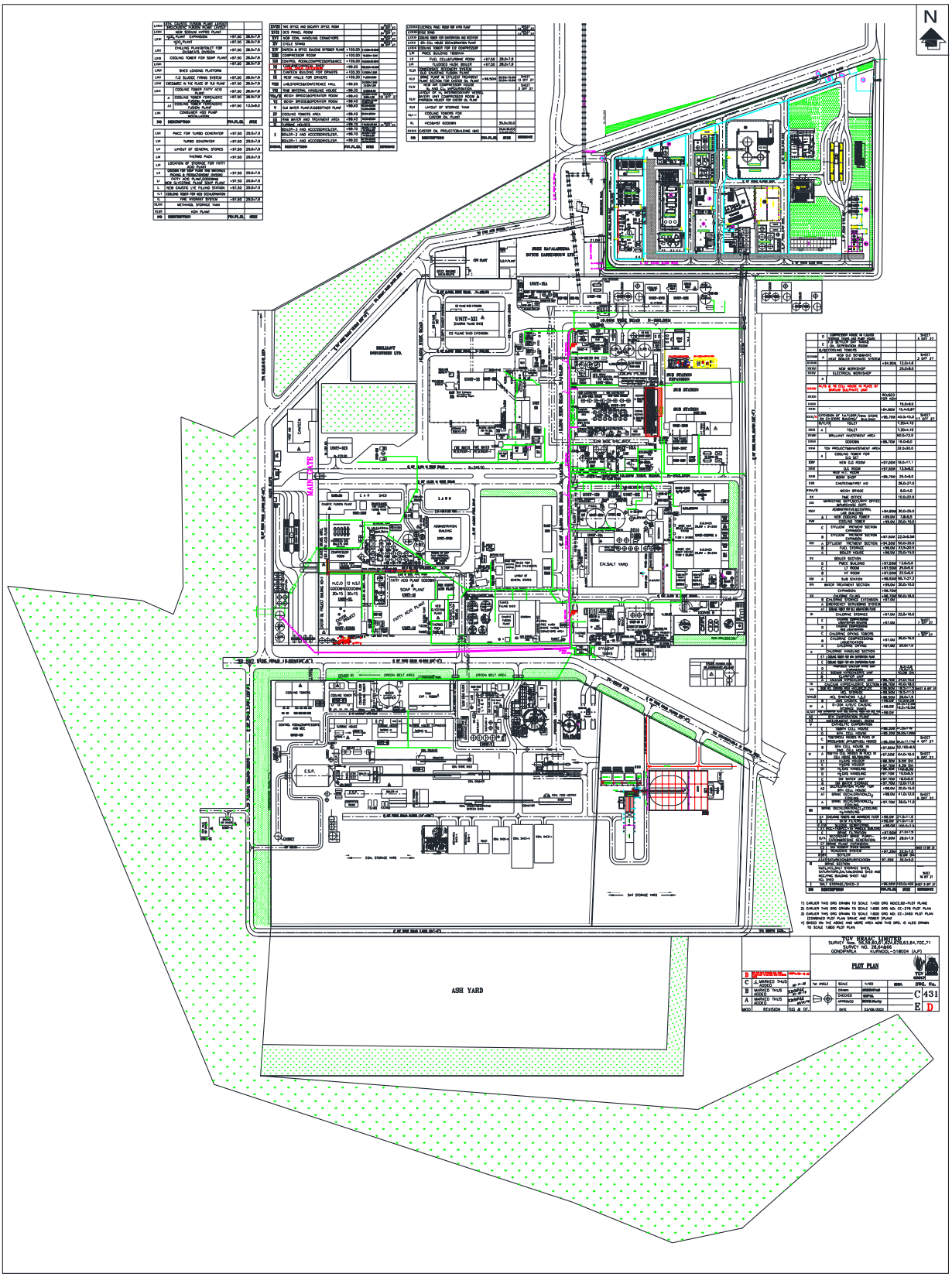


Fig 1.3 Overall Site Layout of TGV SRAAC Limited



Site Photographs of TGV SRAAC Limited.

1.5 Scope of EIA Studies

EIA study involves three basic components, viz. identification, prediction, and evaluation of impacts. The brief scope of EIA study incorporating the Standard terms of reference (TOR) obtained from MoEFCC is as follows:

- An intensive reconnaissance and preliminary collection of environmental information to plan field study.
- Field studies to collect preliminary information, particularly on the quality of the physical environment. Experienced scientists and engineers will collect the data.
- Base line data generation and characterization of air, water, soil, noise and vegetation in the ten-kilometer radius area (impact zone) over a period of Three months.
- A thorough study of the process including provisions for pollution control, and environmental management that includes prediction of impacts and relevant mathematical modeling.
- Preparation of Environmental Management Plan suggesting suitable methods for mitigating and controlling the pollution levels in EMP by adoptive management considering uncertainty, a mitigating and ignorance in impact assessment prediction. Environmental Monitoring Plan is suggested for monitoring the pollution loads at various facilities in the premises and to ensure compliance with the statutory requirements.

Table 1.4 Required Approvals and Applicable statutes

Legal Instrument (Type, Reference,Year)	Responsible Ministries or Bodies	Applic-ability	Remarks
Environment (Protection) Act, 1986and amendments	Central government nodal agency, MoEFCCcan delegate to state departments of environment	Yes	Prior environmental clearance vide So 1533 dt. 14.9.2006 and its amendments till date has to be obtained. The project is categorized as A
Water (Prevention and Control of Pollution) Act, 1974 and amendments	Central Pollution Control Board (CPCB), and Andhra Pradesh Pollution control Board (APPCB).	Yes	Consent to establish and to operate need to be obtained
Air (Prevention and Control of Pollution)Act, 1981 and amendments		Yes	Consent to establish and to operate need to be obtained
Noise Pollution (Regulation & Control) Rule 2000 and amendments		Yes	Prescribed noise standards to be adopted and followed
Forest (Conservation) Act,1980 and amendments	Government of AndhraPradesh (GoAP) and Government of India (GoI)	No	The project site does not consist of any forest land area.
Wildlife (Protection)Act, 1972 and amendments	National Board of Wildlife (NBWL).	No	No sanctuary, national park located within 10 km radius
Ancient Monumentsand Archaeological Sites & Remains Act, 1958 and amendment	Archaeological Survey ofIndia	No	No archaeological monument within 10 km of the project site area boundary.
Hazardous Wastes (Management and Handling) Rules, 1989 and amendments	Central and State Pollution Control Board (CPCB/SPCB)	Yes	Authorization for hazardous waste storage, transport, and disposal must be obtained.
Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 and amendments	Central / State Govern ment	No	No displacement of People and no acquisition of land.
Andhra Pradesh Panchayat Extension to Scheduled Areas Rules, 2011	Govt of Andhra Pradesh	No	The project site does not fall under notified scheduled area.

Water, Land and Trees Act, 2002, GoAP (WALTA, act 2002)	Govt of Andhra Pradesh	No	The expansion is within existing site area.
The Motor Vehicles Act, 1988	State Transport Authority	Yes	Pollution under control certification for all vehicles plying in and out of the project.
The Public Liability Insurance Act 1991	Insurance Company	Yes	To provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardus substance and for matters connected therewith or incidental thereto.

2.0 PROCESS DESCRIPTION

2.1 Type of Project

M/s. TGV SRAAC Limited located at Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh obtained environmental clearance vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 01.05.2018 for expansion of Chlor-Alkali plant and synthetic organic chemicals manufacturing unit subsequently the unit obtained name change in EC dated 01.05.2018 vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 28.09.2021 in an area of **152.4 ha**. The unit obtained consent for establishment (CFE) for expansion vide order no. APPCB/ KNL/ KNL/ 231/ CFE/ HO/2008 dated 23.05.2018. The previous expansion was implemented in phased manner, accordingly the unit obtained consent for operation (CFO) for caustic expansion and chloromethanes separately. It may be noted that the entire capacity mentioned in previous EC dated 01.05.2018 is currently in operation. It is proposed to expand the manufacturing capacity chlor-alkali and chloromethanes by 40% of existing capacity in phased manner with a capital cost of Rs. 280 cores. The manufacturing capacity proposed is presented in **Table 2.1.** Chronology of consents for previous expansion is presented in **Table 2.2.**

Table 2.1 Manufacturing Capacity

S. No.	Product Name	Unit	Capacity			
			Existing/ Permitted	Proposed		Total After Expansion
				Phase I	Phase II	
I. Chlor-Alkali Plant						
1	Caustic Soda Lye (Or) Flakes	TPD	1020	200	200	1420
	Potassium Hydroxide Lye (or) Flakes (100 % basis)	TPD				
2	Liquid Chlorine	TPD	600	120	120	840
II. Chloromethanes						
1	Methyl Chloride	TPD	1.2	0.24	0.24	1.68
2	Methylene Chloride	TPD	158	31.6	31.6	221.2
3	Chloroform	TPD	79	15.8	15.8	110.6
	Total – Chloromethanes		**238.2**	**47.64**	**47.64**	**333.48**
III. Chlorodifluoromethane						
1	Chlorodifluoromethane (R22)	TPD	10	2	2	14

IV. Captive Power Plant						
1	Captive Power Plant (Coal based)	MW	76	30	----	106
2	Power generation Furnace Oil#	MW	31		----	31
V. Castor Oil and Fatty Acid Plant						
1	Oil and Fatty Acid Products (Non-EC Products)	TPD	498	99.5	99.5	697
By-Products						
I. Chlor-Alkali Plant						
1	Hydrochloric Acid (100%)	TPD	313	56.05	56.05	425.1
2	Hydrogen Gas	Nm3	285600	55996	55996	397592
3	Sodium Hypochlorite (100% Cl_2 basis)	TPD	15	3	3	21
4	Barium Sulphate	TPD	10	----	----	----
5	Potassium Carbonate	TPD	50	----	----	50
6	Sodium Sulphate	TPD	10	2	2	14
7	Calcium Hypochlorite (100% Cl_2 basis)	TPD	10	----	----	----
8	Calcium Sulphate	TPD	2	----	----	----
II. Chloromethanes Plant						
1	Carbon tetrachloride*	TPD	12	2.4	2.4	16.8
2	Hydrochloric Acid (100 %)	TPD	47	9.4	9.4	65.8
III. Chlorodifluoromethane Plant						
1	Hydrochloric Acid (100 %)	TPD	8.27	1.65	1.65	11.57

** Carbon Tetrachloride (CCl4) generated will be sold as a feed stock to Authorized users/excess will be incinerated.*
 # Shall be kept as standby.

Table 2.2 Chronology of Previous Consents

Date of Issue	Description	Capacity Issued	Order No.	Valid till
01.04.2021	Consent for operation (CFO) for **Chlor-Alkali expansion, Co-generation Power plant (CPP) and Castor Oil and Fatty Acid Plant**	**Chlor-Alkali – 520 TPD** Liquid Chlorine – 300 TPD Captive Power Plant – 69.8 MW Oil and Fatty Acids – 471 TPD Hydrochloric Acid (100%) – 186TPD Hydrogen – 25,253 m^3/day	APPCB/KNL/KNL/16322/CFO & HWA/ HO/ 1987	28.02.2026
16.07.2021	Consent for operation (CFO) for **Chlor-Alkali expansion**	**Chlor-Alkali – 280 TPD** Liquid Chlorine – 217 TPD	APPCB/KNL/KNL/16332/CFO& HWA/ HO/2021	31.05.2026
16.09.2021	Consent for operation (CFO) for Chloromethanes	Chloromethanes – 125.05 TPD Captive Power Plant – 31 MW	APPCB/KNL/KNL/16332/CFO& HWA/ HO/2021	31.08.2026
06.05.2022	Consent for operation (CFO) for **Chlor-Alkali expansion**	**Chlor-Alkali – 220 TPD** Liquid Chlorine – 83 TPD Hydrochloric Acid (100%) – 92TPD Hydrogen Gas – 198747 m^3/day	1274022/APPCB/KNL/KNL/CFO&HWA/HO/2022	28.02.2026
29.07.2022	Consent for Establishment (CFE) for **Chloromethanes Change in Product Mix**	Chloromethanes – 250.2 TPD Captive Power Plant – 31 MW	266/APPCB/CFE/RO-NLR/HO/2021	29.07.2029
16.11.2022	Consent for operation (CFO) for **Chloromethanes Change in Product Mix**	Chloromethanes – 250.2 TPD Captive Power Plant – 31 MW	1473568/APPCB/KNL/KNL/CFO&HWA/HO/2022	31.08.2026
25.11.2014	Certificate of registration from Ozone Cell, MoEF&CC	Carbon tetrachloride (CCl_4) as Feed Stock	ODS/CS/17/2(1)/2014-OC	

2.2 Need of the Project

Chlor alkali industry is crucial for industrial, infrastructure and agriculture development of India, as it produces Chlorine and Sodium hydroxide. The usage of these chemicals in India is the highest in textiles sector followed by Alumina and organic chemical industry as indicated in **Fig 2.1**.

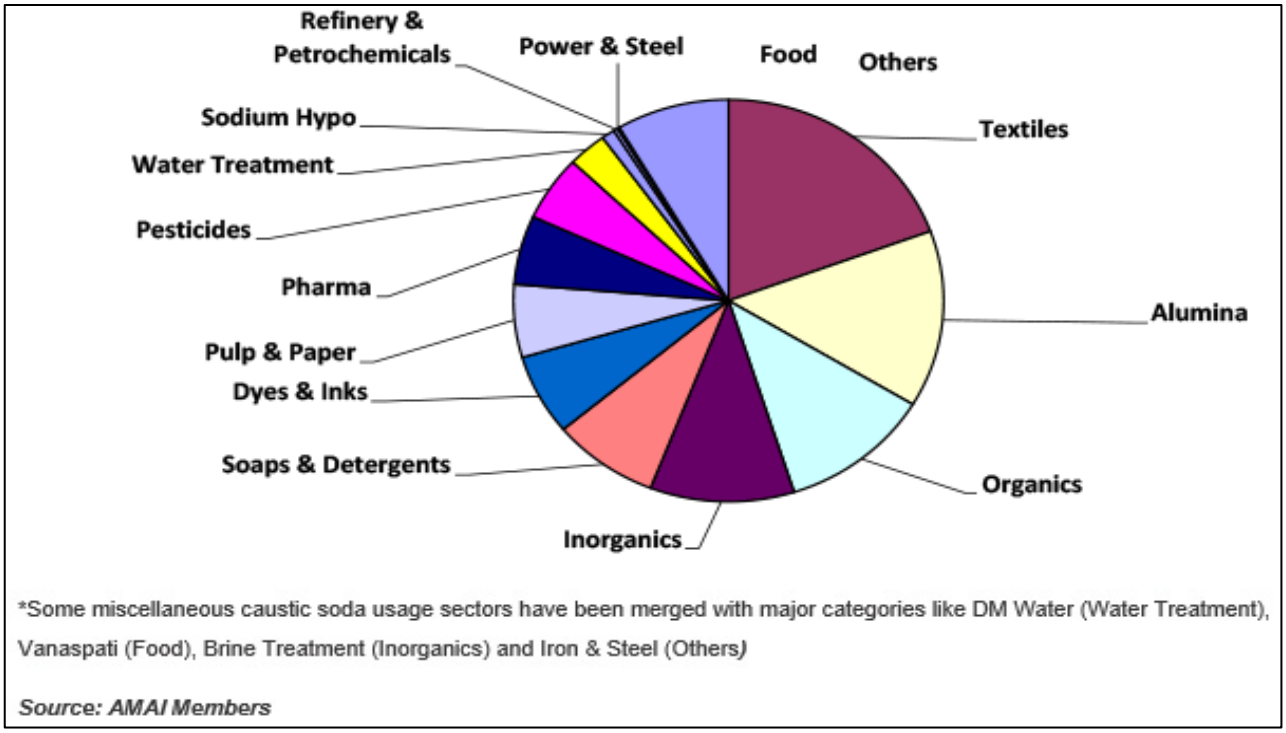


Fig. 2.1 Sector wise Caustic Soda Consumption in India

The growth of textiles, pulp and paper, soaps and detergents, pharmaceutical industry in India increases demand for chlor-alkali products necessitating a robust chlor-alkali industry. Chlorine and Caustic soda are used in the production of Aluminum which is an essential building material in infrastructure sector. Chlorine is used in water treatment processes as a disinfectant, and the growing piped water demand or infrastructure in India increases the need for chlorine production. Chlorine, chlorinated compounds, and caustic are major raw materials of technical grade pesticides and its intermediates. These industrial sectors are major contributors of employment generation in addition to import substitution saving foreign exchange.

The chlorine usage is the highest in India for production of HCl. In recent times, the use of chlorine in PVC manufacturing has also increased and currently about 11 per cent of the chlorine is consumed by PVC sector. In recent years India has also started to export substantial quantity of chlorine-based products.

2.3 Location and Layout of the Project

The plant site is located at Sy. No. Sy. No. Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh in an area of 152.4 ha. The site is located at the intersection of 15^0 49′ 30″ (N) latitude and 78^0 4′ 30″ (E) longitude. The site elevation above mean sea level (MSL) is 300 m. The plant site is surrounded by open lands in east direction, Sree Rayalaseema Hi-Strength Hypo Limited (SRHHL) in north direction, Road connecting the NH-7 with Gondiparla village in the south and west directions. The nearest habitation from the plant is E. Tandrapadu village located at a distance of 0.5 km in northwest direction. The main approach road is NH-7 - Gondiparla village adjacent to the site in northwest direction. The nearest Town is Kurnool at a distance of 0.8 km in southwest direction, railway station is Kurnool located at a distance of 3.02 km in northwest direction and nearest airport is Kurnool located at a distance of 16.5 km in southeast direction. Tungabhadra River is flowing from northwest to southeast direction at a distance of 0.2 km in south direction. Interstate boundary between Telangana and Andhra Pradesh is at a distance of 1.3 km in northeast direction. There are two reserve forests in the study area. Gadidmadugu RF at a distance of 5.5 km in east direction. Pullaiah RF at a distance of 9.3 km in southwest direction. There is no National Park, sanctuary, and critically polluted area within the impact area of 10 km surrounding the site. The location map and site layout are as shown in **Fig 2.2** Plant battery limit layout and overall site layout is presented in **Fig 2.3** and **Fig 2.4** respectively.



Existing Site Facility Photographs of TGV SRAAC Limited

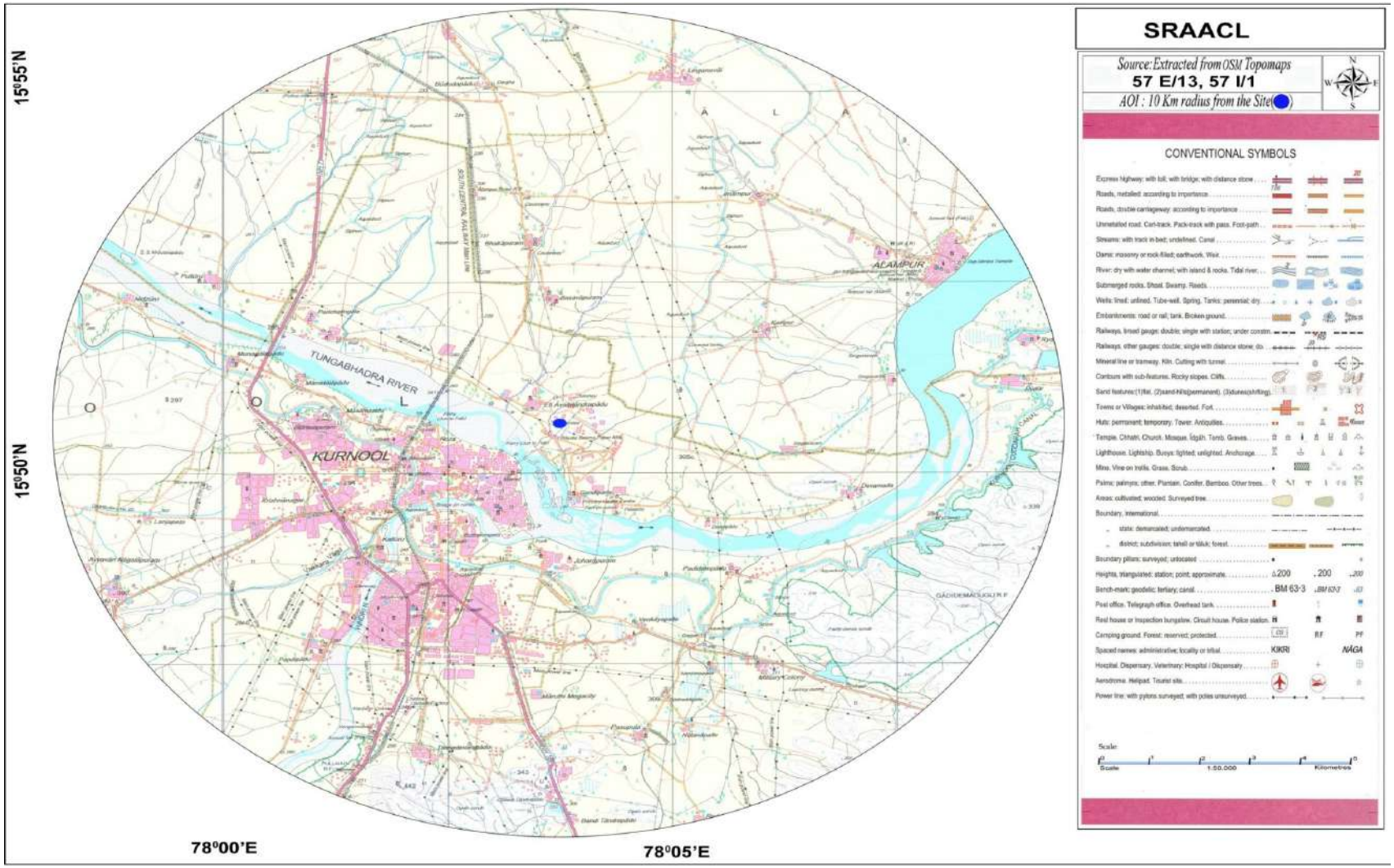


Fig 2.2 Location of M/s. TGV SRAAC Limited.

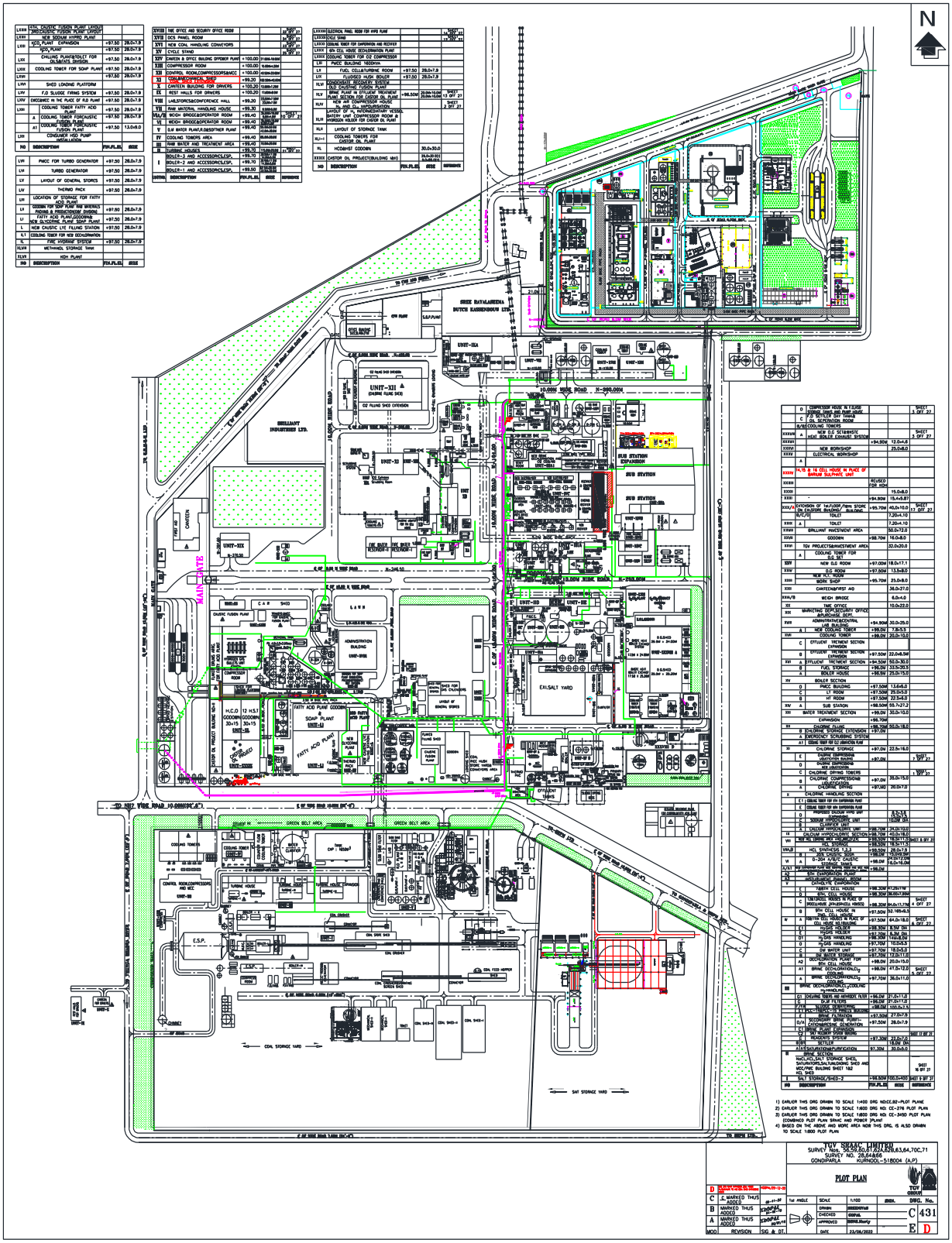


Fig 2.3 Plant Battery Limit of M/s. TGV SRAAC Limited

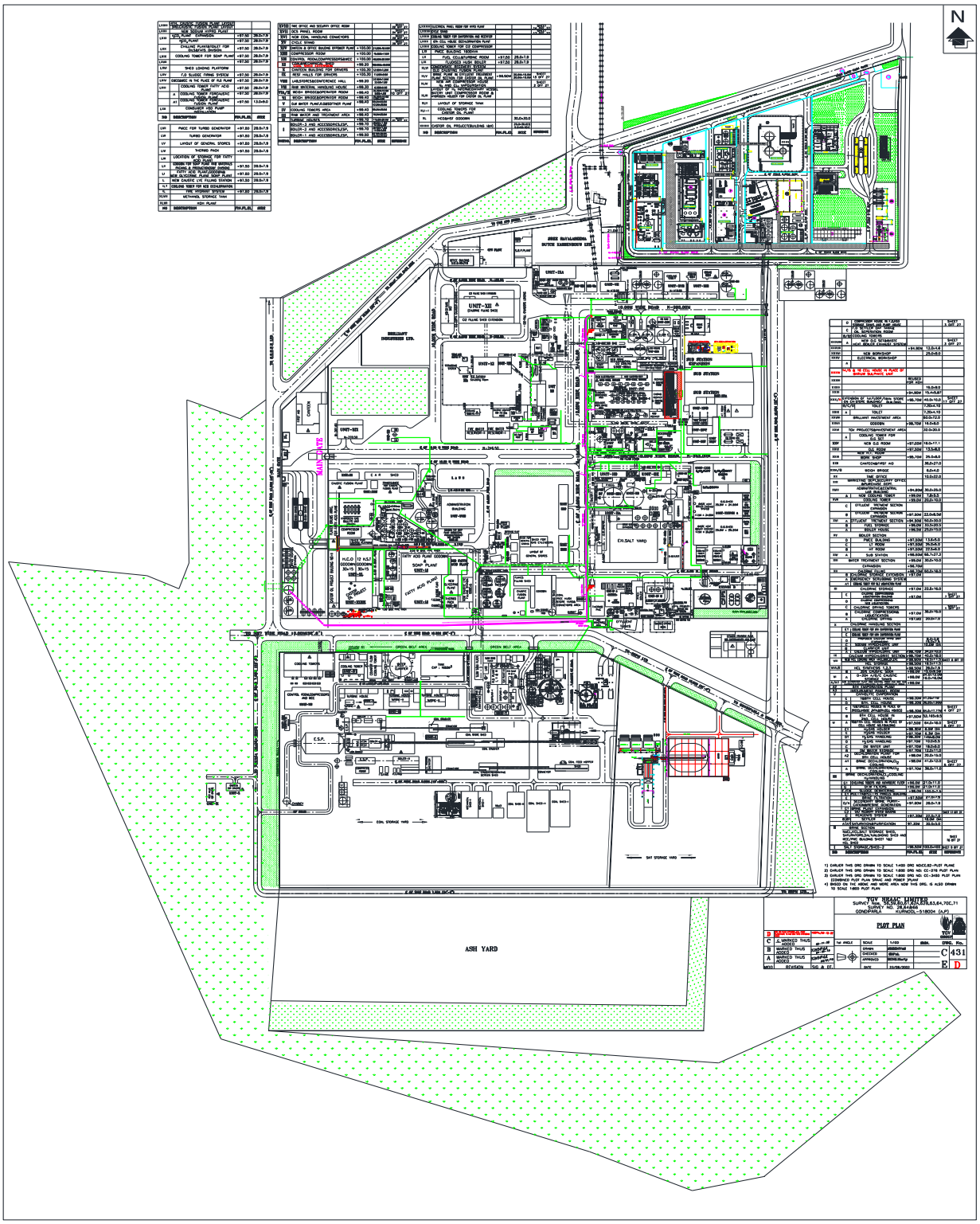


Fig 2.4 Overall Site Layout of M/s. TGV SRAAC Limited.

2.4 Process Description

2.4.1 Process Description of Caustic Soda

Brine Saturation and Precipitation

Brine is prepared by dissolution of NaCl (Salt) in the brine saturators. The saturated brine of around 300 g/l of NaCl flows to the reactor (mechanically agitated), where it is mixed with chemicals to precipitate the impurities. The impurities present in raw brine are mainly Magnesium, Calcium, Sulphate and a small quantity of iron. Caustic soda is used for precipitating Magnesium as Magnesium Hydroxide, Barium Carbonate for precipitating Sulphate as Barium Sulphate and Sodium Carbonate is used for the Calcium precipitation as Calcium Carbonate.

Brine Clarification

The raw Brine is fed by gravity from the precipitation tank to clarifier. Before entering the clarifier, a flocculent agent will be added using the flocculent metering pump. This helps in formation of larger flocks out of very fine precipitates (Particularly $Mg(OH)_2$) and promotes the settling of the precipitated solids and gels in Lamella Clarifier.

Sludge Filtration

The sludge's coming from brine treatment are collected in a receiver and sent to a sludge filter (Vacuum drum filter). The filtrate is recovered in a tank and recycled to the brine system while the sludge cakes are conveyed to trolley for disposal.

Brine Polishing

The purpose of polishing unit is to remove final traces of suspended solids from the brine prior to removal of dissolved impurities in ion exchanger.

Electrolysis

Ultra-pure brine from the head tank flows into the anode chamber of the electrolyser cells brine flow to each electrolyser is regulated by means of magnetic flow meters, with a

tripping mechanism to act in case of low or over flow. Uniform distribution of brine into the different elements of the electrolyser is ensured by means of the long thin inlet hoses.

Cathode chambers of the electrolyte cells similarly receive weak caustic from the catholyte head tank. Anode and cathode chambers of the cell are isolated from each other by the membrane, which selectively allows Na+ through the membrane from the anode chamber to the cathode chamber. Cl_2 is liberated at the anode surface and the brine in the anode compartment is depleted to 170-220 gpl NaCl. The two-phase mixture of depleted brine and chlorine overflows from the anode chambers via the insert pipe into the anolyte header.

As a result of the electrochemical reactions taking place in the cathode chamber, H_2 is generated at the cathode surface and OH- ions combine with the Na+ ions diffusing through the membrane. A two-phase mixture of 32% NaOH and hydrogen overflows from the cathode chambers into the catholyte header. The water required for cathode reaction is partly supplied by the water transport through the membrane and the rest is made up be addition of dematerialized water in the recirculation catholyte loop.

Anode Reaction:	$2NaCl$	$2Na^+ + Cl_2 + 2e^-$
Cathode Reaction:	$2H_2O + 2e^-$	$2OH^- + H_2$
Overall Reaction:	$2NaCl + 2H_2O$	$2NaOH + Cl_2 + H_2$

Catholyte System

The two-phase mixture of 32% NaOH and hydrogen primarily gets separated in the catholyte header itself. 32% NaOH then flows into the vent pot which functions as a seal.

Further gas disengagement is achieved in the vent pot, from where the 32% NaOH overflows under N_2 blanket into the catholyte tank. Overflow tank is connected to the NaOH receiver. A catholyte recirculation system is established from the catholyte tank by means of the catholyte pump, which pumps 32% NaOH to the catholyte head tank. Part of this circulation is diverted under temperature control through the catholyte cooler.

Catholyte flowing to the cells from the head tank is diluted by adding demineralized water under flow control. Catholyte cooler also serves the purpose of heating and cooling during start-up and shut down respectively. Portion of the recirculating catholyte stream is tapped off as 32% NaOH product stream, which is sent to the Caustic evaporation unit.

Anolyte De-chlorination

Considerable amount of Chlorine dissolved in the anolyte requires a de-chlorination unit. De-chlorination is carried out in two process steps;

- First Step is Cl_2 – Desorption under vacuum
- In the second step, remaining free chlorine in brine is chemically destroyed

Prior to entering the Anolyte tank, the anolyte is acidified using acidic brine from the chlorate decomposition. Anolyte is withdrawn from the Anolyte tank by a vacuum unit comprising of vacuum pump into the dichlorination tank where most of the chlorine is desorbed. Desorbed chlorine is condensed in a vapor condenser and sent to the main chlorine header. Condensate from vapor condenser is routed through condensate separator to the Anolyte tank.

The lean brine from vacuum tank is neutralized by 32% NaOH through a pH controller. Sodium bisulphate/sodium meta bisulphate solution in demineralized water prepared in bisulphate preparation tanks is added through bisulphate head tank for chemical destruction of the dissolved chlorine. The addition rate of sodium bisulphate solution is controlled by means of redox controller. Dechlorinated lean brine is pumped to the brine saturator using lean brine pumps. Part of the de-chlorinated lean brine is diverted to Sulphate Recovery System to remove Sodium Sulphate from the Brine through Nano filtration system.

Chlorate Destruction

Electrochemical side reactions in the cell generates chlorates. As the electrolyte recirculates a chlorate destruction unit is required to prevent the accumulation of $NaClO_3$ in the brine / anolyte system. The unit destroys the Sodium Chlorate and Hydrochloric acid reaction.

For the chlorate destruction, a part of the anolyte from the anolyte tank is pumped into the chlorate destruction tank by chlorate feed pumps. Heat for chlorate destruction is supplied by MP steam at 3.0 Kg/Cm2 (g) through a steam jet. Flow of steam is controlled through a control valve depending on the temperature in chlorate destruction tank.

Chlorate is then decomposed by the addition of 33% hydrochloric acid. The amount of HCL added is controlled by the flow of acidified anolyte to anolyte system, which is turn is controlled by pH-value of anolyte in anolyte header. The chlorine generated in the chlorate decomposition tank is transferred to the chlorine header.

The plant is equipped with the latest available membrane technology. This process is environmentally friendly. There is a DCS control room wherein all the operations including the parameters like temperature, pressure, flow etc. are controlled. In case of emergency the operator can use the emergency push buttons in the DCS room. The DCS has indicators and alarms for process parameters like temperature, pressure, flow, and level. Schematic diagram of caustic soda manufacturing process is presented in **Fig 2.5** and mass balance is presented in **Table 2.3**

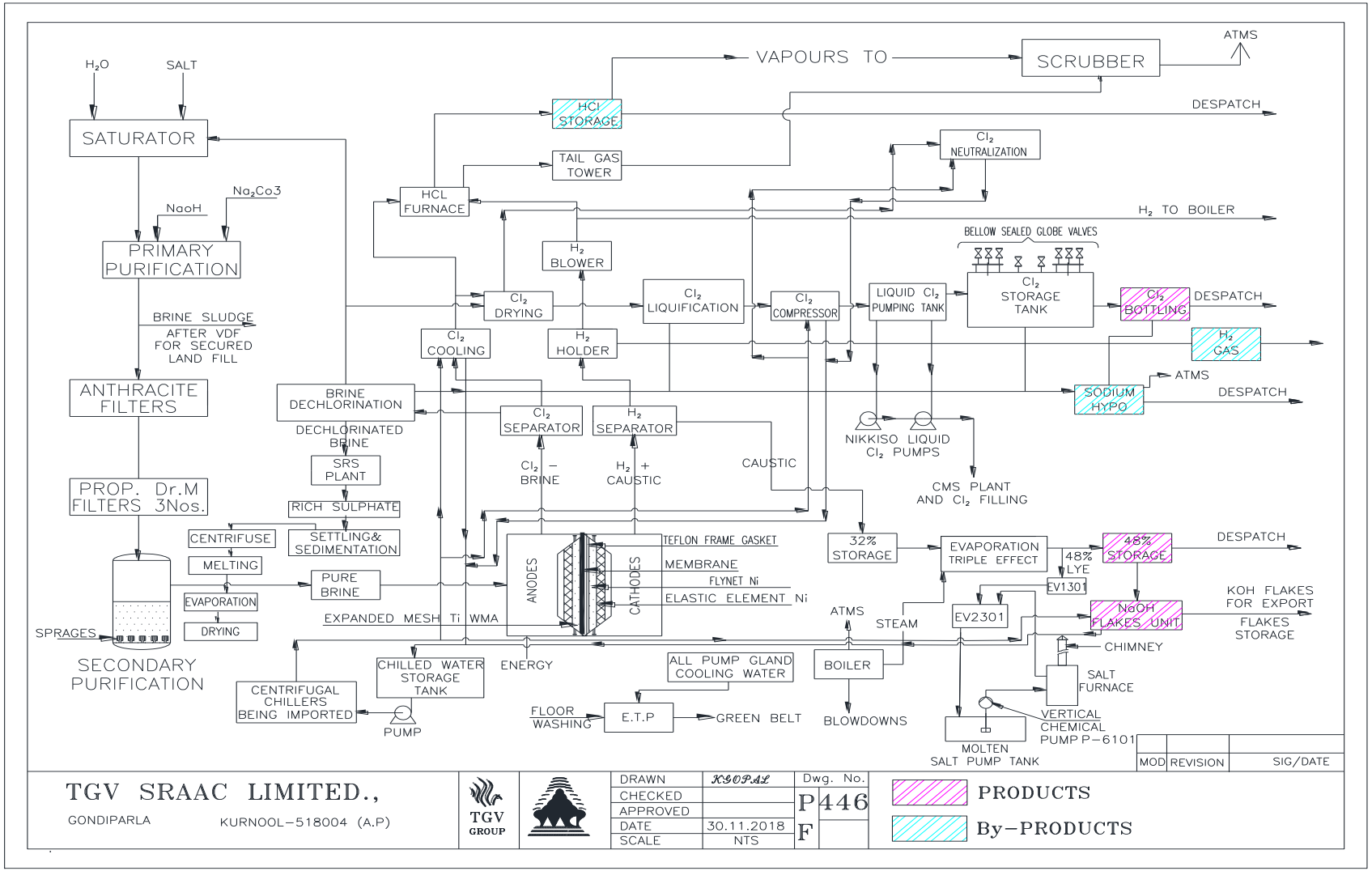


Fig 2.5 Flow Diagram of Caustic Soda Manufacturing Process

Table 2.3 Mass Balance of Caustic Soda – 100 Tons

Input	Quantity (Tons)	Output	Quantity (Tons)
I. Brine Purification			
Sodium Chloride (100%)	143.5	Purified Sodium Chloride	325.4
Impurities in Raw Salts		Sodium Chloride from reaction of HCl and Caustic Soda	2.7
Insoluble	1.3	Water	881.4
Sulphates	0.4	Barium Sulphate	1.2
Calcium	0.2	Sludge	2.7
Magnesium	0.1		
Water in Raw Salt	30.9		
Depleted Brine	874.4		
Sodium Carbonate	6.7		
Caustic Soda	12		
Dilute Hydrochloric acid	5.2		
Barium Carbonate Slurry	4.9		
Water	134		
Total Input	**1213.4**	**Total Output**	**1213.4**
II. Electrolysis of Brine			
Brine - NaCl	328.1	Caustic Soda	100
Water	736.9	Chlorine	88.6
Condensate	144.5	Hydrogen	2.5
		Water in Product	212.5
		Depleted Brine to Brine Purification	805.9
Total Input	**1209.5**	**Total Output**	**1209.5**
III. Caustic Evaporation & Fusion Plant			
Caustic Soda Lye (32%)	312.5	Caustic Soda Flakes	98
		Caustic Soda to Brine Purification	2
		Condensate to Brine Purification	68.0
		Condensate to Electrolysis	144.5
Total Input	**312.5**	**Total Output**	**312.5**

2.4.2 Process Description of Caustic Potash

Caustic potash is produced by the electrolysis of potassium chloride brine. Potassium chloride is the main raw material for caustic potash production. The brine treatment is similar to brine treatment adopted in caustic soda production. Co-products chlorine and hydrogen are handled along with the gases generated from caustic soda plant. Caustic

potash produced in cell house also is similar to electrolysis of caustic soda. The product is enriched to 48% and 90% as per requirement in caustic evaporation and flakes unit respectively. Schematic diagram of Potassium hydroxide manufacturing process is presented in **Fig 2.6** and mass balance is presented in **Table 2.4.**

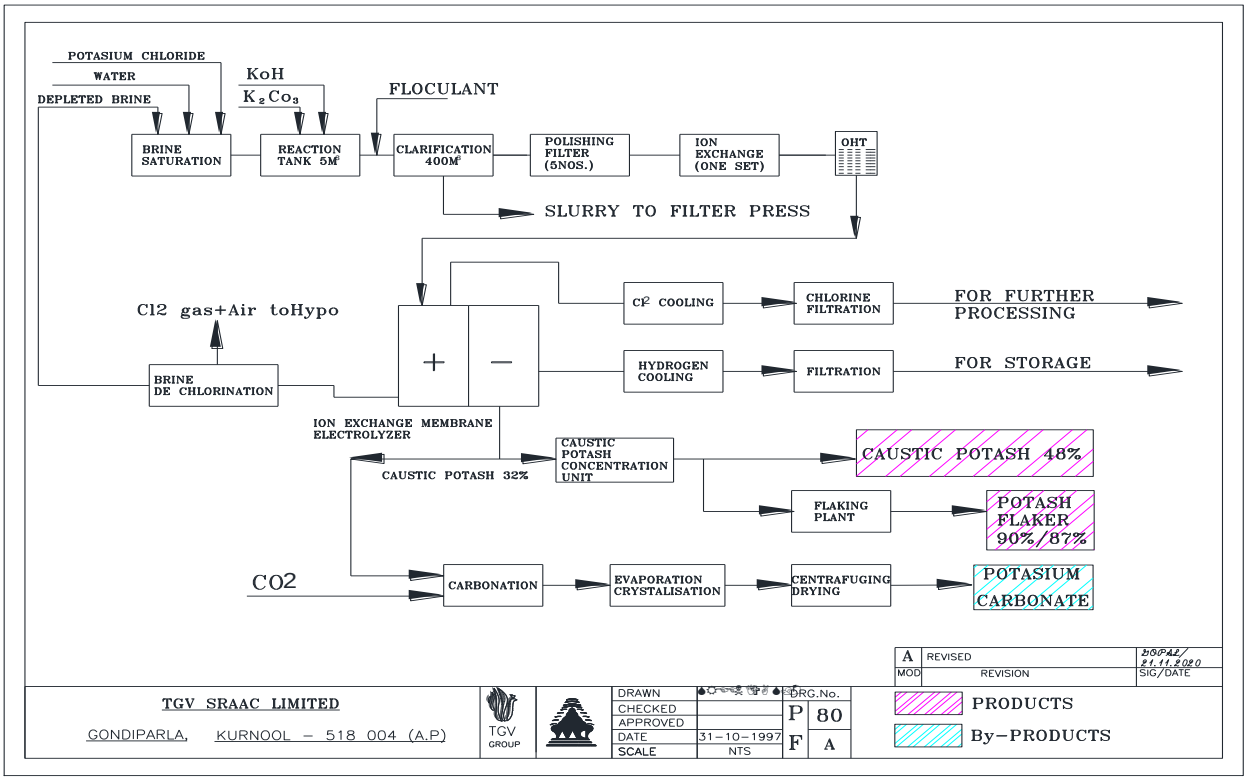


Fig 2.6 Flow diagram of Caustic Potash Manufacturing Process

Table 2.4 Mass Balance of Caustic Potash – 100 Tons

Input	Quantity (Tons)	Output	Quantity (Tons)
I. Brine Purification			
Potassium Chloride (100%)	131.9	Purified Sodium Chloride	229.2
Impurities in Raw Salts		Potassium Chloride from reaction of HCl and Caustic Potash	1.3
Insoluble	0.15	Water	637.1
Sulphates	0.49	Sludge	1.65
Calcium	0.23		
Magnesium	0.1		
Water in Raw Salt	1.5		
Depleted Brine	561		
Potassium Carbonate	3		
Caustic Potash	3.7		
Dilute Hydrochloric acid	1.5		
Barium Carbonate Slurry	0.9		
Water	165		
Total Input	**869.3**	**Total Output**	**869.3**
II. Electrolysis of Brine			
Brine - KCl	230.6	Caustic Potash	100
Water	488.9	Chlorine	63.3
Condensate	148.2	Hydrogen	1.8
		Water in Product	220.5
		Depleted Brine to Brine Purification	482.1
Total Input	**867.6**	**Total Output**	**867.7**
III. Caustic Evaporation & Fusion Plant			
Caustic Potash Lye (31.2%)	320.5	Caustic Potash Flakes	98.0
		Caustic Soda to Brine Purification	1
		Condensate to Brine Purification	73.5
		Condensate to Electrolysis	148.2
Total Input	**320.5**	**Total Output**	**320.5**

2.4.3 Process Description of Liquid Chlorine

In chloro-alkali plant the gaseous emissions are chlorine and hydrogen chloride vapors. Due to advancement of control checks and due to membrane cell electrolysis, possibility of chlorine emission to atmosphere is negligible. Scrubbing systems are provided to neutralize sniff gases effectively. Even the dilute chlorine is also being converted to

sodium hypochlorite after neutralization with caustic soda at control temperature leading to value addition.

(a) Chlorine Emissions

The sources of chlorine emissions are cell house, De-chlorination unit, chlorine liquefaction and chlorine storage and filling.

Cell House

Cell house is equipped with safety inter locks, safety blow out seals, etc. Either during power failure or due to any miss operation chlorine is diverted to neutralization unit automatically. Cell house emissions will not change as the emissions in this section are due to failure of systems only.

De-chlorination Section

Brine after electrolysis which is called depleted brine contains about 0.3 g/l of dissolved chlorine. Vacuum de-chlorination system is installed to suck the dissolved gas in enriched form to main chlorine header instead of blowing it to neutralization unit. This will help to effectively liquefy all the chlorine instead of sending it neutralization unit. This will facilitate reduction in chlorine diversion to neutralization.

Chlorine Liquefaction Section

Chlorine is generated during electrolysis as a co-product. 70% of chlorine is being liquefied and sold as liquid chlorine. After cooling, chlorine is blown to drying unit to eliminate moisture, compressed in compressors, and diverted to liquefier wherein it gets liquefied. During liquefaction, depending upon gas purity, 95% of chlorine gets liquefied and the balance quantity comes out as sniff gas and the same will be burnt in hydrochloric acid synthesis unit.

The industry is supplying Hydrogen chloride gas to a downstream unit to manufacture chlorosulphonic acid. All the sniff chlorine from chlorine liquefaction is burnt in synthesis

unit to make Hydrogen Chloride gas instead of sending it to neutralization. In spite of increase in liquid chlorine production, all the sniff chlorine can be utilized effectively and safely as is being used now in the manufacture of Hydrochloric Acid.

Chlorine storage filling and handling

For chlorine storage, four tanks of 100 MT capacities are available. One tank is always kept as dump tank, chlorine sensors are installed near each tank with an indication in control room to alert all on DCS system, in time, in case of any leakage. Load cells are provided for indication of tank weight locally as well as in control room. Excess level alarm, excess flow shut-off valves, gas masks, etc., have been provided in storage area.

Chlorine sensors are provided in filling section to sense leakage of chlorine. Load cells to allow correct filling of chlorine tonners are provided. Scrubbing system around the filling section to take care of accidental emissions is in operation. Apart from this, emergency kits, gas masks and trained man power are available round the clock. Further closed cubicles are provided for chlorine cylinder filling area with chlorine sensors and auto shut off doors in case of emergency.

An emergency scrubbing system is provided to avoid chlorine storage risk totally for chlorine storage and filling area, to take care of any accidental emission and to avoid spreading of chlorine to nearby area. Arrangements are also being made to take back left-over liquid chlorine, after filling, to liquefaction unit for reprocessing to reduce load on neutralization unit.

Initially, chlorine neutralization was with milk of lime and the resultant bleach liquor was supplied to nearby paper mill. After its closure, the industry has switched over to scrubbing with caustic. Now the industry has three caustic scrubbing towers in series.
With available facilities and expertise in handling chlorine, chlorine emissions to atmosphere are being maintained between 0.6 to 1 ppm in vents. These levels are well below the prescribed limits. The industry has provided thirty-five chlorine sensors at

critical places like chlorine storage and filling, hypo plant. Some sensors output is connected in control room.

Normally chlorine is sent to neutralization from chlorine filling and brine de-chlorination section. In case of either process problems or power failure, release of chlorine to neutralization unit takes place. Chlorine neutralization unit is provided with emergency power supply to run in case of power failure and also one blower and one caustic circulation pump are exclusively provided with diesel engine to run in case of failure of emergency supply also. The resultant Sodium Hypo is a value-added product, since it is being used in many oxidation reactions. A dedicated chilled water system is also provided to take care of heat of reaction during neutralization and to make a quality product. There will be marginal increase in chlorine to neutralization from filling. But as the total quantity of chlorine will be the same, the industry shall be in a position to maintain total scrubbing keeping the outlet emission well below stipulated specification.

A chlorine sensor is also provided at final neutralization tower outlet to monitor the chlorine emission to atmosphere after neutralization. Due to double absorption, chlorine emission from scrubber outlet is below stipulated limits. Since there is no further load on neutralization unit, emission of chlorine to atmosphere will continue to be well below prescribed limits. With available safety precautions, equipment and skilled manpower, practically there will not be any additional chlorine emissions to atmosphere. The quantity of chlorine generated, captive usage and salable product is presented in **Table 2.5.**

Table 2.5 Details of Quantity of Chlorine

S. No	Description	Quantity (TPD)			
		Permitted	Proposed		Total After Expansion
			Phase I	Phase I	
I	**Total Chlorine Generated - A**	**900.4**	**176.5**	**176.5**	**1253.4**
1	Hydrochloric Acid**	300.4	56.5	56.5	413.5
	Total - I	**300.4**	**56.5**	**56.5**	**413.5**
2	**Liquid Chlorine**				
	a. Sodium Hypochlorite (100%)	14.3	2.9	2.9	20
	c. Chloromethanes	257	51.4	51.4	359.8
	d. Sree Rayalaseema Hi-Strength Hypo Ltd	200	-----	-----	200
	d. Shivtek Industries Pvt. Ltd. (for CPW)	60	20	20	100
	Total - II	**531.3**	**74.3**	**74.3**	**679.8**
3	Domestic Market	68.7	45.8	45.8	160.2
	Total - III	**68.7**	**45.8**	**45.8**	**160.2**
	Sub Total (II+III)	**600**	**120**	**120**	**840**
	Grand Total (I+II+III)	**900.4**	**176.5**	**176.5**	**1253.4**
5	Total Chlorine Storage Capacity (MT)#	4 x 100	-----	-----	4 x 100

Note:
1. However chlorine to HCl and liquid chlorine production will vary according to market demands.
2. To consume additional chlorine produced, it is proposed to promote entrepreneurs to establish chlorine derivate products like CPW.
** 1 x 100 MT kept empty to transfer the material from other tank in case of emergency. The excess chlorine will be sold as product*
CPW: Chlorinated Paraffin Wax

2.4.4 Process Description for Hydrochloric Acid (33%)

The HCl synthesis unit consists of three principal parts, viz. burner, synthesis chamber heat exchanger assembly and receptor.

The burner consists of two silica tubes mounted inside graphite housing for their easy replacement. The burner has two inlets, one for chlorine and the other for hydrogen. The synthesis chamber-heat exchanger assembly consists of a combustion chamber provided with two sight tubes, which permit the automatic control of the flame and to light the furnace. The unit synthesis-absorption type includes a distribution element with an inlet for the absorber. The heat exchanger (at the lower part) consists of columns of absorbing blocks. The receptor is a graphite element for the separation of the acid product from the vent gases. At the bottom of this element there is a graphite safety disc and below this an

explosion guard. Hydrogen is sent to the furnace burner from electrolysis room after cooling. Chlorine is directly fed to the furnace burner. A pressure control valve automatically controls the chlorine pressure. Hydrogen and Chlorine lines are fitted with automatic block valves interlocked with the furnace photoelectric cell. In case of flame failure, the two valves are automatically closed, while a third automatic block valve will allow an inert gas to enter the furnace to purge the system.

The hydrochloric acid gas produced in the synthesis furnace is first cooled and absorbed in water in a cooler-absorber. Absorption water before entering the cooler-absorber is used to wash the tail gases in a washing tower. Suction is provided through the system by tails exhaust fans. Mass balance is presented in **Table 2.6**

Table 2.6 Mass Balance of Hydrochloric Acid

Description	Unit	Input		Output
		Hydrogen	Chlorine	Hydrochloric Acid (100%)
Existing/Permitted	TPD	8.6	304.4	313
Proposed				
Phase I	TPD	1.5	54.6	56.05
Phase II	TPD	1.5	54.6	56.05
Total	**TPD**	**11.6**	**413.5**	**425.1**

2.4.5 Process Description of Chloromethanes

The production process of Chloromethanes consists of the following stages, which are described as follows:

I. Hydro chlorination Section

The reaction of this stage proceeds as follows:

$$CH_3OH + HCl \longrightarrow CH_3Cl + H_2O$$

Methanol, vaporized by CH_3OH Evaporator, is fed to the hydro chlorination Reactor at an optimum ratio with hydrogen chloride. The reaction is carried out in vapor phase in the presence of catalyst to produce methyl chloride. Methyl chloride thus obtained is washed with quench liquid itself from condenser in Quench tower to remove a small amount of un-reacted methanol and hydrogen chloride. It is further washed with Caustic tower to

remove traces of acidity followed by concentrated sulfuric acid tower to remove moisture. After these treatments, purified methyl chloride is compressed through CH_3Cl compressor and then it is condensed and collected in a receiver from which it's sent to the chlorination section. 21%HCl from Quench vessel（S2103）is sent to HCL absorption unit to form 31%HCl. The spent sulfuric acid from the bottom of the Dehydrator has a concentration of 85~90% is sold as spent sulfuric acid.

II. Thermal Chlorination Section

Methyl chloride reacts with chlorine in vapor phase in a vessel reactor to form higher chlorinated Chloromethanes.

The reaction of this stage proceeds as follows:

$$CH_3Cl + Cl_2 \longrightarrow CH_2Cl_2 + HCl$$
$$CH_3Cl + 2Cl_2 \longrightarrow CHCl_3 + 2HCl$$
$$CH_3Cl + 3Cl_2 \longrightarrow CCL_4 + 3HCl$$

The reactions are carried out at high temperatures and middle pressures. By control of reaction conditions and ratio of feedstock and recycling Chloromethanes, methylene chloride, chloroform and carbon tetrachloride are formed at desired production ratios. Firstly, Methyl chloride, vaporized by Evaporator is sent to the reactor by means of flow control. Meanwhile, the vapor chlorine, from OSBL, is also sent to chlorination reactor by means of flow control. The recycled organics mainly methyl chloride, methylene chloride and hydrogen chloride, the vapor organics are sent to reactor by means of flow control. The vapor reactant, with high temperatures, is cooled in Quench tower, then hydrogen chloride is separated from CMS compounds through condensers).Large amounts of hydrogen chloride are recycled to hydro chlorination to produce methyl chloride, HCl is sent to HCl Absorption unit to produce 31%HCl.

The organics vapors mainly methyl chloride, methylene chloride and hydrogen chloride, from the top of Recycling tower, are partly recycled to reactor in order to control the temperature of reactor and the ratio of production, and the balance is sent to recycling

tower as reflux liquid, the mixture of methylene chloride, chloroform and carbon tetrachloride, are sent to Rectification section, from the bottom of the recycling tower.

III. Rectification Section

First, the product **mixture** is separated and purified. It is fed to caustic washing drum to remove acid and fed to azeo tower where water is removed from the product. The spent caustic soda from caustic washing drum is sent to effluent treatment section.

IV. Regeneration and Drying Section

The main function of this unit is to collect spent caustic soda containing CMS mixtures and off-spec CMS, then regenerate through CMS dryer and send it to product rectification unit according to their composition. The other key function is to treat normal tail-gases and emergency gases from process sections, by washing with 10% caustic soda in washing tower continuously. Schematic diagram of Chloromethanes manufacturing process is presented in **Fig 2.7.** Material balance of Chloromethanes is presented in **Table 2.7.**

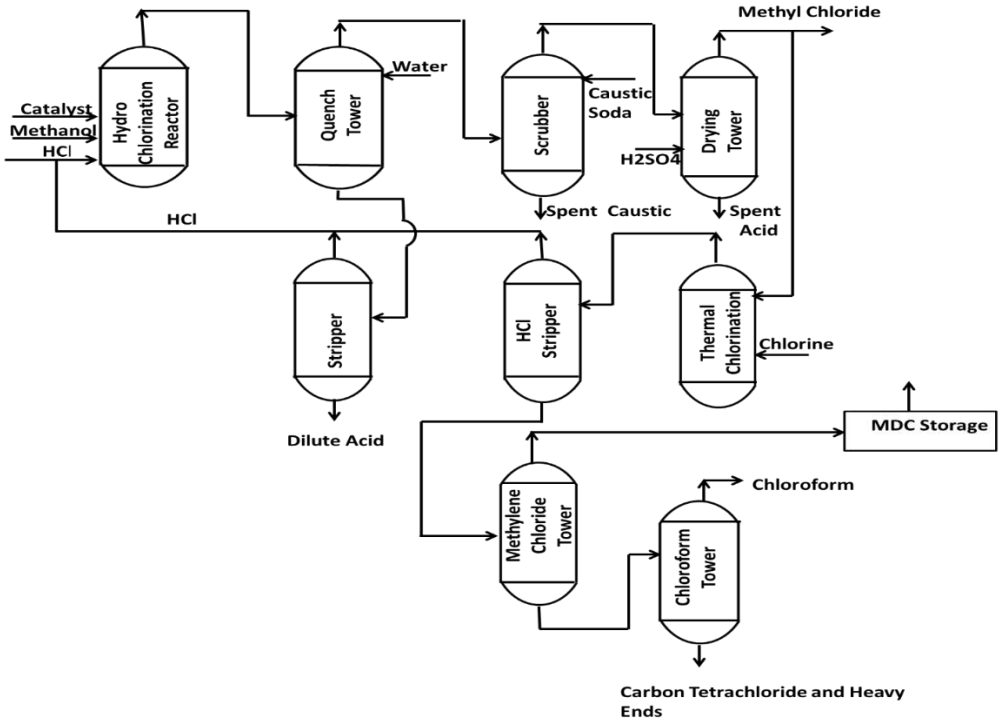


Fig 2.7 Schematic Diagram of Chloromethanes Process Flow

Table 2.7 Mass Balance of Chloromethanes

Input	Quantity (KLD)		Output	Quantity (KLD)	
	Existing	After Expansion		Existing	After Expansion
Methanol	89.8	125.7	Methyl Chloride	1.2	1.68
Chlorine	257	360	Methylene Chloride	158	221.2
Dil. Caustic (10%)	6.5	9.1	Chloroform	79	110.6
Sulfuric acid (98 %)	9	12.6	Carbon tetra chloride*	12	16.8
Hydrogen chloride	77.6	108.7	HCl (100%)	47	65.8
			Spent H_2SO_4 (75 - 80%)	11.9	16.7
			NaCl Sol (10 %)	9.5	13.3
			Wastewater generation	47.3	66.2
			Water evaporation loss	68	95.3
			Organic residue	6	8.4
Total Input	**439.9**	**615.9**	**Total Output**	**439.9**	**615.9**

**CCl_4 generated will be sold as a feed stock to Authorized users/excess will be incinerated*
After expansion includes Existing + Phase I + Phase II

2.4.7 Process Description of Chlorodifluoromethane (R22)



Process Description

This reaction is carried out using Antimony Penta Chloride as catalyst. This reaction involves the generation of HCl as by product. The refrigerant R22 along with HCl will evolve from the reactor in gaseous form. This is to be cooled and HCl absorbed in Hydrochloric acid absorption system, to produce 28 to 30% HCl.

After Knocking of the HCl , the remaining acidity shall be neutralized by circulating caustic. Acid free gases will be dried over sulphuric acid followed by this , the gases will be passed through Dryers. The acid free gas shall be compressed and condensed using water. The condensed product is diverted to crude intermediate storage tank. From these storages, the crude refrigerant shall be fed to Distillation columns to distill and get pure Chlorodifluoromethane. Schematic diagram of Chlorodifluoromethane is presented in **Fig 2.8** and material balance is presented in **Table 2.8**.

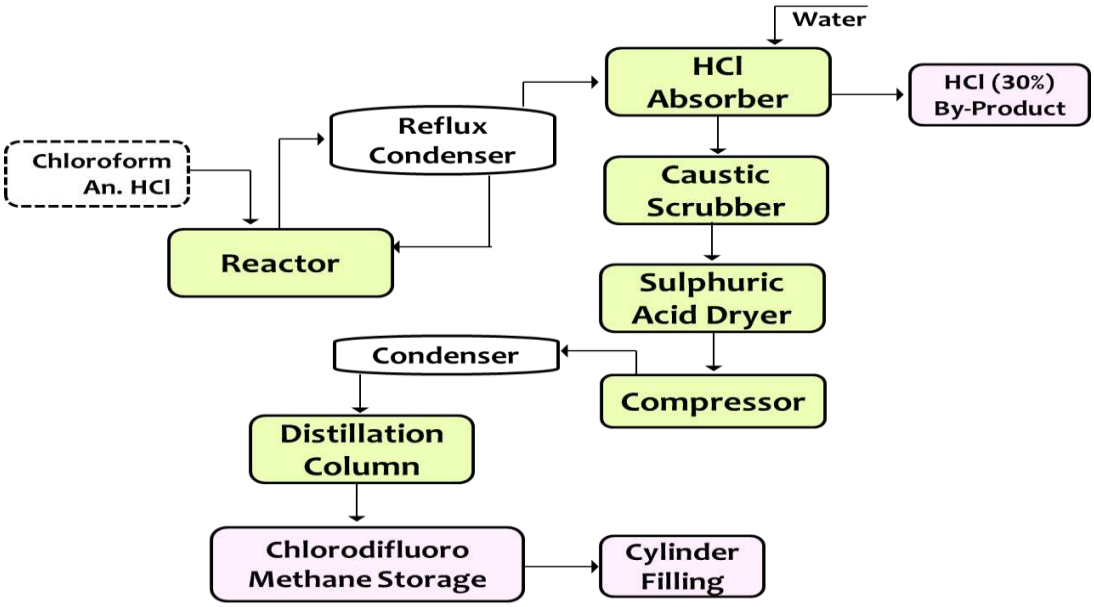


Fig 2.8 Schematic Diagram of Chlorodifluoromethane

Table 2.8 Material Balance of Chlorodifluoromethane

Input	Quantity (KLD)		Output	Quantity (KLD)	
	Existing	After Expansion		Existing	After Expansion
Chloroform	13.9	19.4	Chlorodifluoromethane	10	14
Anhydrous HF	11.9	17	Di. HCl (30%)	25	35.1
Dil. Caustic (10%)	1.9	2.6	Water Loss	378.1	529.3
Sulfuric acid (98 %)	1.9	2.6	Cooling Tower Blow downs	15	21
Water for CT and Scrubbing	404.5	566.3	Antimony Pentoxide	0.2	0.3
Water for HCl scrubbing media	11.8	16.5	Spent Sulfuric acid (75%)	17.3	24.2
Antimony Pentoxide	0.2	0.3	Sodium Chloride	0.3	0.4
Total Input	**445.9**	**624.3**	**Total Output**	**445.9**	**624.3**

After expansion includes Existing + Phase I + Phase II

2.4.8 Process Description of Co-generation Power Plant

Power will be generated using steam turbines in cogeneration plant. It is proposed to install a 120 TPH @ 100 kg/cm^2(g) pressure coal fired boiler to meet the steam requirement of the expansion project. The electricity generated (30MW) in the cogeneration plants will be used for captive consumption for plant operations.

The fuel requirement of the imported coal is approx. 17.5 T/hr at 100% MCR. Fuel will be brought by covered trucks and unloaded at site in covered shed. Coal will be conveyed to the boiler by conveyor system and fed to the boiler by Rotary feeders. AFBC Atmospheric Fluidized Bed Combustion type boiler is chosen considering imported coal and good combustion efficiency. The boiler operates with low bed temperature of 900 °C. Water is heated in the boiler to generate high pressure super-heated steam at 100 kg/cm^2(g) pressure. The boiler shall have standard accessories such as Feed water pumps, Soot blowers, Dosing system, safety valves and cut offs.

Fresh air for fuel combustion will be supplied by FD fans. Pre heated hot air will be supplied at combustion zone as secondary air through PA fans. ID fan will be used to exhaust the waste flue gasses through a stack of adequate height as per PCB norms.

Turbine will have Turbovisory, safety devices, instrumentation, controls and interlocks as per standard engineering practice. The Generator is driven by the Turbine at 1500 rpm through reduction gear box. The generator will have brushless Excitation system and closed-circuit indirect water-cooling system. Power will be generated at 11 kV, 3phase, 50cps frequency. The Generator will be provided with HT breaker, LASCPT, NGR, AVR, Metering & Synchronization panels as per standard engineering practices and protective measures. The power produced at 11 kV will be taken to plant's HT yard through cabling. All necessary protections are incorporated such that power plant is protected from any electrical faults. Schematic diagram of co-generation power plant is presented in **Fig 2.9.**

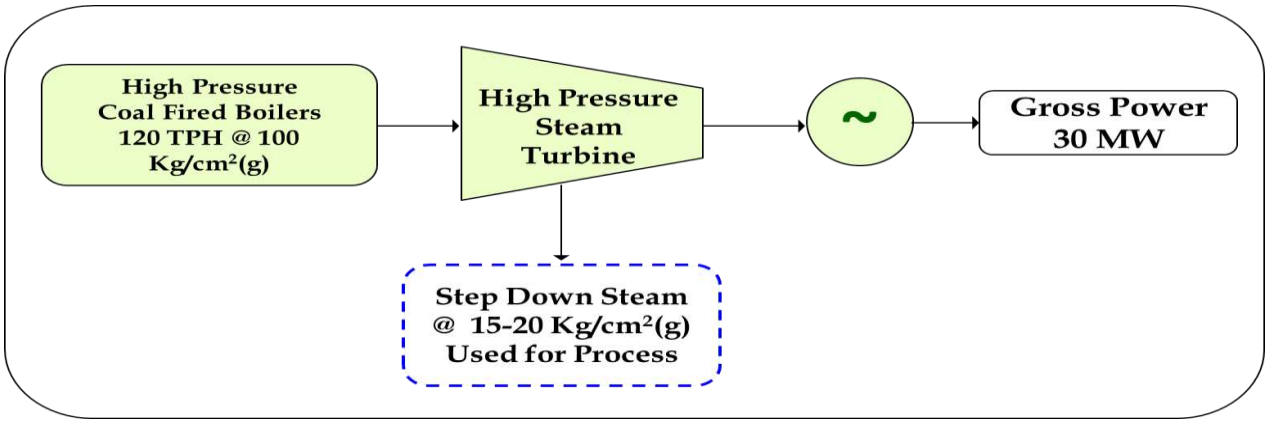


Fig 2.9 Schematic Diagram of Co-generatio Power Plant

2.5 Power and Steam Requirement

The total power required for proposed expansion is 42.1 MW in addition to existing requirement of 107.2 MW. It is proposed to establish 1 x 120 TPH boiler in Phase I to cater the power requirement in Phase I and Phase II. The power required and sources of supple is presented in **Table 2.9.** Steam requirement is presented in **Table 2.10.**

Table 2.9 Total Power required and Source of Supply

Description	Per Ton (KWH)	Consumption (MW)		
		Existing	Proposed	Total
Caustic	2400	102	40	142
Chloromethanes	500	5.2	2.1	7.3
Total		**107.2**	**42.1**	**149.3**
Source of Supply				
Description		**Power Generated (MW)**		
		Existing	**Proposed**	**Total**
110 TPH Coal Fired Boiler		27.5		27.5
100 TPH Coal Fired Boiler		25		25
42 TPH Coal Fired Boiler		10.5		10.5
120 TPH Coal Fired Boiler			30	30
Solar Power Plant		22	8	28
Wind Energy		5	---	5
Grid Supply		50-100	90-140	140
Total		**140**	**128**	**268**

Note
1. Solar power generation is available 4-8 hrs in day time
2. Co-generation Power Plants will be depending on coal availability and supply
3. Grid power source will vary depending on solar and CPP power availability
4. Proposed including Phase I and Phase II.

Table 2.10 Total Steam Required

Description	Per Ton (Ton)	Consumption (TPH)		
		Existing	Proposed*	Total
Caustic	1	51	20	71
Chloromethanes	2	25	10	35
Total		**76**	**30**	**106**

**Proposed including Phase I and Phase II*

2.6 Utilities

It is proposed to establish 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler for proposed expansion to meet the power and steam requirement and 1 x 55 lac salt furnace in addition to the existing utility in Phase I. No additional utility required for Phase II expansion. The list of utilities is presented in **Table 2.11.**

Table 2.11 List of Utilities

S. No	Description	Units	Existing	Phase I	Phase II	After Expansion	APC
1	Coal Fired Boiler	TPH	1 x 110	---	---	1 x 110	ESP
2	Coal Fired Boiler	TPH	1 x 100	---	---	1 x 100	ESP
3	Coal Fired Boiler	TPH	---	1 x 120		1 x 120	ESP
4	Coal Fired Boiler	TPH	1 x 42	---	---	1 x 42	ESP
5	Hydrogen gas fired boiler	TPH	---	1 x 20	---	1 x 20	Effective Stack height
6	Oil and H_2 fired boiler*	TPH	1 x 4	---	---	1 x 4	
7	Oil fired Boiler*	TPH	1 x 3	---	---	1 x 3	
8	Waste Heat Recovery Boiler (WHRB) connected to DG sets*	TPH	4 x 3	---	---	4 x 3	
9	Oil fired boiler#	TPH	1 x 3	---	---	Dismantled	Effective Stack height
10	Husk Fired Boiler#	TPH	1 x 12	---	---	Dismantled	
11	Thermo Pack unit	k.cal/hr	1 x 20 lac	---	---	1 x 20 lac	Bag Filter
12	Thermo Pack unit	k.cal/hr	1 x 35 lac	---	---	1 x 35 lac	Bag Filter
13	Salt Furnace	k.cal/hr	2 x 55 lac	1 x 55 lac	---	3 x 55 lac	Effective Stack height
14	Salt Furnace	k.cal/hr	2 x 15 lac	---	---	2 x 15 lac	
15	DG Sets**	MW	4 x 6.2	---	---	4 x 6.2	
		kVA	3 x 500	---	---	3 x 500	
16	LPG/Hydrogen gas fired Incinerator	Kgs/hr	1 x 343	---	---	1 x 343	Wet Scrubber

** Shall be kept as standby* *# Dismantled* *** Standby DG sets*

2.7 Water requirement

The water required for the plant is mainly for Process, Scrubbers, washings, cooling tower makeup, steam generation and domestic purposes. The total water requirement shall increase from 15.167 MLD to 20.36 MLD. The fresh water consumption is optimized by reusing treated wastewater to an extent of 2.32 MLD, thus reducing fresh water consumption to 18.04 MLD during operation. The required water is drawn from Tungabhadra River through infiltration wells. The unit obtained permission to abstract water from Tungabhadra River in the order of 20 MLD. The total water requirement is presented in **Table 2.12** and Schematic diagram of total water balance is presented in **Fig 2.10.** Detail water balance for is presented in **Table 2.14**.

Table 2.12 Total Water requirement

S.No	Description	Quantity (KLD)			
		Existing/ Permitted	Proposed		Total After Expansion
			Phase I	Phase II	
Fresh Water					
1	Chlor-Alkali Plant	3228	347.9	347.9	3923.8
2	Chloromethanes & Chlorodifluoromethane	2115	60.5	60.5	2236
3	Co-generation Power Plant	8990	2445	-----	11435
4	Castor Oil and Fatty Acid Plant	317	62.2	62.2	441.4
	Total – I: Fresh Water	**14650**	**2915.6**	**470.6**	**18036.2**
Recycled Water					
1	Chlor-Alkali Plant	388	245.8	245.8	879.5
2	Chloromethanes & Chlorodifluoromethane	129	308	308	745
3	Co-generation Power Plant		604	-----	604
4	Castor Oil and Fatty Acid Plant		47.5	47.5	95
	Total – II: Recycled Water	**517**	**1205.25**	**601.25**	**2323.5**
	Grand Total (I + II)	**15167**	**4120.8**	**1071.8**	**20359.7**

Table 2.13 Approvals for Water withdrawal from Tungabhadra River

S.No	Letter No	Dated	Quantity (m^3)
1	Memo No. 16570/Reforms/A2/2011	12.12.2016	9000
2	G.O.Ms. No.12	29.05.2015	8000
3	G.O.Ms. No.12	29.05.2015	3000
	Total		**20000**

Table 2.14 Water Balance – Section Wise

Chlor-Alkali								
Purpose	**INPUT (KLD)**				**OUT PUT(KLD)**			
	Fresh Water		**Recycled Water**		**Loss**		**Effluent**	
	Existing/ Permitted	**After Expansion**	**Existing/ Permitted**	**After Expansion**	**Existing/ Permitted**	**After Expansion**	**Existing/ Permitted**	**After Expansion**
Process & Washings	1093	1272.3		248.5	1001	1393.4	191.5	266.6
Pump Gland Cooling	100	139						
Cooling Towers	1538	1600.9		540	1393	1938.4	145.5	202.7
DM Plant Regeneration	387.5	539.4			387.5	539.4		
Domestic	110	110			17	17	93	93
Gardening		262	388	91	388	353		
Total - I	**3228**	**3923.8**	**388**	**879.5**	**3186**	**4241.4**	**430**	**562.1**
Chloromethanes								
Process	460	644			460	644		
Scrubbers	40	56					40	56
Cooling Towers	1600	1515		725	1486	2080	114	159.6
Domestic	15	21					15	21
Gardening			129	20	129	20		
Total - II	**2115**	**2236**	**129**	**745**	**2075**	**2744.4**	**169**	**237**
Cogeneration Power Plant								
Floor Washings	30	30					30	30
DM Plant and Boiler	1500	2005			1095	1450	405	555
Cooling Towers	7400	9340		555	6800	9095	600	800
Domestic	60	60			10	10	50	50
Gardening				49		49		
Total - III	**8990**	**11435**		**604**	**7905**	**10604**	**1085**	**1435**
Castor Oil & Fatty Acid Plant								
Process & Washings	85	119			35	49	50	70
Floor Washings	6	8.4			6	8.4		

Pump Gland Cooling	10	14			10	14		
Cooling Towers	210	294			196	274.4	14	19.6
Domestic	6	6					6	6
Gardening				95		95		
Total - IV	**317**	**441.4**		**95**	**247**	**440.8**	**70**	**95.6**
Grand Total (I+II+III+IV)	**14650.0**	**18036.2**	**517.0**	**2323.5**	**13413.0**	**18030.4**	**1754.0**	**2329.3**

After expansion includes Existing + Phase I + Phase II

Fig 2.9 Schematic Diagram of Total Water Balance

2.8 Pollution Control Measures

2.8.1 Water Pollution

The main sources of effluent generation from the plant are from process, floor washings, blow downs from boiler and cooling tower and domestic effluents. Effluents from process, washings, utility blow downs and domestic wastewater of Chlor-Alkali, Castor Oil and fatty acid plant and co-generation power plant will be sent to the effluent recycling plant and low TDS water reused as process water. Effluent from chloromethanes and chloro-difluoromethanes are sent to effluent recycling plant followed by RO. RO permeate is reused for process and rejects recycled for brine saturation of Chlor-alkali plant. The total effluent generated and mode of treatment is presented in **Table 2.15.**

Table 2.15 Total Effluent Generated and Mode of Treatment

S. No	Description	Quantity (KLD)				Mode of Treatment/Disposal
		Existing/ Permitted	Proposed		After Expansion	
			Phase I	Phase II		
I	**Chlor-Alkali (Or) Potassium Hydroxide**					
1	Process	191.5	37.5	37.5	266.6	Sent to effluent recycling plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as a process water and rejects sent for brine saturation.
2	Washings					
3	Gland Seal					
4	Cooling towers blow down	145.5	28.5	28.5	202.5	
5	Domestic	93	-----	-----	93	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
	Total - I	**430**	**66.1**	**66.1**	**562.1**	
II	**Chloromethanes and Chlorodifluoromethanes**					
1	Cooling towers blow down	114	22.8	22.8	159.6	Sent to effluent treatment plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as process water and rejects sent for brine saturation.
2	Scrubbers	40	8	8	56	Sent to Brine make-up in chlor-alkali plant.

3	Domestic	15	3	3	21	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
	Total – II	**169**	**33.8**	**33.8**	**236.6**	
III	**Co-Generation Power Plant**					
1	Floor Washings	30	-----	-----	30	Sent to effluent recycling plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as a process water and rejects sent for brine saturation.
2	Cooling towers blow down	600	200	-----	800	
3	DM Plant /RO Rejects	405	150	-----	555	
4	Domestic	50	-----	-----	50	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
	Total –III	**1085**	**350**	**-----**	**1435**	
IV	Non-EC Products (Castor Oil & Fatty Acids)	70	12.8	12.8	95.6	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
Grand Total (I+II+III+IV)		**1754**	**462.7**	**112.7**	**2329.3**	

2.8.1.1 Effluent Treatment Systems

The effluents generated are collected in equalization tank to have uniform flow rate and effluent characteristics to subsequent treatment operations. The effluent from equalization tank is neutralized by using acid/alkali and pumped to HRSCC (High-rate solid Contact Clarifier). Clear water from HRSCC is processed through multi grade filter to remove fine suspended particles. The filtered water from multi grade filter is stored in clear water tank. Bottom sludge from HRSCC is collected in slurry collection tank and pumped to decanter to separate solid. The filtrate from the decanter is recycled to equalization tank. The filtered water from multi grade filter is stored in clear water tank is passed through dual

media filter followed by ultra filtration (UF). Permeate from UF sent to double RO plant, while rejects is recycled to equalization tank. Product (permeate) from RO reused in cooling towers make-up and rejects reused for brine saturation. The Characteristics before and after treatment are presented in **Table 2.16** and schematic diagram of ETP is presented in **Fig 2.11.**

Table 2.16 Effluent Characteristics before and after Treatment

Parameter	Effluent Characteristics	
	Before Treatment	After Treatment
pH	6-9	6-9
Suspended solids	150	<100
Total dissolved solids	2400	<2000
Chlorides	1000	<500
Sulphates	140	140
Biological Oxygen demand	25	15
Chemical Oxygen demand	200	100
Oil and Grease	<10	5

Note: All values except pH are mentioned in mg/l.

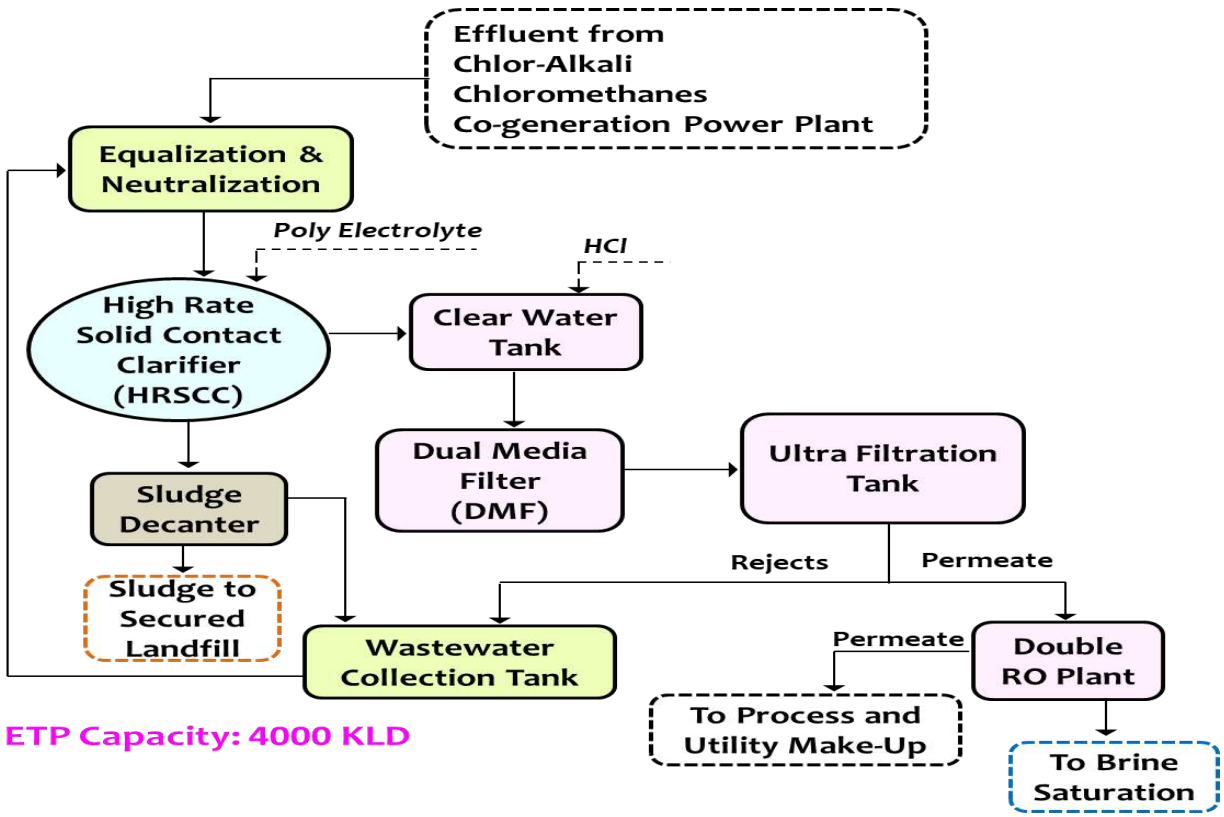
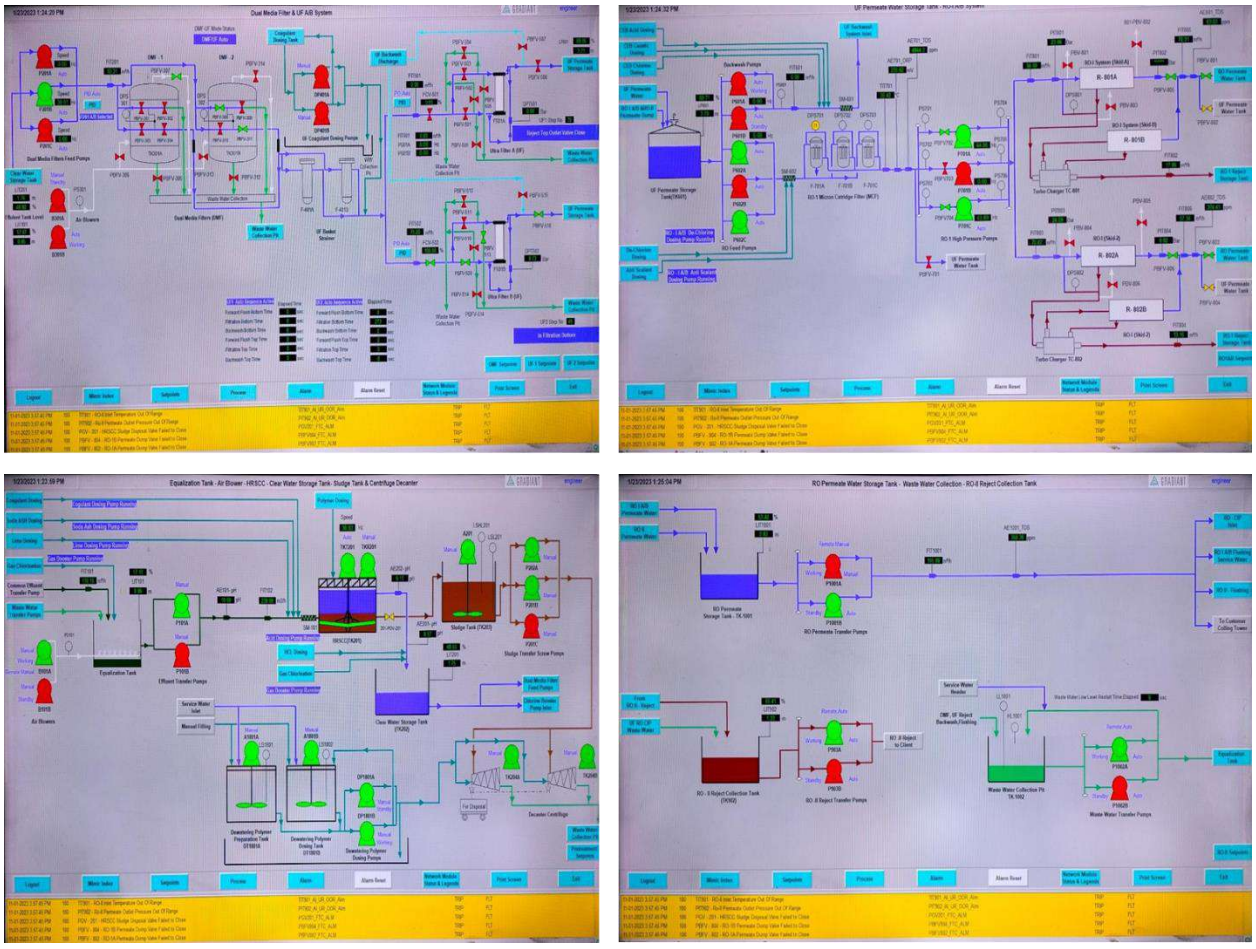


Fig 2.11 Schematic Diagram of Effluent Treatment System



Photographs of Existing Effluent Treatment Plant



Existing Effluent Treatment Plant – DCS Operation

Wastewater from domestic usage will be sent to Castor Oil & Fatty acid plant effluent treatment (ETP-2) (Activated sludge process) plant, and treated wastewater reused for greenbelt development

2.8.2 Air Pollution

2.8.2.1 Emissions from Utilities

The sources of air pollution are proposed 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler and existing 1 x 42 TPH, 1 x 100 TPH, 1 x 110 TPH coal fired Boilers, DG sets and Incinerator in chloromethane plant. The existing boilers are provided with ESP as air pollution control equipment. The air pollution control equipment for proposed coal

fired boiler is Electro static precipitators (ESP). DG sets shall be provided with stack heights based on the CPCB formula for effective stack height. The emission details for the waste heat recovery boilers, Coal fired boilers and DG sets are presented in **Table 2.17.** Other emission sources are presented in **Table 2.18.** Technical specifications of existing and proposed ESPs are presented in **Table 2.19**

Table 2.17 Details of Stacks and Emissions from the Plant

S. No	Stack attached to	Height (m)	Emission rates of Pollutants (g/sec)		
			PM	SO2	NOx
1	WHR Boilers – 1 and 2	46	0.7	27.7	56.2
2	WHR Boiler-3	46	0.35	13.9	28.1
3	WHR Boiler-4	46	0.35	13.9	28.1
4	Hydrogen/Furnace oil fired boiler	20	Traces	Traces	Traces
5	Salt Furnace	30	0.03	2.7	0.53

All the units except salt furnace are kept as standby.

Table 2.18 Emission Details of Other Utilities

S. No	Stack Attached to	Stack Height (m)	Diameter of stack at top (m)	Temp. of exhaust gases (^{O}C)	Exit Velocity (m/sec)	Pollutant Emission Rate (g/sec)		
						PM	SO_2	NO_X
Existing/Permitted								
1	1 x 42 TPH Coal fired Boiler	55	1.37	140	10	0.95	1.44	1.56
2	1 x 100 TPH Coal fired Boiler	69	2.5	185	11.2	3.54	5.8	6.1
3	1 x 110 TPH Coal fired Boiler	80	2.9	185	16	5.39	9.14	11.78
4	3 x 500 KVA DG Set*	4	0.25	185	7.2	0.004	0.028	0.16
5	1 x 343 kg/hr Incinerator*	12	0.6	45	7.0	-	-	2.43
Proposed								
6	1 x 120 TPH Coal fired Boiler	80	2.9	185	16	5.39	9.14	11.78
7	1 x 20 TPH H_2 gas fired Boiler	80	3.0	180	18	----	----	----

**DG sets shall be kept as standby*

Table 2.19 Technical Specifications of ESP

S.No	Design Parameters	Units	Design Value			
			42	100	110	120
1	Gas Flow rate	Cu.m/sec	23.36	57.80	69	70
2	Temperature (flue gas)	^{O} C	140	150	140	140
3	Dust concentration (inlet)	gm/Nm3	56	62	112	114
4	Dust concentration (outlet)	mg/Nm3	115	100	< 50	< 50
5	Number of precipitator/ Boiler	No.	1	1	1	1
6	Number of gas path per Boiler	No.	1	1	1	1
7	Number of fields in series	No.	3	3	5	5
8	Collection efficiency	%	99.84	99.84	99.9	99.9
9	Velocity of gas	m/sec	0.78	1.00	0.63	0.65

S.No	Design Parameters	Units	Design Value			
			42	100	110	120
10	Treatment time	Sec	18.46	15.70	41.09	41.10
11	Number of gas passage	No.	03	16	27	27
12	Nominal width of the ESP	m	4.8	6.8	10.8	10.8
13	Nominal length of the ESP	m	14.5	25	26.25	26.25
14	Specific collecting area	M^2/M^3/Sec	92	78.48	205.43	206.22
15	Total collecting area	M2	4896	4536	14175	14180
16	No. of collecting electrode for ESP	No.		357	980	990
17	No. of emitting electrode for ESP	No.		2016	5670	5680



Existing Electro Static Precipitator Connected to 110 TPH Coal Fired Boiler

2.8.2.2 Emissions from Process

Emission from Chlor-Alkali Plant

In chloro-alkali plant the gaseous emissions are chlorine and hydrogen vapors. Chlorine is generated during electrolysis as a co-product. 70% of chlorine is being liquefied and sold as liquid chlorine. After cooling, the chlorine is blown to drying unit to eliminate moisture, compressed in compressors, and diverted to liquefier wherein it gets liquefied.

During liquefaction, depending upon gas purity, 95% of chlorine gets liquefied and the balance quantity comes out as sniff gas and the same will be burnt in hydrochloric acid synthesis unit.

The hydrogen generated from electrolysis, after cooling passed to the furnace burner. The chlorine is directly fed to the furnace burner to form hydrogen chloride. A pressure control valve automatically controls the chlorine pressure. The hydrochloric acid gas produced in the synthesis furnace is first cooled and absorbed in water in a cooler-absorber. Absorption water before entering the cooler-absorber is used to wash the tail gases in a washing tower. Suction is provided through the system by tails exhaust fans. The hydrochloric acid solution (30-33% strength) is collected in a receiver and stored in storage tanks

Hydrogen gas leaving the cells is saturated with water vapor and is cooled to remove water in heat exchanger using cooling water**.** The cooled gas is passed through a filter to remove the NaOH aerosols. A part of the hydrogen gas is sent to the HCl synthesis unit as per requirement and a part of the hydrogen is sent to the flaking unit, the bottling plant (hydrogen gas is compressed to a pressure of 150 kg/cm^2 and sold as compressed hydrogen) and liquid hydrogen plant

2.8.2.3 Diffuse Emissions

Emissions are also released from distillation process of chloromethanes. Vent condensers in series to distillation columns followed by vacuum pumps are provided to mitigate diffuse emissions. The transfer pumps shall be provided with double mechanical seals. Safety relief valves rupture disc, to reactors, storage tanks, thermal insulation provided for columns and storage tanks.

Due to advancement of control checks and due to membrane cell electrolysis, possibility of chlorine emission to atmosphere is negligible. Scrubbing systems are provided to neutralize sniff gases effectively. Even the dilute chlorine is also being converted to

sodium hypochlorite after neutralization with caustic soda at control temperature leading to value addition. Sources of air emission and control measures is mentioned in **Table 2.20.**

Table 2.20 Source of Air Emission and Control Measures – Chlor-Alkali

Sources	Control Equipment	Specifications
Chlorine		
Chlorine Compressor House	Emergency Scrubber	Diameter: 3m Height: 8m Packing material: Risings Rings Blower: 3500 m^3 Caustic Circulation: 30m^3 Media: Dilute Caustic
Chlorine Filling	Emergency Scrubber	
Chlorine Storage	Emergency Scrubber	
Hydrogen Chloride		
HCl Furnace	Tail Gas Tower followed by Scrubber	Diameter: 0.4m Height: 15m Media: Water Blower: 500 m^3
HCl Storage	Scrubber	

Emergency Scrubber

The Emergency Scrubbing System is connected by ducting of various sizes like 800 mm, 600 mm and 100 mm. The ducting is running through various sections where chlorine leakage is possible. It is also provided with direct caustic pumping facility from evaporation plant in case of emergency. The chlorine absorption capacity of the tower is 20 tons/hour. Emergency scrubbing system is provided to neutralize chlorine in case of chlorine leaks in liquid chlorine storage area, chlorine cylinder filling area etc. The entire chlorine storage tanks facility is located in a closed building. The Cl_2 storage area is provided with suction headers and funnel to remove any chlorine that may leak and take it to emergency scrubbing system where the leaked chlorine is scrubbed with caustic soda circulated in the tower. Similarly, the chlorine filling area also is provided with suction headers and funnels to remove any chlorine leakage and connected to the Emergency Scrubbing System. Inside Chlorine storage area chlorine sensor is provided to give alarm whenever chlorine is 3 ppm and above. Emergency scrubber will automatically switch

on and chlorine level reaches 3 ppm. Chlorine scrubber can also be operated from chlorine filling, chlorine storage, hypo plant and chlorine compressor house.



Emergency Chlorine Scrubber



Tail Gas Tower



Closed Chlorine Storage



Automatic Interlocks



Chlorine Sensors



Chlorine Sensors

Emission from Chloromethanes Section

HCl Absorbing and Off-treatment Section

In normal production, most of the by-product hydrogen chloride from the chlorination unit is sent to the hydro chlorination unit to produce methyl chloride, and the excess hydrogen chloride is absorbed in this section to form by-product of 21%HCl from the hydro chlorination unit and process water to form concentrated hydrochloric acid, which is then stripped in the organic stripper to remove organic matters to produce by-product 31%HCl finally. This unit is also equipped with HCl scrubber and emergency chlorine off-gas scrubber (OSBL) to scrub and neutralize the off-gas containing HCl and Cl_2 with 10% NaOH and water. The flow diagram of HCl absorber is presented in Fig 2.12.

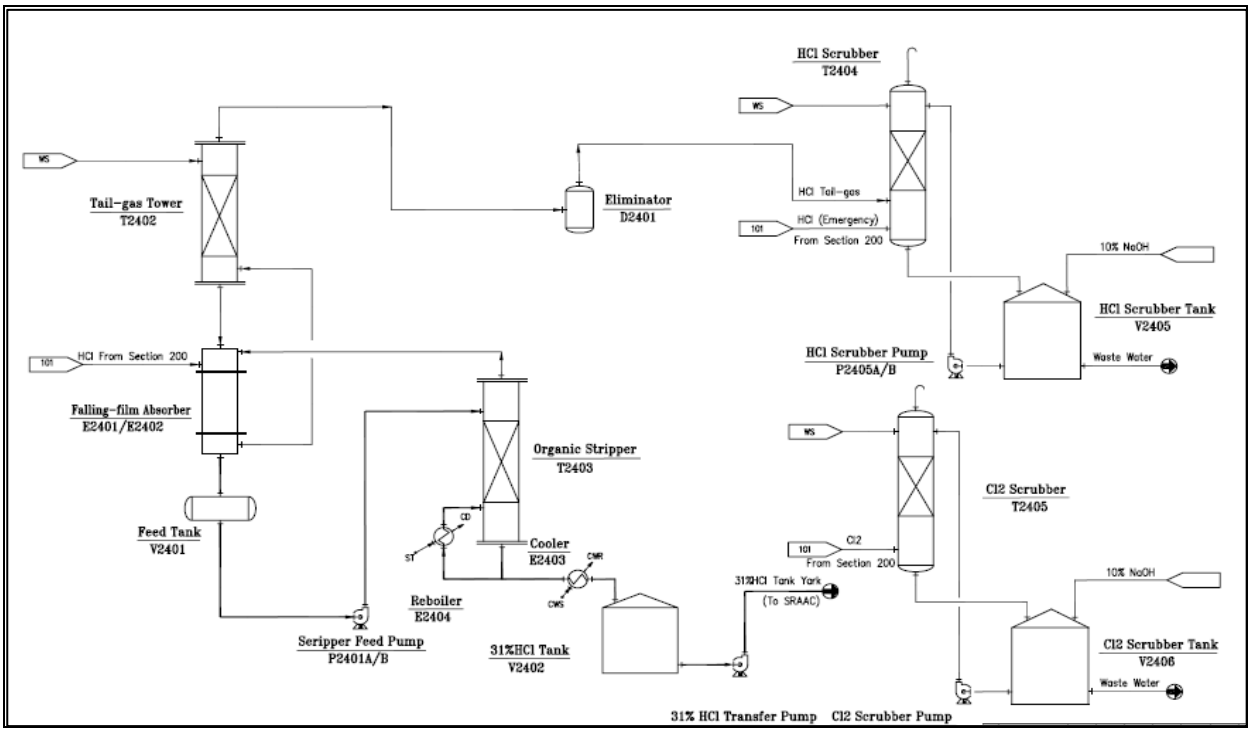


Fig 2.12 Schematic Diagram of HCl Scrubber



Existing HCl Scrubbing System for HCl generated from Chloromethanes

HCl Absorbing & Off-treatment Section – Chloromethanes Unit

In normal production, most of the by-product hydrogen chloride from the chlorination unit is sent to the hydro chlorination unit to produce methyl chloride, and the excess hydrogen chloride is absorbed in this section to form by-product 21%HCl from the hydro chlorination unit and process water to form concentrated hydrochloric acid, which is then stripped in the organic stripper to remove organic matters to produce by-product 31%HCl finally. This unit is also equipped with HCl scrubber and emergency chlorine off-gas scrubber (OSBL) to scrub and neutralize the off-gas containing HCl and Cl_2 with 10% NaOH and water.

Process Description of Thermal Oxidizer (Incinerator Unit)

The major source of waste generated from Chloromethanes plant is distillation residues during the process of purifications of chloromethanes are collected in a day tank and pumped using a metering pump to fuel oil cum liquid waste burner located on the incinerator. The system consists furnace followed by absorption system, scrubbing system and stack.

Liquid Incineration Chamber

Organics in the waste are completely decomposed and oxidized to form CO_2, H_2O and HCl with minimum free Cl_2 under strong oxidation atmosphere, high temperature and turbulence. Extra steam is added directly in the incinerator to ensure that the equilibrium is maintained in favor of HCl formation, which is important to maximize the recovery of HCl from flue gas and minimize free Cl_2, which also needs to be removed before discharge. The high temperature of 1400^{O}C also ensures oxidation of hydrocarbons, which is important to avoid formation of toxic compounds when flue gas cools down. Conditions in the incinerator are controlled closely to ensure constant efficiency of incineration.

Absorption Section (HCl Stripper)

Flue gas from incinerator at 1400 ^{0}C enters absorption section where the HCl in the flue gas is absorbed in a falling film type co current absorber using HCl solution. Main quench cooler is in shell and tube construction with falling film HCl absorber with cooling tower on service side. Tube and tube sheet is in impressive graphite construction. Cooling water is circulated in shell side while flue gas flows through tubes. In the top portion, HCl solution from tail gas / packed tower is introduced in the tubes through liquid distributor where the HCl from the flue gases is absorbed by the liquid flowing through the tubes. The liquid forms a thin film on the tubes. The absorption being exothermic process, heat is removed by circulating cooling tower from shell side. The last section is packed bed saturator, which provides enough residence time to reach saturation temperature. The liquid gets concentrated to 18-20% HCl from the flue gases. At the bottom of the absorber integral recirculation tank along with recirculation pump is provided where part of 18-20% HCl solution is circulated in tail gas packed bed tower.

Tail Gas Absorber

Tail gas absorber is a packed bed tail gas tower. The unabsorbed gases from quench absorber are passed through this tail gas packed bed tower which has packings for maximum absorption of HCl. The part residual HCl not absorbed in the above absorber are further absorbed with the help of DM water and HCl solution. Thus, weak acid generated due to this is then sent to quench cooler absorber as inlet. The flue gases from tail gas absorber are then sent to a final polishing scrubber.

Scrubbing Section

Remaining HCl and Cl_2 in flue gas is removed by absorption in alkali solution (5% caustic solution) in a scrubber. It is a packed column installed directly on top of tail gas tower but isolated by a chimney tray. Reducing agent 5% solution is also added along with alkali solution to decompose NaCl and Na_2SO_4 is discharged as bleed from the recirculation tank of the scrubber. The industry has installed 3 nos. of chlorine sensors

and 5 nos. of VOC analyzer in Chloro methane plant at thermal chlorination, shift tank area and methanol storage area.

Stack

The clean flue gas is exhausted to the atmosphere through a stack at 30m elevation. The stack is also mounted above packed tower. The entire system operates on a force draft generated by combustion air fan to overcome pressure drop in the system. The combustion air fan also provides continuous cooling air for furnace mountings. Schematic Diagram of incinerator is presented in **Fig 2.13** and technical specifications of incinerator is presented in **Table 2.21**.

Table 2.21 Technical Specifications of Incinerator

S.No	Particulars		System Capacity (Max)
1	Waste liquid Feed Rate		343 Kgs/hr. Max
2	Waste Heavy ends for CCl4 rectification		10 kgs/hr. Max
3	Hydrogen Gas consumption (Operation)		5-10 kgs/hr. Max
4	LPG Pilot Burner Designed for startup		15 Kgs/hr
5	Cooling water circulation rate at 32^{O}C at min 3.5 kg/cm^2 gpr		80 m^3/hr
6	DM Soft water for HCl absorber		750-1250 kg/hr
7	Electrical Power (kw) with stand-by pump		45
8	Installed power (kw) with standby pumps		81
9	Low pressure steam at 3 kg/cm^2 gpr		50 kgs/hr. Max
10	Instruments grade compressed air at 4 kg/cm^2 g. pressure		6 Nm^3/hr
11	Emergency water at 3 kg/cm^2 g. pressure at 32^{O}C		75 m^3/hr
12	7% NaOH solution	Nominal when generating 25-30% HCl	25 – 50 kg/hr
13		When too much of impurities in coming CCl4 complete, HCl generated neutralized and send to ETP	750 Kg/hr. Max
14	5 % Na_2SO_4 solution		5 – 10 kg/hr. Max
15	Make-up water requirement when full HCl to be neutralized		7 kl/hr
16	Bleed water (6.5 - 7% conc), when full HCl to be neutralized		8 kl/hr
17	Space requirement		15 Mtr.L x 15 Mtr. W x 16 Mtr. H

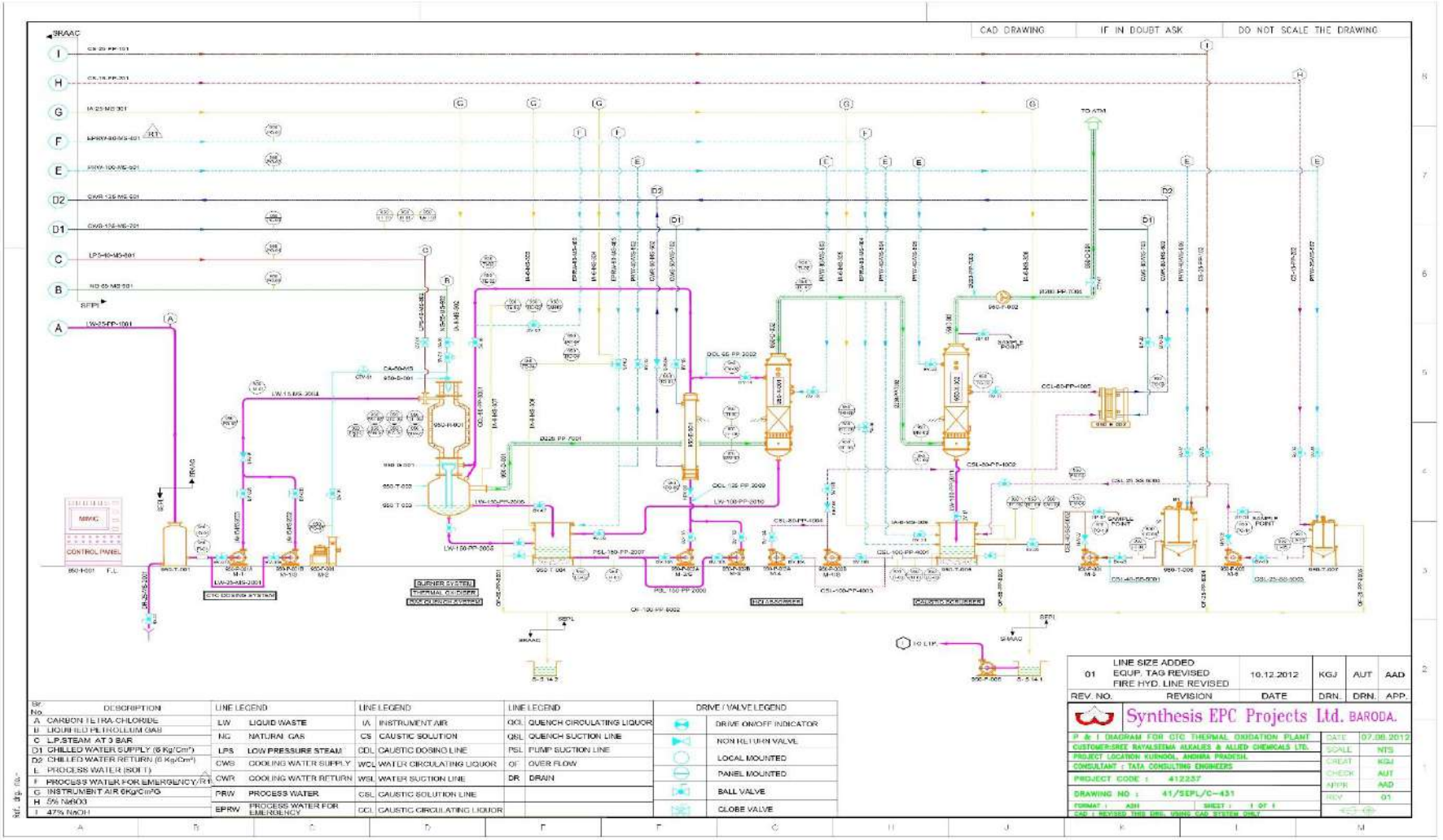


Fig 2.13 Schematic Diagram of CCl4 Incineration System

2.8.2.4 Fugitive Emissions

Fugitive emissions are anticipated from equipment leakage and transfer spills. The periodic maintenance program shall ensure integrity of equipment mitigating the equipment leakage. The spills however shall be managed by adopting spill management plan based on the respective MSDS, spill control kit shall be provided in storage, and production areas. The fugitive emissions shall be reduced by closed transfer and handling of all hazardous chemicals.

Chlorine storage filling and handling

For chlorine storage, four tanks of 100 MT capacities are available. One tank is always kept as dump tank, chlorine sensors are installed near each tank with an indication in control room to alert all, in time, in case of any leakage. Load cells are provided for indication of tank weight locally as well as in control room. Excess level alarm, excess flow shut-off valves, gas masks, etc., have been provided in storage area.

In filling section also, chlorine sensors are provided to sense leakage of chlorine. Scrubbing system around the filling section to take care of accidental emissions is in operation. Apart from this, emergency kits, gas masks and trained man power are available round the clock. To avoid chlorine storage risk totally, the industry has commissioned a scrubbing system exclusively for chlorine storage and filling area, to take care of any accidental emission and to avoid spreading of chlorine to nearby area. Arrangements are also being made to take back left-over liquid chlorine, after filling, to liquefaction unit for reprocessing to reduce load on neutralization unit. Schematic diagram of chlorine neutralizer is presented in **Fig 2.14.**

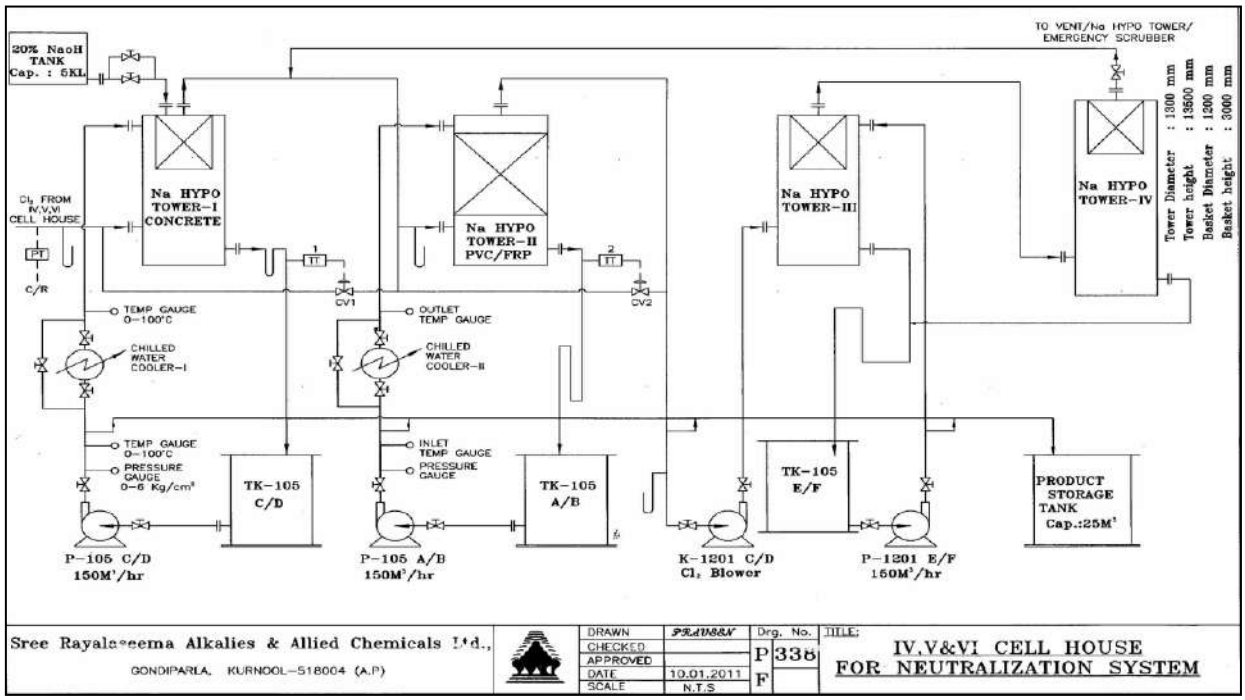


Fig 2.14 Schematic Diagram of Chlorine Neutralizer



Chloromethanes Storage and Handling

Fugitive emissions anticipated from chloromethanes storage are equipment leakage and transfer spills. The periodic maintenance program shall ensure integrity of equipment mitigating the equipment leakage. Reflux condensers are provided to product storage tanks to mitigate loss because of low vapor pressure. The spills however shall be managed by adopting the spill management scheme as mentioned in the respective MSDS. Chloroform sensors are provided to sense leakage of chloroform.



Chloroform Storage Tank with Reflux Condenser



Methanol Storage Tanks with Reflux Condenser



Methylene Dichloride Storage Tanks with Reflux Condenser



VOC Analyser

2.9 Solid Waste

2.9.1 Solid Waste from Chlor-alkali

Sludge is generated during brine purification stage, and Sodium sulphate is recovered through membrane process (nano filtration) from the brine purification and is sold as by product. The sludge generated form the effluent treatment plant will be disposed to landfill within plant premises, which contains mostly inorganics. The quantity of sludge generated depends on composition of salts used. The chemical composition of brine sludge is provided in **Table 2.22.**

Table 2.22 Chemical composition of Brine Sludge

S.No.	Parameter	Percentage (w/w)
1.	Moisture	44
2.	Sand + Clay	26
3.	Calcium carbonate	20
4.	Magnesium hydroxide	9
5.	Barium sulphate	1

2.9.2 Sodium Sulfate Recovery from Brine Sludge

Sodium sulfate is recovered from brine sludge using Nano filtration, centrifuge and crystallizer, evaporation and driers. The resultant product sodium sulfate is sold as product. During the processing of salt for brine system all the impurities have to be removed down to ppb levels except sulphate level which can be maintained up to 6 gms per litre. Taking this aspect to advantage sulphate is precipitated selectively, by taking part of depleted brine stream to sulphate recovery system and processed through nano filtration, crystallization, evaporation and drying unit. After removing sulphate as barium sulphate, the brine stream is diverting back to the system for saturation. The sulphate level in the system is being kept constant as the withdrawal from the system is in proportion that adds to the system from salt addition. Schematic Diagram of sodium sulphate recovery is presented in **Fig 2.15.**

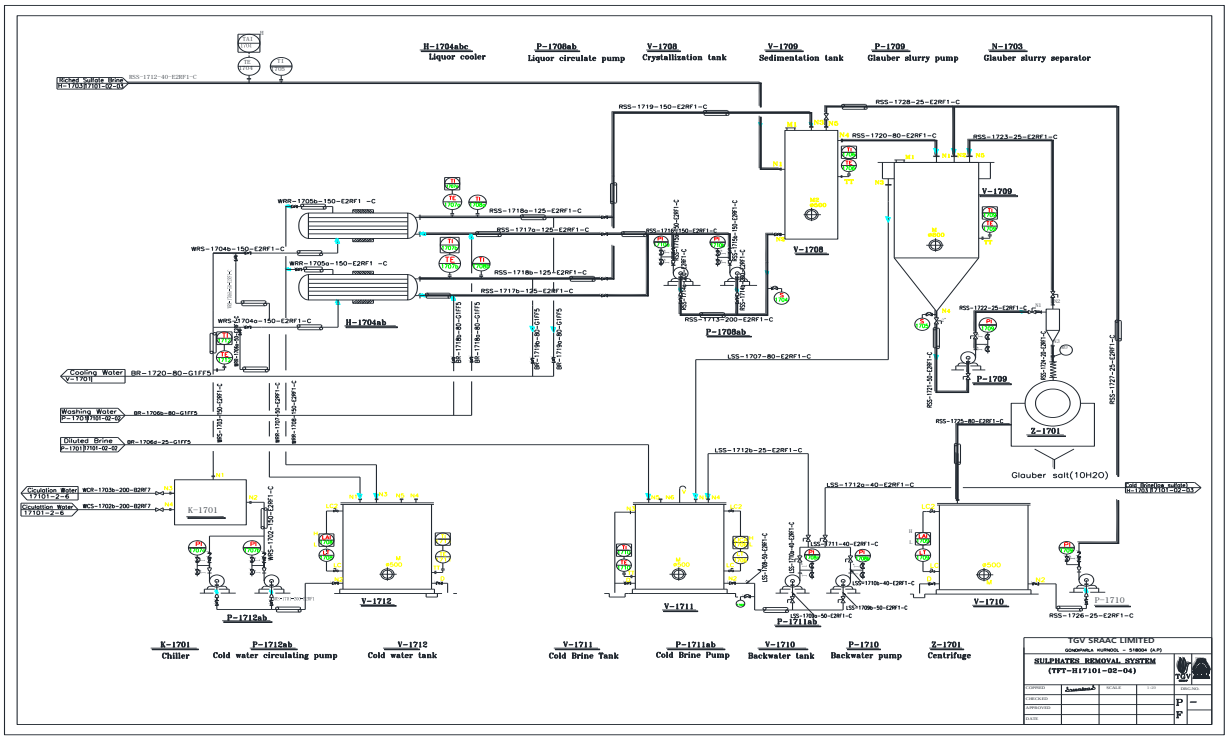


Fig 2.15 Schematic Diagram of Sodium Sulphate Recovery Plant

2.9.3 Solid Wastes from Chloromethane and Chlorodifluoromethane Plant

Used silica gel, calcium chloride, Calcium Fluoride, Antominy Pentoxide and Spent Sulfuric Acid are the wastes generated from the process. These are generated from moisture removal steps of process. Used silica gel and calcium chloride sent to secured landfill within plant premises. Spent sulfuric acid sold as by-product and Calcium Fluoride sold to hydrogen fluoride manufacturers. The details of various sources and quantities of solid waste generated and disposal methods are presented in **Table 2.23.** The plant is having its own secured land filling site. The unit obtained Certificate of registration from Ozone Cell, MoEF&CC for Carbon tetrachloride (CCl_4) as feed stock vide letter no. ODS/CS/17/2(1)/2014-OC dated 25.11.2014.

Table 2.23 Solid Waste Generation and Mode of Disposal

S. No	Description	Units	Existing/ Consented	Proposed		Total	Method of Disposal
				Phase I	Phase II		
Chloro-Alkali Plant							
1	Sludge from Pretreatment of brine on dry basis	TPD	25	5	5	35	Secured landfill within Plant premises
2	Barium Sulphate	TPD	10	---	---	---	Sold as By-Product
3	Sodium Sulphate	TPD	10	1.95	1.95	13.9	Sold as By-Product
Potassium Hydroxide							
1	Sludge	TPD	1.42	0.3	0.3	2	Secured landfill within Plant premise
Chloromethanes Plant							
1	Calcium Chloride	TPD	0.04	0.01	0.01	0.06	Secured landfill within Plant premises
2	Silica gel	TPD	0.036	0.005	0.005	0.05	
3	Bottom residue	TPD	0.5	0.1	0.1	0.7	Sent to In-house Incinerator
4	Spent Sulfuric acid (75-80%)	TPD	11.9	2.4	2.4	16.7	Sold as product
Chlorodifluoromethane (R22)							
1	Calcium Fluoride	TPD	1.2	0.25	0.25	1.7	Secured landfill within Plant premises / Sold to hydrogen fluoride manufacturers
2	Spent Sulfuric Acid (75%)	TPD	17.3	3.45	3.45	24.2	Sold as product
3	Antominy Pentoxide	TPD	0.2	0.04	0.04	0.28	Recovered & reused
Utilities							
1	Ash from Coal fired Boilers	TPD	570	192	---	762	Sold to Cement/ brick manufacturers
2	Ash from Husk fired boiler*	TPD	16.5	---	---	---	Sold to Brick manufacturers
3	Sludge from FO of DG sets*	KL	0.9	---	---	0.9	Sent to Authorized Recyclers
4	Sludge from ETP	Kg/ day	280	20	20	320	Landfill within Plant site
5	Waste Oils	TPA	0.3	---	---	0.3	Reused as secondary fuel
6	Used Batteries	TPD	35	---	---	35	Sent to Authorized Recyclers

2.10 Noise and Vibration

The noise levels may increase due to motors, compressors, turbine, DG set and other activities. The major source of noise generation is turbine which emit noise levels of above 100 dB (A) at a reference distance of 1m from the source. The steam generator and auxiliaries will perform continuously within noise limits as per relevant standard specification but not more than 85 dB (A) at 1 meter from any equipment or sub-equipment. The machines and equipment shall have noise arresting system / low noise levels to limit noise level. Further, all noise generating equipment are housed within acoustic enclosure (where ever possible), to ensure attenuation of noise. The employees are trained in the mitigation measures and personal protection measures to be taken to prevent noise related health impacts. Hearing conservation program is adopted to ensure that employee's hearing is not affected during his working life to an extent greater than that usually occurring with age and to preserve it at a level sufficient for normal speed perception.

CHAPTER 3.0 DESCRIPTION OF THE ENVIRONMENT

3.1 Introduction

Collection of baseline data is an integral aspect of Environmental Impact Assessment Report to establish what is happening without the project, by conducting a baseline data study. Baseline data reflects present status of environment before initiation of any activity of the proposed expansion project. Baseline data facilitates impact assessment as the effects of the proposed expansion are superimposed on baseline data subsequently to assess environmental impacts.

Baseline environment assessment was conducted in the impact zone of 10 km surrounding the plant area during the months of December 2022 - February 2023. Studies were undertaken to generate baseline data on micrometeorology, ambient air quality, water quality, noise levels, flora and fauna, land use, soil quality, and socio-economic status of the community in an area of 10 km surrounding the project site

3.2 Land Environment

Land and soil constitute basic components of physical environment. The expansion project may cause changes in land, soil and denudational processes in different intensities contingent on scale and sptial proximity of the activity and receptors. Land and soil may be altered within the vicinity of 5 km radius and to a lesser extent upto 10 km radial distance due to development of the project.

3.2.1 Physiography

The project expansion is within the existing site located at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh. Salient feature of the site and study area are presented in **Table 3.1**. The area has mainly single-crop agricultural lands irrigated by tube wells. Google earth image of site is presented in **Fig 3.1.** Existing site photographs are presented in **Fig 3.2.** Base map, road network and forest map of study area are presented in **Fig 3.3, Fig 3.4,** and **Fig 3.4** respectively.

Table 3.1 Sailent features of the Site and Study Area

Description	Remarks
Name of the Project	Expansio of Chlor-Alkali manufacturing unit under 7(ii) (a) of EIA Notification by M/s. TGV SRAAC Ltd.
Location of the Project	Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh
Land Use Pattern (Forest, Grazing, Agricultural, Barren etc.)	Private Land – 152.4 ha (1524000 Sq.mts)
Latitudes (North)	15^0 49′ 30″ (N)
Longitudes (East)	78^0 4′ 30″ (E)
Survey of India sheet No	D 44 A1 (57 I/1)
Elevation above Mean Sea Level (AMSL), m	300 m
Seismic zone	Seismic Zone: II as per IS: 1893 (Part 1): 2002, Low Damage Risk Zone (MSKV I or less)
Site surroundings	North : Sree Rayalaseema Hi-Strength Hypo Ltd East : Open lands West : Connecting Road South : Road connecting the NH-7 with Gondiparla village
Nearest Village	E. Tandrapadu village - 0.5 km – NW direction
Accessibility to site	Site connecting – NW direction
Road access	Gondiparla Road – 185 m – West direction NH – 5.2 km – west direction
Nearest Town	Kurnool – 0.8 km – SW direction
District Head quarters	Kurnool – 3.5 km – NW direction
Nearest Railway station	Kurnool - 3.02 km – NW direction
Nearest Airport	Kurnool Airport – 16.5 km – SE
Major Industries	Sree Rayalaseema Hi-Strength Hypo Limited
Water Bodies	Tungabhadra River flowing from NW to SE — 0.2 km — S
The Project / Activity attracts the provisions of CRZ	No.
Reserve Forest	Gadidmadugu RF - 5.5 km - E direction. Pullaiah RF - 9.3 km - SW direction
Inter-state boundary	Telangana and Andhra Pradesh - 1.3 km – NE
Archaeological/ Historical/ Ancient Monuments	Nil within 10 km
Protected Areas notified under the Wild Life (Protection) Act, 1972	None within 10 km radius
Eco-sensitive areas as notified under section 3 of E (P) Act, 1986	None within 10 km radius
Critically polluted areas as identified by the Central Pollution Control Board from time to time	None within 10 km radius



Fig 3.1 Site and Plant Photographs *(Terms of Reference No. 4(vii))*



Fig 3.2 Google Image of the M/s. TGV SRAAC Limited Project Site

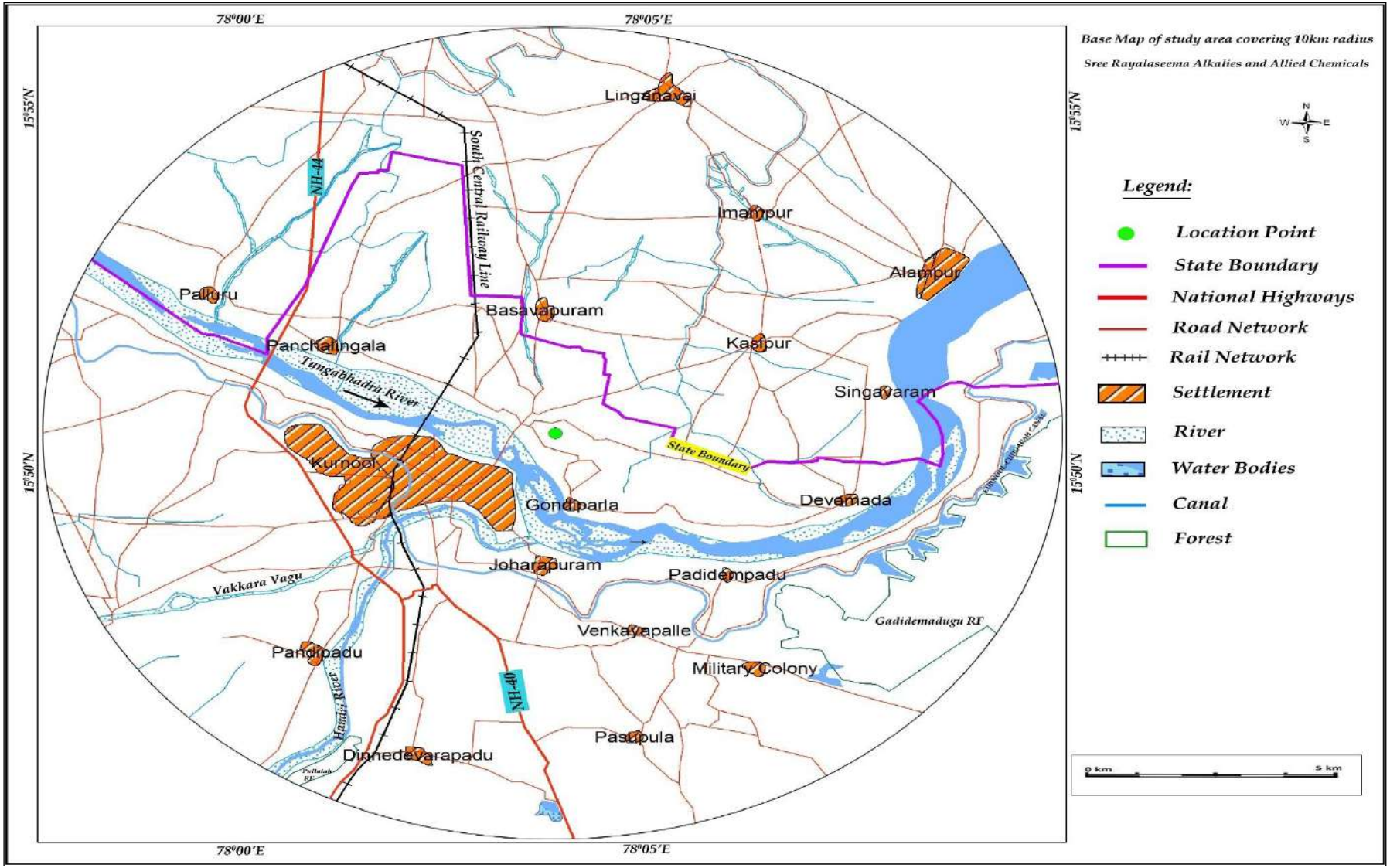


Fig 3.3 Base Map of the Study Area

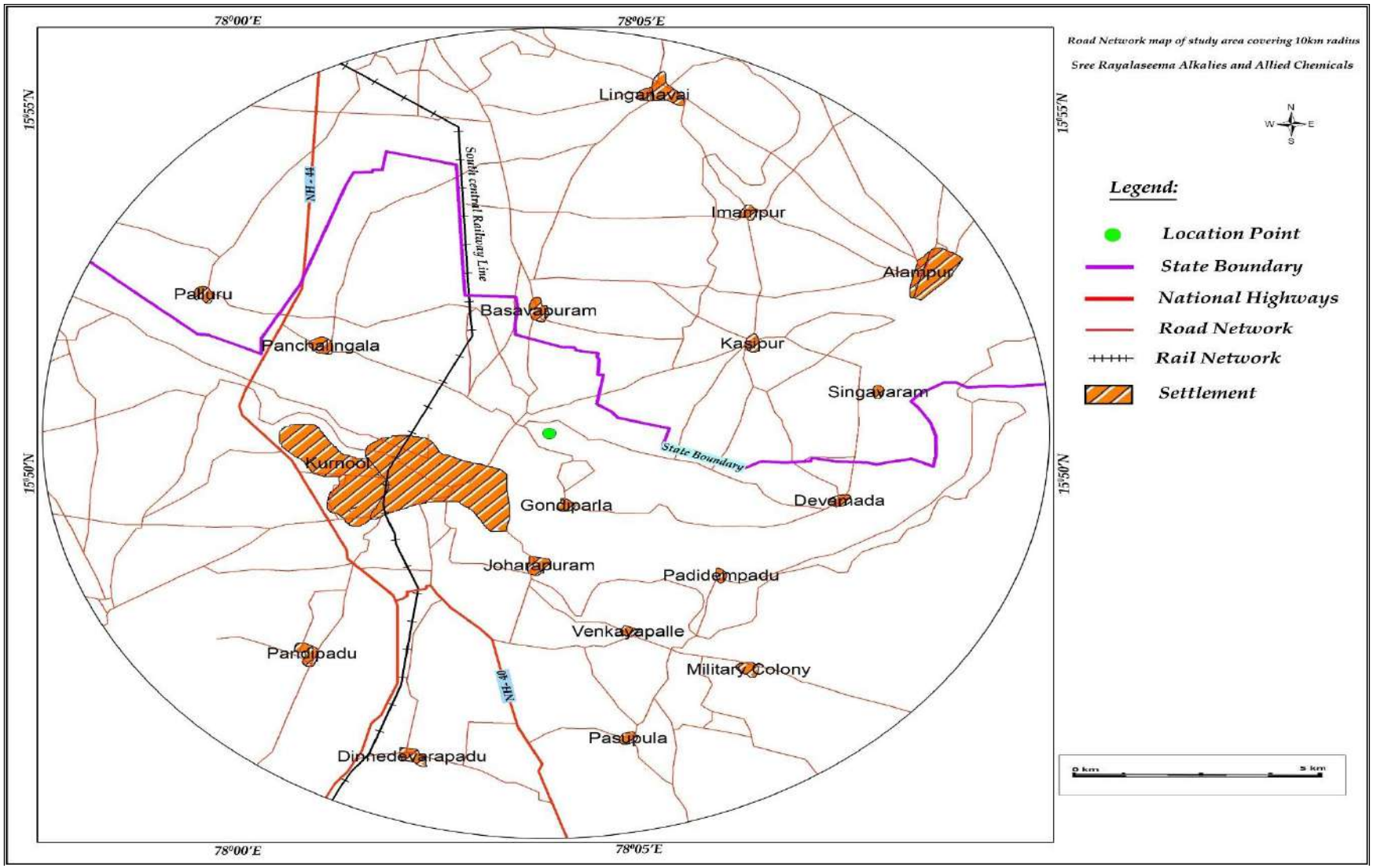


Fig 3.4 Road Network Map of the Study Area

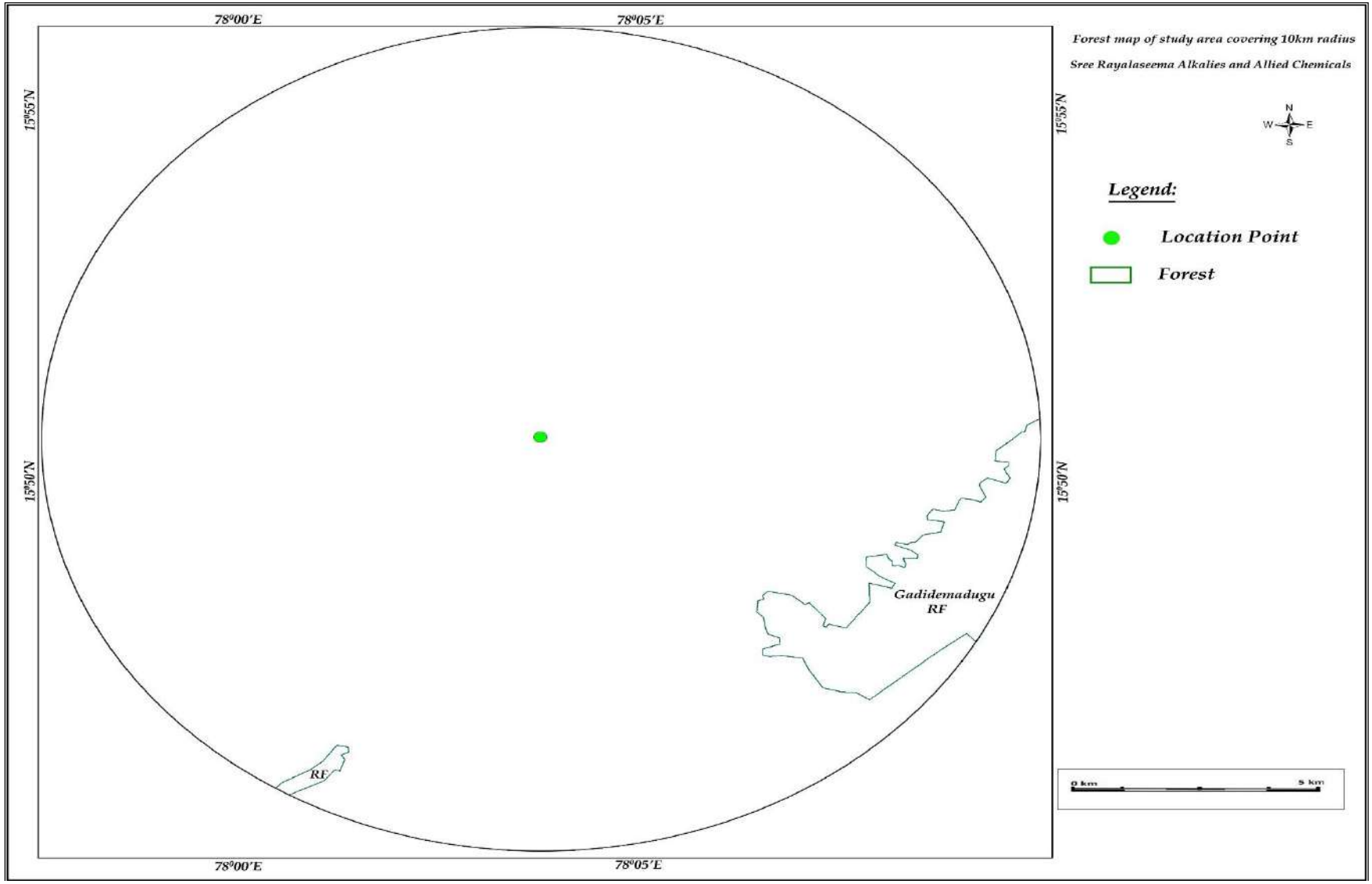


Fig 3.5 Forest Map of the Study Area

3.2.2 Geology *(Terms of Reference No. 4(x))*

The geological formation of the study area comprises of the oldest rock formations of the earth's crust overlain by stratified deposits including quaternary alluvium. The rocks belong to the precambrian and upper crataceous to lower miocene periods.

Coarse grained granite, one of the major rock formations, is characterized by large beds of feldspars and quartz grains of uniform size with flakes of biotite and muscovite micas. At places the rocks are traversed by granite basic material. The alteration of feldspar to pockets of kaolin is a common feature. The complex gneissic formation consists of grey granite, pick granite and granite–gnesis of fine texture. The minerological composition of these rocks consists of quartz, feldsper, biotite and muscovite. Dolorite dykes occur at places and consist mainly of plagioclase feldspars and augite. The rocks occur as exposed boulders of varying sizes oriented along strike lines. Thin capping of basaltic are found to the south-west of the area. Isolated mounds of laterite occur in this basaltic region. Recent and older alluviums are confined to flood plains and valleys. The basalt occurs as tongues confined to the North-Eastern portion of the area and are extensions of vast Deccan Trap to the South and the East. The maximum thickness of the basaltic is about 30 m at the highest point near to plant site. It thins out gradually towards the granite area. The succession of the geological formations of the area is presented in **Table 3.2.** Geological map of the study area is presented in **Fig 3.6.**

Table 3.2 The Succession of Geological Formations

Geological Age	Type of Formation
Sub recent to recent	Alluvium, Colluvium, soils and valley fills
Lower Eocene	Deccan Traps: Laterities & Basalts
Pre-Cambrains (Bhimas)	Sandstones, Limestones and Shales
Archean	Gneissic complex rocks, diorite, coarse grained Granite with doleritic dyke intrusions.

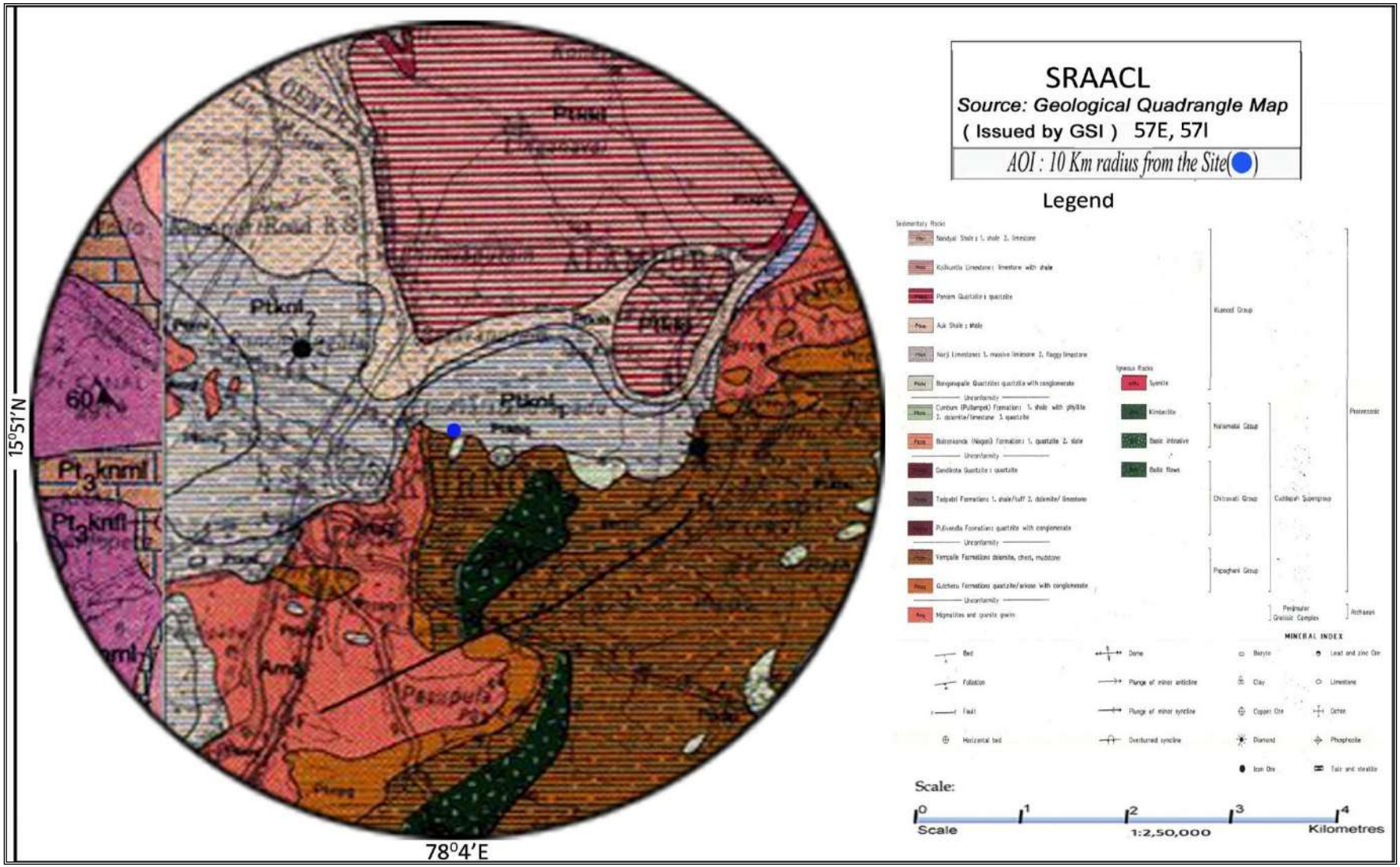


Fig 3.6 Geological Map of the Study Area

3.2.3 Hydrogeology *(Terms of Reference No. 4(x))*

Hydrogeologically the study area is grouped under hard rocks comprising "Archaens" and "Basalts" and soft rocks comprising "Alluvium" and "Laterites". In the Archeans groundwater occurs under confined conditions in the weathered mantle, and under semi-confined conditions in the fractured and fissured zones of the fresh rock below, varying from place to place. The Central Groundwater Board (CGWB) and the State Groundwater Department have carried out an inventory of several observations' wells in the study area. The observations made by these agencies are described below.

In the granitic terrain, the average depth of groundwater ranges from 5-8 m in recharge areas and from ground level to about 3 m in low lying areas and valley bottoms. The productive aquifers in the granitic terrain are met at the depth of 15 – 50 m below the land surface depending upon the topography. The annual water level fluctuation in the recharge areas exceeds 9 m where as it is less than 3m in low laying areas. In basaltic terrain the maximum water level fluctuation is of the order of 20 m in recharge areas while the fluctuation along valley bottoms is about 6 m. The depth of open wells range from 16.0 to 24.0 m below ground level and depth to water level vary from 13 to 20 m bgl. The yield of dug wells varies from 110-350 KLD for a pumping period of 4 to 6 hrs a day. Groundwater depth in the nearest village is 12 m and in Kurool town the groundwater depth is 14 m. The northern part of study area drains from North to south direction and southern part drainage flows from south to north direction, to finally join Thungabadra river. Thungabadra River is flowing in the study area from west to East direction. Groundwater prospects map of the study area in **Fig 3.7.**

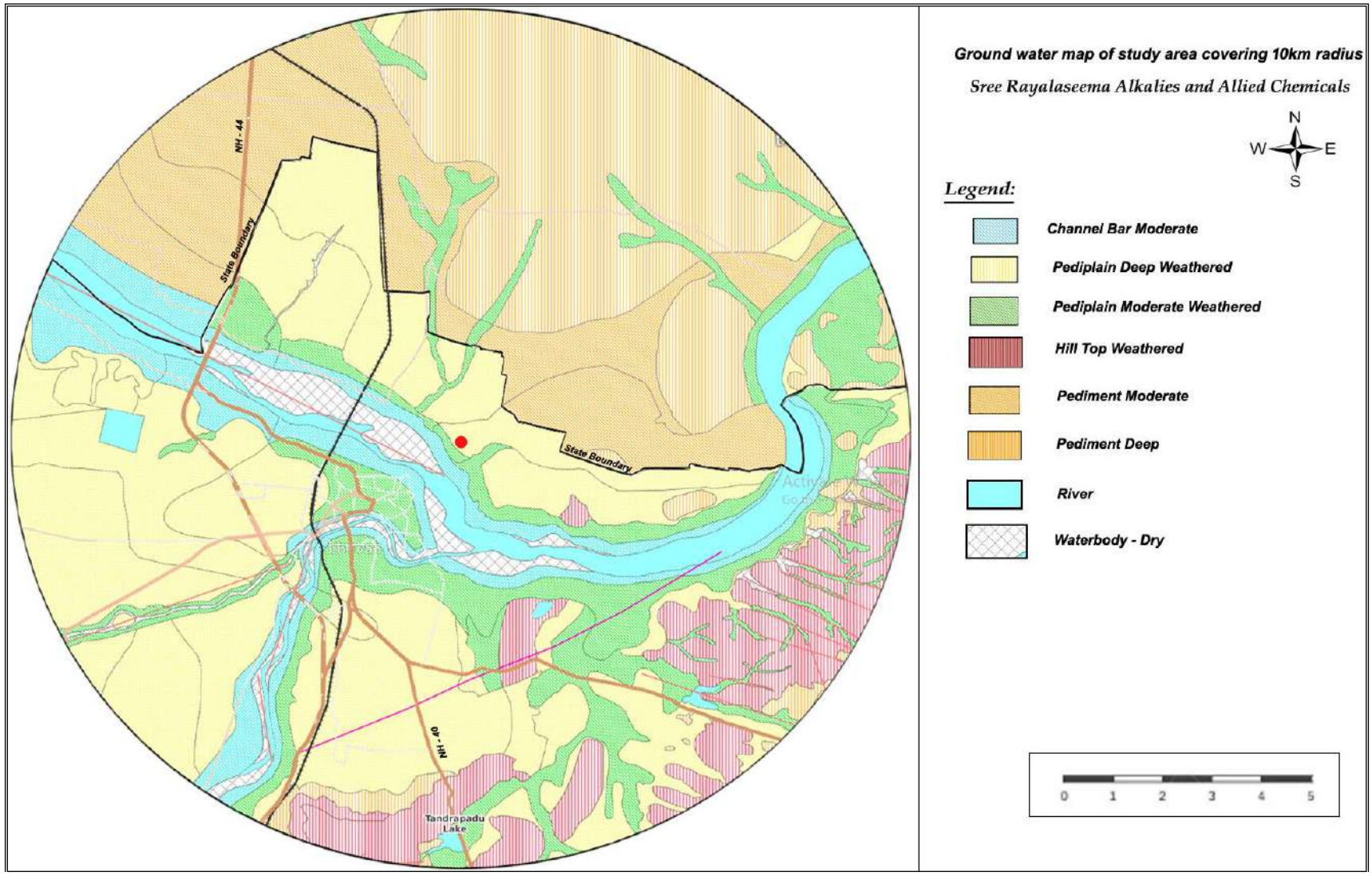


Fig 3.7 Hydrogeological Map of the study area

3.2.4 Soils

Soil may be defined as a thin layer of earth's crust that serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to and influenced by genetic and environmental factors such as parent materials, climate, organisms and physico-chemical action of wind, water and sunlight, all acting over a period of time. Soil differs from the parent materials in the morphological, physical, chemical and biological properties. Also, soil differs among them in some or all the genetic or environmental factors, therefore, some soils are yellow, some are black, and some are coarse textured. They serve as a reservoir of nutrients for plants and crop and also provide mechanical anchorage and favorable tilth.

The Soil characteristics include both physical and chemical parameters. M/s. Team Labs and Consultants field team carried out soil survey to assess the soil characteristics of the study area. The land use and land cover map of the study are shown in **Fig 3.8.** It may be noted that the land use land cover map reflects predominantly agricultural lands. The impact area also has a significant percentage of agriculture nature of the impact area, and also its dependence on tank for irrigation. The digital elevation model of the study area is presented in **Fig 3.9.** The levels in the impact area range from 260 m in east and 310 m in southeastern part of the impact area. Representative soil sampling was done at various locations and these locations are shown in **Fig 3.10.** Analytical data of soil samples is presented in **Table 3.3.**

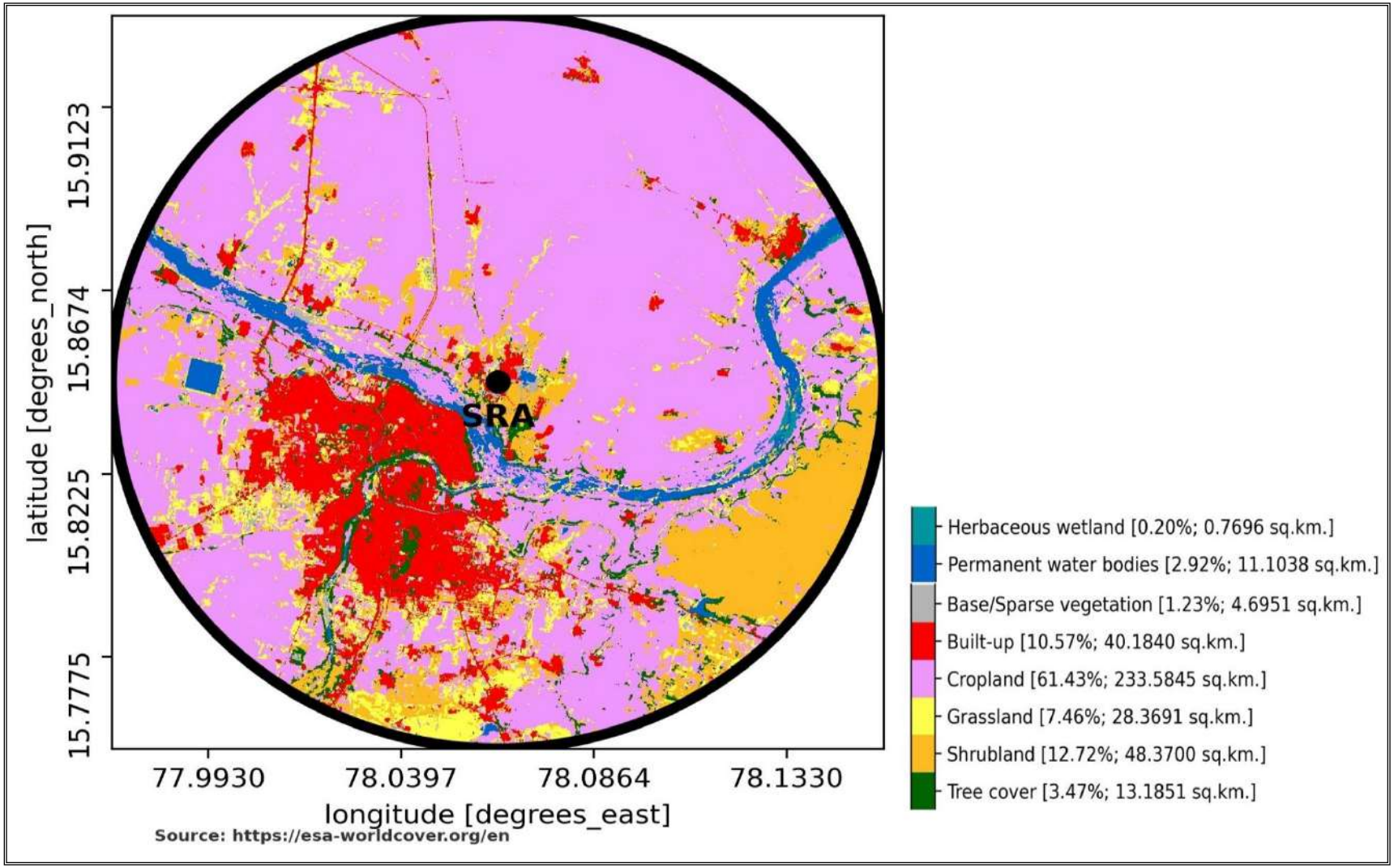


Fig 3.8 Land Use and Land Cover of the study area ***(Terms of Reference No. 4(ix))***

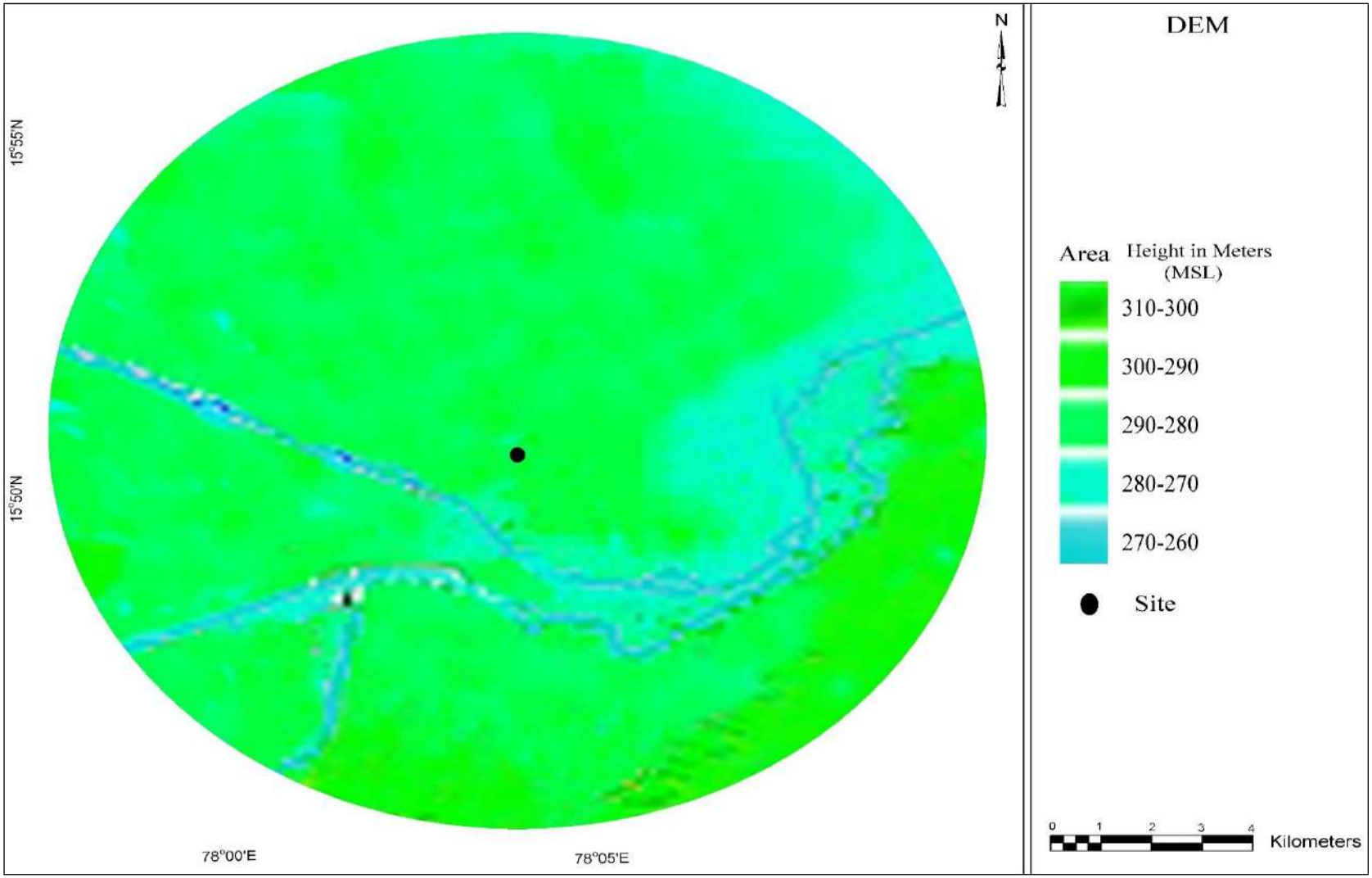


Fig 3.9 DEM of the Study Area

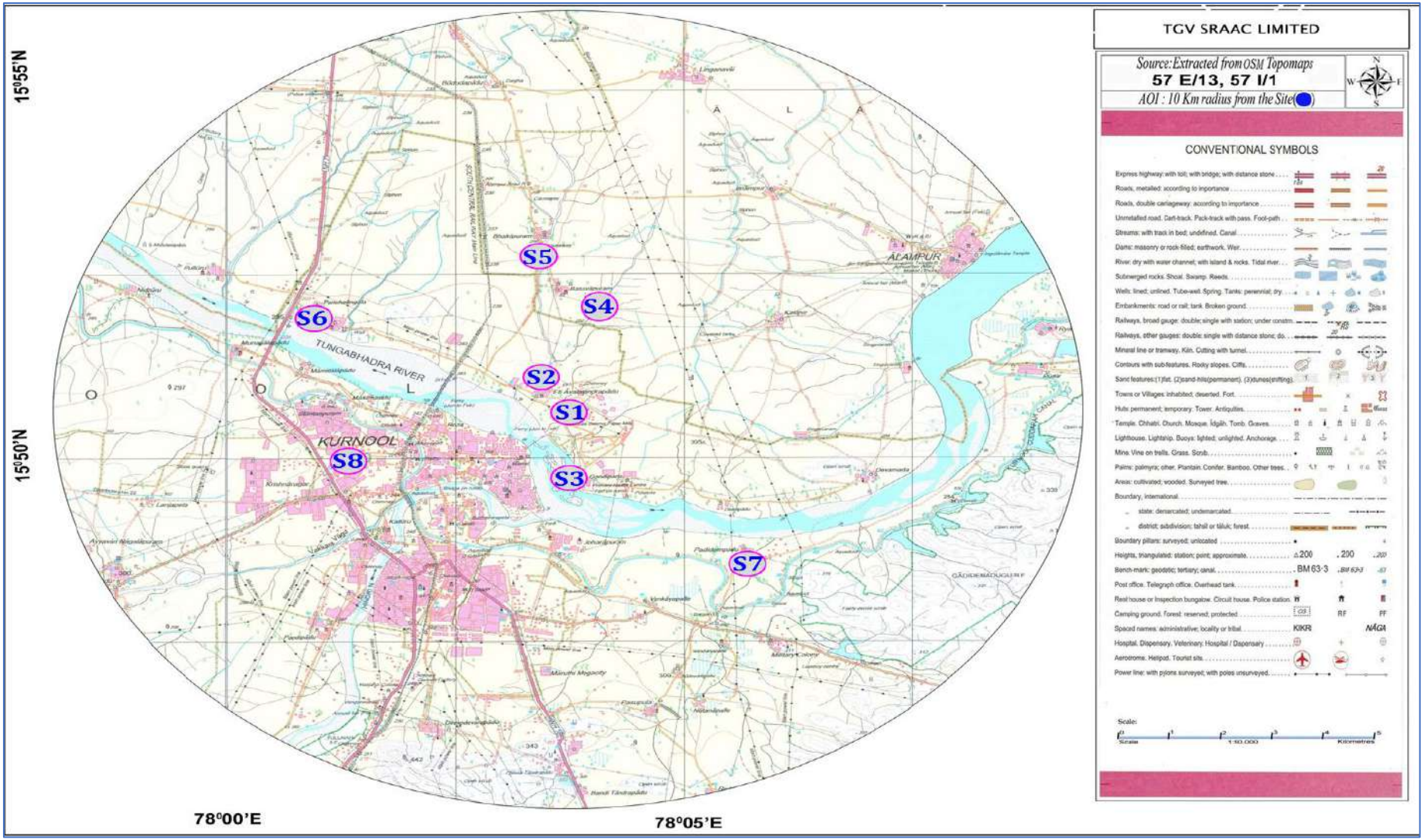


Fig 3.10 Soil Sampling Locations

Table 3.3 Soil Analysis Data *(Terms of Reference No. 6(viii))*

Parameter	Unit	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
pH	-	7.75	7.78	7.61	7.56	6.1	7.35	7.24	7.39
Electrical Conductivity (EC)	dS/m	0.549	0.297	0.22	0.52	0.346	0.29	0.349	0.385
Bulk Density	g/cc	1.11	1.11	1.18	1.05	1.18	1.11	1.18	1.05
Cation-Exchange Capacity (CEC)	Col (+)/kg	6.5	9.8	8.7	7.2	9.5	11.2	7.7	12.9
Infiltration rate	mm/hour	27	17	18	26	17	16	25	15
Porosity	%	58	58	56	60	56	58	56	60
Water Holding Capacity	%	7.82	5.59	4.71	7.63	4.37	5.29	6.18	5.11
Moisture	%	8.49	5.92	4.95	8.27	4.56	5.58	6.59	5.39
Organic Matter	%	0.55	0.80	0.84	0.36	1.36	0.47	0.64	0.47
Carbonates	%	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Sand	%	78	36	42	74	32	37	72	32
Silt	%	9	44	38	13	48	41	9	52
Clay	%	13	20	20	13	20	22	19	16
Organic Carbon	%	0.94	1.38	1.44	0.63	2.35	0.82	1.10	0.82
Nitrogen (as N)	%	0.089	0.067	0.066	0.072	0.084	0.061	0.075	0.098
Carbon / Nitrogen Ration (C/N)	-	10.6	20.6	21.8	8.8	28.0	13.4	14.7	8.4
Phosphorus (as P)	%	0.072	0.113	0.086	0.099	0.122	0.167	0.234	0.131
Potassium (as K)	mg/kg	190	174	196	216	234	190	256	244
Sodium (as Na)	mg/kg	150	144	178	196	210	170	224	214
Calcium (as Ca)	mg/kg	554	347	218	208	317	139	198	208
Magnesium (as Mg)	mg/kg	373	168	211	132	156	90	114	132
Calcium/Magnesium ratio	-	1.49	2.07	1.03	1.58	2.03	1.54	1.74	1.58
Sodium Adsorption Ratio (SAR)	-	1.46	1.87	2.10	2.59	2.61	2.55	2.93	2.74
Chlorides (as Cl)	mg/kg	175	439	472	526	351	386	342	263
Sulphates (as SO_4)	mg/kg	41	26	16	64	57	24	36	52
Zinc (as Zn)	mg/kg	6.2	5.1	4.9	4.2	5.7	6.7	3.9	1.1
Texture	-	Sandy loam	Loam	Loam	Sandy loam	Loam	Loam	Sandy loam	Silt loam
S1- Site, S2- E-Tandrapadu, S3- Gondiparla, S4- Basavapuram, S5- Bhairapuram, S6- Panchalingala, S7- Padidempadu and S8-Kurnool									

The test results of soil samples collected in the impact area are interpreted referring to the book; "Interpreting soil test results" by Pam Hazelton and Brian Murphy. The reference tables are presented in **Table 3.4.** The pH of soil samples ranges from Slightly acidic to mildly alkaline. The cation exchange capacity of the soils is low to moderate. The level of nitrogen of the all samples is low while the potassium levels are medium in seven samples and high in one sample. The calcium magnesium ratio of the samples reflects calcium is low. Bulk density of soil of impact varies from 1.05 g/cc – 1.18 g/cc among sand loamy soils (3 samples), 1.11 – 1.18 g/cc among Loam soils (4 samples) and 1.05 g/cc among Silt Loam soils. The porosity values range from 56-60 % among sand loamy (3 samples), 56-58 % among Loam soils (4 samples) and 60 % among Silt loam soil. Soil texture is predominantly Loam.

Table 3.4 Soil Test Results – Reference Tables

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

Source: Bruce and Rayment (1982).

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

Source: Metson (1961)

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

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

Source: Eckert (1987)

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

Source: Metson (1961)

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

Source: Bruce and Rayment (1982)

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

Source: Abbott (1989)

3.3 Water Environment

Industrial development of any region is contingent on the availability of sufficient water resources, as most of the process industries require water for process or cooling purposes. The proposed expansion project envisages to use surface water for its water requirement, and has the necessary approval for withdrawl of water from Tungabhadra river. The water resources in the impact area broadly fall into following categories; surface water sources mainly consisting of tanks and ponds and ground water sources of tube wells, dug wells and dug/boore wells which abstract accumulated water in the acquifers in the deeper strate of ground.

3.3.1 Surface Water Resources

Tungabhadra River is flowing from Northwest to southwest direction at a distance of 1.5 km in southwest direction. Kurnool - Kadapa canal is flowing beyond the river flowing from west to east direction. There are a few surface water bodies like in the study area mainly in the south eastern boundary draining into Kurool-kadapa canal. The drainage pattern of the study area is dendritic and the flow is mainly into Tungabhadra River. The drainage pattern of the impact area is presented in **Fig 3.11.**

3.3.1.1 Surface Water Quality

In order to have an idea of quality of water flowing in the region, representative water samples were collected and analysed according to IS 3025. The sampling locations of both ground and surface water are presented in **Fig 3.12**. The plant area is mainly drains into Tungabhadra River while drawing its water requirement from the same river, hence up stream and down stream samples are collected in Tungabhadra River. The analytical results of water samples drawn from various locations in the study area during monitoring are presented in **Table 3.5**. From analytical results as per CPCB surface water classification, SW1 and SW2 falls under Class 'C' (Drinking water source after conventioal treatment and disinfection). DO ranges from 5.6 to 5.9 mg/l, Total Coliforms rnages from 749 to 945 MPN/100ml, Chlorides varies from 102 to 105 mg/l, TDS varies from 466 to 472 mg/l.

Table 3.5 Water Analysis Data –Surface Water *(Terms of Reference No. 6(iv))*

Parameters	SW-1	SW-2	Units	Method of Analysis	IS 2296:1982
Temperature	30	30	^{o}C	IS:3025 part 09:2002	NS
Colour	1	1	Hazen	IS:3025 part 04:2012	5
Turbidity	0.1	<0.1	NTU	IS:3025 part 10:2006	5
pH	8.13	8.19	-	IS:3025 part 11:2006	6.5-8.5
Total Solids	488	484	mg/l	IS:3025 part 15:2003	NS
Total Dissolved Solids	472	466	mg/l	IS:3025 part 16:2006	1500
Total Suspended Solids	16	18	mg/l	IS:3025 part 17:2006	NS
Total Hardness (as $CaCO_3$)	210	240	mg/l	IS:3025 part 21:2009	NS
Total Coliforms	749	945	MPN/ 100 mL	APHA-9221A& 9222B:2017	5000
Dissolved Oxygen	5.9	5.6	mg/L	IS 3025 Part 38:1989 (RA:2019)	4
BOD 3 days at 27±1^{0}C	17.2	18.8	mg/L	IS 3025 Part 44:1993 (RA:2019)	3
Chemical Oxygen Demand	**57**	**57**	mg/L	IS 3025 Part 58:2006 (RA:2017)	NS
Calcium (as Ca)	40	46	mg/l	IS:3025 part 40:2009	NS
Magnesium (as Mg)	26	30	mg/l	IS:3025 part 46:2009	NS
Sodium (as Na)	82	71	mg/l	IS:3025 part 45:2003	NS
Sodium Absorption Ratio (SAR)	2.48	2	-	-	Ns
Potassium (as K)	4.2	4.5	mg/l	IS:3025 part 45:2003	NS
Total Alkalinity (as $CaCO_3$)	220	240	mg/l	IS:3025 part 51:2006	NS
Chloride (as Cl)	105	102	mg/l	IS:3025 part 32:2007	600
Sulphates (as SO4)	30	31	mg/l	IS:3025 part 24:2009	400
Nitrite Nitrogen (as NO_3)	6.5	4.9	mg/l	IS:3025 part 34:2009	50
Silica (as SiO_2)	7.2	3.1	mg/l	IS:3025 part 35:2003	NS
Fluoride (as F)	0.37	0.29	mg/l	IS:3025 part 60:2008	1.5
Mineral Oil	Nil	Nil	mg/l	IS:3025 part 39:2013	NS
Aluminium (as Al)	<0.5	<0.5	mg/l	APHA-3111D: 2017	NS
Arsenic (asAs)	<0.001	<0.001	mg/l	IS 3025 (Part 37): 2022	0.2
Cadmium (as Cd)	<0.01	<0.01	mg/l	IS 3025 (part 41):1992 RA:2019)	0.01
Iron (as Fe)	0.13	0.15	mg/l	IS 3025 (part 53):2003 RA:2019)	50
Lead (as Pb)	<0.01	<0.01	mg/l	IS 3025 (part 47):1994 RA:2019)	0.1
Mercury (as Hg)	<0.01	<0.01	mg/l	IS 3025 (part 48):1994 RA:2019)	NS
Zinc (as Zn)	0.09	0.11	mg/l	IS 3025 (part 49):1994 RA:2019)	15
SW1-Tungabhadra River upstream and SW2-Tungabhadra River downstream					

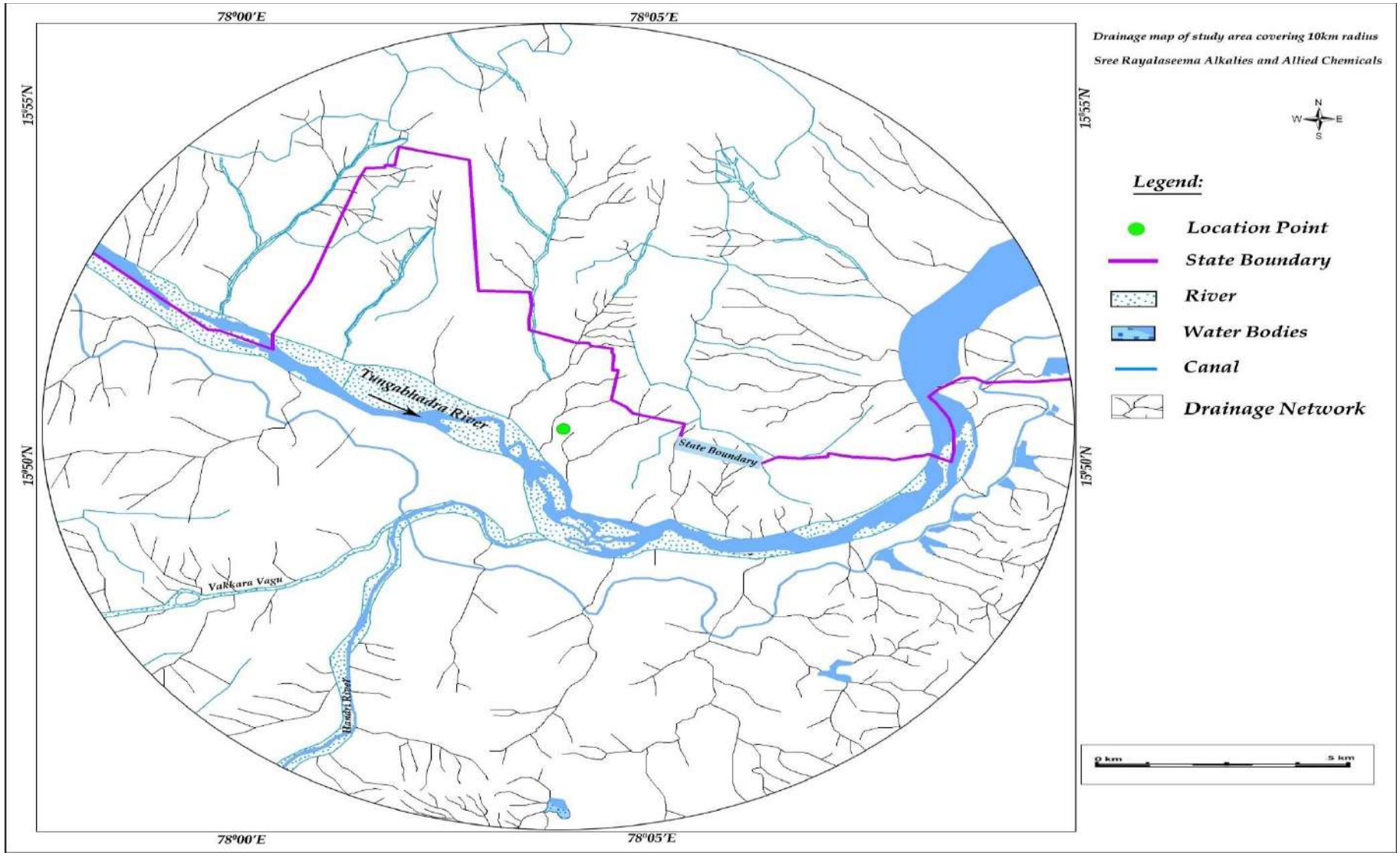


Fig 3.11 Drainage Pattern of the study area ***(Terms of Reference No. 4(xi))***

3.3.1.2 Ground Water Resources

Ground water is the accumulation of water below ground surface, caused by rainfall and its subsequent percolation through pores and crevices. Percolated water accumulates till it reaches impervious strata consisting of confined clay or confined rocks. Occurrence of ground water is controlled by landform, structure and lithology. Ground water abstraction is by means of dug wells, dug cum driven wells, and bore wells and open alluvial. Ground water resources are ample in the study area. Every village has a number of traditional wells large and small. The state authorities have also provided tube wells fitted with hand pump for the drinking water requirement of villages in the study area.

3.3.1.3 Quality of Ground Water *(Terms of Reference No. 6(vi))*

Representative samples are collected from various dug wells and bore wells in the study area. The analytical results of water samples drawn from various locations in the study area are presented in **Table 3.6**. The map showing the locations of sample collection (**Figure 3.11**) is also presented. Total dissolved solids range from 226-901 mg/l, which is contributed by sodium and chlorides. Total hardness varies between 151-601 mg/l. According to Sawyer and McCarty's classification for hardness, 1 sample falls under very hard class and 7 samples fall under hard class of the impact area.

Table 3.6 Locations of Water Sampling

S. No	Location Name	Direction Form site	Distance (Km)	Co-Ordinates	
				Latitude (N)	Longitude (E)
GW - 1	Site	-	-	15°50'46.21"	78°03'45.53"
GW – 2	E - Tandrapadu	NW	0.6	15°51'00.30"	78°03'05.68"
GW – 3	Gondiparla	SE	1.8	15°49'41.06"	78°03'56.66"
GW – 4	Basavapuram	N	2.7	15°52'21.56"	78°03'36.60"
GW – 5	Bhairapuram	NW	4.1	15°53'08.60"	78°03'25.28"
GW – 6	Panchalingala	NW	4.5	15°51'50.97"	78°01'07.75"
GW – 7	Padidempadu	NW	4.15	15°48'42.93"	78°05'41.28"
GW – 8	Kurnool	SW	1.4	15°85'82.72"	78°00'26.28"
Surface Water Samples					
SW – 1	Tungabhadra river up stream	NW	2.0	15°51'5.89"	78°2'28.37"
SW - 2	Tungabhadra river down stream	NE	1.7	15°49'25.63"	78°4'21.49"

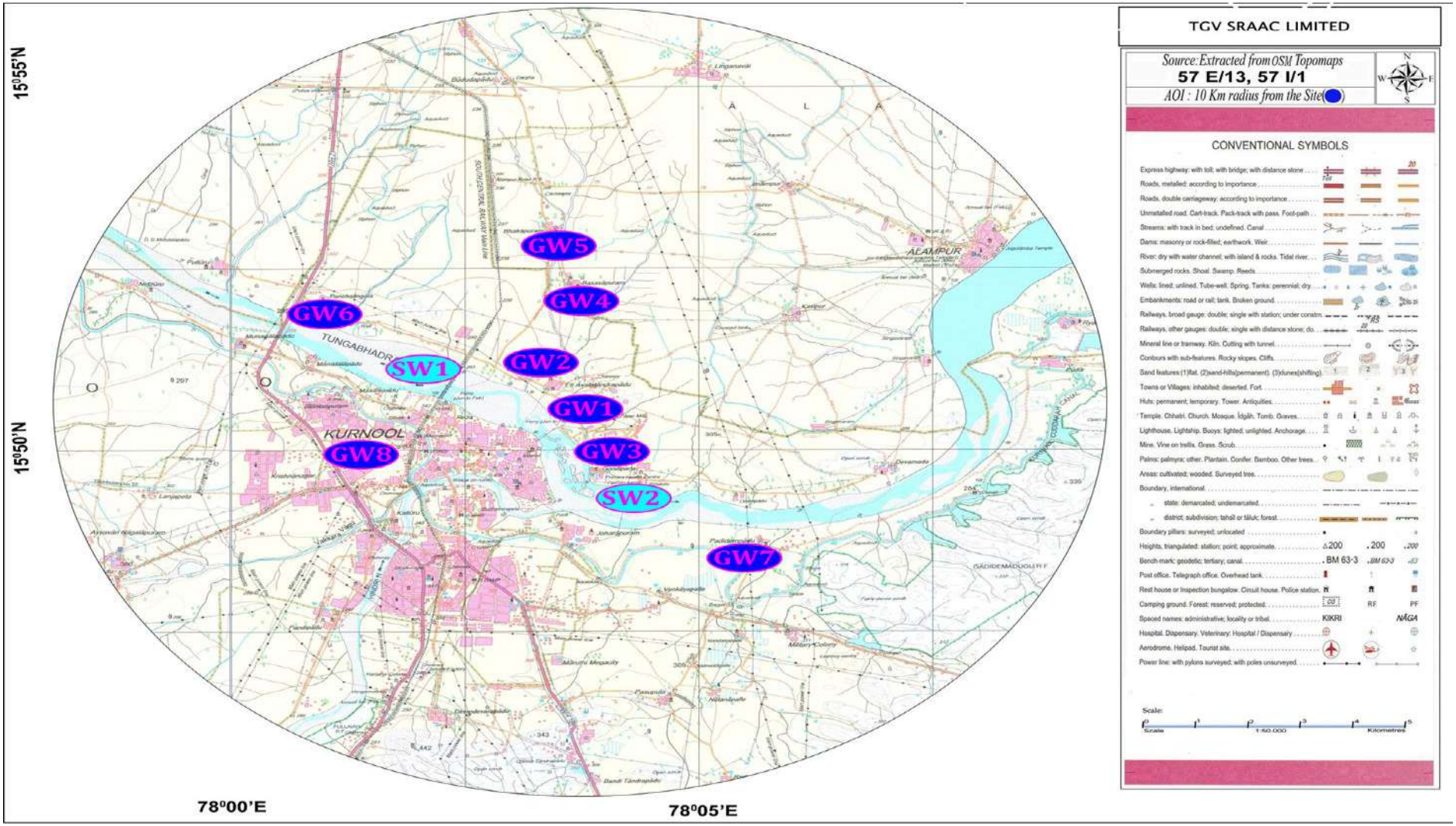


Fig 3.12 Water Sampling Locations (Surface and Ground water)

Table 3.7 Water Analysis Data – Ground Water

Parameters	GW-1	GW-2	GW-3	GW-4	Units	Method of Analysis	IS 10500:2012 Standard	
							Limit-1	Limit-2
Temperature	29	28	29	29	^{o}C	IS 3025 (part 09):1984 (RA:2017)	NS	NS
Colour	3	2	5	3.0	Hazen	IS 3025 (Part 4): 2021	5	15
Turbidity	0.2	0.7	0.5	0.30	NTU	IS 3025 (part 10):1984 (RA:2017)	1	5
pH @25.1^{0}C	7.25	7.37	7.32	6.87	-	IS 3025 (part 11) :2022	6.5-8.5	NR
Total Solids	350	300	391	906	mg/l	IS 3025 (part 15):1984 (RA:2019)	NS	NS
Total Dissolved Solids	347	298	389	901	mg/l	IS 3025 (part 16):1984 (RA:2017)	500	2000
Total Suspended Solids	3.0	2.0	2.0	5.0	mg/l	IS 3025 (Part 17): 2022	NS	NS
Total Hardness (as $CaCO_3$)	182	172	270	601	mg/l	IS 3025 (part 21):2009 (RA:2019)	200	600
Calcium (as Ca)	40	41	37.0	120	mg/l	IS 3025 (part 40):1991 (RA:2019)	75	200
Magnesium (as Mg)	20	17	43	73	mg/l	IS 3025 (part 46):1994 (RA:2019)	30	100
Sodium (as Na)	40	27	19	92	mg/l	IS 3025 (part 45):1993 (RA:2019)	NS	NS
Potassium (as K)	0.61	0.52	0.3	0.81	mg/l	IS 3025 (part 45):1993 (RA:2019)	NS	NS
Total Alkalinity (as $CaCO_3$)	99	79	99	317	mg/l	IS 3025 (part 23):1986 (RA:2019)	200	600
Chloride (as Cl)	60	53	88	232	mg/l	IS 3025 (part 32):1988 (RA:2019)	250	1 000
Sulphate (as SO_4)	80	69	77	94	mg/l	IS 3025 (Part 24/Sec 1): 2022	200	400
Nitrate Nitrogen (as NO_3)	3.7	3.5	4.1	22	mg/l	IS 3025 (Part 34):1988 (RA:2019)	45	NR
Silica (as SiO_2)	5.6	6.1	7.6	18	mg/l	IS 3025 (part 35):1988 (RA:2019)	NS	NS
Fluoride (as F)	0.13	0.25	0.28	0.21	mg/l	IS:3025 part 60:2008 (RA:2019)	1	1.5
Boron (as B)	<0.1	<0.1	<0.1	<0.1	mg/l	APHA-4500B: 2017	0.5	1
Manganese (as Mn)	<0.01	<0.01	<0.01	<0.01	mg/l	APHA-3111B: 2017	0.1	0.3
Zinc (as Zn)	0.17	0.15	0.12	0.25	mg/l	IS 3025 (part 49):1994 (RA:2019)	5	15
GW1- site, GW2-E-Tandrapadu, GW3-Gondiparla, GW4-Basavapuram								

Note

1. ***Above all standard values are mentioned as per IS 10500:2012 (RA 2019), Drinking water specifications***
2. ***Limit 1- Requirement (Acceptable Limit) and Limit 2- Permissible Limit in the Absence of Alternate Source***
3. ***NS- No Specification, NR- No Relaxation, and A-Absent***

Parameters	GW-5	GW-6	GW-7	GW-8	Units	Method of Analysis	IS 10500:2012 Standard	
							Limit-1	Limit-2
Temperature	28	29	29	28	^{o}C	IS 3025 (part 09):1984 (RA:2017)	NS	NS
Colour	5	5	3	2	Hazen	IS 3025 (Part 4): 2021	5	15
Turbidity	0.27	0.62	0.75	0.53	NTU	IS 3025 (part 10):1984 (RA:2017)	1	5
pH @25.1^{0}C	6.92	6.9	7.1	7.51	-	IS 3025 (part 11) :2022	6.5-8.5	NR
Total Solids	415	228	875	308	mg/l	IS 3025 (part 15):1984 (RA:2019)	NS	NS
Total Dissolved Solids	412	226	872	306	mg/l	IS 3025 (part 16):1984 (RA:2017)	500	2000
Total Suspended Solids	3	2	3	2	mg/l	IS 3025 (Part 17): 2022	NS	NS
Total Hardness (as $CaCO_3$)	191	151	485	209	mg/l	IS 3025 (part 21):2009 (RA:2019)	200	600
Calcium (as Ca)	37	29	97	59	mg/l	IS 3025 (part 40):1991 (RA:2019)	75	200
Magnesium (as Mg)	24	19	59	15	mg/l	IS 3025 (part 46):1994 (RA:2019)	30	100
Sodium (as Na)	50	11	111	13	mg/l	IS 3025 (part 45):1993 (RA:2019)	NS	NS
Potassium (as K)	0.98	0.87	2.5	0.51	mg/l	IS 3025 (part 45):1993 (RA:2019)	NS	NS
Total Alkalinity (as $CaCO_3$)	69	74	311	79	mg/l	IS 3025 (part 23):1986 (RA:2019)	200	600
Chloride (as Cl)	46	42	187	65	mg/l	IS 3025 (part 32):1988 (RA:2019)	250	1 000
Sulphate (as SO_4)	130	28	87	58	mg/l	IS 3025 (Part 24/Sec 1) : 2022	200	400
Nitrate Nitrogen (as NO_3)	3.1	23	25	3.9	mg/l	IS 3025 (Part 34):1988 (RA:2019)	45	NR
Silica (as SiO_2)	23.0	0.81	25	6.4	mg/l	IS 3025 (part 35):1988 (RA:2019)	NS	NS
Fluoride (as F)	0.13	0.17	0.11	0.19	mg/l	IS:3025 part 60:2008 (RA:2019)	1	1.5
Boron (as B)	<0.1	<0.1	<0.1	<0.1	mg/l	APHA-4500B: 2017	0.5	1
Manganese (as Mn)	<0.01	<0.01	<0.01	<0.01	mg/l	APHA-3111B: 2017	0.1	0.3
Zinc (as Zn)	0.13	0.28	0.11	0.18	mg/l	IS 3025 (part 49):1994 (RA:2019)	5	15
GW5-Bhairapuram, GW6-Panchalingala, GW7-Padidempadu and GW8-Kurnool								
Note	1. ***Above all standard values are mentioned as per IS 10500:2012 (RA 2019), Drinking water specifications*** 2. ***Limit 1- Requirement (Acceptable Limit) and Limit 2- Permissible Limit in the Absence of Alternate Source*** 3. ***NS- No Specification, NR- No Relaxation, and A-Absent***							

3.4 Air Environment

3.4.1 Meteorology

Micro meterological studies are simultaneously conducted with the ambient air quality monitoring. Meteorology plays a vital role in facilitating dispersion of pollutants; once discharged into the atmosphere, their transport, dispersion, and diffusion into the environment. Meteorological data is necessary for interpretation of baseline data and for air quality impact predictions. Since meteorological data show wide fluctuations with time, meaningful interpretation can only be drawn from long term and reliable data. Such source of data is the India Meteorological Department (IMD) that maintains a network of meteorological stations at several important locations. The climatorlogical table for nearest IMD station at Kurnool is presented in **Table 3.8.**

Extreme Weather

The climatological table indicates a highest temperature of 45.6 ^{0}C observed on May 10, 1921 and June 02, 1998, Lowest Temperature of 6.7 ^{0}C observed on December 29, 1902, while the highest rainfall observed in a day was 200.1 mm on September 09, 1888.

Table 3.8 Normal Climatological Table – IMD Kurnool

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : कुर्नूल
STAION : Kurnool

माह / MONTH	मौसम परिघटना के साथ दिनों की संख्या — WEATHER PHENOMENA — No. OF DAYS WITH						पवन — पवन की गति के साथ दिनों की संख्या (कि. मी. प्र. घं.) — WIND — No. OF DAYS WITH WIND SPEED (Km. p. h.)			
	वर्षण 0.3 मि.मि.या अधिक / PPT 0.3mm Or more	ओले / HAIL	गर्जन / THUNDER	कुहरा / FOG	धूल भरी आंधी / DUST STORM	हेज़ गात / SQU ALL	62 या अधिक / 62 Or more	20-61	1-19	0
जनवरी I	0.6	0	0.1	0.1	0	0	0	0	12	19
JAN II							0	0	19	12
फरवरी I	0.5	0	0.1	0	0	0	0	0	14	14
FEB II							0	0	21	7
मार्च I	1.3	0.1	1.5	0	0	0	0	0	19	12
MAR II							0	0	22	9
अप्रैल I	2.7	0	4	0	0.1	0	0	0	24	6
APR II							0	0	23	7
मई I	5	0	6.6	0	0	0	0	0	28	3
MAY II							0	0	25	6
जून I	9.7	0	5.3	0	0	0	0	0	29	1
JUN II							0	1	27	2
जुलाई I	13	0	3.5	0	0	0	0	0	30	1
JUL II							0	1	27	3
अगस्त I	14.3	0	3.4	0	0	0	0	0	29	2
AUG II							0	1	27	3
सितम्बर I	11.8	0	5.6	0	0	0	0	0	25	5
SEP II							0	0	23	7
अक्तूबर I	7.9	0	4	0.1	0	0	0	0	16	15
OCT II							0	0	15	16
नवम्बर I	3.7	0	0.4	0	0	0	0	0	14	16
NOV II							0	0	13	17
दिसम्बर I	0.7	0	0	0.1	0	0	0	0	11	20
DEC II							0	0	14	17
वार्षिक योग या माध्य I	71.2	0.1	34.6	0.2	0.1	0	0	1	251	113
ANNUAL TOTAL OR MEAN II							0	3	257	105
वर्षों की संख्या I										
NUMBER OF YEARS II			30						30	

माह / MONTH	पवन — पवन की दिशा के दिनों की संख्या का प्रतिशत — PERCENTAGE No. OF DAYS WIND FROM									
	उ	उ.पू.	पू.	द.पू.	द	द.प	प	उ.प	शांत / CALM	
जनवरी I	1	5	8	8	2	1	1	1	73	16
JAN II	2	12	16	14	2	0	0	2	52	12
फरवरी I	3	2	11	11	5	4	3	2	59	18
FEB II	9	15	18	13	4	2	3	5	31	12
मार्च I	2	3	10	14	8	7	6	4	46	19
MAR II	8	10	14	14	5	2	3	5	39	9
अप्रैल I	4	4	7	14	11	11	17	7	25	13
APR II	8	13	14	14	5	3	6	6	31	3
मई I	3	2	2	3	4	13	47	16	10	5
MAY II	9	8	5	6	4	4	25	16	23	2
जून I	1	1	0	0	2	24	57	11	4	1
JUN II	3	1	1	1	2	22	53	10	7	0
जुलाई I	0	0	0	0	1	28	57	9	5	0
JUL II	2	0	0	0	1	19	54	12	12	0
अगस्त I	1	0	0	0	1	19	62	12	5	0
AUG II	2	0	0	0	1	14	56	16	11	0
सितम्बर I	2	1	0	1	1	16	45	14	20	1
SEP II	4	3	1	1	2	8	35	16	30	0
अक्तूबर I	4	7	4	3	2	6	11	6	57	5
OCT II	7	10	5	4	2	2	4	4	62	2
नवम्बर I	5	14	6	2	1	1	2	2	67	9
NOV II	4	14	11	5	0	0	0	1	65	4
दिसम्बर I	3	6	7	5	1	1	1	0	74	13
DEC II	2	7	13	9	1	0	0	0	68	8
वार्षिक योग या माध्य I	2	4	4	5	3	11	27	7	37	103
ANNUAL TOTAL OR MEAN II	5	7	8	6	2	7	21	8	36	50
वर्षों की संख्या I										
NUMBER OF YEARS II					30					

माह / MONTH	मेघ — मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्टमांश — CLOUD — No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS						मेघ — निम्न स्तरी मेघ मात्रा सहित दिनों की संख्या - अष्टमांश — No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS						दृश्यता — दृश्यता सहित दिनों की संख्या — VISIBILITY — No. OF DAYS WITH VISIBILITY					
	0	शू-2	3-5	6-7	8	कुहरा 8	0	शू-2	3-5	6-7	8	कुहरा 8	1 कि.मी. तक / UP TO 1 Km	1-4 कि.मी. / 1-4 Kms	4-10 कि.मी. / 4-10 Kms	10-20 कि.मी. / 10-20 Kms	20 कि.मी. से अधिक / OVER 20 Kms
जनवरी I	16	6	5	3	1	0	27	3	1	0	0	0	0	0.1	6.8	24.1	0
JAN II	12	9	6	4	0	0	20	8	3	0	0	0	0	0	0.4	30.6	0
फरवरी I	18	5	3	2	0	0	25	2	1	0	0	0	0	0	1.9	26.1	0
FEB II	12	9	5	2	0	0	17	8	3	0	0	0	0	0	0.1	27.9	0
मार्च I	19	6	4	2	0	0	27	3	1	0	0	0	0	0	0.5	30.5	0
MAR II	9	11	8	3	0	0	15	12	4	0	0	0	0	0	0.3	30.7	0
अप्रैल I	13	7	6	3	1	0	25	4	1	0	0	0	0	0	0.1	29.9	0
APR II	3	10	11	6	0	0	6	17	7	0	0	0	0	0	0.7	29.3	0
मई I	5	9	8	7	2	0	22	7	2	0	0	0	0	0	0.5	30.5	0
MAY II	2	8	10	10	1	0	7	16	8	0	0	0	0	0	0.6	30.4	0
जून I	1	4	8	12	5	0	10	15	5	0	0	0	0	0	1.7	28.3	0
JUN II	0	2	7	16	5	0	1	13	15	1	0	0	0	0	2	28	0
जुलाई I	0	3	7	13	8	0	8	16	6	1	0	0	0	0	2.4	28.6	0
JUL II	0	0	5	16	10	0	0	13	17	1	0	0	0	0	3.8	27.2	0
अगस्त I	0	3	7	13	8	0	8	16	7	0	0	0	0	0.1	2.4	28.5	0
AUG II	0	1	6	16	8	0	1	15	14	1	0	0	0	0.1	3.1	27.8	0
सितम्बर I	0	5	8	11	5	0	10	14	6	0	0	0	0	0	2.1	27.9	0
SEP II	0	1	6	17	6	0	1	18	11	0	0	0	0	0.2	1.9	28	0
अक्तूबर I	0	6	7	9	4	0	17	9	5	0	0	0	0	0.2	2.9	27.9	0
OCT II	0	4	8	12	5	0	5	17	9	0	0	0	0	0.1	2.8	28.4	0
नवम्बर I	0	7	7	6	1	0	23	5	2	0	0	0	0	0.1	4.2	25.7	0
NOV II	0	7	8	9	2	0	12	13	5	0	0	0	0	0	1	29	0
दिसम्बर I	0	7	5	5	1	0	28	2	1	0	0	0	0	0.6	10.5	19.9	0
DEC II	0	7	7	7	1	0	19	9	3	0	0	0	0	0	0.8	30.2	0
वार्षिक योग या माध्य I	74	66	74	86	36	0	228	96	39	2	0	0	0	1.2	38.1	327.7	0
ANNUAL TOTAL OR MEAN II	50	70	88	119	38	0	103	161	98	3	0	0	0	0.4	17.1	347.5	0
वर्षों की संख्या I																	
NUMBER OF YEARS II				30					30						30		

जलवायवी सारणी
CLIMATOLOGICAL TABLE

BACK

स्टेशन : कुर्नूल
STATION : Kurnool

अक्षांश LAT. 15° 50' देशांतर LONG. 78° 04' समुद्री तल माध्य से ऊंचाई HEIGHT ABOVE M.S.L. 281 मीटर METRES

प्रेक्षणों पर आधारित BASED ON OBSERVATIONS 1981-2010

माह / MONTH		स्टेशन का सतह दाब / STATION LEVEL PRESSURE	वायु तापमान / AIR TEMPERATURE										आर्द्रता / HUMIDITY		मेघ की मात्रा / CLOUD AMOUNTS		मासिक योग / MONTHLY TOTAL	वर्षा के दिनोंकी संख्या / NO. OF RAINY DAYS	वर्षा / RAINFALL				
			माध्य / MEAN						चरम / EXTREMES														
			शुष्क बल्ब / DRY BULB	नम बल्ब / WET BULB	दैनिक अधिक तम / DAILY MAX	दैनिक न्यून तम / DAILY MIN	माह में उच्चतम / HIGHEST IN THE MONTH	माह में निम्नतम / LOWEST IN THE MONTH	उच्चतम / HIGHEST	दिनांक और वर्ष / DATE AND YEAR	निम्नतम / LOWEST	दिनांक और वर्ष / DATE AND YEAR	सापेक्ष आर्द्रता / RELATIVE HUMIDITY	वाष्प दाब / VAPOUR PRESSURE	समस्त मेघ / ALL CLOUDS	निम्न मेघ / LOW CLOUDS			सर्वाधिक सबसे नम महीने का योग / TOTAL IN WETTEST MONTH WITH YEAR	सर्वाधिक शुष्कतम महीने का योग / TOTAL IN DRIEST MONTH WITH YEAR	24 घंटोंकी सबसे भारी वर्षा / HEAVIEST FALL IN 24 HOURS	दिनांक और वर्ष / DATE AND YEAR	माध्य पवन गति / MEAN WIND SPEED
		एच.पी.ए hPa	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C	डि. से °C		डि. से °C		प्रतिशत %	एच.पी.ए hPa	आकाश के अष्टमांश Oktas of sky		मि.मि. mm		मि.मि. mm	मि.मि. mm	मि.मि. mm		कि.मी. प्र. घं. Kmph
जनवरी JAN	I	983.3	21.5	18.1	31.7	17.9	34.4	14.5	37.3	23 2000	8.3	8 1975	70	18.3	1.7	0.3	4	0.3	43.4 1915	0	41.1	18 1915	2.2
	II	979.2	29.8	19.7									35	14.8	2.2	0.7							
फरवरी FEB	I	982	23.8	18.7	34.8	20.3	37.7	16.5	39.9	26 2009	11.1	5 1943	59	17.7	1.1	0.2	2.2	0.2	84.1 1901	0	66.8	4 1928	2.8
	II	977.6	33.3	20.3									26	13.5	1.5	0.7							
मार्च MAR	I	980.2	27.6	20.8	38.2	23.8	40.8	20	43.3	29 1996	12.8	3 1921	52	19.3	1.2	0.2	9.8	0.7	109.7 2008	0	72.7	11 1989	3.3
	II	975.3	36.5	21.8									23	14.2	2.1	1							
अप्रैल APR	I	978.1	30.5	23.2	40.1	26.7	42.6	22.4	44.8	29 2000	15.5	27 1971	51	22.5	2	0.3	26.4	1.6	119.2 2004	0	92.5	25 2004	3.9
	II	972.9	38.1	23.1									25	16.2	3.2	1.6							
मई MAY	I	976	30.7	24	40.5	27.5	43.5	23.1	45.6	10 1921	19.4	22 1955	56	24.4	3.3	0.5	50.4	2.7	382.5 1952	0	165.6	23 1952	5.8
	II	970.7	38.6	24.2									28	18.5	4	1.7							
जून JUN	I	974.5	28.2	23.8	36.2	25.5	40.8	22.3	45.6	2 1998	17.6	5 1999	68	25.9	5.4	1.3	93.6	5.7	359.2 1944	9.4 1899	86.4	30 2000	7.9
	II	970.1	34	24.5									45	22.9	6	2.6							
जुलाई JUL	I	974.7	26.8	23.4	33.6	24.5	36.8	22.3	38.5	9 1966	19.2	25 1976	73	25.9	6	1.5	121.4	7.6	347.6 1989	14.9 1987	132.1	2 1893	7.8
	II	970.9	31.4	24.1									54	24.2	6.6	2.8							
अगस्त AUG	I	975.7	26.1	23.1	32.5	23.9	35.8	22	39.3	8 1983	19.9	24 1966	76	25.9	5.9	1.5	143.4	9	491 1955	1.5 1972	121.9	21 1955	7
	II	971.8	30.6	24.1									57	24.7	6.4	2.5							
सितम्बर SEP	I	977.3	26.2	23.3	32.9	23.8	36	21.8	38.7	20 1987	17	24 1972	77	26.1	5.2	1.4	145	7.7	467.1 1964	3.9 1994	200.1	9 1888	4.8
	II	973.1	30.6	24.1									57	24.7	6.1	2.2							
अक्तूबर OCT	I	979.7	26	22.9	32.5	22.8	35.2	19.7	38.4	5 2002	13	30 1971	75	25.4	4	1	114.1	5.2	379.2 1916	0	185.9	1 2009	2.4
	II	975.9	29.7	23.1									56	22.9	5	1.8							
नवम्बर NOV	I	982.2	23.7	20.4	31.2	20.1	33.5	15.5	38.8	1 1971	9.3	18 1974	72	21.6	2.8	0.5	23	1.9	317 1987	0	145.8	18 1987	1.9
	II	978.5	28.5	21.3									51	19.6	3.7	1.2							
दिसम्बर DEC	I	984	21.4	18.4	30.5	17.8	32.5	14.3	34.4	18 1929	6.7	29 1902	73	18.9	2	0.3	3.9	0.3	144.6 1906	0	71.1	30 1906	1.8
	II	980.2	27.8	19.7									44	16.5	2.9	0.7							
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	979	26	21.6	1.2	0.8	43.8	13.3	45.6	10	6.7	29	67	22.6	3.3	0.7	737.2	43	1139.4	280.2	200.1	9	0.2
	II	974.7	32.4	22.5					5	1921	12	1902	42	19.3	4.1	1.6			2005	1920	9	1888	
वर्षोंकी सं NUMBER OF YEARS	I																						
	II	30	30	30	30	30	30	30	109		109		30	30	30	30	30	30	135	135	141		30

3.4.2 Meteorological Station at Plant Site *(Terms of Reference No. 6(i))*

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

1. Wind Direction and Speed:

The hourly wind speed and wind direction observations are computed for the study period and the same are presented in **Table 3.9** and the wind rose diagrams are presented in **Fig 3.13**. The following observations can be made from the collected data;

- Calm period is observed to be 1.76 % during the time of monitoring.
- The predominant wind direction is East-south-east and South-east.
- Other than predominant wind directions wind was blowing in East and East-noth-east.
- The average wind speed observed to be 2.38 m/s.

2. Temperature: (a) Maximum: 39.6^{0}C (b) Minimum: 14.8^{0}C (c) Average: 28.4^{0}C

3. Humidity: The daily relative humidity values are observed to range between 26-84%.

4. Rain Fall: (a) Maximum: 2.2 mm (b) Minimum: 0 mm (c) Mean: 0.6mm

Table 3.9 Frequency Distribution of Wind Speeds and Wind Directions

Wind Direction	Wind Speed in kmph					
	Calm	1 - 5	5-10	10-15	>15	Total
N		0.46	2.13	0.37		2.96
NNE		0.37	1.44	0.79	0.14	2.73
NE		1.16	4.26	1.02	0.23	6.67
ENE		1.67	6.67	2.59	0.19	11.11
E		1.39	8.06	4.95	0.65	15.05
ESE		2.27	9.26	7.13	1.94	20.60
SE		1.25	9.72	8.19	1.16	20.32
SSE		1.06	5.28	2.36		8.70
S		0.60	1.20	0.28		2.08
SSW		0.60	0.60			1.20
SW		0.46	0.42			0.88
WSW		0.32	0.28			0.60
W		0.37	0.46	0.05		0.88
WNW		0.19	0.65	0.09		0.93
NW		0.46	0.65	0.37		1.48
NNW		0.51	1.39	0.14		2.04
Calm	1.76					1.76
Total	**1.76**	**13.15**	**52.45**	**28.33**	**4.31**	**100.0**

(Monitoring Period: December 2022 – February 2023)

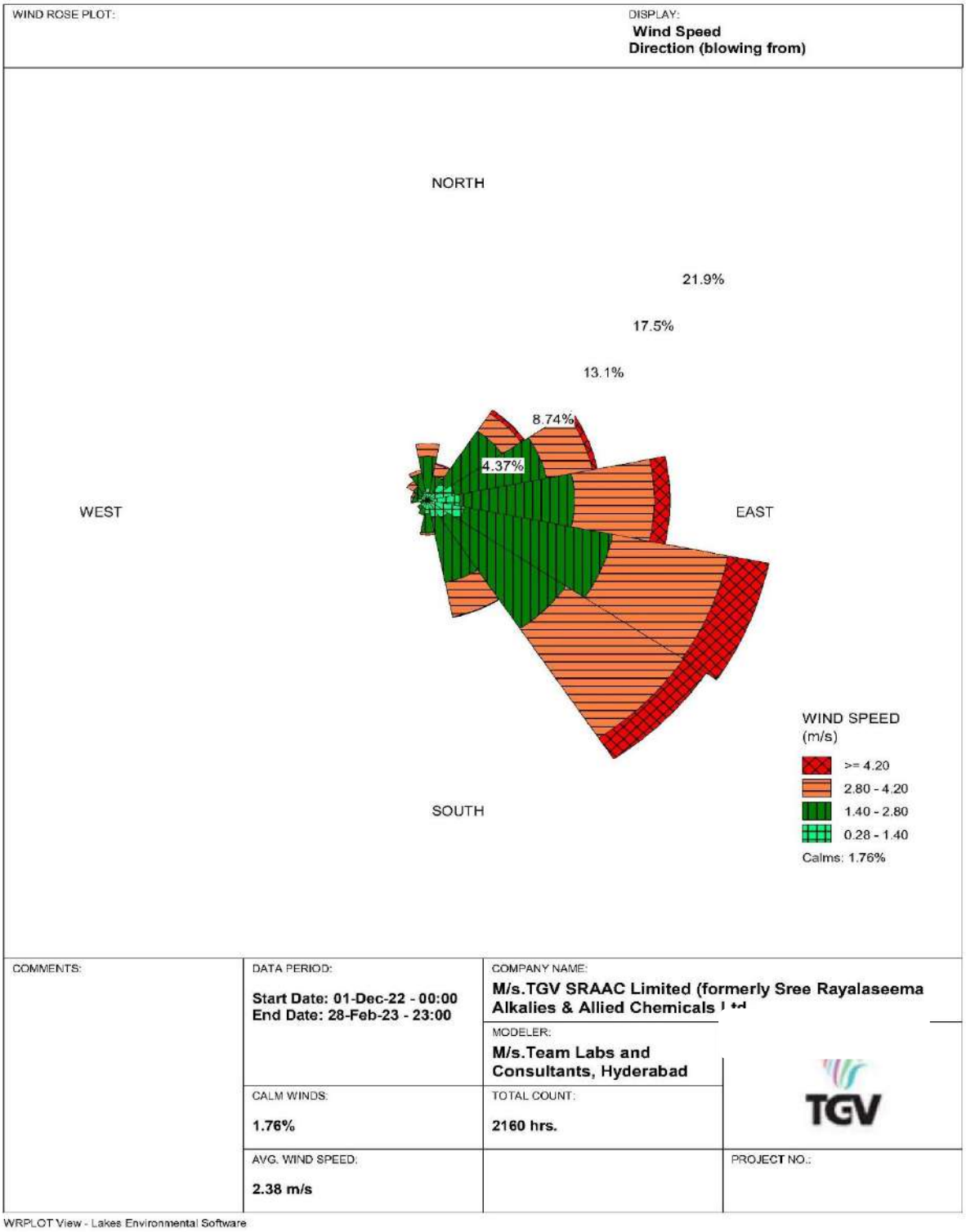


Fig 3.13 Wind Rose Diagram at Site

3.4.3 Ambient Air Quality *(Terms of Reference No. 6(ii))*

Air pollution means the presence in the outdoor atmosphere of one or more or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include smoke, vapors, soot, fumes, gases, mist, odors, particulate matter, radioactive material or noxious chemicals. Air pollution produces a number of adverse effects including offensive smell, loss of atmospheric clarity, soiling of clothes, building and manufactured goods by smoke and dust. The hazards caused to man, animals, vegetation, environment and climate have been understood in the past decade. The effects of air pollution are briefly discussed below;

a) Effect on human beings

Air borne spores, pollen grains, virus, bacteria, fungi, fur and hairs cause various allergic reactions, bronchial asthma, tuberculosis and other infections. Sulphur dioxide produces drying of the mouth, scratchy throat and smarting eyes. It also causes chest constriction, headache, vomiting and death from respiratory diseases. Sulphur trioxide, Nitrogen oxide and carbon monoxide diffuse in the blood stream. They combine with haemoglobin and reduce its oxygen carrying capacity. Nitrogen oxide in high concentration impairs the functioning of lungs by causing accumulation of water in the air spaces. Hydrocarbons have been reported to cause cancer in man. Hydrogen sulphide causes nausea and irritates eyes and throat. Ammonia attacks upper respiratory passages. Ozone causes dryness of mucous membrane of the mouth, nose and throat. It changes visual capacity, causes headache, pulmonary congestion and oedema. Arsines damage red cells in blood, kidney and cause jaundice. Suspended particles like ash, soot and smoke cause eye irritation, tuberculosis and possible cancer. Fine particles of various metals present in the air cause a number of diseases. Heavy dust fall is one of the major causes of asthma, cough and other diseases of lungs and throat. Lead can damage the brain of young children and may even cause death. It affects the normal functioning of the nervous system in adults. Cadmium is a respiratory poison and may cause high blood pressure and a number of heart diseases. Asbestos fibers have been associated in chronic lung diseases.

b) Effect on animals

Air pollution causes wide spread damage to live-stock. The effect of air pollution on domestic animals living in or near industrial areas is similar to those of human beings. Live stocks ingest various fluorine compounds which fall on fodder crops causing abnormal calcification of bones and teeth. It results in lameness, loss of weight and frequent diarrhea.

c) Effect on plants

Air pollution has serious harmful effects on plants. Sulphur dioxide causes chlorosis. It results in the death of cells and tissues. Forest trees are worst affected by sulphur dioxide pollutants. Fluorides damage leafy vegetables such as lettuce and spinach. Oxides of nitrogen and fluorides reduce crop yields. Photochemical smog bleaches and blazes foliage of plants. Hydrocarbons cause premature fall of leaves and flower buds, discolouration of sepals and curling of petals. Ozone damages cereals, fruits and cotton crops. It also causes premature yellowing and shedding of leaves.

d) Effect on materials

The acid rain and photochemical smog affect metals and buildings. Acid rain pollutes the soil and water sources. Acidic products of the air pollutant cause disintegration of textile, paper. Many small industrial units and sources of locomotive pollutants have been sifted to save the famous marble structure, Taj Mahal at Agra. Hydrogen sulphide decolorizes silver and lead paints. Ozone oxidizes rubber goods.

e) Aesthetic loss

Dust and smoke in the air do not allow us to have a clear view of nature's beauty and man-made objects. Smoke and foul smells emitted by factories, automobiles, dirty drains and garbage dumps make the urban life discomfortable. Smoking in public places affects the health of not only the smoker but also the non-smoker.

f) Change in Climate

A change in the earth's climate due to atmospheric pollution is an alarming global concern. It has been observed that in the recent past, the level of CO_2 in the atmosphere has increased from 290 ppm to 330 ppm. Approximately one fourth of this rise has occurred

in the past decade. Rapid increase in population, deforestation and excessive burning of fossil fuel has been responsible for this increase. It is also predicted that this factor alone could lead to rise in global temperature, causing "Green House Effect" or "Global Warming".

Green House effect may be defined as the progressive warming up the earth surface due to blanketing effect of man-made CO_2 in the atmosphere. The thick CO_2 layer functions like the glass panel of a green house preventing re-radiation of heat to outer space. A rise of global temperature by more than 2 or 3 ^{0}C may lead to the melting of polar ice cap and glaciers. This will cause rise in ocean level and consequent flooding of costal towns and submersion of many oceanic islands. This would also affect the rainfall pattern and productivity of agricultural crops.

The data required to asses air quality impacts in and around neighborhood is achieved by designing such a network, which encompasses micro meteorological conditions, quantity and quality of emissions, locations, duration, resources/monitoring technology and operational criteria. The ambient air quality staions were identified considering the above factors.

With the proposed expansion of unit a range of criteria pollutants and non criteria pollutants from process and operations are released into the atmosphere that are dispersed and have a significant impact on neighborhood air environment. Thus, collection of base line data of air environment occupies a predominant role in the impact assessment. The ambient air quality status across the study area forms basis for prediction of the impacts due to the proposed expansion project.

The data required to assess air quality impacts in and around neighborhood is achieved by designing such a network, which encompasses micro meteorological conditions, quantity and quality of emissions, locations, during, resources / monitoring technology and operational criteria.

3.4.4 Scope of Field Study

The scope of baseline status of the ambient air quality can be assessed through a well-designed ambient air quality stations network. Ambient air quality monitoring of the study area consisting of 10 km radius with the plant site as the center point was carried out during the study period. Ambient air quality was monitored at eight locations spread over entire study area. **Fig 3.14** presents the locations of eight ambient air quality-monitoring stations. At each sampling station monitoring was carried out for 24 hours in a day for 2 days a week and for three months. The major air pollutants monitored on 24 hourly basis are; PM_{10}, $PM_{2.5}$, Sulfur dioxide and Oxides of Nitrogen. Sampling and analysis of the above variables is according to the guidelines of Central pollution control board. National ambient air qualiy standards are presented in **Table 3.10.**

Table 3.10 National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air		
		IRR	ESA	Methods of Measurement
Sulphur Dioxide (SO_2)	Annual* 24 Hours**	50 80	20 80	Improved west and Gaeke Ultraviolet fluorescence
NitrogenDioxide (NO_2)	Annual* 24 Hours**	40 80	30 80	Modified Jacob & Hochheiser (Nn-Arsenite) Chemiluminescence
Particulate Matter (Size Less than 10µm) or PM_{10}	Annual* 24 Hours**	60 100	60 100	Gravimetic TOEM Beta Attenuation
Particulate Matter (Size Less than 2.5µm) or $PM_{2.5}$	Annual* 24 Hours**	40 60	40 60	
Ozone (O_3)	8 hours** 1 hour**	100 180	100 180	UV Photometric Chemilminescence Chemical Method
Lead (Pb)	Annual* 24 hours**	0.50 1.0	0.50 1.0	AAS /ICP method after sampling on EPM 2000 or equivalent filter paper ED - XRF using Teflon filter.
Carbon Monoxide (CO)	8 hours** 1 hour**	02 04	02 04	Non Dispersive Infra Red Spectroscopy
Ammonia (NH_3)	Annual* 24 hours**	100 400	100 400	Chemilminescence Indophenol blue method
Benzene (C_6H_6)	Annual*	05	05	Gas Chromotography based continuous analyzer

				Absorption and Desorption followed by GC analysis
Benzo (o) Pyrene(BaP) – Particulate Phase only,	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
Arsenic (As),	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni),	Annual*	20	20	
IRR - Industrial, Residential, Rural and Other Area, ESA- Ecological Sensitive Area (Notified by Central Government)				
G.S.No.826 (E) dated 16th November, 2009. Vide letter no. F. No. Q-15017/43/2007-CPW **Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.* ***24 hourly/8/1 hourly monitored values as applicable, shall be complied with 98 percent of the time in a year.2% of time they may be exceeded the limits but not on two consecutive days of monitoring.*				

3.4.5 Description of Sampling Locations *(Terms of Reference No. 6(ii))*

The location of ambient air quality stations is contingent on the meteorological status of the area. Hence the micro meteorological data was collected before initiating the ambient air quality monitoring. **Table 3.11** presents the ambient air quality locations and their distances and directions from the plant site.

Table 3.11 Locations of Ambient Air Quality Monitoring Stations

S. No	Location Name	Direction Form site	Distance (Km)	Co-Ordinates	
				Latitude (N)	Longitude (E)
AAQ - 1	Site	-	-	15°50'46.21"	78°03'45.53"
AAQ – 2	E - Tandrapadu	NW	0.6	15°51'00.30"	78°03'05.68"
AAQ – 3	Gondiparla	SE	1.8	15°49'41.06"	78°03'56.66"
AAQ – 4	Basavapuram	N	2.7	15°52'21.56"	78°03'36.60"
AAQ – 5	Bhairapuram	NW	4.1	15°53'08.60"	78°03'25.28"
AAQ – 6	Panchalingala	NW	4.5	15°51'50.97"	78°01'07.75"
AAQ – 7	Padidempadu	NW	4.15	15°48'42.93"	78°05'41.28"
AAQ – 8	Kurnool	SW	1.4	15°85'82.72"	78°00'26.28"

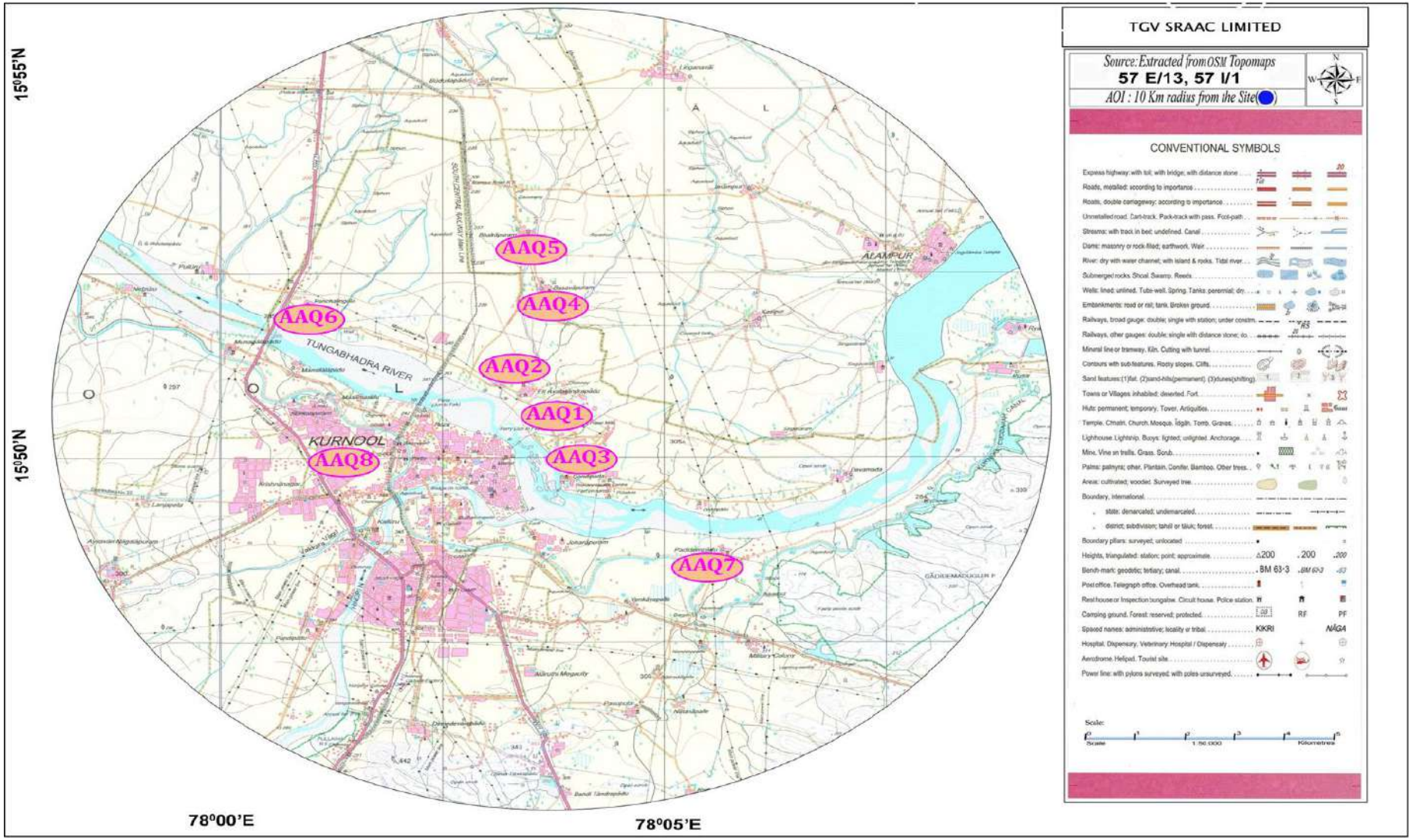


Fig.14 Ambient Air Quality Monitoring Locations

3.4.6 Ambient Air Quality Status *(Terms of Reference No. 6(iii), B3)*

The baseline data for ambient air quality is presented in **Table 3.12.** It may be noted that the monitoring values for VOC and HCl are below detectable limits at all monitoring locations including the plant area. The observed values are found to be within the prescribed NAAQ standards**.** Graphical representation of ambient air quality is presented in **Fig 3.15.**

Table 3.12 Summary Ambient Air Quality Status

Pollutant	Maximum	Minimum	Mean	98 percentiles
1) Site				
PM_{10}	52	37	46.6	52
$PM_{2.5}$	27	15	22.7	27
SO_2	14	9	11.7	14
NO_x	26	9	22.8	26
VOC (in PPM)	0.2	0.1	0.25	0.35
HCl	0.9	0.7	0.8	1.7
2) E-Tandrapadu				
PM_{10}	41	32	36.2	41
$PM_{2.5}$	19	15	16.1	19
SO_2	11	8	9.7	11
NO_x	12	8	10.6	12
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
3) Gondiparla				
PM_{10}	42	34	36.5	42
$PM_{2.5}$	22	19	20.3	22
SO_2	13	8	10.5	13
NO_x	15	9	13.1	15
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
4) Basavapuram				
PM_{10}	39	30	35.8	39
$PM_{2.5}$	18	13	14.1	18
SO_2	10	7	9.5	10
NO_x	12	7	8.7	12
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
5) Bhairapuram				
PM_{10}	40	27	36.1	40
$PM_{2.5}$	17	12	13.5	17
SO_2	9	8	8.6	9
NO_x	11	9	9.9	11
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
6) Panchalingala				

PM_{10}	41	28	34.8	41
$PM_{2.5}$	19	12	14.6	19
SO_2	11	10	10.3	11
NO_x	13	9	11.5	13
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
7) Padidempadu				
PM_{10}	38	25	33.6	38
$PM_{2.5}$	18	14	15.8	18
SO_2	10	7	8.7	10
NO_x	12	9	10.8	12
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL
8) Kurnool				
PM_{10}	49	42	45.3	49
$PM_{2.5}$	24	18	20.0	24
SO_2	14	11	11.9	14
NO_x	15	10	13.2	15
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL

Note: Pollutant concentrations except for VOC are presented in µg/m³.
BDL: Below detectable limit

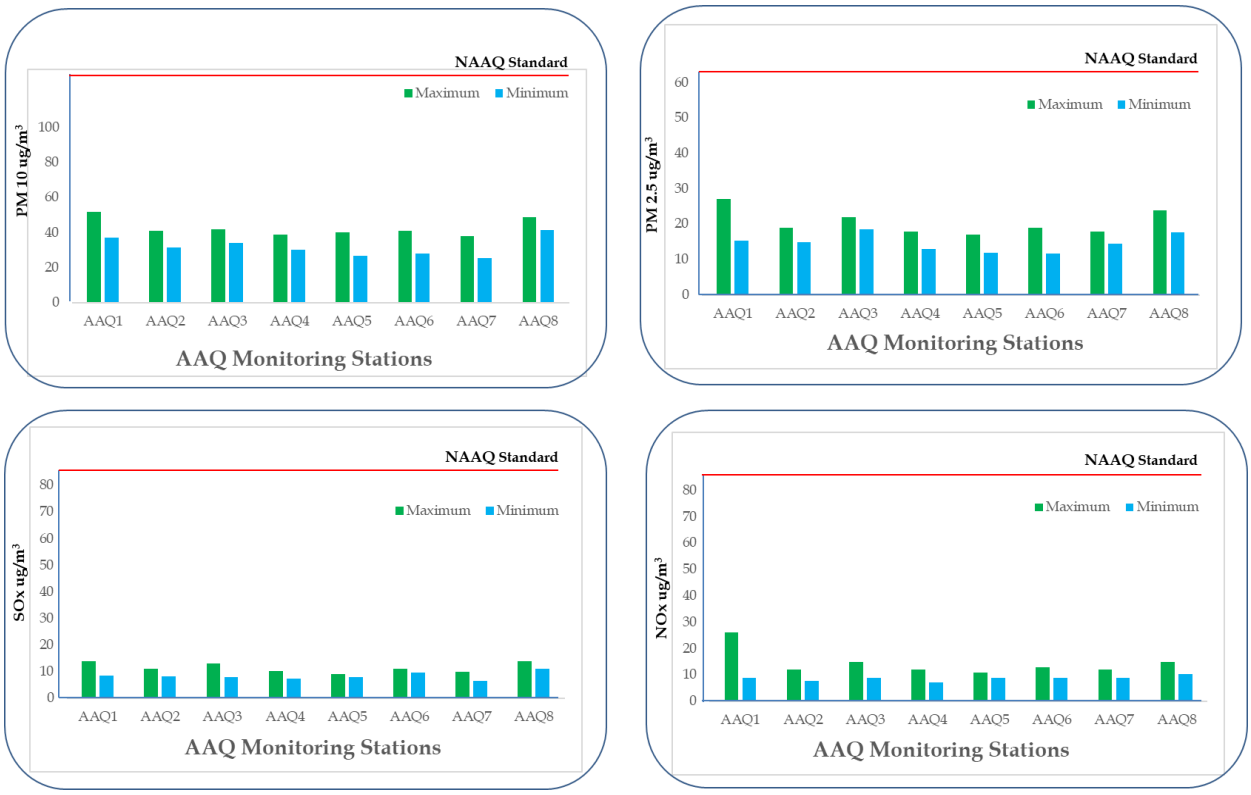


Fig 3.15 Graphs Showing the Results of Ambient Air Quality

Table 3.13 Air Quality Index of AAQ Data

S.No	Location	AQI Index	AQI Category (Range)	Associated Health Impacts
AAQ-1	Site	52	**Satisfactory**	Minor breathing discomfort to sensitive people
AAQ-2	E-Tandrapadu	42	**Good**	Minimal Impact
AAQ-3	Gondiparla	40		
AAQ-4	Basavapuram	38		
AAQ-5	Bhairapuram	41		
AAQ-6	Panchalingala	39		
AAQ-7	Padidempadu	41		
AAQ-8	Kurnool	49		

3.4.7 Noise Environment

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

The impact of noise depends on its characteristics (instantaneous, intermittent, or continuous in nature), time of day (day or night) and location of noise source. **Table 3.14** shows the effects of different noise levels on human beings. The environmental impact of noise can have several effects varying from noise induced hearing loss to annoying depending on noise levels.

The assessment of noise pollution on neighborhood environment due to the plant area was carried out keeping in view, all the considerations mentioned above. The existing status of noise levels is measured at ninelocations at various villages within the study area. **Figure 3.16** presents noise level monitoring locations. The monitored noise levels are shown in **Table 3.15**. Noise levels are observed to be with inthe prescribed limits of rural and residential areas.

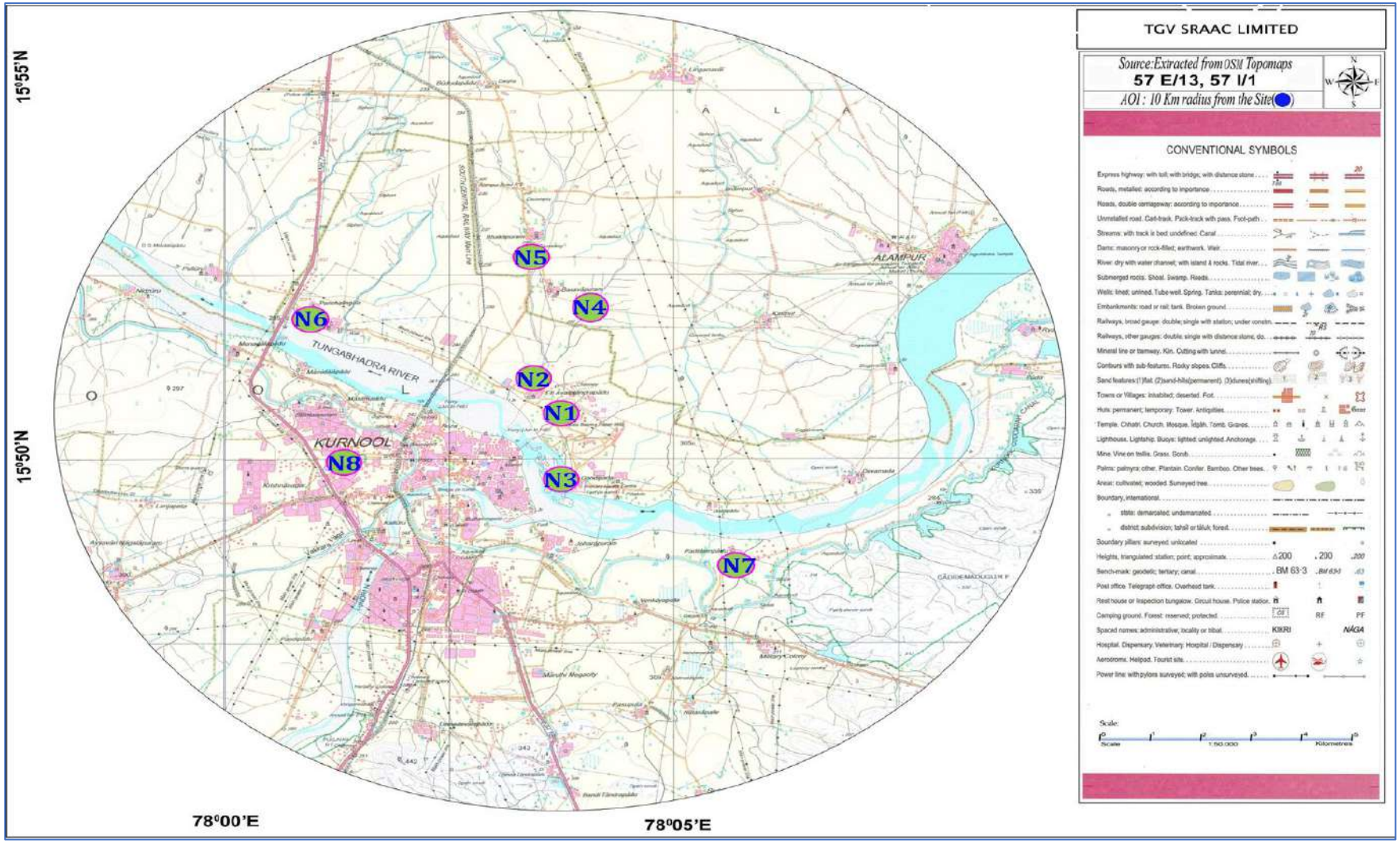


Fig 3.16 Noise Sampling Locations

Table 3.14 Effects on Human Beings at Different Noise Levels

Source	Noise LevelB(A)	Effects
Large Rocket Engine (near by)	180	Threshold of Pains
Hydraulic Press (1 m)	130	
Jet take off (60 m)	120	Maximum vocal effort possible
Automobile Horn (1m)	120	
Construction Noise (3m)	110	
Jet Take off (600 m)	110	
Shout, Punch, Press, Circular Saw	100	Very annoying
Heavy Truck (15m), Farm Machinery	90	Prolonged exposure Endangers Lathes, Sports Car, Noisy Machines hearing loss
Automobile (15m)	80	Annoying
Freeway Traffic (15m)	70	Telephone is difficult, intrusive
Loud Conversations	60	
Living Room in Home	50	Quiet
Power Station (15m)	50	
Bed Room in Home	40	
Soft Whisper (5m)	30	Very quiet
Tick of Wall clock (1m)	30	
Low radio Reception	20	
Whisper	20	
Rattling of Leaves by Breeze	10	Barely audible
	0	Threshold of hearing

Table 3.15 Equivalent Noise levels in the study area *(Terms of Reference No. 6(vii))*

Location Name	Direction fron site	Distance (Km)	Co-Ordinates		Equivalent Noise Levels dB(A)	
			Latitude (N)	Longitude (E)	Leq_{day}	Leq_{night}
Site	-	-	15°50'46.21"	78°03'45.53"	52	40
E - Tandrapadu	NW	0.6	15°51'00.30"	78°03'05.68"	49	37
Gondiparla	SE	1.8	15°49'41.06"	78°03'56.66"	50	42
Basavapuram	N	2.7	15°52'21.56"	78°03'36.60"	48	37
Bhairapuram	NW	4.1	15°53'08.60"	78°03'25.28"	51	39
Panchalingala	NW	4.5	15°51'50.97"	78°01'07.75"	49	38
Padidempadu	NW	4.15	15°48'42.93"	78°05'41.28"	48	37
Kurnool	SW	1.4	15°85'82.72"	78°00'26.28"	56	45

3.4.8 Traffic Study *(Terms of Reference No. 6(ix))*

Traffic study was conducted during three alternative days including a holiday to arrive at peal traffic hours. Peak traffic was observed during 8 – 9 AM and consisting of mainly passangers traffic is 520 PCU. Graphical representation of peak hour traffic is presented in **Fig 3.17.**

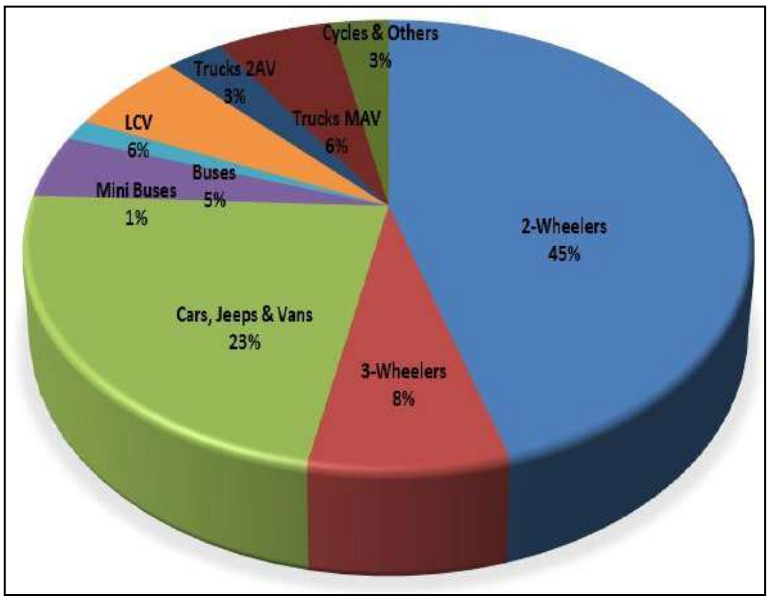


Fig 3.17 Peak Hour Traffic

3.5 Socio Economic Environment *(Terms of Reference No. 6(xi))*

Industrial development reflects in social development, i.e., growth in infrastructure facilities, growth in employment rates, increased demands for housing, and other amenities etc., which will have a bearing on the socio-economic status.

Socio-economic survey is conducted to ascertain the existing socio-economic status to compare the same with the developments due to the project. Baseline data of demographic characteristics- occupational status, literacy, health status and the access to infrastructure facilities for social development in the project area has been studied from the secondary data collected from census department by Team Labs and Consultants.

Demographic characteristics of the study area falling within 10 km radius of the project site have been compiled to assess the pre-project socio-economic status. Secondary data has been collected from various government agencies i.e., chief planning officer, Srikakulam district and other government departments of forestry, irrigation etc., and Mandal Development Offices of the relevant government departments. Census 2011 was complied and presented as follows;

3.6 Demography

The study area falls under the following mandals of Kurnool district; Kurnool, Kallur in Andhra Pradesh and Mahbaubnagar district; Alampur, Manopadu in Telangana State. Study area comprises of 23 revenue villages and 6 hamlets apart from Kurnool Municipality.

3.6.1 Population Distribution

The population distribution of the study area is presented in **Table 3.16.** The population density in the study area is less reflecting the rural nature and lack of irrigation facilities. The total population of the area is 676115 consisting of 338221 males and 337894 females. The population density in this area reflects the rural area. The population of the scheduled castes is 113122 consisting of 55490 males and 57632 females, while the scheduled tribe population is 7441 consisting of 3702 males and 3739 females, which is 16.73 and 1.10% of the total population respectively.

Table 3.16 Population Distribution – Study Area

Category	kms				Total
	0-3	3-5	5-7	7-10	
Total Population	**145381**	**153040**	**351061**	**26633**	**676115**
Total Population – Male	72796	76699	174930	13796	338221
Total Population – Female	72585	76341	176131	12837	337894
Population <6 years	**16852**	**17818**	**39615**	**3179**	**77464**
Male <6 years	8725	9251	20524	1637	40137
Females < 6years	8127	8567	19091	1542	37327
Scheduled Caste Population - Total	**21607**	**23602**	**61132**	**6781**	**113122**
Male – SC	10677	11762	29628	3423	55490
Female – SC	10930	11840	31504	3358	57632
Scheduled Tribe Population Total	**2070**	**2115**	**3151**	**105**	**7441**
Male – ST	1046	1072	1519	65	3702
Female – ST	1024	1043	1632	40	3739

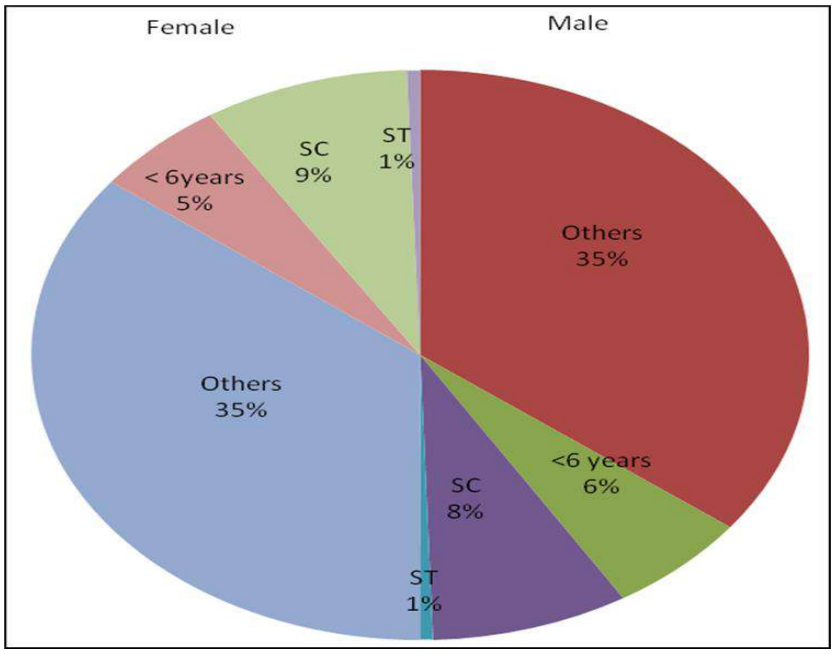


Fig 3.18 Population distribution of the Study Area

3.6.1.1 Literacy

Census operations consider a literate as a person who is above six years old and who can write and read as per the census. Error! Reference source not found. presents the l iteracy levels in the study area. The population below six years old is 77464 consisting of 40137 males and 37327 females, which is 11.46% of the study area population. The percentage of literacy level in the study area among males is 81.81 and 68.40 among females. It may be observed that the literacy level among females is comparatively less than males. Literacy of Study Area Error! Reference source not found.**9**.

Table 3.17 Literacy Study Area

Category	kms				Total
	0-3	3-5	5-7	7-10	
Total Population	**145381**	**153040**	**351061**	**26633**	**676115**
Total Population – Male	72796	76699	174930	13796	338221
Total Population – Female	72585	76341	176131	12837	337894
Population <6 years	**16852**	**17818**	**39615**	**3179**	**77464**
Male <6 years	8725	9251	20524	1637	40137
Females < 6years	8127	8567	19091	1542	37327
Total Literates	**96639**	**100192**	**237678**	**14925**	**449434**
Male –Literates	52940	55201	126770	8937	243848
Female – Literates	43699	44991	110908	5988	205586
Total Illiterates	**48742**	**52848**	**113383**	**11708**	**226681**
Male –Illiterate	19856	21498	48160	4859	94373
Female – Illiterate	28886	31350	65223	6849	132308

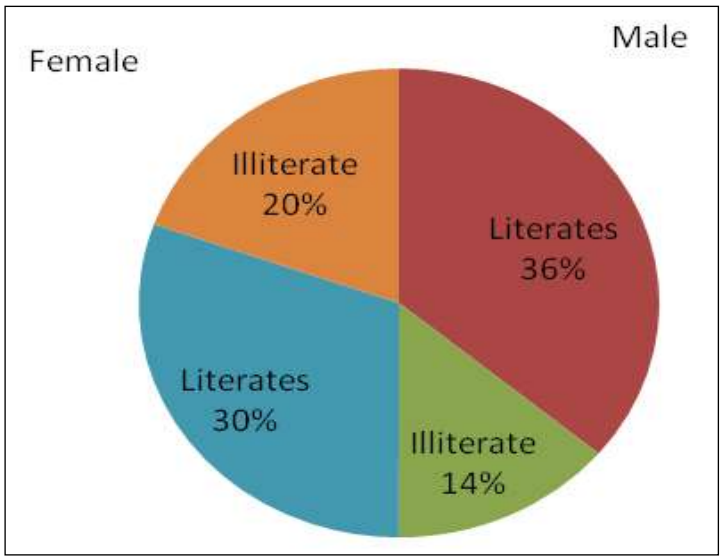


Figure 3.19 Literacy of Study Area

3.6.1.2 Employment/Occupation

Work is defined as participation in any economically productive activity - Physical/ mental. The work force is classified into three categories: a) main workers, b) marginal workers and c) non-workers. Main workers are those who work for a substantial part of the year for a living such as salaried employees, agricultural labor etc. Marginal workers are those who worked the previous year but have not worked for a substantial part of this year. Non-workers constitute students, house wives, dependents, pensioners etc. **Table 3.18** presents the population distribution for employment.

It may be observed that a majority of the study area population falls in the non worker category among 61.07 % of the total population and the marginal workers from about 5.2% of the total population. The male female difference is also significant in all the regions and in all the categories. There are few females among the workers where as there are more non-workers and marginal workers among females.

Table 3.18 Employment - Study Area

Category	kms				Total
	0-3	3-5	5-7	7-10	
Total Population	**145381**	**153040**	**351061**	**26633**	**676115**
Total Population – Male	72796	76699	174930	13796	338221
Total Population – Female	72585	76341	176131	12837	337894
Total Workers	**58250**	**62132**	**130175**	**12653**	**263210**
Total Workers – Male	39278	41462	92316	7036	180092
Total Workers – Female	18972	20670	37859	5617	83118
Total Main Workers	**49356**	**52555**	**115427**	**10906**	**228244**
Main workers – Male	35288	37229	84843	6189	163549
Main Workers – Female	14068	15326	30584	4717	64695
Total Marginal Workers	**8894**	**9577**	**14748**	**1747**	**34966**
Marginal Workers – Male	3990	4233	7473	847	16543
Marginal Workers – Female	4904	5344	7275	900	18423
Total Non-Workers	**87131**	**90908**	**220886**	**13980**	**412905**
Non-Workers – Male	33518	35237	82614	6760	158129
Non-Workers – Female	53613	55671	138272	7220	254776

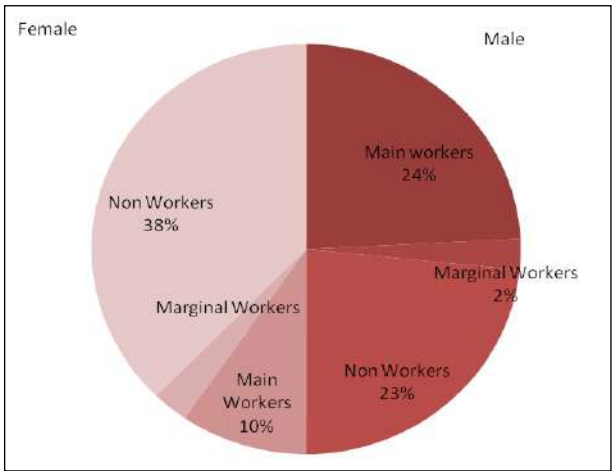


Fig 3.20 Employment Study Area

The main workers are further classified into; Total cultivators: those who engage a single worker or his family member to cultivate land for payment in money, kind or share; Agricultural labor : those who work in other's lands for wages; household workers: workers involved in manufacturing and processing industries in the house hold industries; and other services; Livestock, forestry, fishing and allied activities; Workers involved in mining and quarrying; Workers involved in manufacturing and processing industries in the house hold industries; non house hold industries; construction workers; workers in trade and commerce; workers involved in transport, storage and communication ; and other services: government employees, teachers,

priests, artists etc. **Table 3.19** presents the main workers distribution among the study area population. It may be observed that over 0.89% of the study area population is involved in cultivation or agriculture labor, followed by other services to the tune of 26.74% which is largely due to the proximity to Kurnool town. It may also be observed that the people involved in non household industry are significantly more reflecting on the industrial nature of the area. Significant differences are observed among the male and female workers, Female workers are found to be more in agricultural activity largely due to more percentage of females being agricultural labor.

Table 3.19 Main workers Study Area

Category	kms				Total
	0-3	3-5	5-7	7-10	
Total Population	**145381**	**153040**	**351061**	**26633**	**676115**
Total Population – Male	72796	76699	174930	13796	338221
Total Population – Female	72585	76341	176131	12837	337894
Total Main Workers	**49356**	**52555**	**115427**	**10906**	**228244**
Main workers – Male	35288	37229	84843	6189	163549
Main Workers – Female	14068	15326	30584	4717	64695
Total Cultivators	**868**	**2117**	**1624**	**1409**	**6018**
Cultivators – Male	725	1531	1220	996	4472
Cultivators- Female	143	586	404	413	1546
Total Agriculture Labor	**6679**	**7723**	**9107**	**6389**	**29898**
Agriculture Labor – Male	3412	3986	4513	2909	14820
Agriculture Labor – Female	3267	3737	4594	3480	15078
Total Household Workers	**1977**	**1954**	**7330**	**295**	**11556**
Household Workers – Male	1094	1075	3221	134	5524
Household Workers – Female	883	879	4109	161	6032
Total Others	**39832**	**40761**	**97366**	**2813**	**180772**
Others – Male	30057	30637	75889	2150	138733
Others – Female	9775	10124	21477	663	42039

3.6.1.3 Living Standards and Infrastructure

Sustainable development of any area is dependent not only the population but also on the availability of infrastructure which leads to better living standards. The infrastructure facilities are essential in providing education, awareness, health, communication, potable water, transport etc. The standards of living are the sum of the availability of the infrastructure to the subject community, wide variations in terms of income, economic conditions and patterns of spending.

The infrastructure facilities available in the impact zone are reflecting the rural nature of the entire study area.

I. Educational Facilities

The educational facilities available in the rural areas are meager, despite the proximity to urban area of Kurnool. There are 20 primary schools, 11 middle schools and 6 high schools in the study area. The higher educational need of the population is met by Kurnool, which has several engineering colleges, PG colleges, Junior colleges and degree colleges, apart from medical colleges and Rayalaseema University. The ditrict capital Kurnool caters to the educational needs of surrounding areas as far as 70 kms away from Kurnool.

II. Health facilities

The medical and health facilities available in the impact zone are adequate; there are one PHC, Two PHS and no child welfare centers and 1 RP centre in the entire area. The health needs of the population in this area are met by quacks and other semi qualified persons.

III. Availability of Potable Water

The entire population in this area is dependent on groundwater for drinking purposes. There are no protected water supply schemes in all the villages except in 3 villages. About 14 villages in the study area are dependent on tube wells, while the remaining villages are dependent on wells and hand pumps.

IV. Transport and Communication

Transport is essentially provided by the Andhra Pradesh State Road Transport Corporation (APSRTC). Most of the study area has excellent road network in all the villages except in one village, which has kacha roads. APSRTC bus facility is available for the all the villages. However, it is observed that a number of private transport vehicles are observed in the area connecting them to Kurnool.

V. Sources of Energy and Availability

The primary source of energy in the study area is electricity, and the entire study area has electricity for agriculture and domestic purpose. The urban areas have LPG facility for their cooking purpose. A significant number of people in the urban area are also dependent on Kerosene for cooking purposes, which is contingent on the vagaries of public distribution system. A majority of the rural area is mostly dependent on Kerosene, dried cow dung cakes, wood from roadside trees for their domestic energy needs.

VI. Post and Telegraph facilities

There are 12 post offices in the area and one post and Telegraph office in the study area. Phone facilities however are extended to some of the villages.

VII. Housing

Census defines the house hold as a group of persons living together and sharing their meals from a common kitchen. The number of households in the impact zone is 149551, while the number of the houses is 156250. The density of the households is approximately five. The traditional houses made up of mud walls and covered by dry common grass and leaves of bourses are commonly found in the rural area, which are not considered pucca houses. The government has been augmenting the housing standards by constructing housing colonies for various weaker sections of the society.

3.6.2 Land Utilization

Land use patterns can be prepared on the basis of revenue records though it is not an exact indicator of the actual use of the land at a given time. Land use is presented under the heads of area under forest cover irrigated land, area under cultivation and cultivable wasteland in **Table 3.20.**

Table 3.20 Land Utilization Pattern

Category	Km				Total Area, Ha
	0-3	3-5	5-7	7-10	
Permanent Pastures and Other Grazing Land Area		14.61	16	3.47	34.08
Culturable Waste Land Area	61.2			111.49	172.69
Canals Area				616	678
Barren & Un-cultivable Land Area		156.31	96.58	661.14	914.03
Wells/Tube Wells Area	52	7	152	712.69	923.69
Fallows Land other than Current Fallows Area	188	97.52	236	731.11	1252.63
Forest Area				1084	1084
Area under Non-Agricultural Uses	618	90.07	677.27	1196.62	2581.96
Area Irrigated by Source	92	7	234	1458.18	1791.18
Current Fallows Area	254	284.1	287.76	2120.66	2946.52
Net Area Sown	5138.8	954.39	2599.39	8174.51	16867.09
Total Un irrigated Land Area	5488.8	1329.01	2889.15	9568.1	19275.06
Total	**11892.8**	**2940.01**	**7250.15**	**26437.97**	**48520.93**

3.6.3 Project Economy

M/s. TGV SRAACL proposes to expand manufacturing capacity of chlor-alkali and Chlormethanes in existing site at Gondiparla village, Kurnool mandal and district, Andhra Pradesh. There is a potential for direct/indirect employment of about 150 people during operation phase and 100 during construction phase due to the proposed expansion. The project shall have positive impact on socioeconomic environment due to provision of employment both direct and indirect and proposed CER activities. The employers will contribute to the provident fund, ESI and provide facilities as per the relevant labor act.

The proximity of Kurnool town will provide access to the extensive medical facilities available apart from the ESI medical facilities to the employees and their families. An industrial Canteen is established by the company.

It may be concluded that satisfactory amenities are available for the population of the impact zone, while the amenities are available either within the village or at a minimum distance of 3 km. The area also has large tracts of waste lands which can be utilized for industrial development. The chemical complex has been contributing to

the industrial growth of the area, which in turn; generates employment, and improve the infrastructure facilities of the area by strengthening the same economically.

3.7 Flora and Fauna *(Terms of Reference No. 6(x))*

The study was carried out in project site and study area i.e., 10 km periphery from the project site. Gadidmadugu RF at 5.5 km in east direction and Pullaiah RF at 9.3 km in southwest direction. The study was carried out scientifically using primary and secondary data in order to bring out information on the ecological conditions of the project site and its surroundings. The assessment of flora and fauna of the study area was carried out as per the MoEF guidelines. The main aim of Conservation of Biodiversity is to ensure "No Net Loss" as per Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS). The further loss of biodiversity is unacceptable. Biodiversity must be conserved to ensure it survives, continuing to provide services, values and benefits for current and future generations. This objective is considered during the present ecological assessment:

Biological assessment of the site was done to identify the presence of any Rare or Endangered or Endemic or Threatened **(REET)** species of flora or fauna in the project site as well its impact area to identify whether there is any ecologically sensitive area within the area that is likely to be impacted. The study also designed to suggest suitable mitigation measures, if necessary, for protection of wildlife habitats conservation of REET species if any.

Methods of study

1. Baseline data of Terrestrial and Aquatic biological environment by studying distribution pattern, community structure, population dynamics and species composition of Flora and Fauna. Secondary data is collected from various sources.
2. Areas used by protected, important or sensitive species of Flora or Fauna for breeding, nesting, foraging, resting, over wintering, migration shall be as ascertained.
3. Photo documentation of the flora and fauna including local habitats showing the ecological status of the project site.

4. Discussing the predicted impacts by the proposed activity with local villagers and EIA functional area experts on air, water, noise and other pollutants.
5. Impacts quantification through vegetation analysis.
6. Preparation of the mitigation measures if applicable.

Survey Types used

1. Reconnaissance survey (Near Agricultural, water bodies, Human habitations and Road side) to list out general flora and fauna.
2. Quadrate and Line transact methods for quantification of flora.
3. Direct & indirect observations for fauna.
4. Point count method for birds near water bodies.

Methodology

A reconnaissance survey has been made randomly to observe the critical habitats to study in detail. General interviews were made with local people on native animals and medicinal plants used frequently. A thorough review was made at each sampling point and spent about 20-30 minutes at each point. The present environmental condition is observed at site area and adjoining areas.

A detailed survey of flora and fauna was carried out during the study period. Field visits are personally carried by expert members. The project details were collected from EIA coordinator and discussed the possible impacts of the project on flora and fauna. Secondary data collected from the GIS division especially the maps related to Land use and Land cover, forest type, forest cover, villages / settlements, road, rail network etc. The total area was analyzed in detail and with GIS tools and marked around 12 sampling points by covering the various ecosystems of impact area in all the directions. Only photographs were taken during the field survey and no damage is created to flora and fauna during the sampling. Specimens were not collected and preserved.

Equipment / Instruments deployed

- Digital Camera (NIKON P510)
- Binoculars
- GPS (Garmin)
- Measuring tape
- Field observation book & data forms

Floral study

Quadrate method has been used for carryout the study of trees, shrubs, herbs and grasses. 20 m X 20 m Quadrates for tree species, 5 m X 5 m quadrates for shrubs and 1 m X 1 m quadrates for herbs. Statistical analysis is made for 10 sampling points. Species were compared with standard floras and identifying the plants need for conservation. The status of each species was represented by common, sporadic or rare. The data was compared with the list mentioned in red data book to check REET species.

Ecological parameters *viz.*, abundance, density, frequency, Relative abundance (RA), Relative density (RD), Relative frequency (RF), Important value index (IVI), Shannon-Wiener diversity index were derived from the quantitative primary data collected during field survey.

Importance Value Index (IVI): RD + RF +RA

Species Diversity

Shannon Diversity Index (H') has been used for estimating the diversity among the site area and adjoining areas in order to know the species richness and dorminance.

$$H' = -\sum Pi \cdot \ln Pi$$

Where $Pi = \frac{S = \text{Number of individuals of one species}}{N = \text{Total number of all individuals in the sample}}$

ln = logarithm to the base "e"

Communities with less number of species with high level of dominance or low level of uniformity will have lower diversity. Thus it is a statistical function based on the richness and evenness components. Evenness and dominance are inversely related. This can be also calculated through Statistical Software "**PAST**".

Faunal study

A detailed study has been carried out for faunal species by direct and indirect methods. Direct sightings were made for aves, reptiles and insects and secondary data on mammals was collected from local villagers. Bird surveys were carried out through point count method at dawn and desk near water bodies. These techniques are accepted in EIA studies as per the EIA Notification of 2006. The species sighted were photographed and

identified with standard pictorial guides. Scheduling of species was done according to Indian Wildlife Protection act (1972) and IUCN is done for each species and checked the REET species. No quantitative data was calculated as some species are listed through secondary source. As the animals were migratory, habitats used by protected, important or sensitive species for breeding, nesting, foraging, resting, over wintering, migration were ascertained.

Rationale for Survey Method

The proposed expansion is within the existing site area. The number of quadrants finalized after taking Area species curve. The wastes and other pollution related aspects are also studied to know the impacts. The landuse and land cover, hydrogeology aspects and soil factors are also considered while studying the impacts. The sampling points are taken in all the directions and ecosystems along with the wind direction pattern.

Identification of Species

Species of flora and fauna are identified through local field guides. Unidentified plants are taken pictures and later confirmed by BSI, ZSI and forest officials.

Secondary Data

List of flora and fauna from Forest Department, Previous studies for EIA and other NGOs research in the study area and local villager's information was taken into consideration while preparing the list and other parts of the report.

The proposed expansion does not encounter with any kind of forest types like Reserve Forest, Protected Forest or un- classed Forest (declared Protected under "The Indian Forest Act, 1927") and "Forest (Conservation) Act, 1980 with Amendments Made in 1988". (Source: Forest Department). Further no tree cutting is involved in the project as there is no vegetation at all within this project site. Thus, no forest Clearance is required for the proposed development. There no Scheduled species recorded within the proposed construction site.

Wetland

No wetland notified under "The Ramsar Convention – 1971" or listed under "the National wetland Conservation Programme – 2009" is reported within 10 km from project boundary.

Within 5 km radius of impact area , there are few large trees such as Neem, Borassus and Acacia nilotica, Ziziphus horrida, Mesquite (Prosopis juliflora), Prosopis spicigera, Balanites aegyptiaca, Phoenix sylvestris, Calotropis procera, Carissa spinarum and Cassia auriculata were most widespread, abundant and dominant. In addition to the shrubs mentioned above, there are a few perennial climbers such as *Pergularia daemia, Sarcostemma secamone,* Swallow root *(Decalepis hamiltoni)* and *Cassytha filiformis* present in the study area. The list of plant species recorded during field survey in the study area are given in Error! Reference source not found..

Table 3.21 List of Trees, Shrubs, Perennial Climbers and Grasses in Study Area

Scientific name	Local /Common name	Family
Acacia leucophloea	Tella thumma	Mimosaceae
Acacia nilotica	Nalla thumma	Mimosaceae
Aganosma cymosa	Nalla teega	Apocynaceae
Agave americana	Kalabanda	Agavaceae
Azadirachta indica	Vepa	Meliaceae
Calotropis procera	Jilledu	Asclepiadaceae
Cassia auriculata	Tangedu	Caesalpiniaceae
Cymbopogon coloratus	Bodha gaddi	Poaceae
Cynodon dactylon	Garika gaddi	Poaceae
Euphorbia antiquorum	Bontha jamudu	Euphorbiaceae
Euphorbia tortillis	Naaga jamudu	Euphorbiaceae
Pergularia daemia	Dori	Asclepiadaceae
Prosopis juliflora	Mesquite	Mimosaeceae
Waltheria indica	Nalla benda	Ssterculiaceae
Ziziphus horrrida	Tella regu	Rhamnaceae
Ziziphus nummularia	Regu	Rhamnaceae
Cassia occidentalis	Kasintha	Leguminosae
Balanites aegyptiaca		Balanitaceae
Phoenix sylvestris	Eetha	Arecaceae
Croton bonplandianus	Vana mokka	Euphorbiaceae
Borassus flabellifer	Thadi chettu	Arecaceae
Prosopis spicigera	Jammi	Mimosaeceae

Flora in Study Area

Study area is mostly with human habitations and is mainly urban environment with few aquatic bodies. Most of the region is covered with roads and residential colonies. Hence vegetative survey mainly conducted at road side for trees and near parks and other places for herbs and shrubs. There are no endangered and endemic plants present in the buffer and core zones. There are no medicinal, timber / fuel wood, fodder and other socio-economic purposes. The faunal composition was also estimated based on the direct and indirect evidences. Relative frequency, relative density, relative dominance and the importance value indices of the structural species present in the unopened proposed project site are shown in **Table 3.22.**

Table 3.22 List of Structural Species in Study Area

Botanical Name	Common name	Family	Habit	Status
Abrus precatorius	Guriginja	Fabaceae	Climber	S
Abutilon cryspum		Malvaceae	Shrub	S
Abutilon indicum	*Thuthuru Benda*	Malvaceae	Shrub	C
Acacia leucopholoea	Tella tumma	Fabaceae	Tree	C
Acacia sphenocephala	seemathumma	Mimosaceae	Tree	C
Achrus zapota	Sapota	Sapotaceae	Tree	C
Achyranthes aspera	Uttareni	Amaranthaceae	Herb	C
Aegle marmelos	Maredu	Rutaceae	Tree	C
Aerva lanata	*Konda Pindi*	Amaranthaceae	Herb	C
Ageratum conyzoides		Asteraceae	Herb	C
Alangium salvifolium	Ooduga	Allangiaceae	Tree	C
Albizia amara		Fabaceae	Herb	C
Aloe vera		Asphodelaceae	Herb	C
Alternanthera sessilis	Ponaganti kura	Amaranthaceae	Herb	C
Amaranthus spinosus		Amaranthaceae	Herb	R
Anacardium occidentalis		Anacardiaceae	Tree	C
Andrographis echioides	Noogu nelemu	Acanthaceae	Herb	C
Andrographis paniculata	*Nela Vemu*	Acanthaceae	Herb	R
Anisochilus indica		Lamiaceae	Herb	R
Annona reticulata	Ramaphalam	Annonaceae	Tree	C
Annona squamosa	Seetaphalam	Annonaceae	Tree	C
Artocarpus integrifolia		Moraceae	Shrub	C
Asistasia gangetica		Acanthaceae	Herb	S
Asparagus racemosus	Pilli tigalu	Liliaceae	Herb	C
Atalantia monophylla	Konda nimma	Rutaceae	Herb	R
Atylosia scarabaeoides		Papilionaceae	Herb	C
Azadirachta indica	Vepa	Meliaceae	Tree	C
Bambusa arundinacea	Veduru	Poaceae	Tree	C
Barleria prinotis		Acanthaceae	Herb	C
Bauhinia purpurea	Deva kanchanum	Fabaceae	Tree	C

Botanical Name	Common name	Family	Habit	Status
Blepharis madaraspatana	Balli noraaku	Acanthaceae	Herb	S
Blumea mollis	Kukka pogaku	Asteraceae	Herb	C
Blumea virens	Adavi pogaku	Asteraceae	Herb	C
Boerhaevia diffusa	Atukamaamidi	Nyctaginaceae	Herb	C
Boerhavia erecta		Nyctaginaceae	Herb	C
Boguinevillae spectabilis		Nyctaginaceae	Shrub	C
Borassus flabellifer	Tadi	Arecaceae	Tree	C
Borreria hispida	Madanaaku	Rubiaceae	Herb	C
Caesalphina pulcherrima		Caesalphinaceae	Shrub	C
Calotropis gigantea	Tella Jilledu	Asclepiadaceae	Shrub	C
Calotropis procera	Jilledu	Asclepiadaceae	Shrub	C
Canavalia gladiata		Fabaceae	Climber	R
Canna indica	Mettatamara	Cannaceae	Aquatic plant	C
Capparis zeylanica		Capparidaceae	Shrub	S
Cardiospermum halicacabum	Buddalaaku	Sapindaceae	Herb	S
Cascabela thevitia	*pachaganneru*	Apocynaceae	Shrub	C
Cassia alata		Fabaceae	Shrub	C
Cassia fistula	Rela	Caesalpiniaceae	Tree	C
Cassia occidentalis	Adavi Chennangi	Fabaceae	Herb	C
Cassia siamea	Seema tangedu	Leguminosae	Tree	C
Cassia tora	Tagarisa	Fabaceae	Herb	C
Casuarina equisetifolia	Sarugudu	Casurinaceae	Tree	C
Catharanthus roseus		Apocynaceae	Herb	C
Celsoia viridis		Amaranthaceae	Herb	C
Cieba pentandra		Malvaceae	Tree	C
Cipadessa baccifera		Melicaeae	Shrub	S
Cleome gynandra		Cleomaceae	Shrub	S
Cleome gynandra	Vaminata	Cleomaceae	Herb	C
Cleome viscosa	Yerri Vaminta	Cleomaceae	Herb	C
Clerodendrum serratum		Verbenaceae	Shrub	S
Clitoria ternatea	Shanka puship	Fabaceae	Herb	C
Coccinea indica		Cucurbitaceae	Herb	C
Coccinia grandis		Cucurbitaceae	Herb	C
Cocculus hirsutus	Dusaari	Menispermaceae	Herb	C
Cocos nucifera	Coconut	Arecaceae	Tree	C
Colocasia esculenta	Atuka tiga	Araceae	Herb	C
Commelina benghalensis		Commelinaceae	Herb	C
Costus speciosus	Kevu kanne	Costaceae	Shrub	R
Crinum asiaticum	Adavi ulli	Amaryllidaceae	Herb	S
Cynodon dactylon	Garika	Cyperaceae	Herb	C
Cynoglotis tuberosa		Commelinaceae	Herb	S
Cyperus rotundus	Tunga	Cyperaceae	Aquatic plant	S
Dalbergia sissoo	seesam	Fabaceae	Tree	C
Datura stramonium	Ummetha	Solanaceae	Shrub	C

Botanical Name	Common name	Family	Habit	Status
Delonix regia	Sunkesula	Fabaceae	Tree	R
Dendrocalamus strictus	Sanna vedru	Poaceae	Herb	C
Dendrophthoe falcata	badanika	Loranthaceae	Herb	C
Desmodium pulchellum	Deyyapu mokka	Fabaceae	Tree	S
Dioscorea oppositifolia	Adda dumpa	Dioscoriaceae	Climber	R
Dracena sp.		Dracenaceae	Shrub	R
Eclipta alba	Gunta galijru	Asteraceae	Herb	S
Eclipta prostrata		Astreraceae	Herb	C
Elaeis guineensis	Palm oil tree	Arecaceae	Tree	S
Erithrina indica		Fabaceae	Tree	R
Eucalyptus globulus	Neelagiri thailamu	Myrtaceae	Tree	C
Eupatorium odoratum		Asteraceae	Shrub	C
Euphorbia caudifolium		Euphorbiaceae	Shrub	C
Euphorbia hirta	Pachabotlu	Euphorbiaceae	Herb	C
Evolvulus alsinoides	Visnu krantha	Convolvulaceae	Herb	C
Ficus benghalensis	Marri	Moraceae	Tree	C
Ficus hispida		Moraceae	Tree	C
Ficus religiosa	Raavi	Moraceae	Tree	C
Gmelina arborea		Verbenaceae	Tree	S
Gmelina asiatica		Lamiaceae	Tree	C
Gymnema sylvestre	Podapatri	Asclepiadaceae	Herb	C
Gymnosporia montana	Danti	Verbenaceae	Shrub	S
Helictres isora		Sterculiaceae	Shrub	S
Holarrhena antidysenterica		Apocynaceae	Shrub	C
Hybanthus inneaspermis		Violaceae	Shrub	S
Hygrophila auriculata		Acanthaceae	Herb	C
Hyptis suaveolens	Maha beera	Lamiaceae	Shrub	C
Indigofera linnaei		Fabaceae	Shrub	C
Ipomea aquatica			Aquatic plant	C
Ipomea nil		Convolvulaceae	Climber	S
Ipomea pestigritis		Convolvulaceae	Climber	C
Ipomoea carnea		Convolvulaceae	Shrub	C
Jasminum cuspidatum		Oleaceae	Shrub	C
Jatropha gossypifolia	adaviamudamu	Euphorbiaceae	Tree	C
Justicia procumbens		Acanthaceae	Herb	S
Lanea coromandelica		Anacardiaceae	Tree	S
Lantana camara	Kattera	Verbenaceae	Shrub	C
Lepidagathis cristata	Nakka peeti gadda	Acanthaceae	Herb	S
Leucaena leucocephala	Subabul	Fabaceae	Tree	C
Leucas aspera	Thummi	Lamiaceae	Herb	C
Leucas cephalotis		Lamiaceae	Herb	C
Limonia acidissima	Velaga	Rutaceae	Tree	R
Mangifera indica	Mamidi	Anacardiaceae	Tree	C

Botanical Name	Common name	Family	Habit	Status
Marsilea sp.		Marsileaceae	Aquatic plant	C
Merremia tridentata		Convolvulaceae	Climber	C
Millintonea hurtensis		Bignoniaceae	Tree	C
Mimosa pudica		Mimosaceae	Herb	C
Mollugo nudicaulis		Aizoaceae	Herb	C
Mollugo pentaphylla		Aizoaceae	Herb	C
Morinda tinctoria		Rubiaceae	Tree	C
Mucuna pruriens	Dula gondi	Fabaceae	Climber	S
Mullugo nudicaulis		Molluginaceae	Herb	C
Mytragyna parviflora		Rubiaceae	Tree	S
Nymphaea nouchali		Nymphaeaceae	Aquatic plant	C
Ochna obtusa		Ochnaceae	Tree	S
Ocimum canum		Lamiaceae	Herb	R
Oldenlandia umbellata		Rubiaceae	Herb	C
Opuntia dillenii	Nagajamudu	Cactaceae	Shrub	C
Oxystelma esculentus		Asclepiadaceae	Aquatic plant	S
Parthenium hysterophorus		Asteraceae	Herb	C
Pavonia zeylanica		Malvaceae	Herb	C
Peltophorum pterocarpum	Kondachinta	Caesalphinaceae	Tree	C
Phoenix humilis	Jitteetha	Aracaceae	Shrub	S
Phyllanthus amanus	Nela Usiri	Euphorbiaceae	Herb	C
Physalis minima		Solanaceae	Herb	C
Pithecolobium dulce	Seemachinta	Fabaceae	Tree	C
Plumbago zeylanica		Plumbaginaceae	Herb	C
Plumera alba		Apocynaceae	Tree	C
Pongamia pinnata	Kanuga	Papilionaceae	Tree	C
Portulaca oleraceae		Portulacaceae	Herb	C
Premna tomentosa	Naguru	Verbenaceae	Tree	C
Prosopis chilensis	Sarkaar tumma	Mimosaceae	Tree	C
Prosopis julifera	Sarkaru tumpa	Mimosaceae	Tree	C
Psidium guajava	Jaama	Rutaceae	Tree	C
Pupalia lappacea	Gundu Uttareni	Amaranthaceae	Herb	C
Rhynchosia heynei		Fabaceae	Herb	R
Rhynchosia minima	Adavi vulavateega	Fabaceae	Herb	S
Rostellularia diffusa		Acanthaceae	Herb	R
Saccharam spontanium		Poaceae	Shrub	S
Samanea saman	Nidra ganneru	Fabaceae	Tree	C
Sansevieria roxburghiana		Agavaceae	Herb	R
Sapindus emarginatus	kunkudu	Sapindaceae	Tree	S
Scoparia dulcis		Scrophulariaceae	Herb	R
Sida acuta	Katarumannan	Malvaceae	Herb	C
Sida cordata	Bala	Malvaceae	Herb	C
Solanum surattense	Vakudu	Solanaceae	Herb	S

Botanical Name	Common name	Family	Habit	Status
Sphaeranthus indicus	Bodataram	Asteraceae	Herb	C
Straiga asiatica		Scrophulariaceae	Herb	S
Sysygium cumini	Jinna	Myrtaceae	Tree	C
Tamarindus indica	Chinta	Fabaceae	Tree	C
Tectona grandis	Teaku	Lamiaceae	Tree	C
Tephrosia purpurea		Fabaceae	Herb	C
Terena asiatica		Rubiaceae	Shrub	S
Terminalia arjuna	Tella Maddi	Combretaceae	Tree	R
Terminalia catappa	Badam	Combretaceae	Tree	C
Thevitia populina		Apocynaceae	Shrub	C
Toddalia asiatica	Advi nimma	Rutaceae	Shrub	R
Tragea involucrata	Durada gondi	Euphorbiaceae	Climber	S
Trianthema portulacastrum		Aizoaceae	Herb	R
Urena lobeta		Malvaceae	Herb	C
Vernonia divergens		Asteraceae	Herb	C
Waltheria indica	Nalla Benda	Sterculiaceae	Herb	C
Writea tinctirea		Apocynaceae	Tree	S
Xanthium strumarium		Asteraceae	Shrub	C
Ximenia americana	Nakkera	Olacaceae	Shrub	S
Zea maize	mokkajonna	Poaceae	Herb	C
Zizyphus jujuba	Regu	Rhamnoceae	Tree	C
Zizyphus oenoplia	Pariki	Rhamnaceae	Shrub	C
***C*- Common, S- Sporadic, R- Rare**				

Flora and Fauna of Aquatic Ecosystem

There are few aquatic bodies and Thungabhadar river present within the study area with few common hydrophytes such as *Lemna minor, Ipomoea aquatica, Neptunia oleracea, Typha domingensis*. There were no threatened category species of aquatic and semi aquatic plants in the study area. The floristic survey of the existing farming site witnesses scattered growth of grasses (mainly weeds), rooted hydrophytes, emerging hydrophytes, shrubs in undisturbed area where human movement is absent. Among herbaceous species, weeds are commonly reported such as Congress grass (*Parthenium hysterophorus*), Lantana (*Lantana camara*), and Datura *(Datura stromonium*). Rooted hydrophytes are reported along the banks, where water level is less than a foot or water has recedes after flooding. The commonly reported hydrophytes are *Ipomoea carnea, Argeratum conyzoides, Ipomoea aquatica* etc.

Terrestrial Fauna

The presence or absence of an animal or plant in a certain region depends on its ecological and geographical setting. Wild animals can exist in a region only if prevailing set of conditions are congenial for their survival and perpetuation. Diversity of the species and their abundance is largely dependent on the availability of required habitats.

Terrestrial Fauna Found in Study Area

As the animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. Though there are two reserved forest blocks in the buffer zone, they are in the form of small and isolated patches. As these forest blocks are surrounded by villages on all sides, they are subject to biotic pressures of grazing and cutting. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area. There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere Reserve or Elephant Corridor or other protected areas within 10 km radius from core area. It is evident from the available records, reports and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. There were no resident birds other than common bird species such as Paddy egrets, green bee eaters, Indian rollers, Parakeets, common babblers, Weaver birds, Mynas, Black drangos, Crows, Sparrows. The list of Mammalian species directly sighted or recorded during field survey and from literature of the study area is given in **Table 3.23.** The list of bird species recorded during field survey and literature from the study area are given in Error! Reference source not found.**4.**

Table 3.23 List of Mammalian Species Either Sighted or Recorded in Study Area

Scientific Name	Common Name	Family	WPA Status	IUCN
Herpestes javanicus	Common Indian Mongoose*	Herpestidae	Sch II	LC
Rhinopoma hardwickii	Lesser Mouse-Tailed Bat	Chiroptera		LC
Cynopterus sphinx	Short-Nosed Fruit Bat	Chiroptera	Sch V	LC
Pipistrellus coromandra	Indian Pipistrelle	Chiroptera		LC
Taphozous melanopogon	Black-Bearded tomb bat	Chiroptera		LC
Hipposideros speoris	Schneider's Leaf-Nosed Bat	Chiroptera		LC
Lepus nigricollis	Black-naped Hare	Leporidae	Sch IV	LC
Bendicota bengalensis	Indian mole rat	Muridae		LC
Bendicota indica	Bandicoot rat	Muridae		LC
Mus booduga	Little Indian Field mouse	Muridae	Sch V	LC
Mus musculus	House Mouse*	Muridae	Sch V	LC
Rattus rattus	House rat*	Muridae		LC
Funambulus palmarum	Three striped palm squirrel*	Sciuridae		LC

Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated.

** Indicates direct observation*

Source:

- Forest Department Working plan data (2014-24)
- **Vivek Menon (2014)**, *Indian Mammals: A Field Guide.* Hachette Book Publishing India Pvt. Ltd., Gurgaon, India, pp 1-522; IUCN (2015).
- The *IUCN Red List of Threatened Species.* Version 2015-4; *Schedules I to VI: Indian Wildlife (Protection) Act, 1972*

Table 3.24 List of Bird Species Sighted or Recorded in Study Area

Common Name	Scientific name	IUCN	IWL Schedule
Lesser Whistling-Duck	*Dendrocygna javanica*	LC	IV
Common Quail	*Coturnix coturnix*	LC	IV
Gray Jungle fowl	*Gallus sonneratii*	LC	IV
Little Grebe	*Tachybaptus ruficollis*	LC	IV
Little Cormorant	*Microcarbo niger*	LC	IV
Indian Cormorant	*Phalacrocorax fuscicollis*	LC	IV
Great Bittern	*Botaurus stellaris*	LC	IV
Gray Heron	*Ardea cinerea*	LC	IV
Purple Heron*	*Ardea purpurea*	LC	IV
Cattle Egret*	*Bubulcus ibis*	LC	IV
Indian Pond-Heron	*Ardeola grayii*	LC	IV
Black-shouldered Kite	*Elanus caeruleus*	LC	IV
White-breasted Waterhen	*Amaurornis phoenicurus*	LC	IV
Eurasian Moorhen*	*Gallinula chloropus*	LC	IV
Eurasian Coot	*Fulica atra*	LC	IV
Black-winged Stilt*	*Himantopus himantopus*	LC	IV
Red-wattled Lapwing*	*Vanellus indicus*	LC	IV
Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	LC	IV
Rock Pigeon*	*Columba livia*	LC	IV
Eurasian Collared-Dove*	*Streptopelia decaocto*	LC	IV

Common Name	Scientific name	IUCN	IWL Schedule
Spotted Dove	*Streptopelia chinensis*	LC	IV
Laughing Dove*	*Streptopelia senegalensis*	LC	IV
Greater Coucal	*Centropus sinensis*	LC	IV
Asian Koel*	*Eudynamys scolopaceus*	LC	IV
Asian Palm-Swift	*Cypsiurus balasiensis*	LC	IV
Eurasian Hoopoe	*Upupa epops*	LC	IV
White-throated Kingfisher	*Halcyon smyrnensis*	LC	IV
Pied Kingfisher	*Ceryle rudis*	LC	IV
Green Bee-eater	*Merops orientalis*	LC	IV
Indian Roller	*Coracias benghalensis*	LC	IV
Rose-ringed Parakeet	*Psittacula krameri*	LC	IV
Indian Pitta	*Pitta brachyura*	LC	IV
Common Iora	*Aegithina tiphia*	LC	IV
Black Drongo*	*Dicrurus macrocercus*	LC	IV
House Crow*	*Corvus splendens*	LC	IV
Red-vented Bulbul*	*Pycnonotus cafer*	LC	IV
Common Babbler*	*Turdoides caudata*	LC	IV
Indian Robin*	*Copsychus fulicatus*	LC	IV
Oriental Magpie-Robin	*Copsychus saularis*	LC	IV
Common Myna	*Acridotheres tristis*	LC	IV
Purple Sunbird*	*Cinnyris asiaticus*	LC	IV
Gray Wagtail	*Motacilla cinerea*	LC	IV
Baya Weaver	*Ploceus philippinus*	LC	IV
*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated * *Indicates direct observation.*			

Sources:

- ***Ali, S and Ripley, S.D. 1969.****Handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim, Bhutan and Ceylon,3. Stone Curlews to Owls. Oxford University Press, Bombay, 327pp.*
- ***BirdLife International 2012. In: IUCN 2012****. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 11 March 2013.*
- ***Grimmett, R., Inskipp, C and T. Inskipp, 2001.*** *Pocket Guides to the Birds of the Indian Subcontinent. Cristopher Helm Publishers, Oxford University Press, 384pp.*

The list of reptilian species recorded during field survey and literature from the study area are given in Error! Reference source not found.**5.** The list of Amphibian species r ecorded during field survey and literature from the study area are given in Error! Reference source not found.**6. The list of Fishes either spotted or reported from the study area is given in** Error! Reference source not found.**7.** The list of Butterfly species r ecorded during field survey and literature from the study area are given in Error! Reference source not found.**8.**

Table 3.25 List of Reptiles Either Spotted or Reported in Study Area

Sl. No	Scientific Name	Common Name	IUCN	IWPA
1.	*Ahaetulla nasuta*	Green whip snake	LC	
2.	*Naja naja*	Indian Cobra	LC	II
3.	*Daboia siamensis*	Russel Viper	LC	II
4.	*Dendrelaphis tristis*	Tree Snake	LC	
5.	*Ptyas mucosa*	Common Rat snake	LC	II
6.	*Amphiesma stolata*	Buffstriped keelback	LC	
7.	*Trimeresurus gramineus*	Green pit viper	LC	IV
8.	*Typhlops hypomethes*	Common blind snake	LC	IV
9.	*Varanus bengalensis*	Common Indian monitor*	LC	II
10.	*Chamaeleo zeylanicus*	Chameleon*	LC	II
11.	*Mabuya carinata*	Common Skink*	LC	
12.	*Calotes rouxi*	Forest Calottes*	LC	
13.	*Calotes versicolor*	Common garden lizard*	LC	
14.	*Hemimidactylus brooki*	House gecko*	LC	
15.	*Hemidactylus forenatus*	Southern House Gecko	LC	

Table 3.26 List of Amphibians Either Spotted or Reported in Study Area

S. No	Scientific Name	Common Name	IUCN	IWPA
1.	*Duttaphrynus melanostictus*	Asian common toad	LC	Sch-IV
2.	*Euphlyctis hexadactylus*	Indian green frog	LC	Sch-IV
3.	*Hoplobatrachus tigerinus*	Indian bullfrog	LC	Sch-IV
4.	*Polypedates maculatus*	Indian Tree Frog*	LC	Sch-IV

*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

Sources:

- **Indraneil** Das (2002). *Snakes & other Reptiles of India.*New Holland Publishers (UK) Ltd pp. 1-144;
- **Romulus** Whitaker & Ashok Captain (2006).*Snakes of India; Dreko Books, Chennai, pp 1-146;*
- **IUCN** (2015); *The IUCN Red List of Threatened Species.*Version 2015-4; *Schedules I to VI: Indian Wildlife (Protection) Act, 1972*

Table 3.27 List of Fishes Either Spotted or Reported in Study Area

S. No	Genus/Species	Local Name	Family	IUCN
1	*Ambassis ranga*	Indian glassy fish	Ambassidae	LC
2	*Paraambassis ranga*	Indian X-ray fish	Ambassidae	
3	*Mystus aor*	Peddajella	Bagaridae	LC
4	*Mystus bloekeri*	Narijella	Bagaridae	
5	*Mystus cavasius*	Keerujella	Bagaridae	LC
6	*Mystus seenghala*	Adriai tenger	Bagaridae	
7	*Mystus tengara*	Narijella	Bagaridae	LC
8	*Rita hastata*	Deccan Rita	Bagaridae	LC
9	*Rita Pavimentata*	Velvet Catfish	Bagaridae	
10	*Aorichthys aor*	Indian Shovelnose Catfish	Bagridae	LC
11	*Aorichthys seenghala*	Guizza ayer	Bagridae	
12	*Mystus gulio*	Long whiskers catfish	Bagridae	LC

S. No	Genus/Species	Local Name	Family	IUCN
13	*Mystus krishnesis*	Gangetic mystus	Bagridae	
14	*Mystus armatus*	Cuaree	Bagridae	LC
15	*Rita gogra*	Velvet Catfish	Bagridae	LC
16	*Xenentodon cancila*	Chukkachapa	Belonidae	LC
17	*Channa marulius*	Bullseye snakehead	Channidae	LC
18	*Channa punctatus*	Spotted snakehead	Channidae	LC
19	*Channa striata*	Striped snakehead	Channidae	LC
20	*Etroplus maculatus*	Orange chromide	Cichlidae	LC
21	*Oreochromis mossambicus*	Mozambique mouth-breeder	Cichlidae	
22	*Clarias batrachus*	Walking catfish	Clariidae	
23	*Clarias Gariepinus*	African sharptooth catfish	Clariidae	
24	*Lepidocephalichthys thermalis*	Asara	Cobitidae	LC
25	*Nemacheilus botia*	Mottled loach	Cobitidae	LC
26	*Nemacheilus denisonii*	Schistura denisonii	Cobitidae	
27	*Nemachilus anguilla*	Nemacheilus anguilla	Cobitidae	LC
28	*Amblypharyngodon mola*	Akibedsa	Cyprinidae	LC
29	*Aspidoparia morar*	Akibedsa	Cyprinidae	LC
30	*Barbus filamentosus*	Guddapariga	Cyprinidae	
31	*Barbus narayani*	Guddapariga	Cyprinidae	LC
32	*Barbus neilli*	Pariga	Cyprinidae	LC
33	*Barbus ticto*	Sukkupariga	Cyprinidae	
34	*Barbus dorsalis*	Pariga	Cyprinidae	LC
35	*Barbus Pinnauratus*	Pariga	Cyprinidae	
36	*Barbus sophore*	Chettupariga	Cyprinidae	
37	*Barilius bakeri*	Royal danio	Cyprinidae	
38	*Barilius barila*	Kasirika	Cyprinidae	LC
39	*Barilius barma*	Kasirika	Cyprinidae	
40	*Barilius benielisis*	Kasirika	Cyprinidae	LC
41	*Barilius gatensis*	Kasirika	Cyprinidae	LC
42	*Barilius vagra*	Kasirika	Cyprinidae	LC
43	*Brabus amphibius*	Hippopotamus	Cyprinidae	
44	*Catla catla*	Botcha	Cyprinidae	LC
45	*Chela argentea*	Bedsa	Cyprinidae	
46	*Chela bacaila*	Large razorbelly minnow	Cyprinidae	
47	*Chela clupeoides*	Salmophasia balookee	Cyprinidae	
48	*Chela phulo*	Finescaled Razorbelly Minnow	Cyprinidae	
49	*Chela untrahi*	Mahanadi razorbelly minnow	Cyprinidae	
50	*Cirrhinus cirrhosa*	Mrigal carp	Cyprinidae	
51	*Cirrhinus mrigala*	White carp	Cyprinidae	LC
52	*Cirrhinus reba*	Reba carp	Cyprinidae	LC
53	*Cirrkina fulungee*	Aruzu	Cyprinidae	
54	*Cirrkina reba*	Moyya	Cyprinidae	
55	*Ctenopharyngodon idella*	Grass Carp	Cyprinidae	

S. No	Genus/Species	Local Name	Family	IUCN
56	*Danio devario*	Bengal danio	Cyprinidae	
57	*Deccan White Carp*	Cirrhinus fulungee	Cyprinidae	LC
58	*Discoognathus lamta*	Rathigoraka	Cyprinidae	
59	*Esomus barbatus*	Attapariga	Cyprinidae	LC
60	*Esomus danricus*	Attapariga	Cyprinidae	LC
61	*Garra gotyla stenorhynchus*	Garra tamangi	Cyprinidae	LC
62	*Garra jerdoni*	Rathigoraka	Cyprinidae	LC
63	*Labeo angra*	Angra labeo.	Cyprinidae	LC
64	*Labeo bata*	Bata labeo	Cyprinidae	LC
65	*Labeo boggut*	Kakigenda	Cyprinidae	LC
66	*Labeo calbasu*	Orangefin labeo	Cyprinidae	LC
67	*Labeo fimbriatus*	Fringed-lipped peninsula carp	Cyprinidae	LC
68	*Labeo kawrus*	Kakigenda	Cyprinidae	LC
69	*Labeo porcellus*	Kakigenda	Cyprinidae	LC
70	*Labeo rohita*	Rohu fish	Cyprinidae	LC
71	*Laubuca aipar*	Kotipal	Cyprinidae	
72	*Laubuca laubuca*	Indian glass barb	Cyprinidae	
73	*Opsarius barna*	Balisonda	Cyprinidae	LC
74	*Osteochilus nashi*	Nagendran	Cyprinidae	LC
75	*Osteochilus thomassi*	Nagendran	Cyprinidae	LC
76	*Puntius sarana*	Olive barb	Cyprinidae	LC
77	*Puntius ticto*	Ticto barb	Cyprinidae	LC
78	*Puntius amphibius*	Scarlet-banded barb	Cyprinidae	
79	*Puntius chola*	Swamp barb	Cyprinidae	LC
80	*Puntius fasciatus*	Banded barb	Cyprinidae	LC
81	*Puntius filamentosus*	Dawkinsia filamentosa	Cyprinidae	LC
82	*Puntius jerdoni*	Jerdon's carp	Cyprinidae	LC
83	*Puntius melanostigma*	Ichthyol	Cyprinidae	
84	*Puntius pulchellus*	Hypselobarbus pulchellus	Cyprinidae	
85	*Puntius sahyadriensis*	Khavli barb	Cyprinidae	
86	*Puntius sophore*	Pool barb	Cyprinidae	LC
87	*Puntius vittatus*	Striped barb	Cyprinidae	LC
88	*Rasbora daniconius*	Kotipal	Cyprinidae	LC
89	*Rasbora rasbora*	Slender rasbora	Cyprinidae	LC
90	*Rohtee cotio*	Guniguppidigadu	Cyprinidae	
91	*Rohtee ogilbii*	Vatani rohtee	Cyprinidae	LC
92	*Salmostoma boopis*	Boopis razorbelly minnow	Cyprinidae	LC
93	*Aplocheilus blockii*	Green Panchax	Cyprinodonidae	
94	*Aplocheilus lineatus*	Sparkling panchax.	Cyprinodonidae	LC
95	*Orysias melastigma*	Matta	Cyprinodonidae	
96	*Glossogobius giuris*	Iskadonthu	Gobiidae	LC
97	*Hyporhamphus xanthopterus*	Red-tipped halfbeak	Hemiramphidae	
98	*Macrognathus aculeatus*	Chinnakinti Mukku	Mastacembelide	LC
99	*Mastacembelus armatus*	Konti mukku	Mastacembelide	LC

S. No	Genus/Species	Local Name	Family	IUCN
100	*Mastacembelus pancalus*	Indian mastacembelid eel	Mastacembelide	
101	*Notopterus notopterus*	Olliganthatha	Notopteride	LC
102	*Ophicephalus gachua*	Channa gachua	Ophicephalidae	
103	*Ophicephalus marulius*	Poolamatta	Ophicephalidae	LC
104	*Ophicephalus punctatus*	Koramatta	Ophicephalidae	LC
105	*Ophicephalus striatus*	Malamatta	Ophicephalidae	
106	*Pangasius pangasius*	Pangas catfish	Pangasidae	LC
107	*Pseudeutropius atherinoides*	Indian potasi	Schilbeidae	
108	*Pseudotropius taakree*	Akuchelwa	Schilbeidae	
109	*Silonia silondia*	Silond catfish	Schilbeidae	
110	*Callichrous macrophathlmus*	Theenava	Siluridae	
111	*Callichrous bimaculatus*	Theenava	Siluridae	
112	*Ompok bimaculatus*	Butter catfish	Siluridae	
113	*Ompok pabo*	Pabo catfish	Siluridae	
114	*Wallagonia attu*	Freshwater Shark	Siluridae	
115	*Glyptothorax lonah*	Marpugadu	Sisoridae	LC
Source: Naik et. al., (2015). Fishe biodiversity of Tunga, Bhadra and Thungabhadara Rivers of Karnataka, India, R J of Animal, Vetererary, fishery International Congress Assoication, 1-16 pp. Chacko and G.K. Kurxyan (1948). A survey of the Fishes of the Thungabhadra River 166-176 pp				

Table 3.28 List of Butterflies Either Spotted or Reported in Study Area

S. No.	Scientific Name	Common Name	IUCN	IWPA
1.	*Tarucus nara* Kollar	Rounded Pierrot*	LC	
2.	*Colotis etrida*	Small or Little Orange Tip*	LC	
3.	*Colotis eucharis eucharis*	Plain Orange Tip*	LC	
4.	*Catopsilia pomona*	Common Emigrant*	LC	
5.	*Eurema hecabe simulata*	Common Grass Yellow*	LC	
6.	*Papilio demoleus*	Lime Butterfly*	LC	
7.	*Papilio polytes polytes*	Common Mormon*	LC	
8.	*Papilio polytes stichius*	Common Mormon *	LC	
9.	*Danaus chrysippus chrysippus*	Plain Tiger *	LC	
10.	*Danaus genutia genutia*	Striped Tiger*	LC	
11.	*Euploea core core*	Common Crow*	LC	Sch- IV
Source: Forest Department working plan * *Indicates Primary data*				

It is apparent from the list that **none of the species either spotted or reported is included in Schedule I** of the Wildlife Protection Act. Similarly, none of them comes under the REET category. Some of the birds listed were rare locally but they do not fall under any of the REET categories.

Effect on Migratory corridors, Nesting and Breeding sites

There are no migratory corridors, nesting, and breeding sites within the proposed site or in the core area. No need to take any mitigation measures in this connection.

CHAPTER 4.0 ANTICIPATED ENVIRONMENTAL IMPACTS& MITIGATION MEASURES

4.1 Identification of Impacts

Impact assessment is initiated by impact identification stage followed by prediction and evaluation of impacts. Impact is a change in baseline due to interaction of a development activity with environment, or interaction of environment with development activity, or change in baseline due to a manmade activity or a natural hazard. The interaction of project activity on the environment was assessed by posing questions related to each aspect of project activity to identify valued eco components. After broad identification of impacts, an interaction table enumerating the activity vs factors of various environmental components was prepared for various stages of project implementation considering the entire life cycle of construction stage, operation stage, emergency scenarios, and decommissioning stage for the proposed expansion of Chlor-Alkali plant in phased manner by M/s. TGV SRAAC Ltd. The conceptual site model of Chlor-alkali manufacturing activity is presented in **Fig 4.1** and typical effects of manufacturing activity is presented in **Fig 4.2.**



Ref : Integration and Application Network, University of Maryland Center for Environmental Science

Fig 4.1 Conceptual Model of Chlor-Alkali Industry

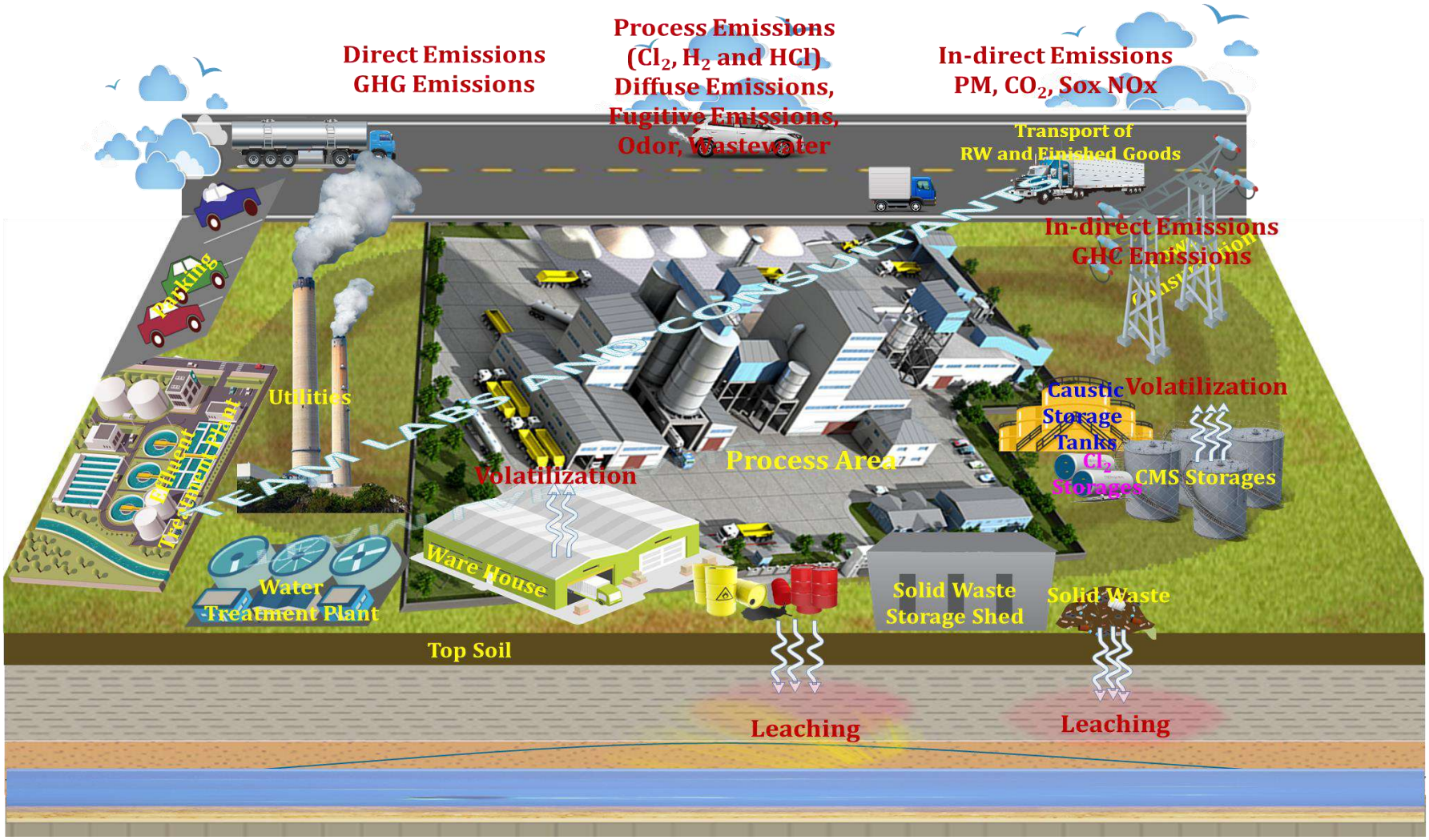
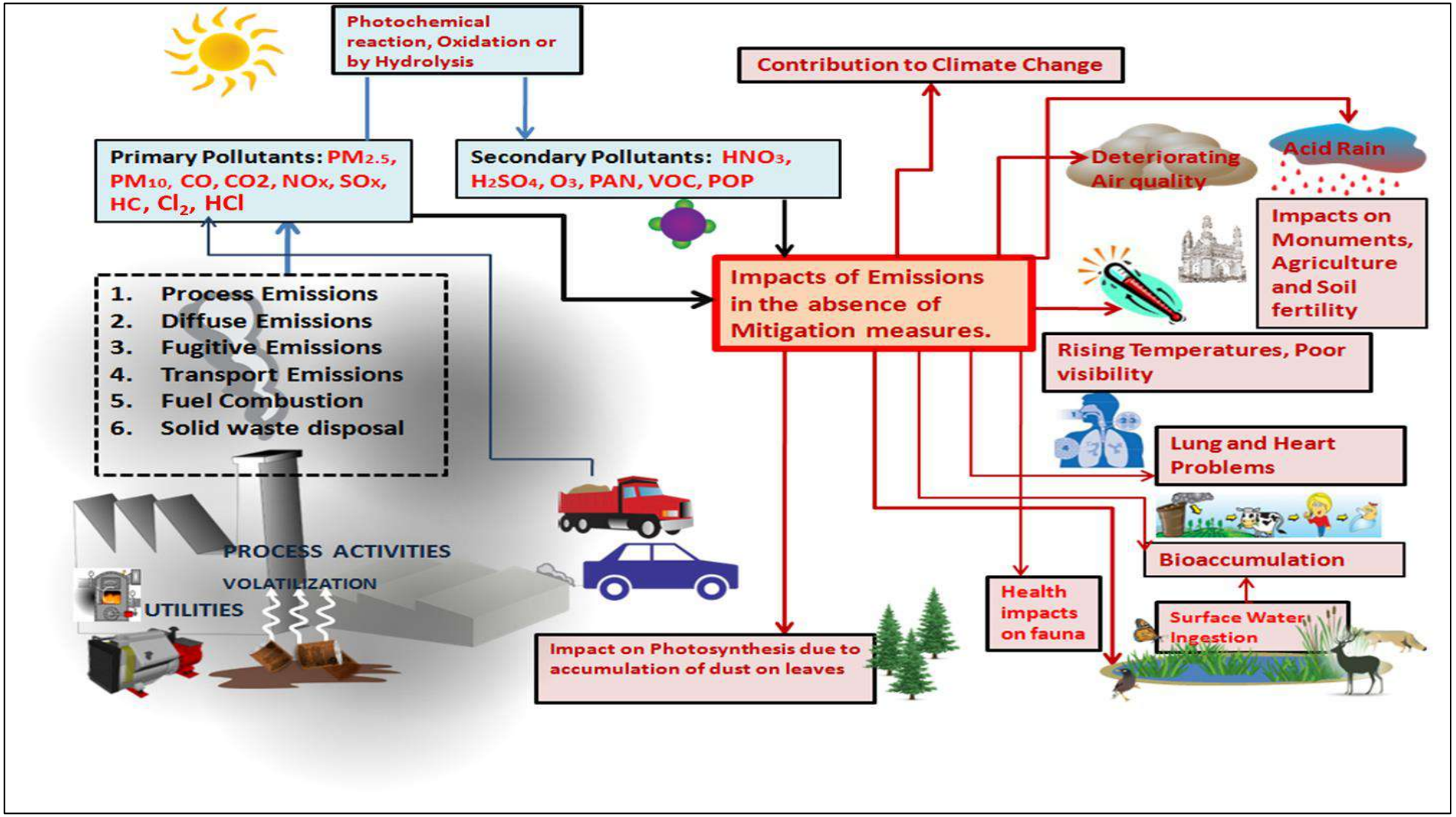


Fig 4.2 Conceptual Model of Impacts Effects due to Chlor-Alkali Manufacturing Activity

4.1.1 Impact Networks

The purpose of identifying the impacts is that it aids in making appropriate decision to mitigate the adverse consequences if any. The degree of extensiveness and scale of impacts and the consequences based on value judgments are generalized while identifying impacts; as it is imperative that the impact will normally lead to a chain of reactions. The construction of network charts brings out to certain extent the appropriate levels of risks that may occur due to the interventions while interacting with hydrological, biological and social systems due to the proposed unit during its life time of construction, operation and decommission including emergency scenarios both natural and manmade. **Fig 4.3 to 4.7** present the identified impacts for various components of environment viz. air, noise, water, land and socio-economic aspects. The impact identification matrix indicating the environmental factors anticipated to have an impact due to the proposed project and impacts due to environment on the proposed project are presented in **table 4.1 to 4.4.**



7Fig 4.3 Impacts on Air Environment

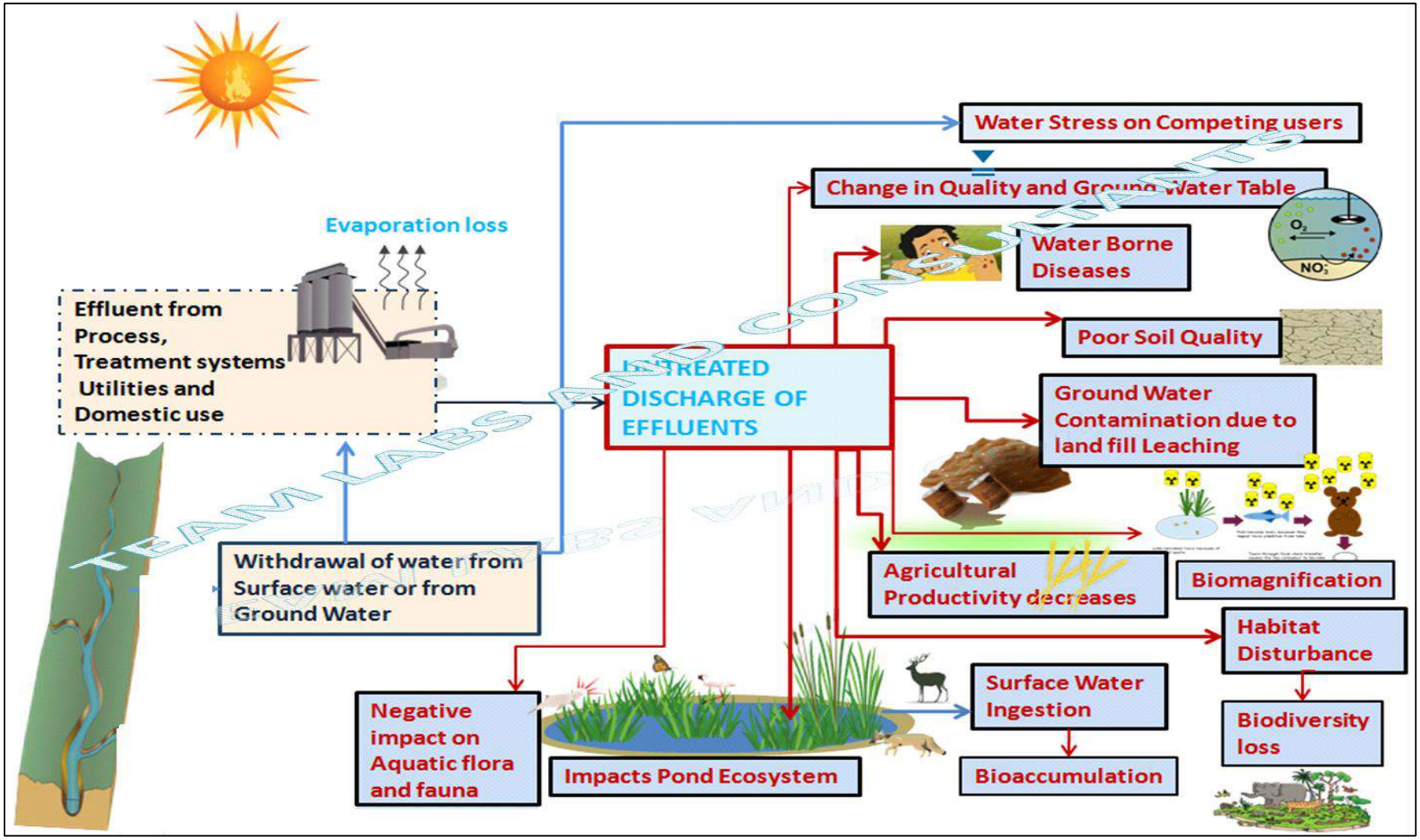


Fig 4.4 Impacts on Water Environment

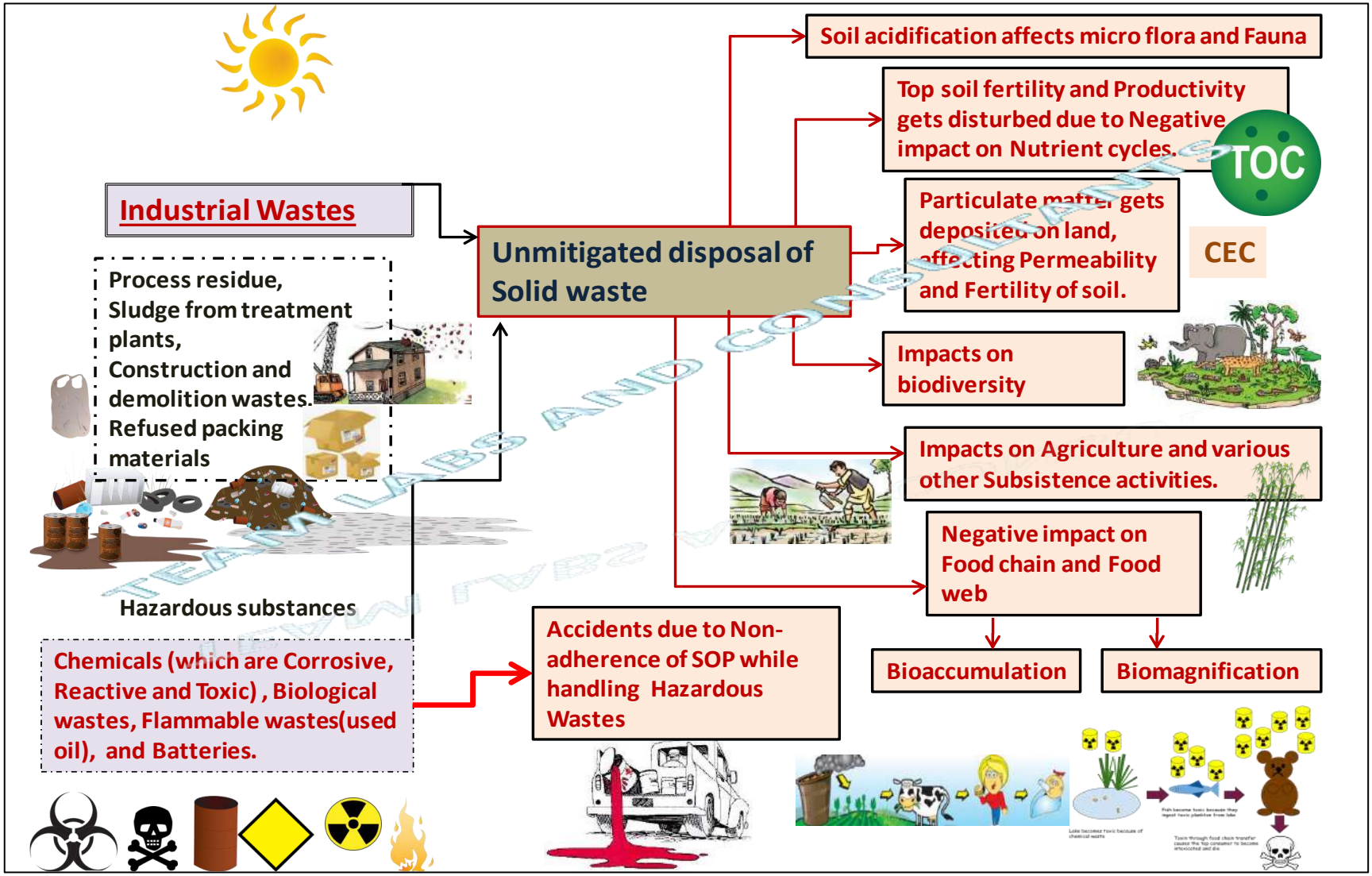


Fig 4.5 Impacts on Solid waste and Soil Quality

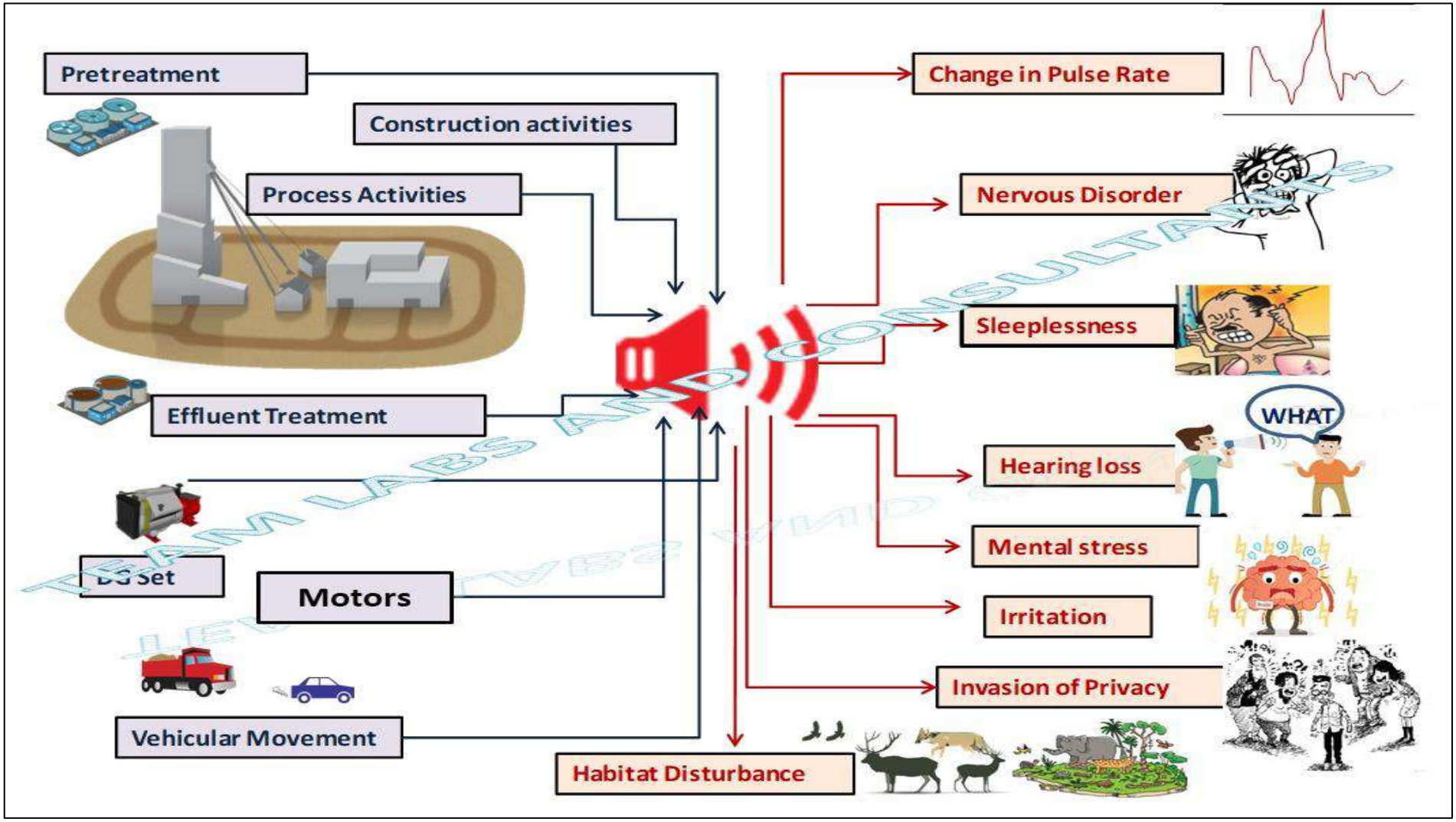


Fig 4.6 Noise Impact on Surrounding Environment

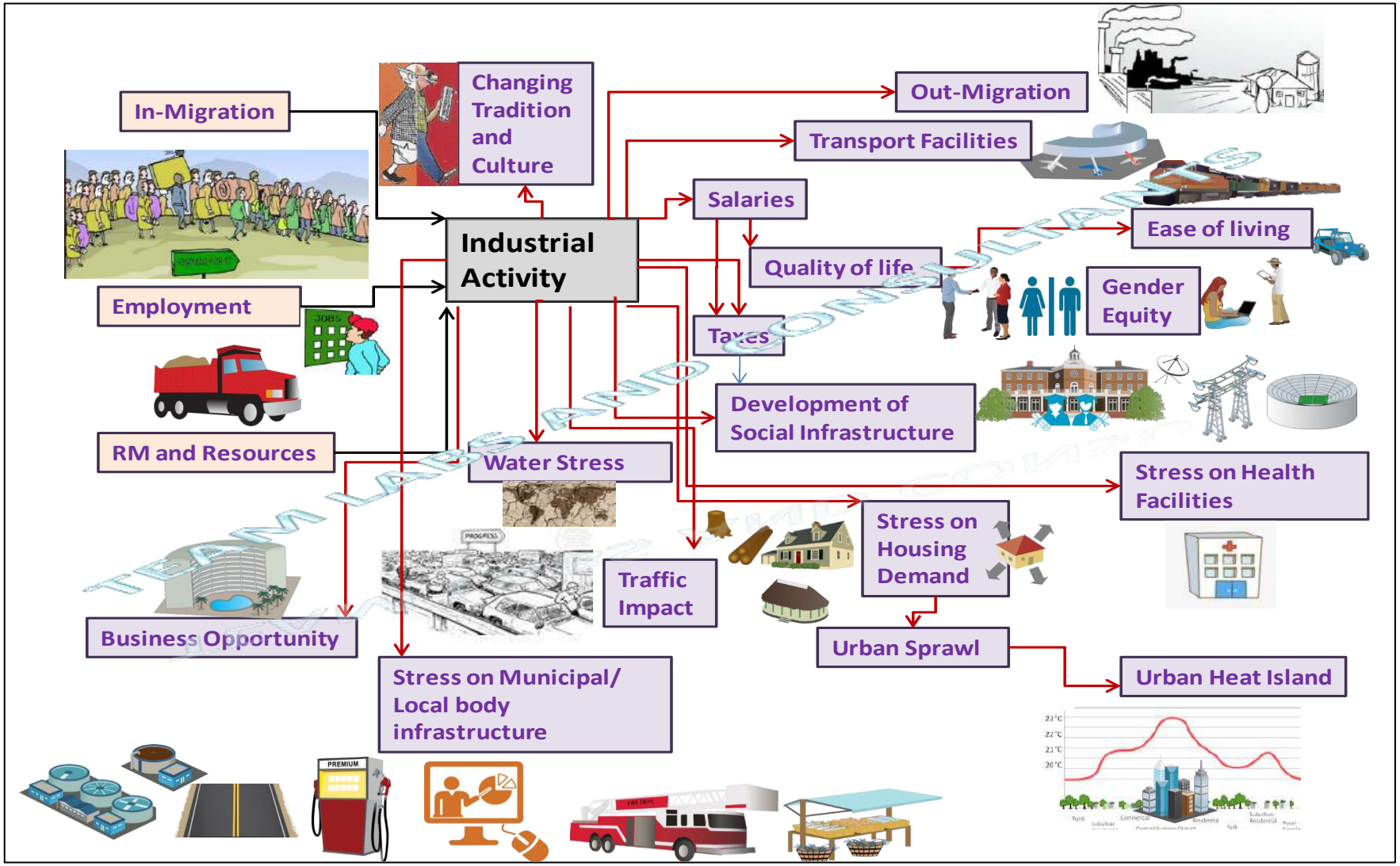


Fig 4.7 Impacts on Socio-Economic on Environment

Table 4.1 Activity and Environmental Impact (Impact Identification Matrix) - Construction Stage

Environment	Abiotic							Biotic		Socio Economic	Others			
Component	Climate	Atmosphere		Land		Water								
Factors	Micrometeorology	Air quality	Noise and vibration	Geology	Soil	Surface Water	Ground Water	Flora	Fauna	Socio Economic	Waste Management	Occupational health and safety	Fire Safety	Climate Change
Activity														
Construction Stage										√				
Clearing and Grubbing		√	√					√	√	√	√	√		
Leveling by way of cut and fill		√	√	√	√	√			√	√	√	√		
Foundation excavation		√	√	√	√		√			√	√	√		
Civil Construction		√	√			√				√	√	√		
Equipment and machinery erection		√	√							√	√	√		
Electrical installation		√	√							√	√	√		
plumbing and piping		√	√							√	√	√		
painting works		√								√	√	√	√	

√ ***Indicates Impact***

Table 4.2 Activity and Environmental Impact (Impact Identification Matrix) - Regular Operation Stage

Environment	Abiotic							Biotic		Socio Economic	Others			
Component	Climate	Atmosphere		Land		Water								
Factors	Micrometeorology	Air quality	Noise and vibration	Geology	Soil	Surface Water	Ground Water	Flora	Fauna	Socio Economic	Waste Management	Occupational health and safety	Fire Safety	Climate Change
Activity														
Operation Stage														
Regular Operation										√				
Raw material and finished product transport		√	√							√		√	√	
Raw material and finished product storage		√										√	√	
Transfer of raw materials and products		√	√									√	√	
Water use							√			√				
Effluent generation		√				√					√	√		
Domestic Wastewater generation		√				√					√	√		
Utility emissions	√	√			√	√		√	√	√	√	√		√
Process emissions	√	√			√	√		√	√	√	√	√		
Diffuse emissions		√			√			√	√	√	√	√	√	√
Wastewater storage		√									√	√	√	
Solid waste transfer and storage		√				√		√			√	√	√	
Waste transport		√								√		√	√	
Effluent transfer and Treatment		√				√		√			√	√	√	
Wastewater Transfer and Treatment		√				√		√			√	√		
Emissions control	√	√	√					√	√		√	√		√
Machine and Equipment Operation			√									√		

√ ***Indicates Impact***

Table 4.3 Activity and Environmental Impact (Impact Identification Matrix) - Incidents and Accidents

Environment	Abiotic							Biotic		Socio Economic	Others			
Component	Climate	Atmosphere		Land		Water								
Factors	Micrometeorology	Air quality	Noise and vibration	Geology	Soil	Surface Water	Ground Water	Flora	Fauna	Socio Economic	Waste Management	Occupational health and safety	Fire Safety	Climate Change
Activity														
Operation Stage														
Incidents and Accidents														
Spillage		√		√	√	√		√	√	√	√	√	√	
Fugitive emissions		√			√			√	√	√	√	√		
Equipment Failures			√							√				
Batch failures											√	√		
Containment failure		√			√	√		√	√	√	√	√	√	
Fire accidents		√	√							√	√	√	√	
Accidents during transport of Raw materials and products		√		√	√	√		√	√	√	√	√	√	
Accidents during transport of wastes		√		√	√	√		√	√	√	√	√	√	
Arson and Vandalism		√		√	√	√		√	√		√	√	√	
Extreme Weather phenomenon	√	√	√		√	√	√	√	√		√		√	√

√ ***Indicates Impact***

Table 4.4 Activity and Environmental Impact (Impact Identification Matrix) – Decommissioning

Environment	Abiotic							Biotic		Socio Economic	Others			
Component	Climate	Atmosphere		Land		Water								
Factors	Micrometeorology	Air quality	Noise and vibration	Geology	Soil	Surface Water	Ground Water	Flora	Fauna	Socio Economic	Waste Management	Occupational health and safety	Fire Safety	Climate Change
Activity														
Plant Decommissioning										√				
Inventory preparation										√				
Transfer and disposal of chemicals		√		√	√	√		√	√	√	√	√	√	
Transfer and disposal of wastes		√		√	√	√		√	√	√	√	√	√	
Decontamination of equipment and containers		√			√	√		√	√	√	√	√	√	
Disposal of Equipment										√		√		
Dismantling of facility		√	√			√				√	√	√		
Demolition Waste		√				√				√	√	√		
Site cleanup		√	√		√	√				√	√	√	√	
Capping drains and locking water sources					√	√	√			√		√		

√ ***Indicates Impact***

4.2 Prediction and Assessment of Impacts

The identified impacts are assessed by posing questions related each activity of proposed project and their interaction with environment during the life cycle of the manufacturing unit i.e., construction, operation and decommissioning stages including incident and accidents scenario during operation stage. The statutory limits of ambient air quality, noise, emissions and discharges as mandated by the MoEFCC was considered to classify the quantifiable impacts as acceptable or not acceptable. However, there are few impacts that cannot be quantified, which need to be qualitatively assessed. There are a number of methods for qualitatively assessing the impacts to arrive at the significance of impact. The qualitative assessment of impacts require characterization with respect to its magnitude, geographic extent, duration, frequency, reversibility, probability of occurrence, confidence rating and impact rating. The manual published by MOEF&CC prescribes the following process for determining the significance of impact; first, an impact is qualified as being either negative or positive. Second, the nature of impacts such as direct, indirect, or cumulative is determined using the impact network. Third, a scale is used to determine the severity of the effect; for example, an impact is of low, medium, or high significance. Accordingly, it was proposed to quantify the impacts which are a direct result of the activities contingent on availability of reliable prediction tools. In case the quantification is not feasible, a subjective assessment of the impact significance using Rapid Impact Assessment Matrix (RIAM) was used. Rapid Impact Assessment Matrix (RIAM) is constructed from a set of well-defined assessment criteria and a collection of specific environmental indicators or components. The environmental indicators are carefully chosen for the purpose of evaluating the potential impacts of the alternatives that are being considered (Pastakia and Jensen, 1998).

4.2.1 Methodology of Rapid Impact Assessment Matrix

The RIAM is suited to EIA where a multi-disciplinary team approach is used, as it allows for data from different sectors to be analyzed against common important criteria within a common matrix, thus providing a clear assessment of the major impacts. With the assessment criteria typically arrayed as the columns of the matrix and the indicators as the rows, the cells are comprised of numbers which provide a measure of the

expected impacts of the indicators when measured against the assessment criteria. Technically, the assessment process is comprised of four steps that must be completed in sequence: Step I — create a set of indicators, Step II — provide numerical values for the indicators, Step III — compute environmental scores and Step IV — evaluate the alternatives. RIAM is based on the knowledge that certain specific criteria are common to all impact assessments, and by scaling these criteria it becomes possible to record the values of the assessments made. RIAM works with both negative and positive impacts. Not all criteria can be given the same weight, and so the criteria are divided into two groups: those which individually are important in their impact; and those that collectively important. The important assessment criteria fall into two groups: (A) Criteria that are of importance to the condition, and which can individually change the score obtained. (B) Criteria that are of value to the situation, but individually should not be capable of changing the score obtained. The value ascribed to each of these groups of criteria is determined by the use of a series of simple formulae. These formulae allow the scores for the individual components to be determined on a defined basis.

The process can be expressed:

(a1) x (a2) = aT

(b1) + (b2) + (b3) = bT

(aT) x (bT) = ES

Group (A) criteria

Importance of condition (A1)

A measure of the importance of the condition, which is assessed against the spatial boundaries or human interests it will affect. The scales are defined:

4 = important to national/international interests

3 = important to regional/national interests

2 = important to areas immediately outside the local condition

1 = important only to the local condition

0 = no importance.

Magnitude of change/effect (A2)

Magnitude is defined as a measure of the scale of benefit/dis-benefit of an impact or a condition:

+ 3 = major positive benefit

+ 2 = significant improvement in status quo

+ 1 = improvement in status quo

0 = no change/status quo

- 1 = negative change to status quo

- 2 = significant negative dis-benefit or change

- 3 = major dis-benefit or change.

Group (B) criteria

Permanence (B1)

This defines whether a condition is temporary or permanent, and should be seen only as a measure of the temporal status of the condition

1 = no change/not applicable

2 = temporary

3 = permanent.

Reversibility (B2)

This defines whether the condition can be changed and is a measure of the control over the effect of the condition.

1 = no change/not applicable
2 = reversible
3 = irreversible.

Cumulative (B3)

This is a measure of whether the effect will have a single direct impact or whether there will be a cumulative effect over time, or a synergistic effect with other conditions.

1 = no change/not applicable
2 = non-cumulative/single
3 = cumulative/synergistic
Environmental components

The RIAM requires specific assessment components to be defined through a process of scoping; and these environmental components fall into one of four categories, which are defined as follows:

Physical/chemical: Covering all physical and chemical aspects of the environment, including finite (non-biological) natural resources, and degradation of the physical environment by pollution.

Biological / ecological: Covering all biological aspects of the environment, including renewable natural resources, conservation of biodiversity, species interactions, and pollution of the biosphere.

Sociological / cultural: Covering all human aspects of the environment, including social issues affecting individuals and communities; together with cultural aspects, including conservation of heritage, and human development.

Economic / operational: To qualitatively identify the economic consequences of environmental change, both temporary and permanent, as well as the complexities of project management within the context of the project activities. The use of these four categories can be, in itself, a competent tool for EIA, though each category can be further sub-divided to identify specific environmental components that better demonstrate the possible impacts. The degree of sensitivity and detail of the system can thus be controlled by the selection and definition process for these environmental components.

Table 4.5 Criteria for Significance of Impacts based on Environmental Scores

Environmental Score	Range Bands	Description of Range Bands
+72 to +108	+E	Major Positive Change/Impacts
+36 to + 71	+D	Significant Positive Change/Impacts
+19 to + 35	+C	Moderately positive change/impacts
+10 to + 18	+B	Positive Change/Impacts
+1 to +9	+A	Slightly Positive Change/impacts
0	N	No Change/status quo/not applicable
-1 to -9	-A	Slightly Negative Change/impacts
-10 to - 18	-B	Negative Change/Impacts
-19 to - 35	-C	Moderately negative change/impacts
-36 to -71	-D	Significant negative change/impacts
-72 to -108	-E	Major negative change/impacts

4.2.2Air Environment

The sources of air pollution from proposed expansion are utility emissions, emissions from process, pollution control facilities, and storages. The direct impact of utility emissions is from proposed 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler and existing 1 x 42 TPH, 1 x 100 TPH, 1 x 110 TPH coal fired Boilers, DG sets and Incinerator emissions from chloromethane plant, consisting of particulate matter, sulfur dioxide, and oxides of nitrogen resulting in change in criteria air contaminants in ambient air quality. The adoption of adequate mitigation measures shall reduce the impact to low levels. The storage of raw materials/products may also lead to diffuse emissions unless adequate mitigation measures like scrubbers, breather valves, double lined storage and condensers are adopted. All these emissions impact air quality negatively, resulting in health impacts indirectly. The anticipated impacts on air environment are presented in **Table 4.6** and **Table 4.7** presents significance of each impact based on RIAM.

The impact assessment indicates that the proposed expansion will have slightly negative change /impacts due to change due to health and odor related containments, greenhouse gases, eutrophication of sensitive ecosystem, change in visibility due to installation of additional boiler and impacts on flora due to wet and dry deposition of pollutants, whereas negative change/ impact is anticipated due to change in criteria air contaminants and impacts on soil due to wet and dry deposition of pollutants.

Table 4.6 Impacts on Air Environment

Impact	Change in Criteria air contaminants	Change in health and odor related contaminants	Change in greenhouse gases	Change in visibility	Effects on vegetation due to dry and wet deposition	Effects on soil due to dry and wet deposition	Eutrophication of sensitive ecosystem due N20 deposition
Activity							
Construction Stage							
Clearing and Grubbing							
Leveling by way of cut and fill	√						
Foundation excavation	√						
Civil construction	√						
Equipment and machinery erection	√						
Painting works		√					
Operation Stage - Regular Operation							
Raw material and finished product transport	√						
Raw material and finished product storage	√						
Transfer of raw materials and products		√					
Effluent generation		√					
Domestic Wastewater generation		√					
Utility emissions	√		√	√	√	√	√
Diffuse emissions		√					
Wastewater storage		√					
Solid waste transfer and storage		√					
Waste transport		√					
Effluent transfer and Treatment		√					

Wastewater Transfer and Treatment		√					
Emissions control	√			√			
Operation Stage - Incidents and Accidents							
Spillage		√			√	√	
Fugitive emissions	√	√			√	√	
Containment failure		√			√	√	
Fire accidents	√	√		√			
Accidents during transport of Raw materials and products	√	√					
Accidents during transport of wastes		√					
Arson and Vandalism	√	√		√			
Extreme Weather phenomenon	√	√		√			
Plant Decommissioning							
Transfer and disposal of chemicals		√					
Transfer and disposal of wastes		√					
Decontamination of equipment and containers		√					
Dismantling of facility	√						
Demolition Waste	√						
Site cleanup	√	√					
Capping drains and locking water sources	√						

√ ***Indicates Impact***

Table 4.7 Impact Significance - Air Environment

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Change in Criteria air contaminants	2	-1	3	3	3	-2	9	-18	-B
Change in health and odor related contaminants	2	-1	2	2	3	-2	7	-14	-B
Change in greenhouse gases	1	-1	2	2	3	-1	7	-7	-A
change in visibility	1	-1	1	1	1	-1	3	-3	-A
Effects on vegetation due to dry and wet deposition	2	-1	1	1	3	-2	5	-10	-B
Effects on soil due to dry and wet deposition	2	-1	1	1	3	-2	5	-10	-B
Eutrophication of sensitive ecosystem due N20 deposition	1	-1	1	1	1	-1	3	-3	-A

4.2.2.1 Details of Mathematical Modeling

A large number of different mathematical models for dispersion calculations are in practice in many parts of the world. Most of the models for prediction of downwind concentrations are based on Gaussian dispersion. The principle behind the Gaussian dispersion models is Gaussian probability distribution of concentration in both vertical and horizontal cross wind directions about the plume central line.

Predictions of ground-level concentrations of the pollutants were carried out based on-site meteorological data collected during the study period. For calculation of predicted ground-level concentrations, ISC AERMOD model of Lakes Environmental based on USEPA, AERMOD algorithms, was used; as it's based on a more sophisticated algorithm incorporating deposition, better algorithm for area sources, etc. The required data on emission was obtained from the proponent, and all sources were considered.

Mixing Height

The mixing heights for ambient air quality predictions are adopted from Atlas of Hourly Mixing Height and Assimilative Capacity of Atmosphere in India by S.D Attri, Siddartha Singh, B. Mukhopadhya and A.K Bhatnagar, Published by Indian Metrological Department, New Delhi. 2008. The mixing heights range from 300 to 1450 m during summer season. There is no record of inversion for this area (Reference: Atlas of Hourly Mixing Height and Assimilative Capacity of Atmosphere in India by S.D Attri, Siddartha Singh, B. Mukhopadhya and A.K Bhatnagar, Published By Indian Metrological Department, New Delhi. 2008). There is no record of inversion in this area as observed from the IMD data.

4.2.2.2 Utility Emissions

The sources of air pollution are proposed 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler and existing 1 x 42 TPH, 1 x 100 TPH, 1 x 110 TPH coal fired Boilers, DG sets and Incinerator in chloromethane plant. The existing air pollution control equipment for coal fired boilers is Electro static precipitators (ESP). DG sets shall be provided with stack heights based on the CPCB formula for effective stack height. The emission rates of SO_2, NOx and Particulate Matter from each stack are presented in **Table 4.9.**

Table 4.9 Emission Details of Pollutants from Stack

S. No	Stack Attached to	Stack Height (m)	Diameter of stack at top (m)	Temp. of exhaust gases (^oC)	Exit Velocity (m/sec)	Pollutant Emission Rate (g/sec)		
						PM	SO_2	NO_X
Existing/Permitted								
1	1 x 42 TPH Coal fired Boiler	55	1.37	140	10	0.95	1.44	1.56
2	1 x 100 TPH Coal fired Boiler	69	2.5	185	11.2	3.54	5.8	6.1
3	1 x 110 TPH Coal fired Boiler	80	2.9	185	16	5.39	9.14	11.78
4	3 x 500 KVA DG Set*	4	0.25	185	7.2	0.004	0.028	0.16
5	1 x 343 kg/hr Incinerator*	12	0.6	45	7.0	-	-	2.43
Proposed								
6	1 x 120 TPH Coal fired Boiler	80	2.9	185	16	5.39	9.14	11.78
7	1 x 20 TPH H_2 gas fired Boiler	80	3.0	180	18	----	----	----

#DG sets will be used during load shut down by TRANSCO.

4.2.2.3 Air Quality Predictions *(Terms of Reference No. 7(i))*

Predictions of ground level concentrations of the pollutants were carried out based on site meteorological data collected during the study period. For calculation of ground level concentrations (GLCs), a grid of 10 km X 10 km with a receptor interval of 400 meters is considered.

It may be observed that the predicted maximum 24 hourly GLCs of PM_{10}, $PM_{2.5}$, $SO_2$and NOx are 0.72, 0.32, 3.07 and 4.54 µg/m^3 respectively, and the maximum values are observed within the site area.

The cumulative concentrations at various villages are tabulated. It may be observed from the table that the predicted results show that the incremental rise over the existing baseline status of ambient air quality is within the limits prescribed by National Ambient Air Quality standards (NAAQ), and hence the impact due to the proposed expansion is low on ambient air quality. Hence, the control measures and height of the stack is sufficient to disperse the pollutants into the atmosphere and keeping the baseline levels within the prescribed limits. The predicted ground-level concentrations are graphically displayed for PM_{10}, $PM_{2.5}$, SO_2, and NO_x, respectively in **Figure 4.7 – 4.11.** The cumulative concentration of baseline data and predicted values is presented in **Tables 4.10**.

Table 4.10 Cumulative Concentrations at Various Villages

Station	Distance (Km)	Baseline Concentration, µg/m^3				Predicted GLC, µg/m^3				Cumulative Concentration, µg/m^3			
		PM_{10}	$PM_{2.5}$	SO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NO_x
E - Tandrapadu	0.6	41	19	11	12	0.14	0.06	0.60	0.77	41.12	19.12	11.60	12.77
Gondiparla	1.8	42	22	13	15	0.18	0.01	0.08	0.09	42.19	22.01	13.08	15.09
Basavapuram	2.7	39	18	10	12	0.02	0.01	0.08	0.10	39.02	18.01	10.27	12.10
Munagalapadu	4.1	40	17	9	11	0.01	0.01	0.06	0.07	40.00	17.01	9.06	11.07
Panchalingala	4.5	41	19	11	13	0.03	0.01	0.13	0.17	41.03	19.02	11.13	13.17
Pulluru	4.15	38	18	10	12	0.01	0.00	0.04	0.05	37.99	18.00	10.04	12.05
Kurnool	1.4	49	24	14	15	0.03	0.01	0.14	0.18	49.03	24.01	14.14	15.18
Reserved Forests													
Gadidmadugu RF	5.5	--	--	--	--	0.01	0.00	0.07	0.09	0.01	0.00	0.07	0.09
Pullaiah RF	9.3	--	--	--	--	0.00	0.01	0.02	0.03	0.00	0.01	0.02	0.03

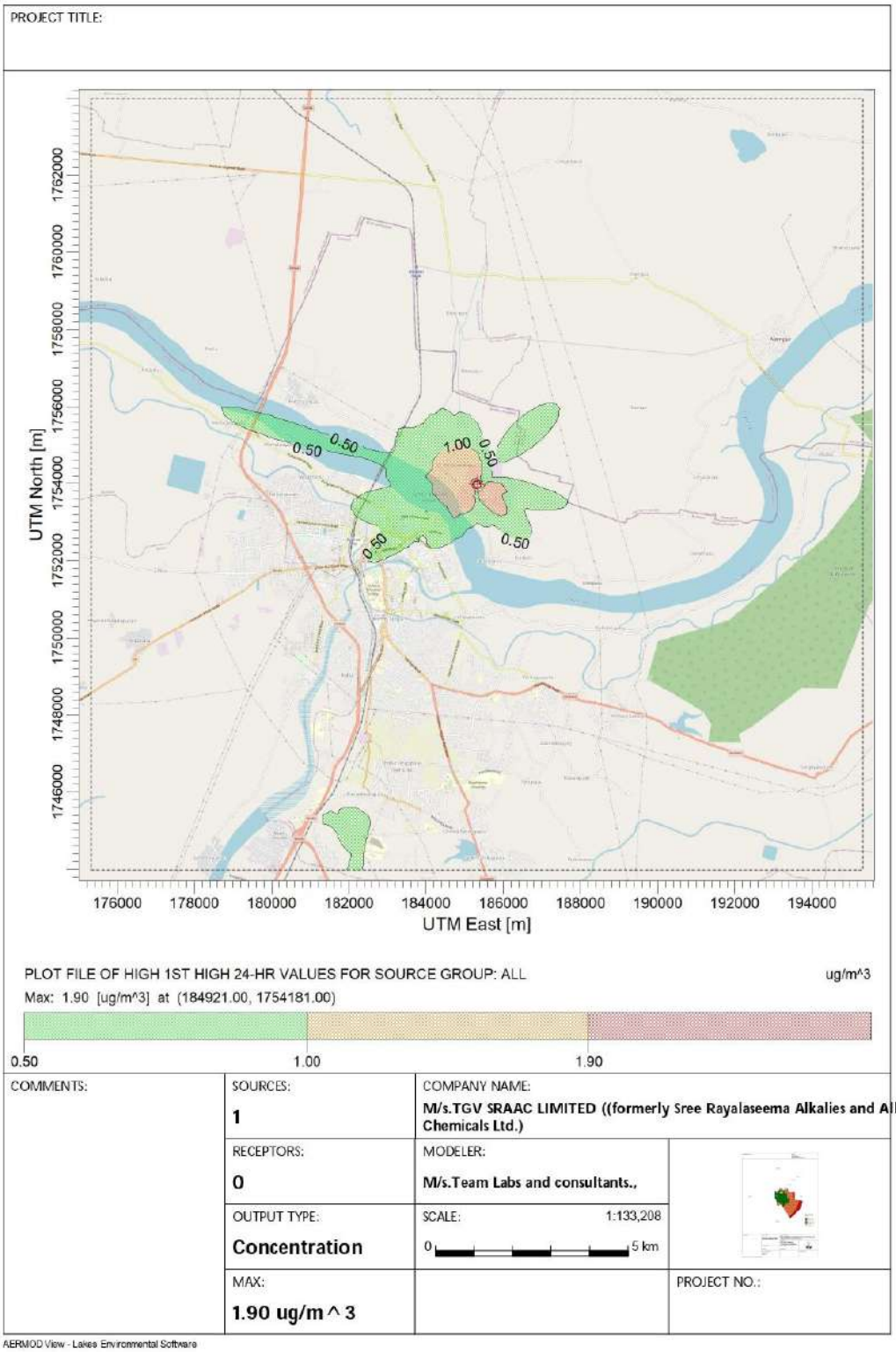


Figure 4.7 Isopleths Showing 24 Hourly GLC's of PM

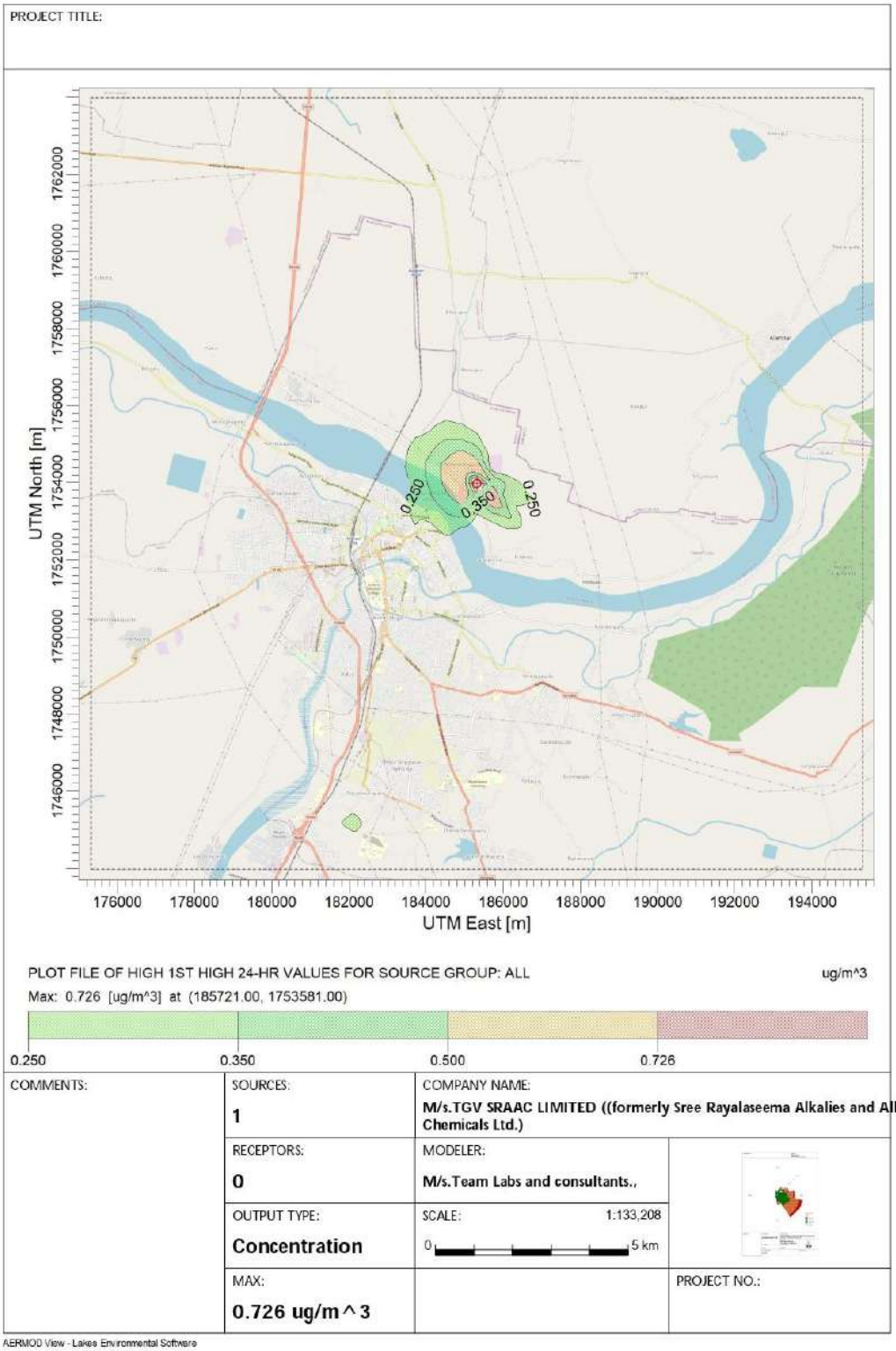


Figure 4.8 Isopleths Showing 24 Hourly GLC's of PM_{10}

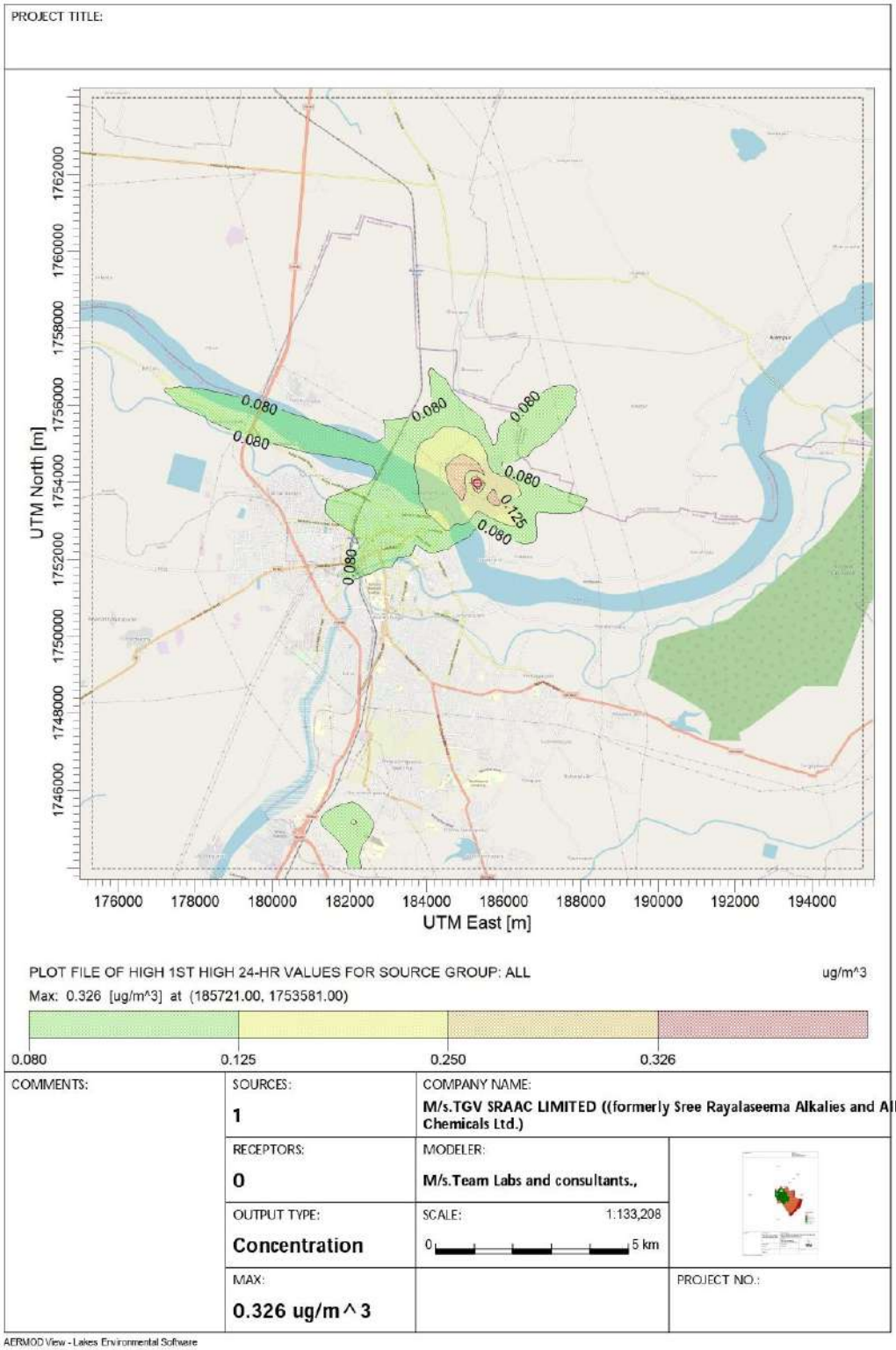


Figure 4.9 Isopleths Showing 24 Hourly GLC's of $PM_{2.5}$

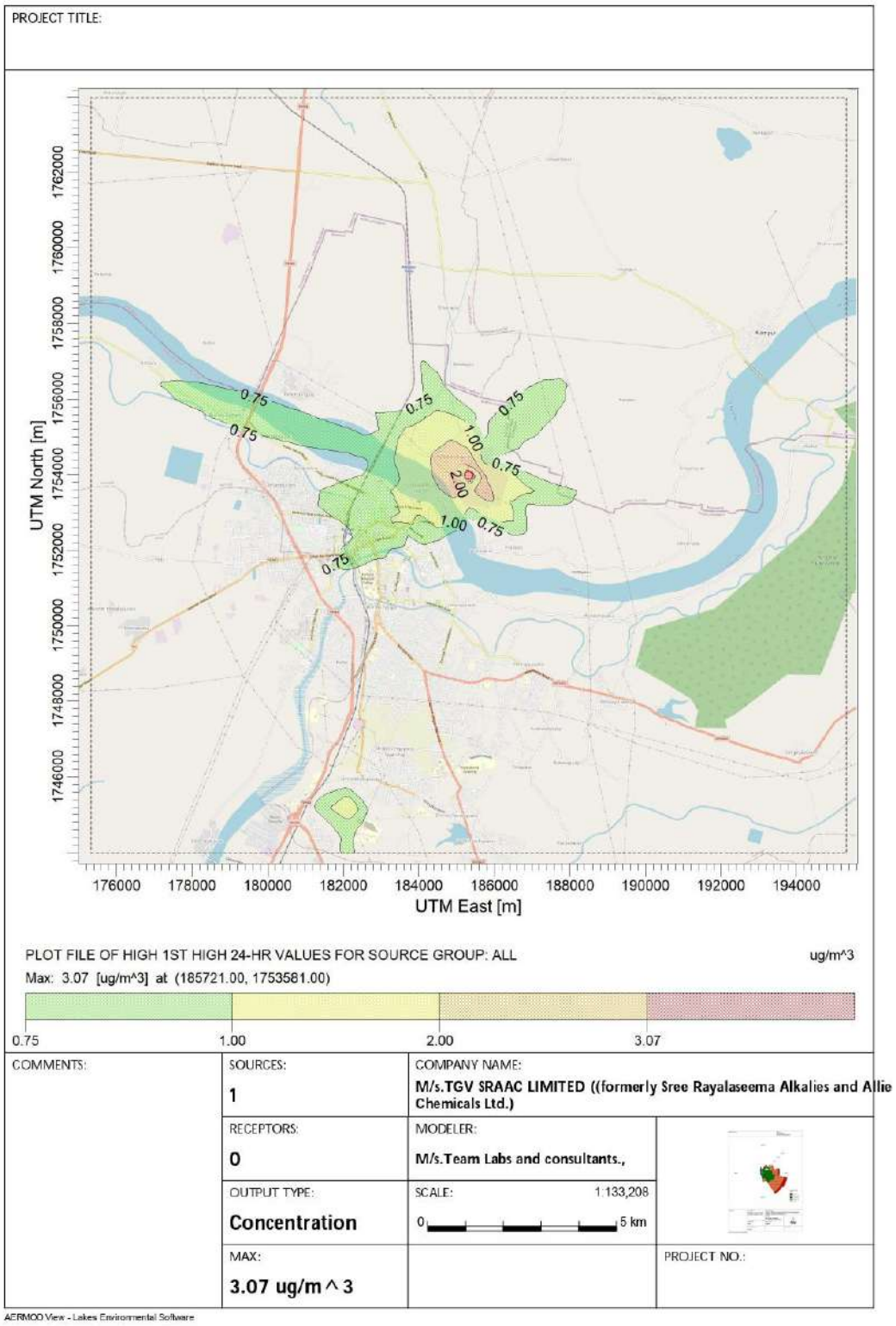


Figure 4.10 Isopleths Showing 24 Hourly GLC's of SO_2

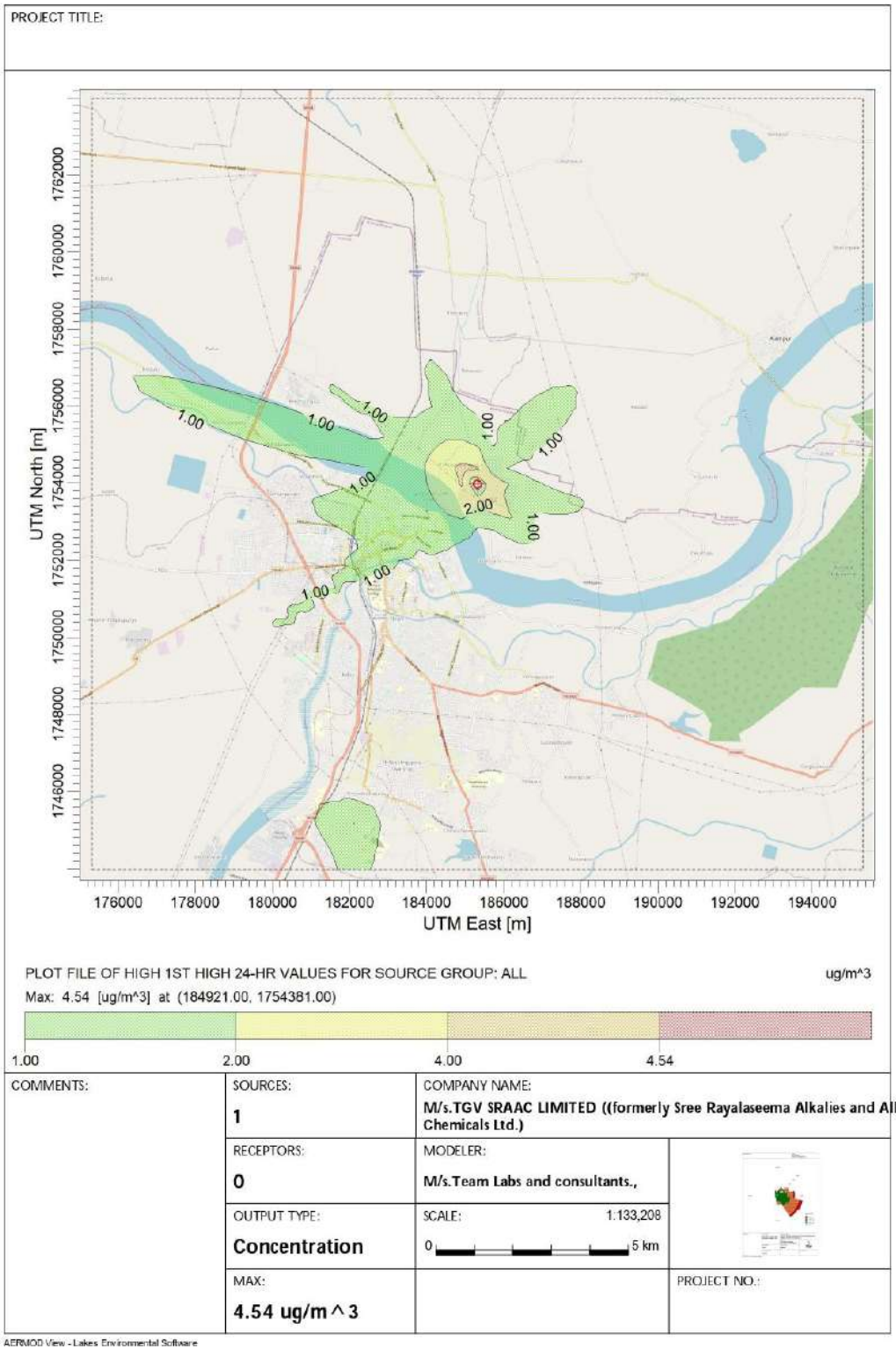


Figure 4.11 Isopleths Showing 24 Hourly GLC's of NO_X

4.2.2.4 Mitigation Measures

Chlorine and hydrogen chloride vapors are gaseous emission from manufacturing process. Due to advancement of engineering controls and due to advances in membrane cell electrolysis, possibility of chlorine emission to atmosphere is negligible. Scrubbing systems are provided to neutralize sniff gases effectively. Even the dilute chlorine is also being converted to sodium hypochlorite after neutralization with caustic soda at control temperature leading to value addition. The emissions from utilities like boilers and DG sets are mainly conveyed through point sources of tall stacks after passing through air pollution control equipment. The diffuse emissions are mainly released from distillation process of chloromethanes. Vent condensers in series to distillation columns followed by vacuum pumps are provided to mitigate diffuse emissions. The transfer pumps shall be provided with double mechanical seals. Safety relief valves, rupture disc to reactors, storage tanks, thermal insulation are provided for columns and storage tanks. The fugitive emissions are mitigated by adopting spill management plan based on the respective MSDS, spill control kits in storage, and production areas. The fugitive emissions shall be reduced by closed transfer and handling of all hazardous chemicals. Mitigation measures for utility emissions during construction and operation phases are presented in **Table 4.12.**

Table 4.12 Mitigation Measures Construction and Operation

Activity	Impact	Mitigation measure
Construction phase		
Emission from transportation of materials	➢ Change in air quality - PM, SO_2, NOx ➢ Change in visibility ➢ Health Impact	➢ PUC certification of transport vehicles. ➢ Avoidance of engine idling ➢ Water sprinkling system on roads. ➢ Periodic maintenance.
Construction staging areas	Change in Air quality - PM	➢ Barricading the site with 3 m height MS sheets. ➢ Water sprinkling ➢ Undertake work section wise demarcated, and barricade if possible
Emissions from DG sets	➢ Change in air quality ➢ Health Impact	➢ Effective stack height. ➢ Periodic maintenance.
Materials handling, including material stockpiling, transfer, and processing	➢ Change in Air quality - PM	➢ Reduced drop height. ➢ Rubber padding at discharge point and at the impact point, avoidance of metal bunkers.
Spillage of materials	➢ Change in Air quality - PM, Volatiles if any	➢ Water sprinkling, ➢ Follow MSDS guidelines

Activity	Impact	Mitigation measure
Welding	➢ Change in Air quality – PM, fumes	➢ Personnel Protective Equipment (PPE)
Painting	➢ Change in Air quality – PM, VOC fumes	➢ Personnel Protective Equipment (PPE)
Insulation	➢ Change in Air quality – PM, Glass wool particulate	➢ Personnel Protective Equipment (PPE)
Operation Phase		
Emission from co-generation Power Plant -	➢ Change in air quality ➢ Health Impacts ➢ Greenhouse gases	➢ Electro Static Precipitators (ESP) ➢ Usage imported coal with < 0.5% sulfur content ➢ Effective stack height ➢ Energy conservation and recovery by reuse of step-down pressure steam for process. ➢ Control of air fuel ratio ➢ Waste heat recovery systems ➢ Automatic control of combustion parameters. ➢ Steam lines and traps should be checked for leaks periodically and repairs should be scheduled ➢ Personnel Protective Equipment (PPE) ➢ Regular monitoring of stacks
Standby DG set	➢ Change in air quality ➢ Health Impacts	➢ Stack height based on CPCB formula
Chlorine	➢ Change in odor and health related contaminants ➢ Change in air quality ➢ Health impact	➢ Captive usage in CMS Plant ➢ Liquification of chlorine ➢ Two stage scrubbing system ➢ Emergency chlorine off-gas scrubber
Hydrogen Chloride	➢ Change in air quality ➢ Change in odor and health related contaminants	➢ Two stage scrubbing system ➢ Tail scrubber ➢ Graphite condensers
VOCs and low boiling chemicals	➢ Change in air quality ➢ Change in odor and health related contaminants ➢ Health impact	➢ Reflux condenser for MDC and Chloroform storage tanks ➢ Thermal insulation ➢ Pressure relief valve ➢ Breather values
Equipment leakage and transfer spills	➢ Change in odor and health related contaminants ➢ Effect on soil due to dry and wet deposition	➢ Spill management plan ➢ Propose ventilation system ➢ Regular maintenance ➢ Chlorine, HCl and Hydrogen sensors ➢ Automatic cutoff valves ➢ PPE to employees ➢ House-keeping

Activity	Impact	Mitigation measure
ETP operation	➢ Change in odor and health related contaminants ➢ Health Impact	➢ SOP implementation for operation of ETP both during regular operation and during any upsets ➢ Closed storage effluents ➢ Scheduled Periodic maintenance ➢ PPE to operators ➢ Inhouse laboratory to monitor quality ➢ Online monitoring systems

4.2.2.5 Location of Portholes and approach platform for Sampling points Guidelines

Portholes shall be provided for all chimneys, stacks, and other sources of emissions. The sampling point should be located at a distance equal to at least eight times the stack or duct diameters downstream and two diameters upstream from source of low disturbance such as a Bend, expansion, construction valve, fitting or visible flame for rectangular stacks, the equivalent diameter can be calculated form the following equation;

$$\text{Equivalent Diameter} = \frac{2\,(\text{Length} \times \text{Width})}{(\text{Length} + \text{Width})}$$

The diameter of the sampling port should not be less than 100 mm dia". Arrangements should be made so that the porthole is closed firmly during the non-sampling period. An easily accessible platform to accommodate 3 to 4 persons to conveniently monitor the stack emission from the portholes shall be provided. Arrangements for an Electric Outlet Point of 230V 15 A with suitable switch control and 3 Pin point shall be provided at the Porthole location. The ladder shall be provided with adequate safety features to approach the monitoring location with ease.

4.2.3 Water Environment

The impact on water environment of the proposed expansion project is due to abstraction of water from Tungabhadra River through infiltration wells, and generation of wastewater from process washings, floor washings, scrubbers, utilities, RO/DM rejects and domestic usage. The total water requirement increased from 15.167 MLD to 20.36 MLD. The fresh

water consumption is optimized by reusing treated wastewater to an extent of 2.32 MLD, thus reducing fresh water consumption to 18.04 MLD during operation.

The abstraction of surface water for industrial use shall have negative impact. The release of untreated effluents may change ground water quality, change in run off quality, change in ground water and surface water interaction, change in channel morphology leading to deterioration of production levels of both terrestrial and aquatic flora and fauna, resulting in higher concentrations of chemicals in food chain. The treated effluent is being reused completely for utility makeup and brine saturation, and the same practice is proposed for expansion. Hence the impact of wastewater shall be for the duration of plant operation, with negative impact due to surface water abstraction. The impacts due to various activities during the life time of the project including the emergency scenarios on water environment for both surface water and ground water is presented in **Tables 4.13** and **4.14** respectively. The impact significance is calculated using RIAM and presented in **Tables 4.15** and **4.16** respectively for both surface and ground water environment respectively.

The impact assessment indicates that the impact due to proposed expansion on surface water has negative change/ impact due to release of process related chemicals and spillage, slightly negative change /impacts on change in runoff quality, runoff peak flow, change in drainage pattern, surface water quality, surface and ground water interaction, change in channel morphology and change in erosion and sedimentation and Dry and wet deposition leading to acidity.

The impact assessment indicates that the proposed expansion on ground water will have moderately negative change/ impact due to change in ground water quality, negative change/ impacts due to change in ground water quality, flow regime and surface water interaction.

Table 4.13 Impacts on Surface Water

Impact	Change in runoff quantity	Change in runoff peak flow	Change in surface drainage pattern	Change in Surface water Quality	Change in surface and ground water interaction	Change in channel morphology	Change in erosion and sedimentation	Dry and wet deposition leading to acidity
Activity								
Construction Stage								
Leveling by way of cut and fill	√	√	√		√	√	√	
civil construction	√	√	√		√		√	
External development and Compound wall	√						√	
Operation Stage								
Regular Operation								
Raw material and finished product transport	√							
Effluent generation								
Domestic Wastewater generation								
Utility emissions								√
Process emissions								√
Solid waste transfer and storage								
Effluent transfer and Treatment								
Wastewater Transfer and Treatment								
Incidents and Accidents								
Spillage				√				
Containment failure				√				
Accidents during transport of Raw materials and products				√				
Accidents during transport of wastes				√				
Arson and Vandalism				√				
Extreme Weather phenomenon	√	√						
Plant Decommissioning								

Transfer and disposal of chemicals				√				
Transfer and disposal of wastes				√				
Decontamination of equipment and containers				√				
Dismantling of facility								
Demolition Waste							√	
Site cleanup							√	
Capping drains and locking water sources	√	√						

√ ***Indicates Impact***

Table 4.14 Impacts on Ground Water

Impact	**Change in ground water quantity**	**Change to ground water quality**	**Change in ground water flow regime**	**Change in ground water and surface water interaction**
Activity				
Construction Stage				
Foundation excavation	√	√	√	√
Operation Stage				
Regular Operation				
Water use				
Operation Stage				
Incidents and Accidents				
Spillage		√		
Containment failure		√		
Accidents during transport of Raw materials and products		√		
Accidents during transport of wastes		√		
Extreme Weather phenomenon	√		√	
Plant Decommissioning				
Capping drains and locking water sources	√	√		

√ ***Indicates Impact***

Table 4.15 Impacts Significance - Surface Water

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Change in runoff quantity	1	-1	3	2	2	-1	7	-7	-A
Change in runoff peak flow	1	-1	3	2	2	-1	7	-7	-A
Change in surface drainage pattern	1	1	3	3	2	1	8	8	+A
Change in Surface water Quality	1	-1	2	2	2	-1	6	-6	-A
Change in surface and ground water interaction	1	-1	3	3	2	-1	8	-8	-A
Change in channel morphology	1	1	3	2	2	1	7	7	+A
Change in erosion and sedimentation	1	-1	3	2	2	-1	7	-7	-A
Release of process related chemicals and spills	2	-2	3	2	2	-4	7	-28	-C
Dry and wet deposition leading to acidity	2	-1	2	2	2	-2	6	-12	-B

Table 4.16 Impacts Significance - Ground Water

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Change in ground water quantity	1	-2	3	2	3	-2	8	-16	-C
Change to ground water quality	1	-1	2	2	2	-1	6	-6	-B
Change in ground water flow regime	1	-1	2	2	2	-1	6	-6	-B
Change in ground water and surface water interaction	2	-1	2	2	2	-2	6	-12	-B

4.2.3.1 Mitigation Measures

Effluent generation source from proposed expansion is from process, floor washings, blow downs from boiler and cooling tower and domestic effluents. Effluents from process, washings, utility blow downs and domestic wastewater of Chlor-Alkali, Oil and fatty acid division and co-generation power plant will be sent to the effluent recycling plant and low TDS water reused as process water. Effluent from

chloromethanes and proposed chlorodifluoromethanes are sent to effluent recycling plant followed by RO. RO permeate reused for process and rejects recycled for brine saturation of Chlor-alkali plant. The total effluent generation after expansion is 2329.3 KLD of which 2323.5 KLD (99.75%) is treated and reused. The domestic wastewater is treated in biological treatment systems and the treated wastewater is reused for greenbelt development. The mitigation and control measures proposed for adoption during operation phase is presented in **Table 4.17.**

Table 4.17 Mitigation Measures for Water Environment

Activity	Impact	Mitigation measure
CONSTRUCTION PHASE		
Development of Infrastructure for expansion	➢ Change in ground water and surface water interaction	➢ Provision of storm water drains in the first stage of construction. ➢ Rain water harvesting ➢ Place storage areas for fuels and lubricants away from any drainage leading to water bodies ➢ Dispose any wastes generated by construction activities in designated sites
Temporary sheds for construction labor	➢ Change in ground water quality due to sewage disposal ➢ Change in ground water and surface water interaction	➢ Supply of domestic water for drinking and sanitary purpose ➢ Provision of mobile STP ➢ Provision of sanitation facilities – separate toilets and bathrooms for men and women.
OPERATION PHASE		
Process washings, floor washings, scrubbers, utility blow downs and DM/RO rejects	➢ Change in ground water quality ➢ Soil contamination ➢ Health Impacts	➢ Effluent treatment followed by complete reuse of treated wastewater for utility make-up and brine saturation.
Domestic wastewater		➢ Treatment in ETP and reused for greenbelt development

4.2.3.2 Storm Water Management *(Terms of Reference No. 7(x))*

The storm water from open areas, and green belt area, and the overflow of the roof water storage sump shall be collected in a storm water storage tank in northern part of the site and reused for plant and process. The storage pond shall have a capacity of 2800 m^3. Existing storm water storage pond is presented in **Fig 4.12**.



Fig. 4.12 Storm Water Storage Pond

4.2.4 Noise Environment

The project activities that have an impact on noise environment are turbines, operation of motors, pumps, compressors, DG sets resulting in direct impact of increasing ambient noise levels both within the plant area and outside. Excessive noise will trigger health risks such as headaches, depression, deafness and retardation of sensory mechanisms in the impact area population. The incremental noise levels due to these activities were predicted and the values reflect low impact outside the premises. The increase in noise levels shall have low impact, restricted to within site area due to its low magnitude and occasional frequency. The incremental noise levels however shall have direct negative impact on the noise levels, with low significance due to mitigation measures and also due to absence of sensitive receptors within 0.5 km of the sources. The impact significance is calculated using RIAM. The impacts due to various activities during the life time of the project including the emergency scenarios on noise levels is presented in **Table 4.18**. The impact significance on noise levels is presented in **Table 4.19.**

The impact assessment indicates that the proposed expansion will have negative change/impact due to change in ambient noise levels and change in behavior due to

noise, whereas slightly negative change/ impacts are anticipated due to effects on sensitive receptors leading to gradual impairment.

Table 4.18 Impacts on Noise Level

Impact	Noise and vibration	Change in ambient noise levels	Change in behavior due to noise	Effects on sensitive receptors leading to gradual impairment
Activity				
Construction Stage				
Clearing and Grubbing	√	√		
Leveling by way of cut and fill	√	√		
Foundation excavation	√	√		
civil construction	√	√		
Equipment & machinery erection	√	√		
Electrical installation	√	√		
plumbing and piping	√	√		
Operation Stage				
Regular Operation				
Raw material and finished product transport	√			
Transfer of raw materials/ products	√			
Co-generation plant operation	√	√	√	√
Emissions control	√	√		
Machine & Equipment operation		√	√	√
Incidents and Accidents				
Equipment Failures	√	√		
Fire accidents	√	√		
Extreme Weather phenomenon	√	√		
Plant Decommissioning				
Dismantling of facility	√	√		
Site Cleanup		√		

√ *Indicates Impact*

Table 4.19 Impacts Significance – Noise Environment

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Change in ambient noise levels	1	-1	3	2	3	-1	8	-8	-A
Change in behavior due to noise	1	-1	3	2	2	-1	7	-7	-A
Effects on sensitive receptors leading to gradual impairment	0	0	1	1	1	0	3	0	N
Change in ambient noise levels	1	-1	3	2	3	-1	8	-8	-A

4.2.4.1 Prediction of Impact on Noise Quality

The sound pressure level generated by noise source decreases with increasing distance from the source due to wave divergence. An additional decrease in sound pressure levels also occurs with increasing distance from the source due to atmospheric effect or interaction with the objects in the transmission path. This is due to excess attenuation. The sound pressure level is also affected by medium of travel and environmental conditions. The propagation model has been devised to take into account these factors and predict the noise levels at various distances round a single or a multiple source. The model uses the following formula as a basis for such predictions.

$(L_{ob}) = (L_r) - (L_{div}) - (L_{atm})$

Where (L_{ob}) = Observed noise level at a distance R from source

(L_r) = Noise level of source measured at reference distance r

(L_{div}) = Loss due to divergence at distance R from source

$= 20 \log (R/r)$

(L_{atm}) = Attenuation due to atmosphere at distance R from the source.

$= a \times R/100$, where a is atmospheric attenuation coefficient in dB (A)/100m.

For hemispherical wave divergence in a homogenous loss free atmosphere $(L_{atm}) = 0$.

The total impact of all sources at particular place is then estimated by adding as the contribution of noise from each of the following sources as follows;

$$(L_{eq}) = 10 \log \Sigma_{i=1}^{i=n} \{10^{(L_{ob})^i/10}\}$$

Where n = total number of sources

The calculated noise levels are further super imposed (logarithmically) on the background noise levels. The model assumes that the noise spectrum is mainly centered on a spectrum of 1000 Hz and attenuation due to building materials is also at the same frequency. DhwaniPro is a computer program developed to undertake construction, industrial and traffic noise propagation modeling for which an environmental noise assessment may be required. A variety of scenarios can be created quickly in DhwaniPro, allowing the user to determine the impact of changing the source, layout and adding/ removing the effects of shielding due to noise mitigation devices such as barriers

The major sources of noise generation and noise levels, considered for modelling is presented in **Table 4.20**. The predicted cumulative noise levels due to the source and the existing level as calculated from the logarithmic model without noise attenuation ranged between 66 to 104 dB(A). The maximum noise level falls within the plant boundary. The impact of noise on the population in the surrounding area will be negligible, as the nearest habitation is at least 0.35 km away from the site. Isopleth showing noise propagation is presented at **Fig 4.12.** Noise levels mitigation measures during construction and operation stage are presented in **Table 4.21.**

Table 4.20 Sources of Noise Generation (Tentative)

Source of Noise	Leq dB(A)
Construction Phase	
Front end loader	72-84
Dump truck	83-94
Jack Hammer	81-98
Crane	75-77
Welding generator	71-82
Concrete Mixer	74-88
Concrete Pump	81-84
Concrete Vibrator	76
Air Compressor	74-87
Truck	83-94
Tamper	74-77
Paver	86-88

Source of Noise	Leq dB(A)
Operation Phase	
Turbines	96-101
Boilers	87-92
Chillers	90-103
Compressors	40-92
Cooling Towers	50-60
Motors	26-48
Pumps	80-85
Engines	70-95
Blowers	70-120
DG sets	85-90
Nitrogen Plant	55-60
Instrument Air Plant	85-95



Fig 4.12 Isopleth showing Noise Propagation

Table 4.21 Noise Levels Mitigation Measures

Activity	Impact	Mitigation measure
Construction Phase		
Transport vehicles	➢ Increase in Noise levels	➢ Avoidance of engine idling. ➢ Transport during day time. ➢ Periodic maintenance.
Construction equipment: drills, Pneumatic equipment, excavators, dumpers etc.	➢ Increase in noise levels, and vibration	➢ Periodic maintenance. ➢ Enclosed operator room. ➢ Attenuating screens between operators and sources. ➢ Periodic maintenance. ➢ Barriers, guard covers, isolation of equipment, anti-vibration pads. ➢ Training to operators and drivers. ➢ PPE to operators.
Material Transfer	➢ Increase noise levels	➢ Reduced drop height. ➢ Rubber padding at discharge point and at the impact point, avoidance of metal bunkers.
Other construction works	➢ Impact on workers' health due to noise levels	➢ Training to workers. ➢ PPE.
Operation Phase		
Transport vehicles	➢ Increased noise levels on site.	➢ Periodic maintenance. ➢ Training to drivers. ➢ Avoidance of idling engines.
Turbine,	➢ Increased noise levels. ➢ Impact on employee health. ➢ Vibration.	➢ Acoustic insulation of operational control rooms. ➢ Vibration monitoring. ➢ Periodic maintenance. ➢ PPE to employees. ➢ Hearing conservation program
DG sets	➢ Increased noise levels. ➢ Impact on employee health. ➢ Vibration	➢ Acoustic enclosures ➢ PPE to employees
Pumps and Motors	➢ Increased noise levels. ➢ Impact on employee health. ➢ Vibration	➢ PPE to employees ➢ Proper lubrication ➢ Modernization of equipment

4.2.5 Land Environment

There will not be any change in land use, the proposed expansion is within existing site area of 152.4 ha. The proposed expansion plan involves construction of utilities, treatment systems and storages. There is no major alteration of terrain, however it may lead to additional sealing of land due to foot print of the structures. The proposed expansion shall also result in increased generation of solid waste, mainly brine sludge and solid waste from treatment facilities and control measures which will be sent to in-house secured land

fill. Handling of hazardous waste has a potential to contaminate soil, ground water, land capability and permeability of soil. The impact on land environment is mainly due to accidental spillages of chemicals, effluents and wastes. The impact significance is calculated using RIAM. The impacts due to various activities during the life time of the project including the emergency scenarios on land environment is presented in **Table 4.22**. The impact significance on land environment is presented in **Table 4.23.**

The impact assessment indicates that the proposed expansion on soil will have moderately negative change/ impacts due to soil bio diversity and ecological integrity: C/N ratio, negative change/ impacts due to accidental release of chemicals leading to degradation of soil quality, soil compaction, and change in acid buffering function due to wet and dry deposition: CEC and base saturation, whereas slightly negative change/ impacts due to change in erosion, land capability, ground sealing, permeability, loss of emission protection and loss of nutrients due to land use operations. Mitigation measures during construction and operation stage are presented in **Table 4.24.**

Table 4.22 Impacts on Land Environment

Impact	Soil profile disturbance	Erosion	Accidental releases leading to degradation of soil quality	Soil bio diversity and ecological integrity: C/N ratio	Alteration of terrain	Land capability effects	Soil compaction	Ground sealing: change in water balance	Change in filter function: permeability	Change in acid buffering function due to wet and dry deposition: CEC and base saturation	Loss of emission protection
Activity											
Factors											
Construction Stage											
Levelling by way of cut and fill	√	√		√	√		√	√	√		√
Foundation excavation	√	√			√				√		√
Civil Construction								√			
Utility emissions										√	
Process emissions										√	
Diffuse emissions										√	
Operation Stage											
Incidents and Accidents											
Spillage	√		√	√		√					
Fugitive emissions	√			√		√					
Containment failure	√			√		√					
Accidents during transport of Raw materials and products	√			√		√					
Accidents during transport of wastes	√			√							

Arson and Vandalism				√							
Extreme Weather Phenomena		√									
Plant Decommissioning											
Transfer and disposal of chemicals			√	√							
Transfer and disposal of wastes			√	√							
Decontamination of equipment and containers			√	√							
Site cleanup	√	√					√				
Capping drains and locking water sources		√									

√ ***Indicates Impact***

Table 4.23 Impacts Significance – Land Environment

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Soil profile disturbance	1	-2	3	2	2	-2	7	-14	-B
Erosion	1	-1	2	2	2	-1	6	-6	-A
Accidental releases leading to degradation of soil quality	2	-1	2	2	2	-2	6	-12	-B
Soil bio diversity and ecological integrity: C/N ratio	2	-2	2	2	2	-4	6	-24	-C
Alteration of terrain	1	-2	3	3	2	-2	8	-16	-B
Land capability effects	1	-1	2	2	2	-1	6	-6	-A
Soil compaction	1	-2	2	2	2	-2	6	-12	-B
Ground sealing: change in water balance	1	-1	3	3	2	-1	8	-8	-A
Change in filter function: permeability	1	-1	3	3	2	-1	8	-8	-A
Change in acid buffering function due to wet and dry deposition: CEC and base saturation	2	-1	2	2	2	-2	6	-12	-B
Loss of emission protection	1	-1	2	2	2	-1	6	-6	-A
Loss of nutrients due to land use operations	1	-1	2	2	2	-1	6	-6	-A

Table 4.24 Impacts and Mitigation Measures – Land Environment

Activity	Impact	Mitigation measure
Construction Phase		
Infrastructure development	➢ Soil profile disturbance ➢ Accidental release of oils, paints etc. leading to degradation of soil quality ➢ Erosion ➢ Ground water sealing; change in water balance	➢ confined within the site premises. ➢ Segregation at source and disposal to Municipal Solid waste facilities ➢ Provision of storm water drains in the first stage of construction.
Construction & Demolition waste	➢ Soil quality degradation	➢ Segregation followed by reuse or disposal to recyclers
Plastic Waste - containers and liners	➢ Soil quality degradation ➢ Clogging of drains	➢ Disposal to recyclers ➢ Pre monsoon maintenance of all drains
Waste Oils	➢ Soil quality degradation	➢ Stored in labeled containers ➢ Sold to authorized recyclers
Municipal Solid waste	➢ Soil contamination	➢ Recyclables are sent to recyclers, inerts are used for filling low lying areas.

Activity	Impact	Mitigation measure
	➢ Change in odor and health related containments	➢ Do not burn construction / domestic waste
Metal Scrap	➢ Soil quality degradation	➢ Sale to outside agencies/ recyclers
Used PPE	➢ Soil quality degradation	➢ Disposal to TSDF at Nellore
Operation Phase		
Storage of raw materials, coal storage	➢ Spillages of RM during loading leading to soil contamination and ground water contamination ➢ Change in air quality ➢ Health impact	➢ Dedicated closed shed with concrete flooring for styrene storage and dedicated warehouse for raw materials storage. ➢ Dedicated entry of vehicle to CMS and Chlor-alkali tank farm ➢ Covered shed for coal storage
ETP sludge	➢ Soil contamination ➢ Change in odor and health related containments	➢ Designated covered storage ➢ Garland drains to storage facility ➢ Disposal to In-house secured landfill ➢ Personal Protective Equipment (PPE)
Coal Ash	➢ Change in air quality ➢ Health impact	➢ Disposal to brick/cement manufacturers
Plastic Waste - containers and liners	➢ Soil quality degradation ➢ Clogging of drains	➢ Disposal to recyclers ➢ Pre monsoon maintenance of all drains
Waste Oils	➢ Soil quality degradation	➢ Stored in labeled containers ➢ Sold to authorized recyclers
Biomedical waste	➢ Change in odor and health related containments	➢ Sent to common biomedical waste treatment facility (CBMWTF)
Metal Scrap	➢ Soil quality degradation	➢ Sale to outside agencies/ recyclers
Used PPE	➢ Soil quality degradation	➢ Disposal to TSDF at Nellore

4.2.6 Biological Environment

The ecological factors that are considered most significant as far as the impact on flora and fauna concerned are:

1. Whether there shall be any reduction in species diversity?
2. Whether there shall be any habitat loss or fragmentation?
3. Whether there shall be any additional risk or threat to the rare or endangered or endemic or threatened (REET) species?
4. Whether there shall be any impairment of ecological functions such as
   (i) disruption of food chains,
   (ii) decline in species population and or
   (iii) Alterations in predator-prey relationships?
5. Whether it is possible to attain the global objectives of 'no net loss' of biodiversity?
6. Whether it is possible to improve the biological diversity through the proposed activity?

There is no direct threat to any rare or endangered or threatened biological species as indicated by the baseline data, due to the proposed expansion is within the existing site area. The project is not going to cause any fragmentation of habitat or disruption of food cycles or destruction of breeding grounds or blockade of migratory routes. The major impacts of the project are mainly during construction and subsequently on account of atmospheric pollution. The industry is required to limit its emissions as per the NAAQ of 2009. It has to strictly adhere to the conditions stipulated by the regulatory bodies. The project authorities are going to take all steps and measures in order to strictly comply with National Ambient Air Quality Standards of 2009. The project may not have impacts on terrestrial flora and fauna. Further, as there are no rare or endangered or threatened (RET) species within the impact area, the project does not pose any direct threat to the survival of any rare species. Hence, the proposed project activity is unlikely to pose any additional threat to REET species in the impact area. It may be concluded that the impacts are indirect, and positive due to development of green belt, and of low significance. The impacts due to various activities during the life time of the project including the emergency scenarios on flora and fauna are presented in **Tables 4.25** and **4.26** respectively. The impact significance on Flora and Fauna are presented in **Tables 4.27** and **4.28** respectively. Action plan for proposed enhancement of greenbelt is presented in **Table 4.29.** Mitigation measures during construction and operation stage are presented in **Table 4.30.**

Table 4.25 Impacts on Flora

Impact	Terrestrial vegetation reduction	Removal of traditionally used plants	Reduction in species and community diversity	Reduction in landscape diversity	Potential acid input and N2 deposition	Fragmentation of habitat
Activity						
Clearing and Grubbing	√	√	√	√		√
Operation Stage						
Regular Operation						
Utility emissions					√	
Diffuse emissions					√	
Emissions control					√	
Operation Stage						
Incidents and Accidents						
Spillage					√	
Fugitive emissions					√	
Containment failure					√	
Accidents during transport of Raw materials and products					√	
Accidents during transport of wastes					√	
Arson and Vandalism					√	
Extreme Weather phenomenon	√	√	√			
Plant Decommissioning						
Transfer and disposal of chemicals					√	
Transfer and disposal of wastes					√	
Decontamination of equipment and containers					√	

√ ***Indicates Impact***

Table 4.26 Impacts on Fauna

Impact	Habitat availability- loss or alteration	Habitat fragmentation	Reduced habitat connectivity	Increased mortality risk	Reduced abundance/ diversity
Activity					
Construction Stage					
Clearing and Grubbing	√	√	√	√	√
Levelling by way of cut and fill	√	√	√	√	√
Operation Stage					
Regular Operation					
Utility emissions				√	
Diffuse emissions				√	
Emissions control				√	
Operation Stage					
Incidents and Accidents					
Spillage				√	
Fugitive emissions				√	
Containment failure				√	
Accidents during transport of Raw materials and products				√	
Accidents during transport of wastes				√	
Arson and Vandalism				√	
Extreme Weather phenomenon	√				
Plant Decommissioning					
Transfer and disposal of chemicals				√	
Transfer and disposal of wastes				√	
Decontamination of equipment and containers				√	

√ ***Indicates Impact***

Table 4.27 Impacts Significance – Flora

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Terrestrial vegetation reduction	1	-2	2	3	2	-2	7	-14	-B
Removal of traditionally used plants	1	-1	2	2	2	-1	6	-6	-A
Reduction in species and community diversity	1	-1	2	2	2	-1	6	-6	-A
Reduction in landscape diversity	1	-1	2	2	2	-1	6	-6	-A
Potential acid input and N2 deposition	2	-1	2	2	2	-2	6	-12	-B
Fragmentation of habitat	2	-1	3	3	3	-2	9	-18	-B
Terrestrial vegetation reduction	1	-2	2	3	2	-2	7	-14	-B

Table 4.28 Impacts Significance – Fauna

Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Habitat availability - loss or alteration	2	-1	2	2	2	-2	6	-12	-B
Habitat fragmentation	2	-1	2	3	2	-2	7	-14	-B
Reduced habitat connectivity	2	-1	3	3	2	-2	8	-16	-B
Increased mortality risk	2	-1	3	2	2	-2	7	-14	-B
Reduced abundance/diversity	2	-1	2	2	2	-2	6	-12	-B

The impact assessment indicates that the proposed expansion on flora will have slightly negative change/impacts on removal of traditionally used plants, reduction in species and community diversity and landscape diversity, whereas negative change/ impacts due to terrestrial vegetation reduction, potential acid input and N2 deposition and fragmentation of habitat. The impact assessment indicates that the proposed project on fauna will have negative change/ impacts due to loss or alteration of habitat availability, fragmentation of habitat, and reduced habitat connectivity, increased morality risk and reduce abundance/ diversity. Greenbelt is developed in an area of 89.03 ha (58.42%) of

site area with 2,53,575 samplings covering the boundary of the site as part of environment management plan and proposed to increase density to enhance environmental quality through mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, prevention of soil erosion, and creation of aesthetic environment. It has a full-fledged Environment monitoring management cell. Existing greenbelt photographs are presented in **Fig 4.13**

Table 4.29 Action Plan for Proposed Enhancement of Greenbelt

S.No	Year	No. of saplings to be planted	Budget (Rs)
1	2024-25	6425	19, 27,500
Total		**6425**	**19,27,500**

Table 4.30 Impacts and Mitigation Measures - Biological Environment

Activity	Impact	Mitigation measure
Construction Phase	➢ Habitat loss ➢ Habitat fragmentation	➢ Optimizing foot print ➢ Plantation before starting construction work. ➢ Development of greenbelt. ➢ Replantation of trees
Operation Phase	➢ Reduction in species and community diversity	➢ Plantation of native species, preferably similar species that are getting removed ➢ Avoidance of monoculture plantation. ➢ Storage of top layer of soil and reuse.



Fig 4.13 TGV SRAAC Limited – Existing Greenbelt

4.2.7 Socio-economic Environment

The proposed expansion envisages employment to 140 people, with monthly salary outlay of Rs. 30 lakhs which will have a direct positive impact. The proximity of the site to Kurnool is 0.8 km, which has adequate infrastructure with respect to housing, education, transport, health and civic amenities, and hence the additional influx of 140 people may have low impact on infrastructure availability. The impact on health was assessed by air quality impact predictions and was observed to be within prescribed NAAQ standards. There will be medium significant, direct negative impact due to community expectations and public safety concern as the unit handles, and produces hazardous chemicals. The proposed corporate environment responsibility (CER) activities from the company shall also enhance the public approval for the proposed expansion and ensure improvement in infrastructure in the surrounding villages. The overall impact due to this expansion shall be positive, both direct and indirect with high significance. The impacts due to various activities during the life time of the project including the emergency scenarios on Socio-economic environment is presented in **Table 4.31**. The impact significance calculated using RIAM method on socio-economic environment is presented in **Table 4.32**. Mitigation measures are presented in **Table 4.33.**

The proposed project shall have moderately negative impact on traffic, health concern, public safety concern, while negative impact on traditional use impact, impact on health, common water resource both ground and surface water, slightly negative change/ impacts on migration: in and out. Positive impacts were observed due to change/ impacts on employment, housing, change in quality of life, business opportunity for locals in associated activities, whereas moderately positive change/ impacts on social infrastructure, community expectations, gender equity, positive change/ impacts on municipal / local body infrastructure.

Table 4.31 Impacts on Socio Economic

Impact	Employment	Migration: in and out	Housing impact	Social infrastructure	Municipal/ Local Body Infrastructure	Traffic Impact	Traditional use impact	Impact on health	Impact on common water resource both ground and surface water	Change in quality of life	Community expectations	Gender equity	Business opportunity	Health concern	Public safety concern
Activity															
Construction Stage											√	√	√		
Clearing and Grubbing	√						√								
Levelling by way of cut and fill	√														
Foundation excavation	√														
civil construction	√														
Equipment and machinery erection	√	√													
Electrical installation	√	√													
plumbing and piping	√	√													
painting works	√														
Operation Stage															
Regular Operation	√	√	√	√	√					√	√	√			
Raw material and finished product transport	√					√							√		
Water use									√						
Utility emissions								√							
Diffuse emissions								√							

Waste transport	√					√							√		
Operation Stage											√				
Incidents and Accidents															
Spillage								√						√	√
Fugitive emissions								√						√	√
Equipment Failures														√	√
Batch failures															
Containment failure								√							√
Fire accidents															√
Accidents during transport of Raw materials and products								√						√	
Accidents during transport of wastes								√						√	
Plant Decommissioning		√	√							√	1				
Inventory preparation	√														
Transfer and disposal of chemicals	√														
Transfer and disposal of wastes	√														
Decontamination of equipment and containers	√														
Disposal of Equipment	√														

Dismantling of facility	√														
Demolition Waste	√					√									
Site cleanup	√														
Capping drains and locking water sources	√														

√ ***Indicates Impact***

Table 4.32 Impact Significance – Socio Economic

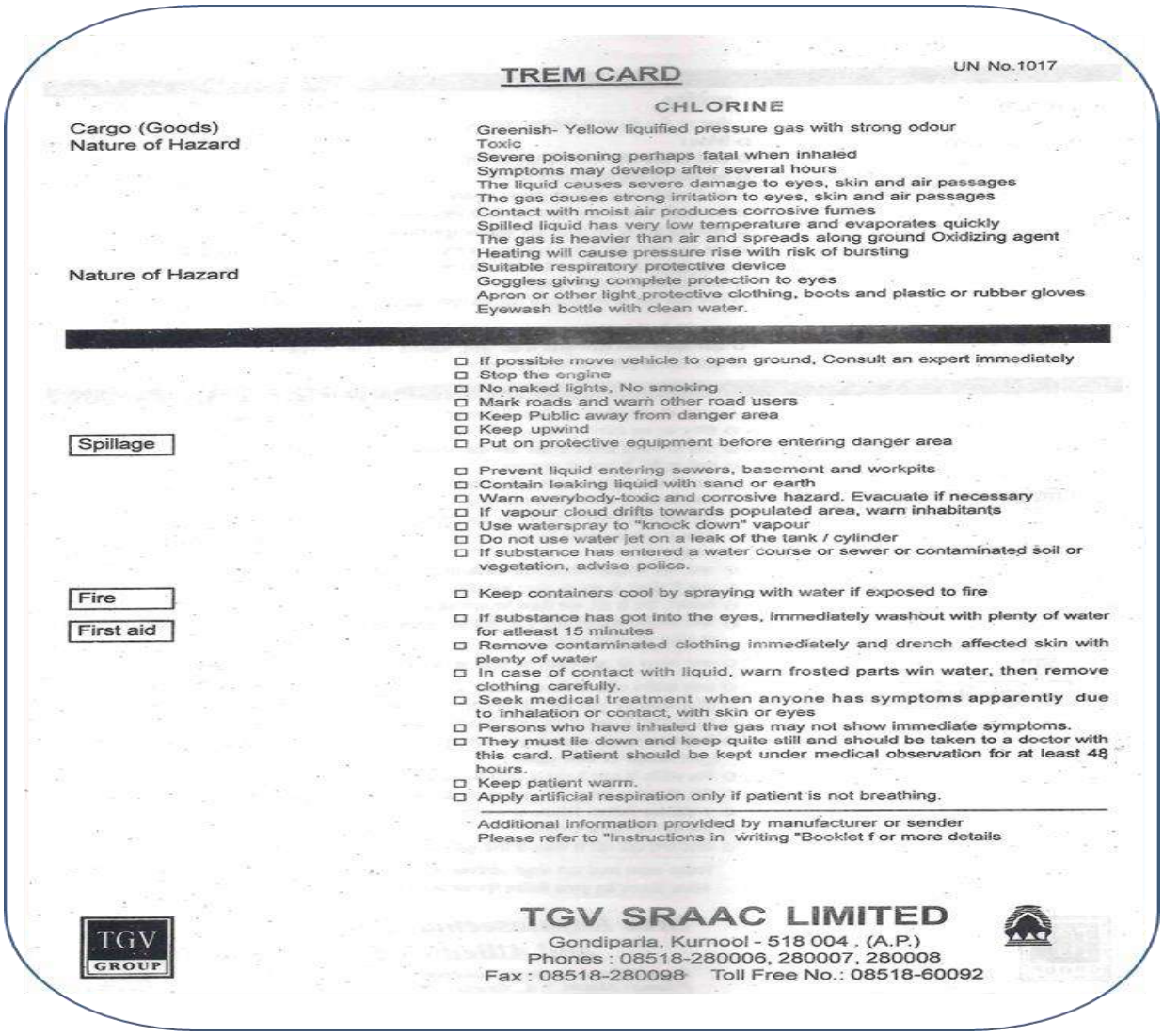
Impact	Importance of condition (A1)	Magnitude of change/effect (A2)	Permanence (B1)	Reversibility (B2)	Cumulative (B3)	(a1) x (a2) = aT	(b1) + (b2) + (b3) = bT	(aT) x (bT) = ES	Significance
Employment	3	2	3	3	3	6	9	54	+D
Migration: in and out	1	-1	3	3	3	-1	9	-9	-A
Housing impact	2	2	3	3	3	4	9	36	+D
Social infrastructure	2	2	2	3	3	4	8	32	+C
Municipal/Local Body Infrastructure	2	1	2	3	3	2	8	16	+B
Traffic Impact	2	-2	2	3	3	-4	8	-32	-C
Traditional use impact	1	-2	3	2	2	-2	7	-14	-B
Impact on health	2	-1	3	2	3	-2	8	-16	-B
Impact on common water resource both ground and surface water	2	-1	3	2	3	-2	8	-16	-B
Change in quality of life	2	2	3	3	3	4	9	36	+D
Community expectations	2	2	2	3	2	4	7	28	+C
Gender equity	2	2	2	3	2	4	7	28	+C
Business opportunity	2	2	3	3	3	4	9	36	+D
Health concern	2	-2	2	3	3	-4	8	-32	-C
Public safety concern	2	-2	2	3	3	-4	8	-32	-C

4.2.7.1 Health Impacts and Mitigation

The major source of air pollution due to proposed expansion is multiple combustion equipment like boilers and DG sets in addition to process activities, and the air quality impact prediction found significant increase in ambient air quality. The cumulative concentrations were observed to be within the prescribed limits. However, it is proposed to conduct health camps in habitations, to observe any change in health status and disease burden. It is proposed to increase the density of greenery in the surrounding areas and also on site, which will act as a secondary mitigation measure by absorbing gases and particulates. Occupational health center with regular doctor provided on site, and all the employees will undergo periodic medical checkup. The construction labor camps are allowed to use onsite OHS center, in addition to provision of creche, first aid facilities as required under factory act. All employees shall be provided with appropriate personal protective equipment in addition to training as required.

Table 4.33 Impacts and Mitigation Measures – Scio-Economic Environment

Impact	Mitigation measure
➢ Traffic	➢ Provision of dedicated parking facility ➢ TREM cards to vehicle drivers ➢ Regular training program for drivers ➢ Avoidance of truck movement during shift changes ➢ Avoidance of truck loading and movement during peak hours. ➢ Temporary sheds for driver
➢ Impact on health	➢ Implementation of pollution control measures ➢ Conducting regular health camps in surrounding villages ➢ Inhouse occupation health centre
➢ Traditional impact	➢ Implementation of corporate environmental responsibility (CER) activities
➢ Infrastructure of village	➢ Avenue plantation ➢ Development of greenery in surrounding villages as part of CSR



TREM CARD

UN No.1017

CHLORINE

Cargo (Goods)
Nature of Hazard

Greenish- Yellow liquified pressure gas with strong odour
Toxic
Severe poisoning perhaps fatal when inhaled
Symptoms may develop after several hours
The liquid causes severe damage to eyes, skin and air passages
The gas causes strong irritation to eyes, skin and air passages
Contact with moist air produces corrosive fumes
Spilled liquid has very low temperature and evaporates quickly
The gas is heavier than air and spreads along ground Oxidizing agent
Heating will cause pressure rise with risk of bursting

Nature of Hazard

Suitable respiratory protective device
Goggles giving complete protection to eyes
Apron or other light protective clothing, boots and plastic or rubber gloves
Eyewash bottle with clean water.

Spillage

- If possible move vehicle to open ground, Consult an expert immediately
- Stop the engine
- No naked lights, No smoking
- Mark roads and warn other road users
- Keep Public away from danger area
- Keep upwind
- Put on protective equipment before entering danger area
- Prevent liquid entering sewers, basement and workpits
- Contain leaking liquid with sand or earth
- Warn everybody-toxic and corrosive hazard. Evacuate if necessary
- If vapour cloud drifts towards populated area, warn inhabitants
- Use waterspray to "knock down" vapour
- Do not use water jet on a leak of the tank / cylinder
- If substance has entered a water course or sewer or contaminated soil or vegetation, advise police.

Fire

- Keep containers cool by spraying with water if exposed to fire

First aid

- If substance has got into the eyes, immediately washout with plenty of water for atleast 15 minutes
- Remove contaminated clothing immediately and drench affected skin with plenty of water
- In case of contact with liquid, warn frosted parts win water, then remove clothing carefully.
- Seek medical treatment when anyone has symptoms apparently due to inhalation or contact, with skin or eyes
- Persons who have inhaled the gas may not show immediate symptoms.
- They must lie down and keep quite still and should be taken to a doctor with this card. Patient should be kept under medical observation for at least 48 hours.
- Keep patient warm.
- Apply artificial respiration only if patient is not breathing.

Additional information provided by manufacturer or sender
Please refer to "Instructions in writing "Booklet f or more details

TGV SRAAC LIMITED
Gondiparla, Kurnool - 518 004 , (A.P.)
Phones : 08518-280006, 280007, 280008
Fax : 08518-280098 Toll Free No.: 08518-60092

TGV SRAAC Limited Driver Term Card



Existing Occupational Health Centre

4.2.8 Corporate Environment Responsibility *(Terms of Reference No. 11)*

The proposed expansion provides an opportunity for the local people to get employment directly or indirectly and helps in the up-liftment of the socioeconomic status of the area. M/s. TGV SRAAC Limited propose to involve in social activities of the stakeholders/surrounding community by planning the betterment of neighboring social conditions through awareness and welfare programs will ensure an improved relation, useful in the long run. Many of the beneficiaries of such programs shall include own employees as well. The goodwill of the local populace can never be ignored. Another

important facet of social environment identified by the project management is a green appearance, hence the management will develop a green belt towards aesthetic beautification as the same is necessary to be considered as a responsible, social neighbor. The budget allocated for funding corporate social responsibility activity is presented in **Table 4.34.**

Table 4.34 Tentative Budget (2023-24 to 2026-27)

S. No	Name of Village	Activity			Total Rs. Lakhs
		Construction/Upgradation/ Repairs of roads in villages	Portable RO Plant	Roadside Plantation.	
		Cost (in Rs. Lakhs)			
1	E - Tandrapadu	40	10	10	60
2	Gondiparla	40	10	10	60
3	Panchalingala	90	---	10	100
	Total	**170**	**20**	**30**	**220**

4.2.9 Prediction of Impact on Vehicular Traffic

As the plant is located adjacent to the national highway there will not be any unauthorized shop or settlements along the road connecting the plant site. The traffic density of the connecting road is low mainly consisting of local transport, commercial and passenger vehicle traffic. There will be 35-42 truck trips per day to the factory due to proposed project. The traffic study for the both the units of the connecting road revealed that the peak traffic volume in PCU is 520 during 8 to 9AM and the level of service of the connecting road remains B, after proposed project also. Modified level of service for connecting roads considering the truck trips for proposed project is presented in **Table 4.35.**

Table 4.35 Modified level of services for connecting roads

Road	Existing volume, PCU/hr	Existing volume/ Capacity	Additional volume PCU/hr	Modified Volume PCU/hr	Modified volume/ Capacity	Modified Los & performance
Godiparla village – NH -7	520	0.29	49	569	0.32	B (Very Good)

4.2.9.1 Mitigation Measures

Dedicated parking facility is provided in an area of 1.63 acres to ensure smooth internal circulation. The parking facility is provided with basic amenities for vehicle drivers,

including rest rooms, toilets, dining room etc. Sanitation, fuel, restroom etc. are provided to the labour force during construction as well as to the workers during operation phase. Vehicles will not be allowed to wash onsite. Traffic signage including road safety mirrors are in place along the roads. Speed shall be restricted to 30 km/hour within the site and shall be strictly implemented to ensure safety of men, material and property.

4.3 Limitation and Uncertainty

The paradigm of post normal science assumes that science is neither value free nor certain in contrast to normal science, and it is imperative to consider uncertainty due to ambiguity and ignorance in the science of impact assessment. It may be noted that cause and effect relation cannot be sufficiently established, as current understanding of natural systems is insufficiently clear to account for all the potential variation. Prediction and assessment are conducted on the basis of known assumed causal relationships only, and the chance of unknown cumulative and or causal relationships may change the impacts and their significance. Hence the uncertainty due to ambiguity and ignorance of causal relations warrants adaptive management.

Therefore, it is suggested to incorporate resilience in impact assessment and the consequent environment management. Accordingly, TGV SRAAC Limited shall endeavor to update the impact assessment considering any additional knowledge or information indicating potential adverse impacts and shall incorporate adaptive management.

5.0 ANALYSIS OF ALTERNATIVES

The proposal is for expansion of chlor-alkali, synthetic organic chemicals (chloromethanes) expansion in existing site area at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh. Analysis of alternatives was undertaken to assess process, technology, and treatment options to identify the optimum options. The siting is not assessed in this case as it is an expansion project. The objective of this assessment is to identify best available technology not entailing excessive costs, and to reduce pollution loads by optimizing both raw material and resource consumption.

5.1 Alternative Sites

The proposal is for expansion of chlor-alkali, synthetic organic chemicals (chloromethanes) expansion in existing site area spread over an area of 152.4 ha. The land area available for expansion is sufficient and hence there is no requirement of alternative site or additional site area.

5.2 Alternatives in Process

a. Chlor-Alkali Process

In 1800, Cruickshank was the first to prepare chlorine electrochemically. The process was, however, of little significance until the development of a suitable generator and of synthetic graphite for anodes in 1892. These two developments made possible the electrolytic production of chlorine, the Chlor-alkali process, on an industrial scale. About the same time, both the diaphragm cell process (Griesheim cell, 1885) and the mercury cell process (Castner-Kellner cell, 1892) were introduced. The membrane cell process was developed much more recently in1970. The main three technologies applied for chlor-alkali production are the diaphragm cell process (Griesheim cell, 1885), the mercury cell process (Castner–Kellner cell, 1892), and the membrane cell process (1970)., mainly using sodium chloride as feed or to a lesser extent using potassium chloride for the production of potassium hydroxide.

Each process represents a different method of keeping chlorine produced at the anode separate from the caustic soda and hydrogen produced, directly or indirectly, at the cathode. The basic principle in the electrolysis of a sodium chloride solution is the following: - At the anode, chloride ions are oxidised and chlorine (Cl2) is formed. - At the cathode: In the mercury process a sodium/mercury amalgam is formed and hydrogen (H2) and hydroxide ions (OH-) are formed by the reaction of the sodium in the amalgam with water in the denuder. In membrane and diaphragm cells, water decomposes to form hydrogen (H2) and hydroxide ions (OH-) at the cathode. There are three basic processes for the electrolytic production of chlorine, the nature of the cathode reaction depending on the specific process.

For all processes the dissolving of salt, sodium chloride, is:

$NaCl \rightarrow Na^+ + Cl$

The anode reaction for all processes is:
$2\ Cl^-\ (aq) \rightarrow Cl_2(g) + 2\ e$

The cathode reaction is:
$2\ Na^+\ (aq) + 2\ H_2O + 2e^- \rightarrow H_2(g) + 2\ Na^+\ (aq) + 2\ OH^-\ (aq)$

The overall reaction is:
$2\ Na^+\ (aq) + 2\ Cl^-\ (aq) + 2\ H_2O \rightarrow 2\ Na^+\ (aq) + 2\ OH^-\ (aq) + Cl_2(g) + H_2(g)$

Inputs and pollutant outputs from the Chlor-alkali industry are quite specific to the cell technology used, the purity of the incoming salt and the specifications of the products. The chlor-alkali process is one of the largest consumers of electrical energy. A simplified process diagram of the three cell technology processes is presented in **Fig 5.1**. A comparative statement presenting the main characteristics of each process is presented in **Table 5.1.** The advantages and disadvantages of these three processes are presented in **Table 5.2.**

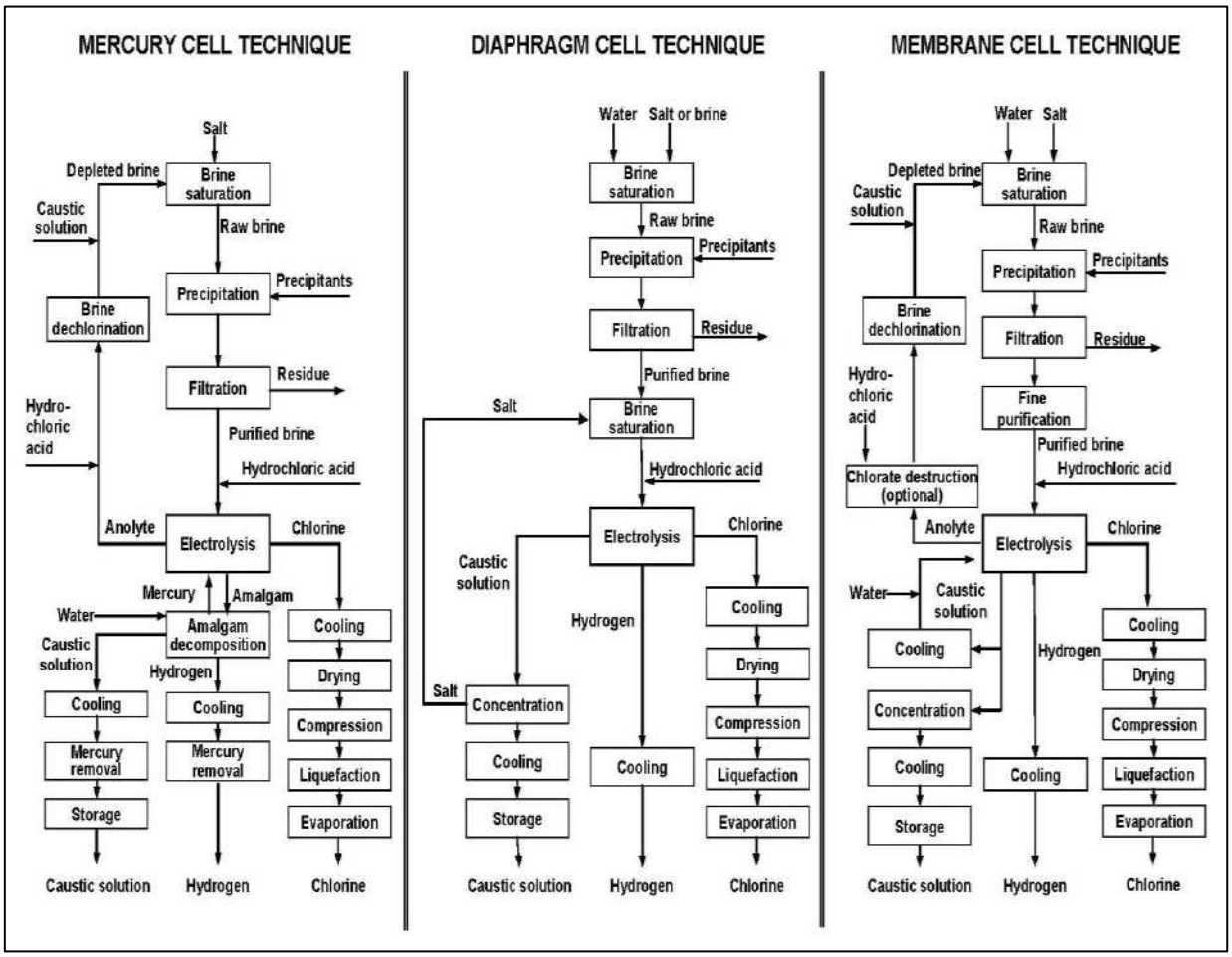


Fig 5.1. Simplified scheme of Electrolysis Cells

Table 5.1 Main Characteristics of Electrolysis Process

	Mercury-Cell	Diaphragm-Cell	Membrane-Cell
Caustic Quality	High, <30 PPM NaCl 5- 150 µg Hg/ l (Before treatment the Hg level is between 2.5 - 25 mg Hg/l	1.0 - 1.5% by weight NaCl (Before treatment the NaCl content is about 18%) 0.1 % NaClO3 Not suitable for some applications	High <50 PPM NaCl
Caustic concentration	50 %	12 % requires concentrations to 50% for some applications	33% requires concentration to 50 % for some applications
Chlorine Quality	Contains low levels of oxygen (<0.1%) and hydrogen	Oxygen content between 1.5 - 2.5 %	Oxygen content between 0.5% and 2 % depending on whether an acidified electrolyte is used.
Brine feedback	Some purification required but depends	Some purification required but depends on purity of salt or brine used	Very high purity brine is required as impurities affect

	on purity of salt or brine used		membrane performance
Variable electric load performance	Good variable electricity load performance, down to 30 % of full load possible for some cell rooms, which is very important in some European countries	Tolerates only slight variation in electricity load and brine flows in order to maintain diaphragm performance	Variable electricity load performance less than for mercury (40 - 60%) depending on design load), affects product quality, and efficiency at lower loads

Historical mercury and PCDD/Fs contamination of land and waterways from mercury and diaphragm chlor-alkali plants is a big environmental problem at some sites. For many years, the mercury cell has been a significant source of environmental pollution, because some mercury is lost from the process to air, water, products and wastes. Inorganic mercury can be metabolised to form highly toxic methyl mercury by anaerobic bacteria, and this organic mercury is bio-accumulated1 in the food chain. The diaphragm cell process has a potential to release asbestos emissions into work room atmosphere.

Table 5.2 Advantages and Disadvantages of the Three Chlor-Alkali Process

Process	Advantages	Disadvantages
Diaphragm Process	Use of well brine, low electrical energy consumption	Use of asbestos, high steam consumption for caustic concentration in expensive multistage evaporators, low purity caustic, low chlorine quality, cell sensitivity to pressure variations
Mercury Process	50 % caustic direct from cell, high purity chlorine and hydrogen, simple brine purification	Use of mercury, use of solid salt, expensive cell operation, costly environmental protection, large floor space
Membrane Process	Low total energy consumption, low capital investment, inexpensive cell operation, high-purity caustic, insensitivity to cell load variations and shutdowns, further improvements expected	Use of solid salt, high purity brine, high oxygen content in chlorine, high cost of membranes

The manufacturing technology chosen for chlor-alkali plant is membrane-cell technology which is environment friendly, compared to the other two technologies.

b. Chloromethane Process

The manufacturing of chloromethane is initiated by Methyl chloride manufacturing either by hydro chlorination of methanol or chlorination of methane (hoechest process), followed chlorination of methyl chloride (Shauffer process). Both the processes of methyl chloride were evaluated with respect to safety and environmental aspects, and hydrochlorination of methanol was adopted as the reaction is in liquid phase, and less hazard of handling hydro chloric acid compared to chlorine and methane. This method shall also avoid accumulation of hydrogen chloride, and can be tailored to favor production of individual chlorination products. The trend across the world is to replace methane as carbon base with methanol. Accordingly, HUALU process was adopted which involves 3 steps; Hydro chlorination of methanol in vapour phase in presence of catalyst, thermal chlorination of methyl chloride in vapour phase with chlorine and rectification, azeotrope separation and dehydration of the mixed products.

5.2.1 Alternatives in Technology

a. Chlor-Alkali Unit

The manufacturing process results in gaseous products of chlorine and hydrogen which require specific containment and handling practices. It is proposed to operate entire electrolysis process, storage areas with DCS system for raw material charging to end product, by-products storage. By DCS system, critical parameters of operation like temperature, pressure accidental risk to life will be reduced, exposure to chemicals will be minimal. Sensors for chlorine, hydrogen with adequate scrubber systems provided for both emergency and regular operations. TGV SRAAC Ltd. is the first unit to adopt Bipolar Membrane technology for manufacture of Caustic. This technology is least polluting. The management is consciously undertaking steps to improve Process Operations, Recycling, Reducing, Recovering, so that effluent generation is brought to minimum.

b. Chloromethanes

The manufacturing process results in gaseous products of hydrogen chloride and excess chlorine which require specific containment and handling practices. The entire process, storage areas will be provided with DCS system for complete operation to avoid exposure of operators for chlorine and HCl gases, with adequate scrubber systems provided for both emergency and regular operations to minimise the diffuse and fugitive emissions. Storage tanks with safety interlocks, rupture discs and sensors for chlorine and HCl followed by emergency scrubber system are provided for storage facility in addition to the DCS system.

5.2.2 Alternatives in treatment/mitigation options

The emission sources in the proposed expansion project are utilities, storages, process and effluent treatment system. The alternatives assessed for air pollution control equipment for the proposed boiler are cyclone, multicone cyclone, scrubbers, bag filter and electro static precipitator. Electro static precipitators are selected for large capacity high pressure boilers as the optimum technology to ensure particulate emission standards as prescribed by CPCB/SPCB, while bag filters are provided for thermo pack unit. The alternatives assessed for mitigating emissions from process are scrubber with double stage, condensers, DCS system for chloromethanes and chlor-alkali process and storage to mitigate diffuse emissions, nitrogen blanketing with breather valves and thermal insulation for storages, nitrogen blanketing for methanol, dichloromethane, chloroform tanks. Condensers are proposed to mitigate both diffuse and process emissions and the alternatives of medium assessed were RT water, cold water, chilled brine. Cold water and chilled brine were identified as the best medium to mitigate release of VOC emissions into atmosphere.

6.0 ENVIRONMENTAL MONITORING PROGRAM

6.1.1 Introduction

Environmental monitoring is proposed with an objective of monitoring the efficiency of environmental management measures adopted by way of engineering controls, work practices etc. during both construction and operation phase, to facilitate adaptive management. It provides basis for evaluating the efficiency of mitigation and pollution control measures and suggest further actions that need to be taken to achieve the desired effect. The monitoring includes: (i) visual observations; (ii) monitoring of environmental parameters at specific locations; and (iii) sampling and regular testing of various parameters.

6.1.2 Objectives

The primary objective of post project monitoring is to ensure a basis for adaptive management, by evaluation of efficiency of mitigation and pollution control measures, updating of actions and impacts on baseline data, adoption of additional mitigation measures if the present measures are insufficient, and by generation of data which may be incorporated in environmental management plan in future projects.

6.1.3 Methodology

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;
- Monitoring standards;
- Responsibilities for monitoring;
- Direct responsibility,
- Overall responsibility;
- Monitoring costs.

Environmental monitoring of the parameters involved and the threshold limits specified are discussed below for the proposed expansion of Chlor-alkali, Chloromethanes and co-

generation power plant about 40% of existing capacity in phased manner by M/s. TGV SRAAC Limited.

6.1.4 Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters recommended are PM_{10}, $PM_{2.5}$, Oxides of Nitrogen (NO_X), Sulphur Dioxide (SO_2), Chlorine, HCl and Volatile organic compounds. These are to be monitored at designated locations starting from the commencement of construction activity. Data will be generated at all identified locations in accordance to the National Ambient Air Quality Standards **(Table 6.1)** location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Table 6.1 National Ambient Air Quality Standards

S. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecological Sensitive Area (Notified by Central Government)	Methods of Measurement
1	Sulphur Dioxide (SO_2)	Annual* 24 Hours**	50 80	20 80	Improved west and GaekeUltraviolet fluorescence
2	Nitrogen Dioxide (NO_2)	Annual* 24 Hours**	40 80	30 80	Modified Jacob & Hochheiser (Nn-Arsenite) Chemiluminescence
3	Particulate Matter (Size Less than 10 µm) or PM_{10}	Annual* 24 Hours**	60 100	60 100	Gravimetic TOEM Beta Attenuation
4	Particulate Matter (Size Less than 2.5µm) or $PM_{2.5}$	Annual* 24 Hours**	40 60	40 60	Gravimetic TOEM Beta Attenuation
5	Ozone (O_3)	8 hours** 1 hour**	100 180	100 180	UV Photometric Chemilminescence Chemical Method
6	Lead (Pb)	Annual* 24 hours**	0.50 1.0	0.50 1.0	AAS /ICP method after sampling on EPM 2000 or equivalent filter paper ED-XRF using Teflon filter.

7	Carbon Monoxide (CO)	8 hours** 1 hour**	02 04	02 04	Non Dispersive Infra Red (NDIR) Spectroscopy
8	Ammonia (NH_3)	Annual* 24 hours**	100 400	100 400	Chemilminescence Indophenol blue method
9	Benzene (C_6H_6)	Annual*	05	05	Gas Chromotography based continuous analyzer Absorption and Desorption followed by GC analysis
10	Benzo (o) Pyrene(BaP) – Particulate Phase only,	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As),	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni),	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

**Average Arithmetic mean of minimum 104 measurement in a year taken for a week 24 hourly at uniform interval.*
***24 hourly/8 hourly values should meet 98 percent of the time in a year*

6.1.5 Water Quality Monitoring

The physical and chemical parameters recommended for analysis of water quality relevant are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, BOD, chloride, sulfate, Oil and Grease. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500: 1991 (stated in**Table6.2**)

Table 6.2 Indian Standard Drinking Water Specifications – IS: 10500:1991

S. No	Substance or Characteristics	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
ESSENTIAL CHARACTERISTICS						
1	Colour, Hazen units, Max.	5	Above 5, consumer acceptance decreases	25	3025 (Part 4) 1983	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources
2	Odour	Unobjection-able	-	-	3025 (Parts5):1984	a) Test cold and when heated b) Test at several dilutions
3	Taste	Agreeable	-	-	3025 (Part 7& 8) 1984	Test to be conducted only after safety has been established
4	Turbidity NTU, Max.	5	Above 5, consumer acceptance decreases	10	3025 (Part 10)	-
5	pH Value	6.5 to 8.5	Beyond this range, the water will affect the mucous membrane and/or water supply system	No relaxation	3025 (Part 11) 1984	-
6	Total hardness (as $CaCO_3$) mg/l, *Max*	300	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21) 1983	-
7	Iron (as Fe) mg/l, *Max*	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1	32 of 3025: 1964	-
8	Chlorides (as CI) mg/l, *Max*	250	Beyond this limit, taste, corrosion and palatability are affected	1000	3025 (Part 32) 1988	-
9	Residual, free chlorine, mg/l, *Min*	0.2	-	-	3025 (Part 26) 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be *Min* 0.5 mg/l

DESIRABLE CHARACTERISTICS						
1	Dissolved solids mg/l, *Max*	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	3025 (Part 16) 1984	-
2	Calcium (as Ca) mg/l, *Max*	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40) 1991	-
3	Magnesium (as Mg), mg/l, *Max*	30	Encrustation to water supply structure and adverse effects on domestic use	100	16, 33, 34 of IS 3025: 1964	-
4	Copper (as Cu) mg/l, *Max*	0.05	Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this	1.5	36 of 3025: 1964	-
5	Manganese (as Mn) mg/l, *Max*	0.1	Beyond this limit taste/appearance are affected, has adverse effects on domestic uses and water supply structures	0.3	35 of 3025: 1964	-
6	Sulphate (as 200 SO_4) mg/l, *Max*	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	3025 (Part 24) 1986	May be extended up to 400 provided (as Mg) does not exceed 30
7	Nitrate (as NO_2) mg/l, *Max*	45	Beyond this, may cause methemoglobinemia	100	3025 (Part 34) 1988	-
8	Fluoride (as F) mg/l, *Max*	1	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025: 1964	-
9	Phenolic compounds (As C_6H_5OH) mg/l, *Max*	0.001	Beyond this, it may cause objectionable taste and Odour	0.002	54 of 3025: 1964	-
10	Mercury (as Hg) mg/l, *Max*	0.001	Beyond this, the water becomes toxic	No relaxation	(see Note) Mercury ion analyzer	To be tested when pollution is suspected
11	Cadmium (as Cd), mg/l, *Max*	0.01	Beyond this, the water becomes toxic	No relaxation	(See note)	To be tested when pollution is suspected
12	Selenium (as Se), mg/l, *Max*	0.01	Beyond this, the water becomes toxic	No relaxation	28 of 3025: 1964	To be tested when pollution is suspected
13	Arsenic (As As) mg/l, *max*	0.05			3025 (Part 37) 1988	

14	Cyanide (As CN), mg/l, *Max*	0.05		No relaxation	3025 (Part 27) 1986	
15	Lead (as Pb), mg/l, *Max*	0.05		No relaxation	(see note)	
16	Zinc (As Zn). Mg/l, *Max*	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025: 1964)	To be tested when pollution is suspected
17	Anionic detergents (As MBAS) mg/l, *Max*	0.2	Beyond this limit it can cause a light froth in water	1	Methylene-blue extraction method	To be tested when pollution is suspected
18	Chromium (As Cr^{6+}) mg/l, *Max*	0.05	May be carcinogenic above this limit	No relaxation	38 of 3025: 1964	To be tested when pollution is suspected
19	Poly nuclear aromatic hydrocarbons (as PAH) g/1, *Max*	-	May be carcinogenic above this limit	-	-	-
20	Mineral oil mg/l, *Max*	0.01	Beyond this limit undesirable taste and odour after chlorination take place	0.03	Gas Chromatographic method	-
21	Pesticides mg/l, *Max*	Absent	Toxic	0.001	-	-
22	Radioactive materials:				58 of 3025:01964	-
23	a) Alpha emitters Bq/l, *Max*	-	-	0.1	-	-
24	Beta emitters pci/1, *Max*	-	-	1	-	-
25	Aluminium (as Al), mg/l, *Max*	200	Beyond this limit taste becomes unpleasant	600	13 of 3025:1964	-
26	Aluminium (as Al), mg/l, *Max*	0.03	Cumulative effect is reported to cause dementia	0.2	31 of 3025: 1964	-
27	Boron, mg/l, *Max*	1	-	5	29 of 3025: 1964	-

Source: Indian Standard Drinking Water Specification-IS10500:1991.

6.1.6 Noise Level Monitoring

The measurements for monitoring noise levels would be carried out at all designated locations in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989 (refer **Table 6.3)** Sound pressure levels would be monitored on twenty-four-hour basis. Noise level will be recorded at a "A" weighted frequency using a "slow time response mode" of the measuring instrument. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan **(Table 6.3)**

Table 6.3 Noise level standards (CPCB)

Type	Noise level for Day	Noise level for
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40
Day time - 6.00 am - 9.00 pm (15 hours)		

The monitoring plan along with environmental parameters and the time frame is presented in the **Table 6.4.**

Table 6.4 Environmental Monitoring Plan ***(Terms of Reference No. 7 (xii))***

S. No	Particulars	Monitoring Frequency	Standards	Duration of Sampling	Important monitoring parameters
Ambient Air Quality Monitoring					
1	Industry Main Gate, nearby two villages	Monthly	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	24 hrs	PM_{10}, $PM_{2.5}$, SO_2, NOx, HCl and VOC
2	Work place monitoring Process area 3 locations, Chlorine Storage, HCl Storage, Product storage area, and ETP area	Monthly		8 hr	PM, VOC, Cl_2 and HCl
Stack Emissions Monitoring					
1	Stacks connected to 4 nos. coal fired boilers and 2 nos. oil fired boilers and 1 no H_2 fired boiler, 2 nos. thermo packs, 2 nos. salts furnaces	Monthly	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	--	PM, SO_2, NOx, recommended methods of CPCB.

2	Stacks connected to 7 nos. DG sets.	Quarterly	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	--	PM, SO_2, NOx, recommended methods of CPCB.
Water Quality Monitoring					
1	Process water	Daily	Water Quality standards by CPCB	Grab	pH, TDS, SS, BOD, COD and Oil & Grease Hardness, chlorides, using APHA or BIS analytical methods.
2	Effluents	Quarterly		Grab	pH, TDS, SS, BOD, COD using APHA or BIS analytical methods.
3	Treated effluent after ETP before marine disposal	Daily		Grab	pH, TDS, TSS, COD, BOD and Oil and Grease using APHA or BIS analytical methods.
Noise Quality Monitoring					
1	Noise Levels at 3 Locations with in plant site and 2 locations outside site	Quarterly	Noise standards by CPCB	24 hrs	Equivalent noise levels in dB(A)
Soil Quality Monitoring					
1	Soil: RM Storage area, near process area, CMS Tank Farm, and ETP area.	Once a year			pH, EC, CEC, Lead, Moisture, Texture, Bulk Density etc.

6.1.7 Location of Portholes and approach platform for Sampling points Guidelines

Portholes shall be provided for all chimneys, stacks, and other sources of emissions. The sampling point should be located at a distance equal to at least eight times the stack or duct diameters downstream and two diameters upstream from source of low disturbance such as a Bend, expansion, construction valve, fitting or visible flame for rectangular stacks, the equivalent diameter can be calculated form the following equation;

$$\text{Equivalent Diameter} = \frac{2\ (\text{Length} \times \text{Width})}{(\text{Length} + \text{Width})}$$

The diameter of the sampling port should not be less than 100 mm dia". Arrangements should be made so that the porthole is closed firmly during the non-sampling period.

An easily accessible platform to accommodate 3 to 4 persons to conveniently monitor the stack emission from the portholes shall be provided. Arrangements for an Electric Outlet Point of 230V 15 A with suitable switch control and 3 Pin point shall be provided at the Porthole location. The ladder shall be provided with adequate safety features to approach the monitoring location with ease.

6.1.8 Responsibility of Monitoring and Reporting System

The overall responsibility of monitoring the above parameters shall lie with the management of TGV SRAAC Limited. The maintenance/environment wing is responsible for day to day monitoring of effluent, raw water and treated water quality. The Ambient air quality, Stack emissions, soil, noise and water quality are monitored by either third party or by the Environment management division of the unit.

Records shall be maintained for analysis of raw effluents and treated effluents, ambient air quality data, stack emissions monitoring results, micro- meteorological data and noise levels. These records are not only required for the perusal of the Pollution Control Board authorities but also to derive at the efficiencies of the pollution control equipment as the objective of the project proponent is not only compliance with statutory regulations, but also a serious commitment towards clean environment.

The industry shall maintain the records as per the hazardous waste regulations and EPA regulations and apply for the annual consents for air and water, and renewal of authorization for the storage of hazardous waste as per Hazardous Waste (Handling &Management) Rules, 1989. The records of hazardous waste manifest will be maintained. Reporting system provides the necessary feedback for project management to ensure compliance with stipulated standards and facilitate adaptive management. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the environmental management plan get implemented in the project.

6.2 Environmental Monitoring Budget

The environmental monitoring budget for monitoring air, water, soil, and noise levels is presented in **Table 6.5.** It may be noted that the annual expenditure for environmental monitoring is Rs. 12.63 lakhs.

Table 6.5 Environmental Monitoring Budget

Particulars	Monitoring Frequency	Unit Cost Rs.	Annual Cost Rs.
Ambient Air Quality Monitoring	Monthly	7500	270000
Work Place Monitoring	Monthly	2000	168000
Stack Emissions Monitoring	Monthly	2700	356400
DG Set Stack Emissions Monitoring	Quarterly	2700	75600
Process water	Daily*	500	165000
Effluents - Stream wise	Daily*	600	2400
Treated effluent (ETP water)	Daily*	600	198000
Noise Level Monitoring	Quarterly	1000	20000
Soil Quality	Once a year	2000	8000
Total (Rs.)			**1263400**

** May be analyzed by In-house laboratory.*

7.0 Introduction

This chapter presents the risk assessment study results for the plant operations, transport, and storage of raw materials, and identifies maximum credible accident scenarios to draw the emergency management plan addressing various credible scenarios identified.

7.1. Objectives and Scope

The products from chlor-alkali and chloromethanes (CMS) and raw materials used for process are both hazardous and toxic in nature. The risks associated with the chemical industry are commensurate with their rapid growth and development. Apart from their utility, chemicals have their own inherent properties and hazards. Some of them can be flammable, explosive, toxic or corrosive etc. The lifecycle of a chemical should be considered when assessing its dangers and benefits. In order to ensure the health and safety of persons at or near the facilities, Govt. has approved some regulations. The regulation requires Employers to consult with employees in relation to:

- Identification of major hazards and potential major accidents
- Risk assessment
- Adoption of control measures
- Establishment and implementation of a safety management system
- Development of the safety report

The involvement of the employees in identification of hazards and control measures enhances their awareness of these issues and is critical to the achievement of safe operation in practice. In order to comply with regulatory authorities, M/s TGV SRAAC Limited have entrusted Team Labs and Consultants, Hyderabad to review and prepare Hazard analysis and Risk assessment for their facility along with an approach to on-site emergency preparedness plan as required under the acts and rules. (Manual on emergency

preparedness for chemical hazards, MOEFCC, New Delhi). In this endeavor, the methodology adopted is based on;

- visualizing various probable undesirable events which lead to major accidents
- detailed and systematic assessment of the risk associated with each of those hazards, including the likelihood and consequences of each potential major accident event; and
- identifying the technical and other control measures that are necessary to reduce that risk to a level that is as low as reasonably practicable

The strategy to tackle such emergencies, in-depth planning and person(s) or positional responsibilities of employees for implementation and coordination of timely and effective response measures are described in onsite detail in Emergency Plan.

7.2 Project Details

The plant site is located at Sy. No. Sy. No. Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh in an area of 152.4 ha. The site is located at the intersection of 15^0 49′ 30″ (N) latitude and 78^0 4′ 30″ (E) longitude. The site elevation above mean sea level (MSL) is 300 m. The plant site is surrounded by open lands in east direction, Sree Rayalaseema Hi-Strength Hypo Limited (SRHHL) in north direction, Road connecting the NH-7 with Gondiparla village in the south and west directions. The nearest habitation from the plant is E. Tandrapadu village located at 0.5 km in northwest direction. The main approach road is NH-7 - Gondiparla village adjacent to the site in northwest direction. The nearest Town is Kurnool at 0.8 km in southwest direction, railway station is Kurnool located at 3.02 km in northwest direction and nearest airport is Kurnool located at 16.5 km in southeast direction. Tungabhadra River is flowing from northwest to southeast direction at a distance of 0.2 km in south direction. Interstate boundary between Telangana and Andhra Pradesh is at a distance of 1.3 km in northeast direction. There are two reserve forests in the study area. Gadidmadugu RF at 5.5 km in east direction. Pullaiah RF at 9.3

km in southwest direction. There is no National Park, sanctuary, and critically polluted area within the impact area of 10 km surrounding the site. The manufacturing capacity is presented in **Table 7.1.**

Table 7.1 Manufacturing Capacity

S. No.	Product Name	Unit	Capacity			
			Existing/ Permitted	Proposed		Total After Expansion
				Phase I	Phase II	
I. Chlor-Alkali Plant						
1	Caustic Soda Lye (Or) Flakes	TPD	1020	200	200	1420
	Potassium Hydroxide Lye (or) Flakes (100 % basis)	TPD				
2	Liquid Chlorine	TPD	600	120	120	840
II. Chloromethanes						
1	Methyl Chloride	TPD	1.2	0.24	0.24	1.68
2	Methylene Chloride	TPD	158	31.6	31.6	221.2
3	Chloroform	TPD	79	15.8	15.8	110.6
	Total – Chloromethanes		**238.2**	**47.64**	**47.64**	**333.48**
III. Chlorodifluoromethane						
1	Chlorodifluoromethane (R22)	TPD	10	2	2	14
IV. Captive Power Plant						
1	Captive Power Plant (Coal based)	MW	76	30	----	106
2	Power generation Furnace Oil#	MW	31		----	31
V. Castor Oil and Fatty Acid Plant						
1	Oil and Fatty Acid Products (Non-EC Products)	TPD	498	99.5	99.5	697
By-Products						
I. Chlor-Alkali Plant						
1	Hydrochloric Acid (100%)	TPD	313	56.05	56.05	425.1
2	Hydrogen Gas	Nm3	285600	55996	55996	397592
3	Sodium Hypochlorite (100% Cl_2)	TPD	15	3	3	21
4	Barium Sulphate	TPD	10	----	----	----
5	Potassium Carbonate	TPD	50	----	----	50
6	Sodium Sulphate	TPD	10	2	2	14
7	Calcium Hypochlorite (100% Cl_2)	TPD	10	----	----	----
8	Calcium Sulphate	TPD	2	----	----	----
II. Chloromethanes Plant						
1	Carbon tetrachloride*	TPD	12	2.4	2.4	16.8
2	Hydrochloric Acid (100 %)	TPD	47	9.4	9.4	65.8
III. Chlorodifluoromethane Plant						
1	Hydrochloric Acid (100 %)	TPD	8.27	1.65	1.65	11.57

Table 7.2 List of Raw Materials and Inventory *(Terms of Reference No. 3(iv) & (3(v))*

S. No	Name of Raw Material	Inventory (MT)	Mode of Storage	Physical Form	Nature of Chemical
Chlor-Alkali					
1	Raw Salt	20000	Closed go down	Solid	Corrosive
2	Caustic Soda	1 x 700; 1 x 600 1 x 450; 1 x 110	Storage Tanks	Liquid	Corrosive
3	Caustic Potash	1 x 425; 1 x 350 1 x 250; 1 x 110	Storage Tanks	Liquid	Corrosive
4	Barium Chloride	1 x 25	Storage Tank	Liquid	Corrosive
5	Potassium Chloride	2000	Covered Shed	Solid	Corrosive
6	Caustic Potash Lye	1 x 1000	Storage Tanks	Liquid	Corrosive
7	Hydrochloric Acid	2 x 300	MSRL tanks	Liquid	Corrosive
8	Chlorine	4 x 100	Pressure Vessels	Liquid	Toxic
9	Hydrogen	1 x 20 m^3	Holder	Gas	Flammable
Chloromethanes					
1	Methanol	1 x 553; 1 x 155	Storage Tanks	Liquid	Flammable
2	Sulfuric Acid	1 x 70; 1 x 30	Storage Tank	Liquid	Corrosive
3	Methylene Chloride	2 x 144.8	Storage Tank	Liquid	Carcinogenic
4	Chloroform	2 x 166.4	Storage Tank	Liquid	Carcinogenic
5	Carbon tetrachloride	1 x 51	Storage Tank	Liquid	Carcinogenic

7.3 Process Description

The manufacturing process for all the products is presented in Chapter 2 of EIA Report from Page No. 2-10 to 2-28.

7.4 Plant Facilities

The manufacturing facility shall be provided with

1 Production Area
2 Utilities
3 Quality Control, R&D lab
4 Effluent Treatment plant
5 Warehouse
6 Tank farm area
7 Chlorine Storage Area
8 Administrative Office
9 Coal and Ash Storage Area

7.4.1 Production Area

Caustic/Potash synthesis consists of

i. Brine dichlorination, saturation and purification
ii. Electrolysis of brine
iii. Chlorine handling
iv. Hydrogen Handling
v. Hydrochloric gas synthesis
vi. Caustic Evaporation and flaking

The following inter locks have been provided for safe operation at Chlor-Alkali Plant

1 Interlock-101 will stop polarization unit (PU-1020) and open DM water addition valve (HV-121) to the electrolyser when rectifier is on

2 Interlock-102 will start polarization unit and close DM water valve to electrolyser if rectifier is stopped

3 Interlock-103 will trip the rectifier i) on and very low level of brine overhead tank and inter lock bypass switch in off position. ii) Emergency tripping from cell house/process control room/rectifier and iii) stoppage of chlorine blowers

4 Interlock-104 will stop H_2 blowers, open valve on Cl_2 line to hypo unit on rectifier failure

5 Interlock-111 will trip the rectifier on very high voltage in elements of the electrolyser

6 Interlock-583A low level of brine overhead tank will trip the rectifier

7 Interlock-611 failure of chlorine blower will trip the rectifier

8 a Interlock-211 the standby caustic catholyte circulation pump will start on auto of the running pump fails and if the stand by pump fails to start an alarm will sound at the control room

b Interlock-411 the standby DM water pump will start on failure of running pump

c Interlock-521/522 on failure of depleted brine pump the standby pump will start within 5 sec. and if this does not start the anolyte brine pump and feed brine pump will trip in 5 sec. With an alarm indication in DCS

d Interlock -581 the standby feed brine pump to overhead tank will start on auto if the running fails

e Interlock-724 high liquefaction pressure opens the vent valve to Hypo

f Interlcok-2101 very low suction pressure of the Hydrogen blower will trip the

blowers

9 The electrolyser section is provided with DCS arrangement and indications, annunciators are available in the control panel.

10 Field indicating instruments like Rotameters, Manometers, Pressure gauges, Temperature indicators are provided.

11 The electrical installations, fittings conform to the area classification.

12 The plant is being provided with a proper ring main hydrant system with TAC approval.

13 First aid firefighting equipment's like extinguishers are provided in requisite members.

14 Respiratory protective appliances like self-contained breathing apparatus, airline mask, cylinder air mask is provided especially in all the areas handling chlorine.

15 Chlorine sensors/ alarms are provided in selected locations like chlorine storage, chlorine filling, chlorine neutralization tower outlet and at Northern side of HCl compound wall, HCl plant, Cell House, Old Dichlorination, Main Gate and Cogen Plant.

16 Wind indicator is provided.

17 Water seals are provided in Chlorine and Hydrogen headers and the seals, vents etc., in the Chlorine header are connected to the Hypo header.

18 Usage of materials like FRP coated PVC, PVDF lines and valves for wet chlorine and corrosive services offers better life and reliability.

II. Chloromethanes

Manufacturing of Chloromethanes consists of Hydrochlorination and Thermal chlorination will be carried out in closed reactor with all in-built safety measures and automatic cut-off valves and switches.

7.4.2 Utilities:

It is proposed to establish 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler for proposed expansion to meet the power and steam requirement and 1 x 55 lac salt furnace in addition to the existing utility in Phase I. No additional utility required for Phase II expansion. The list of utilities is presented in the following **Table 7.3**.

Table 7.3 List of Utilities

S. No	Description	Units	Existing	Phase I	Phase II	Total After Expansion	Control Equipment
1	Coal Fired Boiler	TPH	1 x 110	---	---	1 x 110	ESP
2	Coal Fired Boiler	TPH	1 x 100	---	---	1 x 100	ESP
3	Coal Fired Boiler	TPH	---	1 x 120		1 x 120	ESP
4	Coal Fired Boiler	TPH	1 x 42	---	---	1 x 42	ESP
5	Hydrogen gas fired boiler	TPH	---	1 x 20	---	1 x 20	Effective Stack height
6	Oil and H_2 fired boiler*	TPH	1 x 4	---	---	1 x 4	Effective Stack height
7	Oil fired Boiler*	TPH	1 x 3	---	---	1 x 3	Effective Stack height
8	Waste Heat Recovery Boiler (WHRB) connected to DG sets*	TPH	4 x 3	---	---	4 x 3	Effective Stack height
9	Oil fired boiler#	TPH	1 x 3	---	---	Dismantled	Effective Stack height
10	Husk Fired Boiler#	TPH	1 x 12	---	---	Dismantled	Effective Stack height
11	Thermo Pack unit	k.cal/hr	1 x 20 lac	---	---	1 x 20 lac	Bag Filter
12	Thermo Pack unit	k.cal/hr	1 x 35 lac	---	---	1 x 35 lac	Bag Filter
13	Salt Furnace	k.cal/hr	2 x 55 lac	1 x 55 lac	---	3 x 55 lac	Effective Stack height
14	Salt Furnace	k.cal/hr	2 x 15 lac	---	---	2 x 15 lac	
15	DG Sets**	MW	4 x 6.2	---	---	4 x 6.2	Effective Stack height
		kVA	3 x 500	---	---	3 x 500	
16	LPG/Hydrogen ga fired Incinerator	Kgs/hr	1 x 343	---	---	1 x 343	Wet Scrubber

** Shall be kept as standby* *# Dismantled* *** Standby DG sets*

**DG sets will be used during load shut down by Transco.*

7.4.3 Quality Control, R&D Lab

The QC department comprise of an in-process lab with instruments like HPLC, GC etc. It will be maintained by highly qualified and trained people. The activities include;

- In-process quality check during manufacturing
- Validation of facilities
- Complaint handling

Also, a process development laboratory provided for in-house process development, initial evaluation of process technology in case of technology transfer, back-up for production department to address any issues arising during commercial production.

7.4.4 ETP and Solid waste storage

The total effluents are treated in effluent treatment plant based on Zero Liquid Discharge principle and the treated effluent is reused for cooling tower make-up and brine make-up. The system consists of ETP -1 to treat effluent generated from chlor-alkali, chloromethanes and co-generation power plant and ETP-2 to treat wastewater from oil & fatty acid division and domestic wastewater.

7.4.5 Ware Houses

The plant had sufficient storage facility for safe handling of raw materials for expansion quantity. All solid raw materials shall be stored in marked areas with proper identification. Liquid raw materials and CMS products are stored according to material compatibilities and hazard nature. Adequate firefighting facilities are in place and are provided as per NFPA norms.

7.4.6 Tank Farm Area

There is no additional storage proposed for expansion. The existing storage for chlorine with 4 x 100 Tons capacity is sufficient. The details of tank farms in various sections are presented in **Table 7.2.** A separate tank farm area provided for chlor-alkali and chloromethanes manufacturing facility to avoid cross contamination and in-view of safety storage. All liquid raw materials, CMS products with high inventory and for toxic, corrosive chemicals provided with dykes to ensure safety in case of tank failure. Acid proof lining for the dykes shall be provided for acid storage tanks. Condensers for low volatile storage tanks vents. Vent Condensers for dichloromethane and chloroform storage tanks vents. Liquid Chlorine will be stored on tonners in closed shed with vents connected to emergency scrubber. Chlorine sensors, rupture discs are provided at storage area.

7.4.7 Chlorine Storage Area

Gas cylinders storage conforms to SMPV-Unfired rules-1981.Chlorine storage tanks will be stored in a dedicated area with interlocks and continuous chlorine leak detection system monitoring system. Operational cylinder is firmly secured. Pressure regulator, metal piping, non-return valve, and safe residue bleed off arrangement is be incorporated in installation design. Strict hot work control and display of danger signs is ensured. M/s. TGV SRAAC Limited first time in India chlorine storage is completely closed with automatic interlocking system, chlorine sensors and emergency scrubbing system.



Closed Chlorine Storage



Automatic Interlocks

7.4.8 Administrative Office

An administrative office is at the entrance of the factory to ensure the entry of authorized personnel only into the premises.

7.4.9 Coal and Ash Storage

Coal will be stored under covered shed with water sprinkler system in emergency. Ash silos will be provided for storage and handling of ash generated from combustion of coal. Water sprinkling system shall be installed on stocks of coal in required scales to prevent spontaneous combustion and consequent fire hazards. The stack geometry shall be adopted to maintain minimum exposure of stock pile areas towards predominant wind direction. Plant layout is shown in **Fig 7.1.**

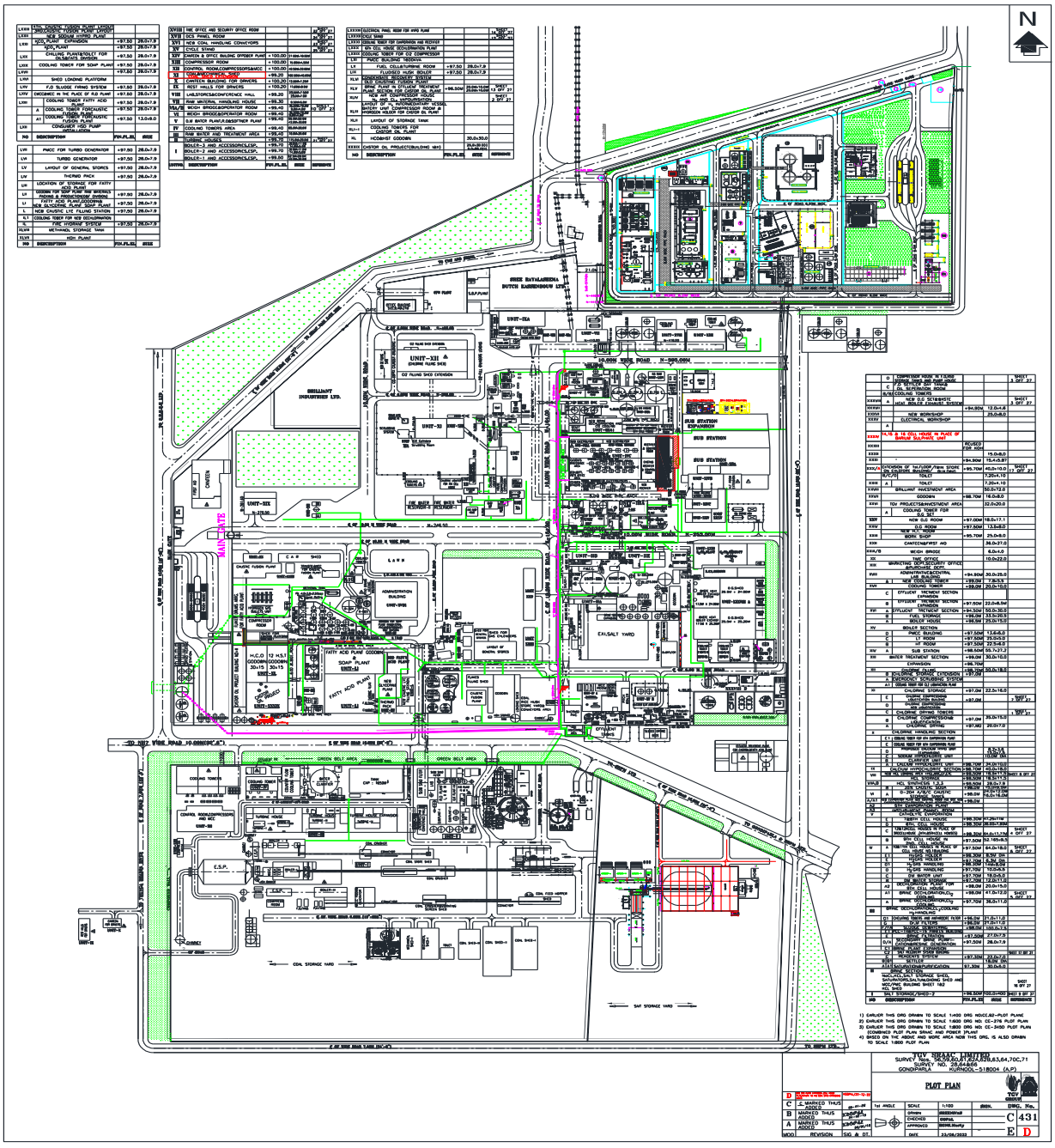


Fig 7.1 Plant Battery Limit of TGV SRAAC Limited

Applicability of GOI Rules to Storages

The interpretation of "The Manufacture Storage and Import of Hazardous chemicals" issued by the Ministry of Environment and Forests, GOI, which guides the preparation of various reports necessary for safe handling and storage of chemicals shows that the present project requires preparation of safety reports before commencing operation and risk assessment is not mandatory. The applicability of various rules is presented in **Table 7.4.**

Table 7.4 Applicability of MSIHC Rules to Storage

S. No	Name of Chemical	Inventory (Kl)	Threshold Quantity (T) For Application of Rules	
			5,7-9, 13-15	10 - 12
1	Methanol	1 x 553; 1 x 155	1500	10000
2	Sulfuric Acid	1 x 70; 1 x 30	1500	10000
3	Methylene Chloride	2 x 144.8	1500	10000
4	Chloroform	2 x 166.4	1500	10000
5	Carbon tetrachloride	1 x 51	1500	10000
6	Chlorine	4 x 100	1500	10000

7.5 Hazard Analysis and Risk Assessment *(Terms of Reference No. 3(ix))*

7.5.1 Introduction.

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the plant. On the other hand, risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards present in the plant.

Hazard and risk analysis involve very extensive studies, and requires a very detailed design and engineering information. The various hazard analysis techniques that may be applied are hazard and operability studies, fault-tree analysis, event-tree analysis and failure modes and effects analysis.

Risk analysis 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's etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies.

In the sections below, the identification of various hazards, probable risks, maximum credible accident analysis, consequence analysis are addressed which gives a broad identification of risks involved in the plant.

7.5.2 Hazard Identification *(Terms of Reference No. 3(ix))*

The major hazardous chemicals involved in the plant are Chlorine, Hydrogen and Hydrochloric acid, Methylene chloride, methanol and Diesel oil, furnace oil among the utilities.

Chlorine is toxic and in gaseous state at normal temperature and pressure. Hydrogen gas is flammable and explosive. Hydrochloric acid are corrosive chemicals and in liquid state at normal temperature and pressure. Methanol is flammable, Methylene chloride is carcinogenic and is in liquid state at ambient temperature and pressure.

7.5.2.1 Hazards in Unit Operations

The various unit operations often involve hazardous material handling under hazardous operating conditions, adopting hazardous reactions. Hazards associated with storage area of chlor-alkali; chloromethanes are presented in **Table 7.5.** Hazards associated with plant operations are presented in **Table 7.6.**

Table 7.5 Hazard Associated and Mitigative/ Control Measures -Storages

S.No	Name of Material	Storage Condition	Type of Hazards	Control Measures
1	Liquid chlorine	Liquid under pressure (11.0kg/cm sq. temp.-5 ^{O}C to 10^{0}C)	Toxic	Following provision have been made; field level indicator H/H level alarm Low high-pressure alarm in control room two rupture disc along with two safety valves on each side of tank outlet the safety valve led to Hypo. Storage

				shed is provided with chlorine sensors and the storage tanks are connected to scrubbing system with isolation valves.
2	Hydrochloric Acid (33%)	Liquid at atmospheric pressure and temp.	Corrosive	Neutralizing & Flushing arrangement have been provided level Measuring device provided to prevent over flow of tank
3	Hydrogen	Gas at 150 kg/cm2 at ambient temperature.	Flammable	Hydrogen release to water seal. Fire hydrant network provided. Hydrogen gas detectors.
4	Caustic Soda Lye	Liquid at atmospheric pressure and temp.	Caustic	Neutralizing & Flushing arrangement have been provided level Measuring device provided to prevent over flow of tank
5	Caustic Potash		Caustic	
6	Caustic Soda / Potash Flakes	Solid in HDPE bags at ambient Condition	Caustic	Packed in air tight bags to prevent spillage store in ware house which is a closed building. Adequate measure for safe handling are taken
7	Methylene chloride	Liquid at atm pressure and temp	Flammable/ Carcinogenic	Fire hydrant network provided with Foam arrangement.
8	Methanol		Flammable	

Table 7.6 Hazard Associated and Mitigative/ Control Measures -Plant Operations

Section/Plant	Nature of Emergency	Corrective Action
Cell House	1.Chlorine gas release 2. Occurrence of fire a) Hydrogen b) Electrical 3.Mild Explosion 4. Electrical shock	Reduce load on electrolyser, if necessary, even to zero. Reduce load on electrolyser to zero. -do- -do-
Cl_2 plant (Incl. Dichlorination)	Chlorine gas release due to pipe rupture.	Reduce load on electrolyser to `O' ka.
Cl_2 storage and filling.	Chlorine gas release due to pipe rupture (or) valve leaks.	Reduce load on electrolyser and declare emergency.
HCl plant	1.Fire 2.Explosion 3.Cl_2 gas release.	Trip the furnace Inform control room
Hypo	Cl_2 gas release from vent / seals.	-Reduce load on electrolysis. -Stop de-gassing from other plant section. -Check/change circulation liquor.

Co-generation Power Plant (Coal)	1.Fire	-Avoidance of deterioration in quality -Avoidance of heating in the pile -Cleaning of coal storage floor -Non-combustible walls and floors -Alert system when temp. exceeds 42^{O} C -Cleaning of stack to facilitate dissipation of heat by wind from the surface of the stack -Limited height (4-5m) for coal piled

After identifying hazards through a qualitative process, quantification of potential consequences of identified hazards using simulation modelling is undertaken. Estimation of probability of an unexpected event and its consequences form the basis of quantification of risk in terms of damage to property, environment or personnel. Therefore, the type, quantity, location and conditions of release of a toxic or flammable substance have to be identified in order to estimate its damaging effects, the area involved, and the possible precautionary measures required to be taken.

7.5.3 Identification of Vulnerable Areas

The unit operations in the process and storage areas involve mass and energy transfer operations to effect the necessary physical changes. Nature of chemicals and the operating conditions create special hazardous situations. In the present case the chemicals handled are flammable and toxic in nature. With these factors in mind a thorough examination of the process information is carried out and a list of inventories of the hazardous chemicals is prepared to identify the hazardous situations. High inventory liquid raw materials like chlorine, methanol, methyl chloride, chloroform is stored in tank farms with appropriate safety and firefighting facilities to handle any kind of emergencies.

Considering operating modes of the facility, and based on available resources the following hazard identification process are chosen;

a) Fire Explosion Index and Fire Explosion and Toxicity Index (FETI) Approach;
b) Maximum Credible Accident and Consequence Analysis (MCACA);
c) Classification of Major Hazard Substances;

d) Manufacture Storage and Import of Hazardous Chemical Rules, 1989 (GOI Rules, 1989);
e) Identification of Major Hazardous Units.

7.5.4 Hazard Factors

A study of past accident information provides an understanding of failure modes and mechanisms of process and control equipment and human systems and their likely effects on the overall plant reliability and safety. Some of the major contributing factors for accidents in chemical industries are:

S. No	Contributing Factor	Percent Loss
1	Equipment design faults	41
2	Process design faults	10
3	Operator errors	31
4	Maintenance deficiencies	12
5	Material hazards	6

7.5.5 Common Causes of Accidents

Engineering and Instrumental

Based on the analysis of past accident information, common causes of major chemical plant accidents are identified as:

- Poor house keeping
- Improper use of tools, equipment, facilities
- Unsafe or defective equipment facilities
- Lack of proper procedures
- Improving unsafe procedures
- Failure to follow prescribed procedures
- Jobs not understood
- Lack of awareness of hazards involved
- Lack of proper tools, equipment, facilities
- Lack of guides and safety devices
- Lack of protective equipment and clothing

Failures of Human Systems

An assessment of past chemical accidents reveals human factor to be the cause for over 60% of the accidents while the rest are due to other plant component failures. This

percentage will increase if major accidents alone are considered for analysis. Major causes of human failures reported are due to:

- Stress induced by poor equipment design, unfavorable environmental conditions, fatigue, etc.
- Lack of training in safety and loss prevention.
- Indecision in critical situations.
- Inexperienced staff being employed in hazardous situations.

Often, human errors are not analyzed while accident reporting and accident reports only provide information about equipment or component failures. Hence, a great deal of uncertainty surrounds analysis of failure of human systems and consequent damages. The number of persons/materials are potentially exposed to a specific hazard zone is a function of the population density and distribution near the accident location. The failure rate data and ignition sources of major fires are presented in the following **Tables 7.7 and 7.8.**

Table 7.7 Failure Rate Data

S.No	Item	International Data
1.	Process Controllers	2.4×10^{-5} hr^{-5}
2.	Process control valve	2.0×10^{-6} hr^{-1}
3.	Alarm	2.3×10^{-5} hr^{-1}
4.	Leakage at biggest storage tank	5.0×10^{-5} yr^{-1}
5.	Leakage of pipe line	1×10^{-7} m^{-1} yr^{-1}
6.	Human Failure	1×10^{-4} $(demand)^{-1}$

Table 7.8 Ignition Sources of Major Fires

S.No	Ignition Source	Percent
1.	Electrical (wiring of motors)	23%
2.	Smoking	18%
3.	Friction	10%
4.	Overheated material	8%
5.	Burner flames	7%
6.	Combustion sparks	5%
7.	Spontaneous ignition	4%
8.	Cutting & welding	4%
9.	Exposure (fires jumping into new areas)	3%
10.	Mechanical sparks	2%
11.	Molten substances	1%

12.	Chemical actions	1%
13.	Static sparks	1%
14.	Lightening	1%

7.6 Fire & Explosion Index (F & EI):

7.6.1 Methodology

Dow Chemical Company issued a guideline for hazard determination and protection. By this method a chemical process unit is rated numerically for hazards. The numerical value used is the Fire and Explosion Index (F&EI) which is most widely used for hazard evaluation in chemical process industries.

The guide applies to process unit only and not to auxiliary units such as power generating stations, plant water systems, control rooms, fired heaters, structural requirements, corrosive nature of material handled and personal safety equipment. These are regarded as basic features that do not vary according to the magnitude of the fire and explosion hazard involved. The guide also does not cover the processing and handling of explosives such as dynamite, TNT etc.

Computation of F&EI

The F&EI is calculated as a product of Material factor, General process hazard factor, and special process hazard factor The Material factor is a measure of the intrinsic rate of potential energy release from fire or explosion of most hazardous material or mixture of materials present in significant quantity, whether it is raw material, product, etc. by combustion or chemical reaction. “In significant quantity” here means such quantity that the hazard represented by the material actually exists. The National Fire Protection Agency of USA (NFPA) have specified standard values for material factor which should be used for F&EI calculations and are available in Dow’s Hazard Classification Guide. In case itis not readily available, it can be calculated using the heat of combustion, flammability indices etc.

The F&EI index is calculated as a product of Material factor, General process hazard factor, and Special process hazard factor.

Hazard Ranking

Degree of Hazard for F&EI

F&EI Index Range	Degree of Hazard
1 – 60	Light
61 – 96	Moderate
97 – 127	Intermediate
128 – 158	Heavy
159 & above	Severe

The estimated values of F&EI and hazard ranking are given in the **Table 7.9.** The radius of exposure is determined by 0.26meter x respective F&EI. The estimated values of F&EI reflect light hazard in view of the low volume of chemicals.

The fire and explosion index evaluation can be very useful in developing plant layouts or adding equipment and buildings to existing plants. Evaluation of the F&EI calculations and layout considerations will result a safe, operable, maintainable and cost-effective arrangement of equipment and buildings.

Table 7.9 Fire & Explosion Index for Tank farm

S. No.	Name of Chemical	Fire & Explosion Index (F1*F2*MF)	Radius of Exposure (m) F&EIx0.26	Degree of Hazard
1	Caustic Lye 48%	8	2.1	Light
2	Methylene chloride	110.2	28.6	Intermediate
3	Methanol	108.5	28.2	Intermediate
4	30% Hydrochloric Acid HCl	8	2.1	Light
5	Chloroform	4.9	1.27	Light

F& E index value calculated considering the maximum storage capacity of chemical and values are found to be Intermediate for most of the chemicals stored in bulk quantity, moderate for chloroform storage, light for caustic lye, and dilute HCl storage reflecting the threshold limits as prescribed in MSHC rules.

7.7 Fire & Explosion and Toxicity Index (FETI):

Fire Explosion & Toxicity Indexing (FETI) is a rapid ranking method for identifying the degree of hazard. The basic objectives that characterize Fire Explosion and Toxicity Index are;

- Identification of equipment within the plant that would contribute to the initiation or escalation of accidents.
- Quantification and classification of the expected damage potential of fire
- Explosion n and toxicity index in relative terms.
- Determination of area of exposure

In preliminary hazard analysis, alcohol is considered to have Toxic and Fire hazards. The application of FETI would help to make a quick assessment of the nature and quantification of the hazard in these areas. Before hazards index is applied, the installation in question is sub divided into logical, independent elements or units. The unit is logically characterized by the nature of the process that takes place in it.

Fire explosion and Toxicity Index is a product of Material Factor and Hazard Factor. Material factor represents the flammability and reactivity of the chemicals. The hazards factor itself is a product of general process and special process hazard. Respective Material Factor (MF), General Hazard Factors (GHF), Special Process Hazard factors (SPH) are computed using standard procedure of awarding penalties based on storage, handling, and reaction parameters. Material factor is a measure of intrinsic rate of potential energy release from fire and explosion produced by combustion or other chemical reaction. General factor is a measure of intrinsic rate of potential energy release from fire and explosion produced by combustion or other chemical reaction.

General Process Hazard

The plant activities, which contribute to a significant enhancement of potential for Fire and Explosion, have been identified. The measured values of penalties have been added to

obtain the value of General Process Hazard as given in DOW's Fire & Explosion Index Hazard classification guide.

Special Process Hazard

The Special Process Hazard includes the factor that contributes the probability and occurrence of accident. They are;

- Process temperature
- Low pressure
- Operation in or near flammable range
- Operation pressure
- Low temperature
- Quantity of Flammable and toxic material
- Corrosion and erosion
- Leakage, Joints

Toxicity Index

Toxicity index is primarily based on the index figures for health hazards established by the NFPA in codes NFPA 704, NFPA 4 n and NFPA 325 m. NFPA Index figures of toxicity factor for Health Hazard index Nh are mentioned in **Table 7.10.**

Table 7.10 Toxicity Index

NFPA Hazard Index	Toxicity Factor
0	0
1	50
2	125
3	250
4	325

MAC (ppm)	Penalty (T_S)
<5	125
5-50	75
> 50	50

Toxicity Index = [Th+Ts (1+GPH+SPH)]/100

By comparing the indices of FEI and Toxicity index, the unit under consideration is classified into one of the following three categories,

Classification of Toxicity Index

Degree of Hazard	Toxicity Index
Light	<6
Moderate	6-10
Severe	>10

Fire Explosion and Toxicity Index for Storage Facility

Fire explosion and Toxicity Index values obtained for rectified Spirit and ENA both combined through FETI are presented in **Table 7.11.**

Table 7.11 Fire Explosion and Toxicity Index for Storage Facility

S. No.	Name of Chemical	Storage Quantity (KLD)	Toxicity Factor (Th)	Penalty Index (Ts)	FETI	Degree of Hazard
1	Methylene chloride	144.8	50	50	3.3	Light
2	Methanol	553	50	50	3.6	Light
3	Chloroform	166.4	125	75	5.6	Light
4	Chlorine	100	250	125	10.2	Severe

7.8 Hazard and Operability Study (HAZOP)

Hazard and Operability Study (HAZOP) is a highly structured and detailed technique, developed primarily for application to chemical process systems. A HAZOP can generate a comprehensive understanding of the possible 'deviations from design intent' that may occur. However, HAZOP is less suitable for identification of hazards not related to process operations, such as mechanical integrity failures, procedural errors, or external events. HAZOP also tends to identify hazards specific to the section being assessed, while hazards related to the interactions between different sections may not be identified. However, this technique helps to identify hazards in a process plant and the operability problems. It is performed once the engineering line diagrams of the plant are made available. It is carried out during or immediately after the design stage. The purpose of the study is to identify all possible deviations from the way the design/operation is expected to work and all the hazards associated with these deviations. A multi-

disciplinary team was constituted with chemical, mechanical and instrumentation engineers, R&D chemist and production manager. It is important to keep the team small enough to be efficient, while retaining a sufficient spread of skills and disciplines for all aspects of the study to be covered comprehensively. The group discussion is facilitated by a Chairman and the results of the discussion are recorded by a Secretary. Every investigation must be led by Chairman who is familiar with the HAZOP study technique, which is primarily concerned with applying, controlling the discussions and stimulating team thinking.

The preparative work for HAZOP studies consisted of four stages i.e., obtaining the data, converting into usable form, planning the sequence of the study and arranging the necessary meetings. The documents referred to for the study include process description, process flow diagrams, P&I diagrams plant layout, operating manuals including startup & shutdown, safety instructions etc., The parameters such as temperature, pressure, flow, level were investigated for deviation and hazard situations are identified.

Some basic definitions of terms frequently used in HAZOP studies are deviation, causes, consequences and guide words etc., Deviations are departures from the design intent which are discovered by systematically applying the guide words. Causes are the reasons why deviations might occur. Consequences are the reasons why deviations should they occur. Guide words are simple words used to understand a particular plant section in operating condition in order to guide and simulate the creative thinking process and so discover deviations. NO, less, more, as well as, part of, reverse, other than are guide words used.

Potential problems as represented by the consequences of the deviation should be evaluated as they arise and a decision reached on whether they merit further consideration or action. Except for major risk areas where a fully quantitative assessment

is required this decision is made semi-quantitatively on the consequence (usually scaled as trivial, important or very probable).

7.9 Maximum Credible Accident and Consequence Analysis (MCACA)

The potential hazards due to flammable and toxic nature of the raw materials, process streams and products can be quantified. However, it is necessary to carry out a hazard analysis study to visualize the consequences of an unexpected release from chemical plant, which consists of a number of process units and tank farm facilities. The present study provides quantified picture of the potential hazards and their consequences.

7.9.1 Methodology

MCACA aims at identifying the unwanted hazardous events, which can cause maximum damage to plant and personnel. At the first instance, all probable accident scenarios are developed. Scenarios are generated based on properties of chemicals, physical conditions under which reactions occur or raw materials stored, as well as material strength of vessels and conduits, in-built valves and safety arrangements, etc. Creating a scenario does not mean that it will occur, only that there is a reasonable probability that it could. A scenario is neither a specific situation nor a specific event, but a description of a typical situation that covers a set of possible events or situations.

The following steps are involved in identifying the maximum credible accident scenarios.

a. A detailed study of the process and plant information including process flow diagrams and piping & instrumentation diagrams.
b. Hazard classification of chemicals, operations and equipment.
c. Identification of representative failure cases of vessels and the resulting release scenarios
d. Establishment of credibility of visualized scenarios based on past accident data.

7.9.2 Representative Accident Scenarios

A study of past accidents, which took place in similar process units and the present plant, provides reasons and course of accidents and there by focusing on most critical areas. A

thorough examination of engineering details indicated many possible scenarios like gasket leak, pinholes in pipes and vessels apart from rupture of pipelines and vessels and catastrophic failure of vessels resulting in a pool. Heat radiation damage distances for Pool fire was considered.

Failure Frequency:

The release scenarios considered above can be broadly divided in to two categories

(i) Catastrophic failures which are of low frequency and

(ii) Ruptures and leaks which are of relatively high frequency

Vapor or liquid release from failure of gasket, seal and rupture in pipe lines and vessels fall in second category whereas catastrophic failure of vessels and full-bore rupture of pipe lines etc., fall in to first category. Typical failure frequencies are given in **Table 7.12.**

Table 7.12 General Failure Frequencies

Item	Mode of failure	Failure frequencies
Pressure Vessel	Serious leak	$1.0*10^{-5}$/Year
	Catastrophic	$3.0*10^{-6}$/Year
Pipe lines		
=50 mm dia	Full bore rupture	$8.8*10^{-7}$/m.year
	Significant leak	$8.8*10^{-6}$/m.year
>50 mm =150 mm dia	Full bore rupture	$2.6*10^{-7}$/m.year
	Significant leak	$5.3*10^{-6}$/m.year
>150 mm dia	Full bore rupture	$8.8*10^{-8}$/m.year
	Significant leak	$2.6*10^{-6}$/m.year
hose	Rapture/Failure	$4.0*10^{-5}$/hr
Unloading arm	Rapture/Failure	$3.0*10^{-8}$/hr
Check valve	Failure on demand	$1.0*10^{-4}$/on demand
motor operated valve	Failure on demand	$1.0*10^{-3}$/ on demand
Flange	Leak	$3.0*10^{-4}$/ Year
Pump seal	Leak	$5.0*10^{-3}$/ Year
Gasket failure	Failure	$5.0*10^{-5}$/ Year
Process safety valve(PSV)	Lifts heavily	$4.0*10^{-3}$/ Year
	Blocked	$1.0*10^{-3}$/ Year
	Lifts lightly	$6.0*10^{-2}$/ Year

7.9.3 Consequence Analysis

The accidental release of hazardous chemicals leads to subsequent events, which actually cause the damage. The damages are of three types.

1) Damage due to heat radiation.

2) Damage due to Over pressure effects subsequent to explosion

3) Damage due to toxic effects

The type of damage and extent of damage depends on nature of chemical, the conditions of release, atmospheric conditions and the subsequent events. The sequence of probable events following the release of a hazardous chemical is schematically shown in **Figure 7.2.** In the present study ALOHA software from USEPA is used. These models for various steps are described in the following sub-sections.

7.9.4 Release Models and Source strength

This depends on the nature of failure of the unit and the content of the unit and operating temperature and pressure of the unit. The release may be instantaneous due to total failure of storage unit or continuous due to leakage or rupture of some component of the storage facility. The material discharged may be gas or liquid or the discharge could be manifested through two phase flow.

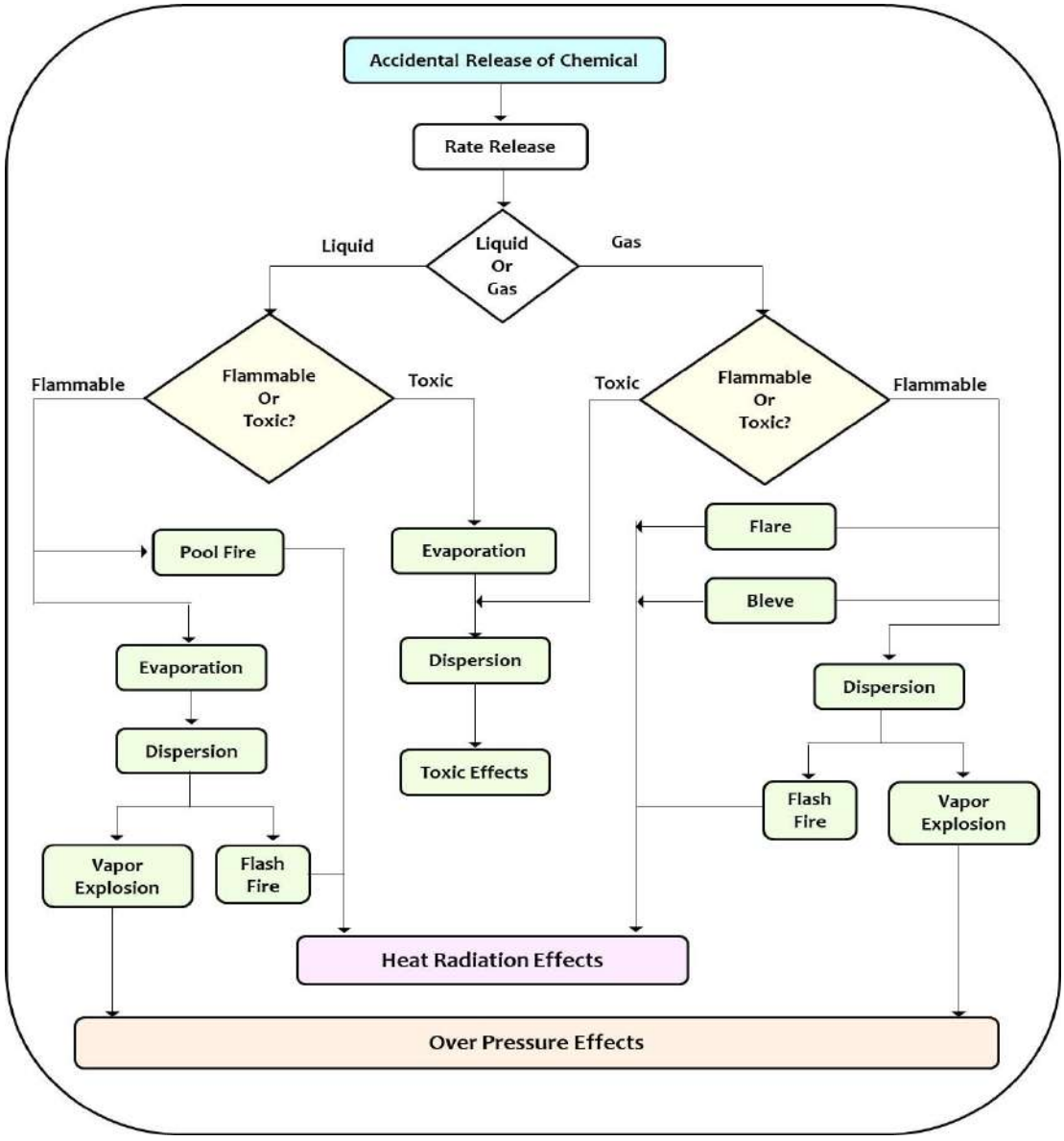


Fig 7.2 Steps in Consequence Calculations

The following criteria tables present heat radiation intensities (**Table 7.13**), radiation exposure and lethality (**Table 7.14**), and damage due to peak over pressure is presented in **Table 7.15.**

Table 7.13 Damage Due to Incident Radiation Intensities

S. No	Incident Radiation (KW/m2)	Type of Damage Intensity	
		Damage to Equipment	Damage to the People
1	37.5	Damage to process Equipment	100% lethality in 1 min. 1% lethality in 10 sec.
2	25.0	Minimum energy required to ignite wood at indefinitely long exposurewithout a flame	50 % lethality in 1min. Significant injury in 10 sec.
3	19.0	Maximum thermal radiation intensity allowed n thermally unprotected adjoining equipment.	---
4	12.5	Minimum energy to ignite with a flame, melts plastic tubing	1% lethality in 1 min.
5	4.0	--	Causes pain if duration is longer than 20 sec, however blistering is unlikely (First degree burns)
6	1.6	--	Causes no discomfort on Longer exposure

Source: Techniques for Assessing Industrial Hazards by World Bank

Table 7.14 Radiation exposure and lethality

Radiation Intensity (KW/m2)	Exposure Time (seconds)	1% Lethality	Degree Burns
1.6	--	0	No Discomfort even after longer exposure
4.5	20	0	1st
4.5	50	0	1 st
8.0	20	0	1 st
8.0	50	<1	3 rd
8.0	60	<1	3 rd
12.0	20	<1	2 nd
12.0	50	8	3 rd
12.5	--	1	--
25.0	--	50	--
37.5	--	100	--

Table 7.15 Damage Due to Peak Over Pressure

Human Injury		Structural Damage	
Peak Over Pressure(bar)	**Type of Damage**	**Peak over Pressure(bar)**	**Type of Damage**
5 – 8	100% lethality	0.3	Heavy (90%Damage)
3.5 – 5	50% lethality	0.1	Repairable (10%Damage)
2 – 3	Threshold lethality	0.03	Damage of Glass
1.33 – 2	Severe Lung damage	0.01	Crack of Windows
1 – $1^{1/3}$	50% Eardrumrupture	-	-

Source: Marshall, V.C.(1977)' How lethal are explosives and toxic escapes.

7.9.5 Results of Consequence Analysis

The damages due to the accidental release of chemicals are of three types.
a) Damage due to heat radiation
b) Damage due to Toxic effects

The damage distances are calculated for wind velocities 5 m/sec for the weather conditions stability class D & F respectively. All the results are considered for ground elevation unless otherwise specified. ALOHA software is used for quantifying the damage. Damage contours are drawn for the worst-case scenarios (Highlighted).

7.9.5.1 Heat radiation effects *(Terms of Reference No. Sp. TOR (13))*

When a non-boiling liquid spills, it spreads into a pool. The size of the pool depends on the availability of the bund and obstacles. The heat load on objects outside a burning pool of liquid is calculated with the heat radiation model. The average heat radiation intensity, the diameter-to-height ratio dependent on the burning liquid, geometric view, distance from the fire, relative humidity of air, horizontal or vertical orientation of the object radiated with respect to fire are factored. All storage tanks in tank-farm area are provided with dykes. For each of the hazardous chemicals involved various scenarios such as pipe line leaks of 5mm or pipeline ruptures or catastrophic vessel ruptures of the inventories as outlined have been considered and damage distances for Lower Flammability Limits (LFL) and heat radiation effects for the three levels of intensity are calculated and presented in **Table 7.16**. Heat radiation damage distances for most of the scenarios are

not occurring in the case of release from 50 mm holes at a height of 0.1 m from the bottom of the tank for one hour, in the storage tanks. In case of pipeline leaks, 5 mm leaks are considered for 15 mm and 50 mm pipe sizes. The release rates from 5 mm leaks are observed to be low, and these leaks have low incident hazard. The concentration of the flammable material in the vapor cloud was found to be below the lower flammability limits. Heat radiation damage distance (Pool Fire) is presented in **Fig 7.3 to Fig 7.4.**

Table 7.16 Heat Radiation Damage Distances – Tank Farm (Pool Fire)

S. No	Name of Raw material	Capacity (KL)	Dia. (m)	Ht (m)	Hole Dia (mm)	Release Rate (Kg/min)	Heat radiation damage distances in m for KW/m²		
							37.5	12.5	4.0
1	Dichloromethane	145	4.0	11.5	50	185	27	29	48
2	Methanol	553	7.7	12.0	50	520	14	24	33

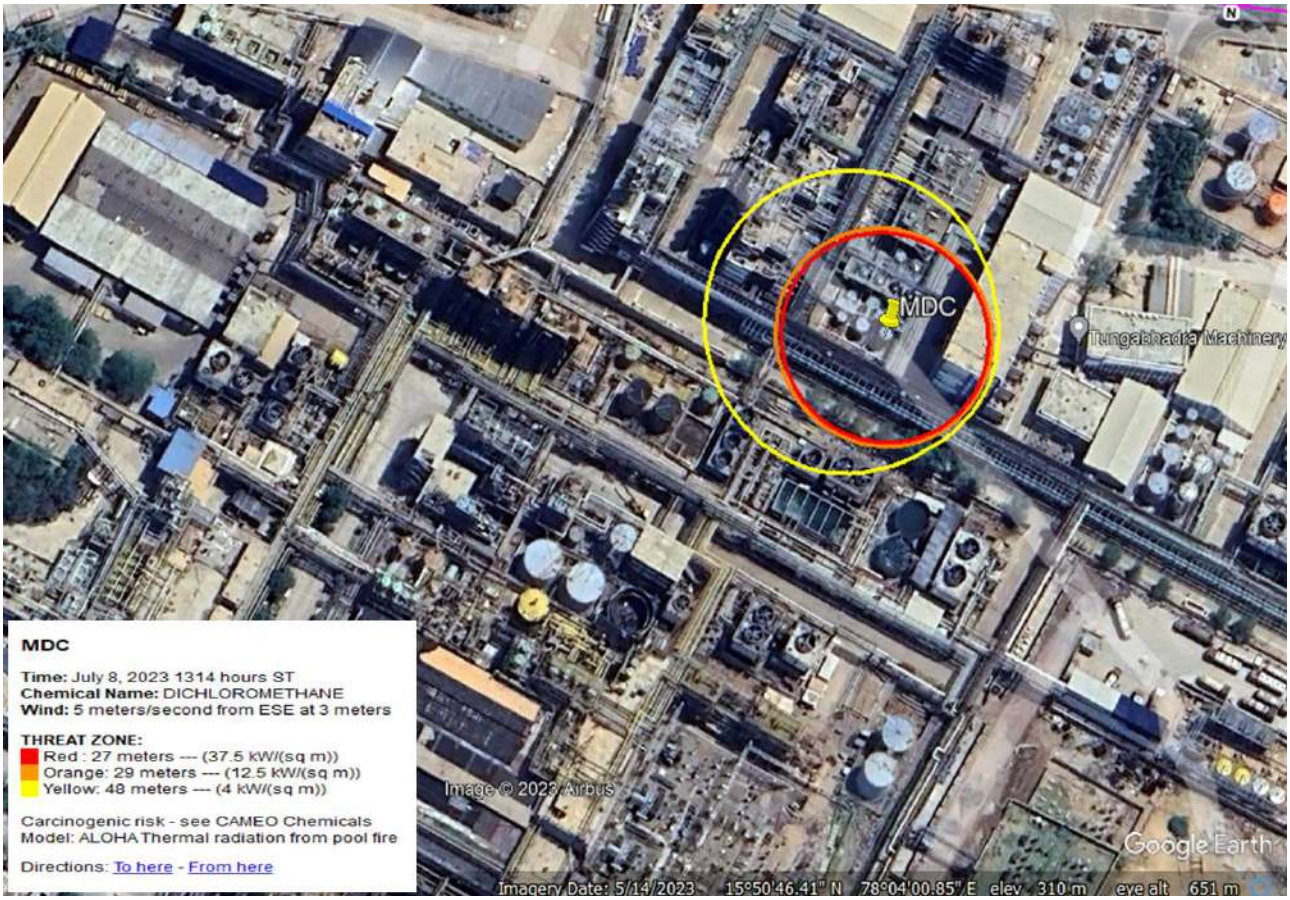


Fig 7.3 Heat Radiation Damage - 145 Methylene Chloride Tank

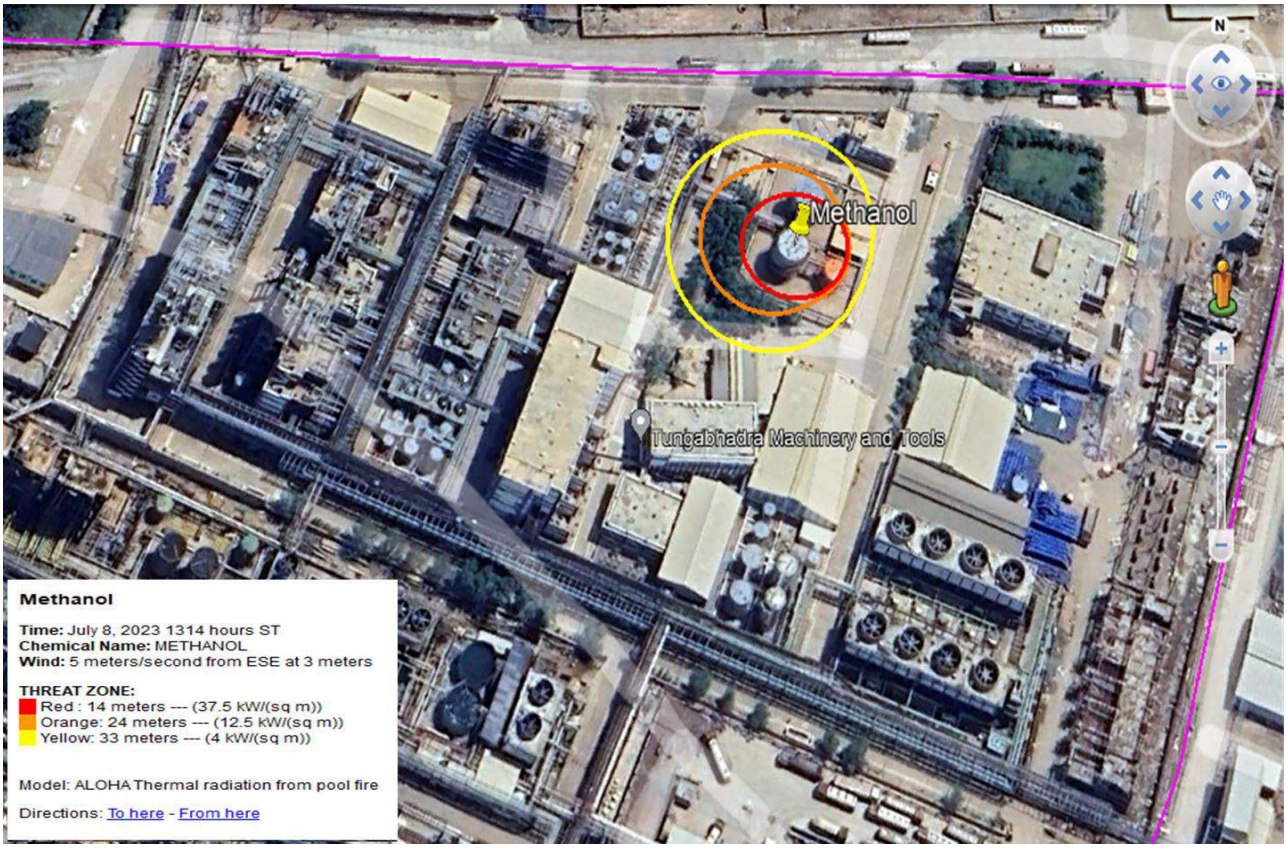


Fig 7.4 Heat Radiation Damage - 553 Methanol

7.9.5.2 Toxic Dispersion Damage Distances

The storage of toxic chemicals was evaluated with respect to failure of containment resulting in toxic dispersion and the toxic damage distances were calculated using ALOHA software. The results of the same are presented in **Table 7.17**. Toxic Dispersion damage distances for chlorine and chloroform storage tank are shown in **Fig 7.5 to 7.6.**

Table 7.17 Toxic Dispersion Damage Distances

S. No.	Scenario Description	IDLH (ppm)	Release Rate Kg/min	Distance (m)	Storage Tank Details			
					Height (m)	Dia (m)	Total Volume (m3)	Storage Pressure
1	Chlorine (Liquid Storage)	10	97.7	527	12	3.3	100	11kg/cm2(g)
2	Chloroform	166	83.4	208	12	4.2	166	Atmospheric



Fig 7.5 Toxic Dispersion Radiation Damage – 100 m³ Liquefied Chlorine Tank

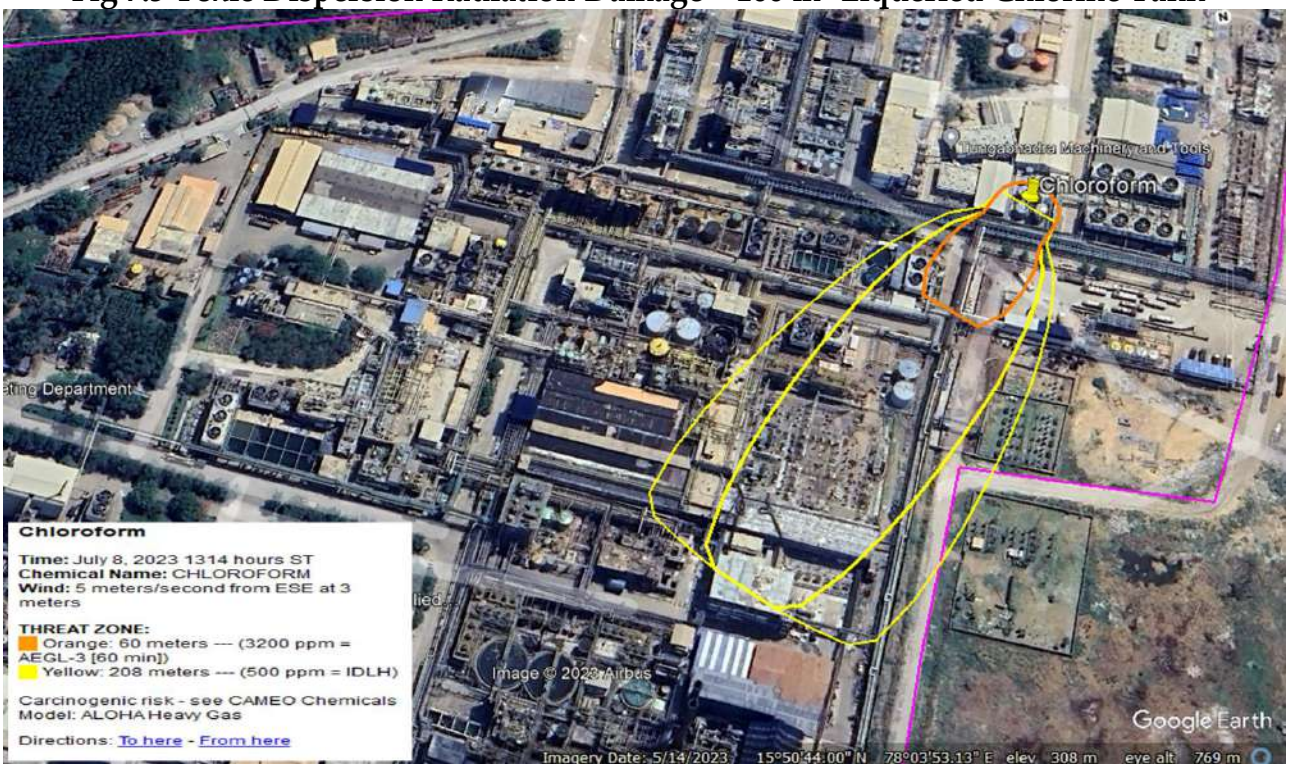


Fig 7.6 Toxic Dispersion Radiation Damage – 166 Kl Chloroform Tank

7.9.6 Observations:

From the previous incident records published in literature and hydrocarbon release data bases, it has been observed that pinhole leaks contribute highest percentage whereas the second cause is small sized leaks of 25 mm diameter in tank farm. Accordingly, the consequence analysis was carried out for 25 mm sized leaks in the tank farm.

7.9.7 Recommendations:

The following are the recommendations to minimize the hazards and improve the safety of the proposed plants. Plants of this nature, which handle a variety of chemicals, face problems of fire and vapor cloud explosions. It has been observed that the damage distances are more or less confined to the plant area only. Taking precautionary safety measures as outlined below in addition to existing safety measure can further minimize these effects.

1. The Onsite Emergency Plan needs to be reviewed in view of identified new emergencies due to HARA Study or HAZOPS.
2. Skid Mounted Auto Modular DCP type fire protection is to be installed over storage areas.
3. Nitrogen Inertization is to be ensured during charging of methanol
4. The scrubber vent terminal, vented contents are to be monitored to ensure that neutralization is adequate.
5. All flammable liquid chemicals would be transferred to tankers by strictly following SOP's.
6. Suggested to provide suitable fire suppression system over Hydrogen gas holder.
7. During chloromethanes extraction process, it is recommended to ensure that ingress of air is avoided to prevent formation of flammable or explosive mixtures. Such ingress could occur during intentional vacuum breaking or during power failure and inert gas system is to be always in position.

7.9.8 Toxic Management Plan *(Terms of Reference No. Sp. TOR (14))*

Handling: Storage & handling in compliance with MSDS. The transfer of raw materials shall be mainly by closed pipeline systems. The complete operation will be operated by DCS system**.**

Engineering Control Measures: Automatic cut-off valves, switches are provided for control addition and separation. Vent condensers in series with chilled water circulation to distillation columns of CMS plants to mitigate atmospheric emissions of toxics.

Personnel Protective Equipment: Personal protective equipment shall be provided to all employees including contract employees. All the employees shall be provided with gumshoe, helmet, masks, goggles. The other equipment like ear muffs, gloves, respirators, aprons etc., will be provided to employees depending on the work area allocated to them. The PPE selection shall strictly follow the prescribed guidelines of MSDS.

Health Monitoring of Employees: The pre-employment screening and periodic medical examination shall follow the guidelines of factories act. The pre-employment screening shall obtain medical history, occupational history followed by physical examination and baseline monitoring for specific exposures.

Table 7.18 Frequency of Health Monitoring

Occupation	Type of evaluation		Frequency
Process area	Physical Observation	Height Weight	Once a year for regular employees. Half yearly for contract employees
	Eyes	Color vision	
	Detailed Test	Hearing Ability; Physical Status, Lung function test, General Condition; Previous Accidents, Skin Infections; Any Physical Handicap	
	Clinical Observation	Heart; Hydrocele; Central Nervous System; Liver functioning; Diabetes; Any operations undergone; Symptoms of communicable and other contagious disease and Medical fitness	
Noise prone areas	Audiometry		Annually

7.9.9 Transportation *(Terms of Reference No. 7(iii)*

All the raw materials and finished products are transported by road. Dedicated parking facility will be provided for transport vehicles. There will be 35-42 additional truck trips per day to the factory due to expansion. Safety signages placed at various locations in the battery limit. The drivers of the vehicles are provided with TREM cards and will be explained the measure to be adopted during various emergencies.

Transportation of raw materials may result in accidents due to high speed collision, low speed collision, overturning and non-accident-initiated release. The initiating and contributing causes are presented in **Table 7.19.**

Table 7.19 Truck Incidents – Initiating and Contributing Causes

Human Errors	Equipment Failures	System or Procedural Failures	External Events
Driver Impairment Speeding Driver Overtired Contamination Overfilling	Non-dedicated trailer RR crossing guard Failure Leaking Valve Leaking Fitting	Driver incentives Driver training Carrier selection Container Specification Route selection	Vandalism/ Sabotage Rain Fog Wing Flood/washout
Other Vehicle's Driver Taking Tight	Brake Failure Insulation/Thermal Protection Failure	Emergency response training Speed Enforcement	Fire at rest areas/parking areas Earthquake
Unsecured Load	Relief device failure Tire failure Soft shoulder Overpressure Material defect Steering failure Sloshing High center of gravity Corrosion; Bad Weld; Excessive Grade Poor Intersection design Suspension system	Driver rest periods Maintenance Inspection Time of day Restrictions	Existing accident

The scenarios presented for storages are calculated for transport related incidents/accidents and presented in **Table 7.20.**

Table 7.20 Transportation Specific Concerns

Concern	Road
Spill on Water	Over or near a body of water
Unconfined Pools	In an undisturbed flat area
BELVE-Induced catastrophic vessel failure	Possible if sufficient quantity in car with small leak to feed fire or if double tank trailer or burning fuel leak
Toxic products of combustion or reaction	Dependent on material and whether ignition occurs

7.10 Disaster Management Plan *(Terms of Reference No. 7(xiii)*

7.10.1 Introduction

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, and forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social

care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re- establishment of essential services.

An emergency may be said to begin when operator at the plant or in charge of storage of hazardous chemicals cannot cope up with a potentially hazardous incident, which may turn into an emergency. The emergencies could be a major fire or explosion or release of toxic gas or a combination of them.

The proposed expansion will store fuels, which are flammable in nature, and the storage will be as per the Controller of Explosives and OISD norms. The hierarchy of the employees is yet to be determined and the project is still in the initial stages of designing. Hence a tentative disaster management plan is prepared to be suitably modified before commissioning of the plant.

7.10.2 Objectives of Emergency Management Plan (ON-SITE)

(Terms of Reference No. 7(xiii)

An emergency could be defined as a situation which poses a threat of safety and health of a person or/ process, plant, equipment, and property. It may or may not require outside help; There may be two types of emergencies; Intended and Unintended.

Unintended may result in

a. Fire
b. Explosion
c. Toxic release
d. Natural disaster like flood, Earth quake, Cyclone etc.

If the consequences of an industrial accident will be limited to within the factory premises, then that can be termed as on-site Emergency and a plan developed to tackle such an emergency is called on-site emergency plan. The purpose of the OSEP is aimed at providing basic guidelines to the concerned for effectively managing the resources at their command.

Scope of On-Site Emergency Plan (ONSEP)

The OSEP will be identifying emergency situations, areas that are likely to be affected, the emergency action to be taken, the key personnel with their responsibilities, along with other general detail like plant layout, infra structural facilities, neighboring industries, and possible mutual aid facilities. This plan will not cover the emergencies leading to offsite consequences.

General Considerations of Emergency Management

An emergency situation arises out of an accident and it can lead to loss of production, damage to property, human suffering etc. A major emergency occurs suddenly with a potential to cause loss of life and serious impairment to property and environment. The OSEP is limited to operations and facilities within the plant.

Main Objectives of ONSEP

1. To save the lives of the plant personnel.
2. To minimize the effects of the accident on people and property.
3. To take steps to fight fire or to contain leaks or spills in the early stages so that it does not escalate into off site emergencies.
4. To control and localize the emergency.
5. Steps to minimize the effects will include First aid, Rescue, Evacuation and Rehabilitation apart from controlling the origin of emergency.

Elements of ONSEP

1. Control of the occurrence, limiting & localizing the emergency and eliminating the hazard.
2. Arrange for safe shut down of the plant.
3. Ensuring the safety of the people.
4. Rescue and rehabilitation operations as required.
5. Rendering first aid and medical attention.
6. Providing information to the relatives of the injured and statutory authorities.
7. Making sure about the safety of the place before reentry.
8. Preservation of records and evidence for investigation purpose.
9. Inform employees & general public in vicinity about the role to be played by them in the event of an emergency.

10. In case of Flood, earth quake or cyclone, evacuation of the employees or contract labors is to be carried out in such a way that minimum employees or contract labors will remain in the premises to run the plant shut down, if required during above emergency to be done with consent of key personnel.

7.10.3 Emergencies Identified

Preliminary hazard analysis has identified the following possible scenarios capable of having potential for causing On-Site Emergency.

Toxic Release: Release of Chlorine gas from various process locations, storage, filling, transfer thro' pipeline and leak from tonners stored & loaded in trucks within the plant leading to toxic dispersion.

Fires & Explosions involving Hydrogen or Fuels: Hydrogen gas can leak from various process locations, gas holders, compressors, intermediate storage pressure vessels and pipe lines leading to jet fires, vapour cloud explosions and BLEVE.

- Fires in large size transformers involving transformer oil.
- Fires / Explosion in Autoclaves in Castor oil plant involving Hydrogen.
- Fires / Explosion in Hydrochloric acid synthesis involving Hydrogen.
- Explosion in Electrolyser.
- Fires in Husk storage.

Fire & Explosions involving Methanol & Methyl Chloride: Leakage of Methyl Chloride from Process tank, Pipeline, Compressors, leading to jet fires, vapour cloud explosion and BLEVE.

Leakage of Methanol while unloading, from storage tank, Pipelines, vaporizer, Leading to jet fires, vapour cloud explosion and BLEVE.

Spills involving Corrosive Chemicals & Hot Material in Fatty Acid Section: Spills of Sulphuric acid, Hydrochloric acid and Caustic soda can occur due to failure of storage vessel & pipe lines causes severe eye injury etc.

Fall from height while working at height.

7.10.4 Emergency Organization

Executive Director (Technical) shall be the Site Controller for the entire plant. As per the area and nature of accident they will take charge to discharge their duties. HOD (Prod) / HOD (F.A) / HOD (CMS) / HOD (PP) shall be Incident Controller for C.S. division, O&F division, and CMS plant respectively.

Shift Engineer will be functioning as Incident Controller in the absence of H.O.D (Production)/ H.O.D (F.A)/ HOD (CMS) / HOD (PP).

H.O.D (Mech.-C.S. Div.), HOD (Mech-CMS), H.O.D (Safety), Fire and Security Officers and S.H. (H.R & Welfare), Medical Officer / Para Medical Staff and All Department heads are designated as Key Personnel and must respond to emergency call and report to Site/Incident Controller.

Apart from the key personnel certain employees in shifts are identified as essential employees to combat emergencies.

Essential Employees

Supervisors of Chlorine Plant, Control room and Oil & Fats Division, Chloromethanes plant, D.G. Set Operator, River water pump Operator, Safety and Security Guards on duty, Drivers, Electricians, Instrument technician, Mechanical Fitters, First Aiders, Lab Chargemen, Hypo plant / HCl plant Chargemen and Civil Personnel are designated as essential employees during shift timings. These people will report to their department heads at the site of emergency and carryout their instructions to bring the emergency under control under the overall direction of Incident Controller.

Any other Person(s) requisitioned by Site/Incident Controller(s) from time to time will be treated as essential employees. Shift Engineer is expected to receive the first message about any emergency, he is considered to hold greater responsibility in controlling the

emergency till the arrival of Site Controller/Incident controller of respective divisions and other key personnel at the scene of emergency.

7.10.5 Emergency Procedures

Any person who notices first an emergency within the factory will contact the Shift Engineer of respective division / Main Control Room Supervisor of that shift and intimate him about the emergency.

To be furnished: The informer and receiver must identify each other first. The informer then gives the detail about the exact incident and location and along with any other relevant information he can give about the incident. Since it is an emergency communication everyone must be brief and precise

Declaration of Emergency: The Shift Engineer on receipt of the information will initiate suitable action to contain and control of the emergency. He will arrange to inform the key personnel about the incident depending upon the severity of the incident, he will initiate action for declaration of emergency through P.A. System

Assembly Points: The front side of the administrative building – Assembly Point -1, and D.G. sets Furnace oil storage area – Assembly Point -2 and Security Main Gate – Assembly Point -3 are designated as Assembly Points for Caustic Soda Division. The accommodation capacity in each Assembly point is approximately 300.

North-east gate (Security Main gate area) – Assembly Point -1 and South gate (Near DCS Building) – Assembly Point -2 and CMS -2 (North-West Gate)- Assembly Point - 3 are designated as assembly points at Chloromethanes plant. The accommodation capacity in each Assembly point is approximately 200.

Main gate of Co-gen Plant Assembly Point -1 and besides Themax Boiler, Assembly Point -2 are designated as assembly points at Co-gen plant. The accommodation capacity in each Assembly point is approximately 100







Emergency Control Centre: A room in the Administrative Building has been designated as Emergency Control Centre

7.10.6 Emergency Procedures

The following actions are to be taken during emergency

1. To initiate Safe shut down of the plant.
2. To ensure Safety of persons and property.
3. To act for Controlling the emergency.
4. To take suitable measures to avoid spreading of emergency

I. Shut Down of the Plant: If the emergency warrants shut down of the plant, it must be done according to the procedures laid down in the operating manuals of that section. The procedures are available in all the units and all the operating personnel are familiar about the procedures.

II. Auxiliary Requirements: In case of fire the main power to that section must be switched off. Diesel Generator must be started to cater to the emergency equipment's. Fire water tank level must be maintained to ensure adequate water supply for the firefighting operations.

III. Instruction to Employees

1. Be calm, do not get panicky.
2. Do not approach the site of disaster as a spectator.
3. Do not believe in rumors, better ascertain facts.
4. Do not engage phones/P. A systems unnecessarily.
5. Ensure that all contract laborer's working in the premises is immediately sent to main security gate.
6. Remain at your working place unless called & attend to instructions.
7. All non-essential staff members should collect at the suitable assembly points after assessing the wind direction & wait for further instruction.
8. Come out in open, Check the wind direction & move quickly in perpendicular direction of wind, for wind direction checking see the wind sock installed in the plant.
9. Cover your nose with wet handkerchief & breath through it.
10. Use any possible mode of conveyance to move away.
11. Do not run, walk fast.
12. In case of flood, go to higher level with necessary precautions. In case of earthquake, leave the building & run to open area with necessary precautions or take shelter in corner of building.

13. In case of flood, Chemicals that are highly reactive with water resulting into explosion, such chemicals are to be stored at higher elevation.

14. In case of heavy rain, ensure that ceilings are leakage proof for storage area to avoid any hazardous incidence.

7.10.7 Procedure for Evacuation

On declaration of emergency all persons who have not been designated as essential persons will have to leave their respective places of work and reach the Assembly Point thro' a designated escape route as will be announced thro' P.A. system. The evacuation activity in individual sections will be organized by concerned section supervisor. Arrow markings in fluorescent paint has been made indicating the route to be taken to reach Assembly Point. All employees are made familiar with the routes so they can take the route without panic during emergency.

7.10.8 Communication in Emergency

The siren is used to intimate everyone about the existence of an emergency in the plant. Siren will be activated by only the designated persons - Shift Supervisor or Shift Engineer. The siren can be activated based on the area of emergency since switches are provided in different critical locations. The siren will be sounded in three blasts of "half minute" duration with an interval of 15 seconds in between the blasts.

In case of power outage emergency power is available apart from hand siren which is available will be operated. The location of hand siren is at Castor oil plant and other at Chlorine compressor house.

The Shift Engineer of respective divisions on receipt of the intimation will instruct the Chloro alkali control room supervisor he interim will inform the telephone operator who is present thro' out 24 hours to get in touch with the key personnel and inform them about the emergency. Further he will arrange announcement thro' Public Address system to all plant personnel about the emergency.

He will ask the control room supervisor to make announcement thro' P.A. System about the nature, and location of emergency and direct the persons to reach the Assembly Point thro' Safe Escape Route based on wind directions. Intercom is available for internal communication with better back-up. If power has failed and telephones become inoperative walkie-talkie will be used. Cell phones are available with key personnel.

Emergency Control Centre:

Emergency Control Centre has been designated and site controller will receive and give all communications from this center. Till the arrival of site controller respective shift in charges will discharge these duties from his post/scene of emergency. In case of any emergency in O&F div., the Shift In charge of C. S. Div. will discharge the duties of site controller till his arrival.

Location of Push Buttons for Activating the Siren

The switches for activating the siren are located at the following places:

Caustic Division:

a) Chlorine storage area.
b) Chlorine compressor area.
c) Chlorine filling area.
d) Main control room.
e) Main Gate

Chloromethanes Division:

a) Security main gate.
b) Freon Compressor Room.
c) Old DCS Building 3rd Floor.
d) Old T.C. Building 1st Floor
e) Methyl Chloride Compressor Room.

7.10.9 Emergency Facilities

It is necessary that all directions and instructions have to be issued from one particular place and this place must be safe and is unlikely to be affected from the likely points of

hazard and it must be easily approachable. Based on these considerations one **Office room in the Administrative Building is designed as Emergency Control Centre.**

The following facilities are available at the control center.

a) Intercom and External Telephones
b) Factory lay out plan.
c) Plan indicating hazardous inventories, Control room, Assembly Points, Escape Routes, Sources of safety equipment's, Firefighting appliances etc.
d) Address and telephone numbers of key personnel/essential employees.
e) Address and telephone numbers of District Emergency Authorities like:
   - Dist. Collector
   - Superintendent of Police
   - Dist. Medical Officer
   - Nearest Police Station
   - Primary Health Centre
   - Municipal Commissioner
   - Govt. and Private Hospitals
   - ESI Dispensary
   - Home Guards
   - Dist. Veterinary Officer
   - Voluntary Organizations
   - Regional Transport Officers.
g) Address and telephone numbers of neighboring industries and contact persons.
h) Address and telephone numbers of outside experts/organizations.

7.10.10 Emergency Responsibilities

I. Shift Engineer (C.S) / Shift Engineer (O&F) / Shift In charges (CMS) Plant / Shift In charge Boiler (P.P)

On receipt of information about emergency in the plant he initiates the following actions.

a) Contact telephone operator intimate him about the emergency and ask him to convey the message to the site controller, incident controller and other key personnel.
b) Instruct the control room supervisor to announce thro' P.A. system about the emergency and about the wind direction and the safe escape route to be followed.
c) Reach the scene of emergency, assess the situation, and initiate necessary action to contain the emergency.
d) If the conditions warrant takes steps to shut down the plant.

e) If it is felt that the situation is serious declare emergency, arrange for sounding of siren to alert people and arrange for evacuation of persons.
f) Hold charge till the incident controller arrives at the site.

II. Site Controller – Executive Director (Tech)

a) On receipt of the information, he will reach the emergency control center assumes charge of the entire emergency operation.
b) Assess the situation in consultation with Incident Controller/Shift Engineer and Declares emergency if the situation warrants.
c) Be in close touch with the Incident Controller and co-ordinates all action concerning safe shut down, control of emergency, decontamination, etc.
d) Co-ordinates all actions regarding rescue, head count at assembly point, first aid, admission to hospitals, evacuation if required.
e) Directs all operation for firefighting.
f) Arranges for dissemination of proper information to the relatives of employees, public, media, etc.
g) Inform all statutory authorities like Factory Inspectorate, Pollution control board, Controller of explosives, etc.
h) Inform all neighboring industries about the emergencies.
i) Get in touch with the industries who have agreed upon mutual aid scheme and seek assistance if required.
j) If the situation is likely to get escalated and lead to off-site implications he will inform about the incident to Dist. Collector, Superintendent of Police, nearest Police Station, Dist. Fire Officer, Dist. Medical Officer, Primary Health Centre, Regional Transport Officer, Factories Dept., Government and Private Hospitals, Voluntary Organizations, etc., and proceed with off-site emergency plan.
k) Seek the help of outside experts if a need is felt.
l) Co-ordinate all action for decontamination and make fit for re-entry.
m) Arranges for giving "All clear" signal to announce conclusion of the emergency.
n) Arranges for preservation of evidences for further investigations.

III. Incident Controller – HOD (Production) of respective division /Shift in charge of respective division (C.S Division, O&F Division, CMS Plant & Co-gen Plant)

a) On receipt of information about the emergency he will reach the scene of emergency.
b) After assessing the situation to initiate action for safe shutdown of plant, controlling the emergency and ensuring safety of the plant personnel.

c) Arrange for announcement through P.A. System about location, nature of emergency and the wind direction along with the safe escape route to be taken.
d) Informs 'Site Controller' about the situation for planning further action and acts according to the instruction of the site controller.
e) Advises the firefighting crew about the methods and precautions.
f) Ensure that all the personal protective equipment's, tools and appliances are available.
g) Co-ordinates action regarding evacuation of persons from site to assembly point.
h) Oversees all activities regarding rescue, search, and transportation.
i) Arranges all activities for cleanup and decontamination of the area.
j) Arranges cell phones / messengers for communication requirements during power failure.
k) Preserve all evidences.
l) Inform site controller about conclusion of emergency and permission for re-entry.
m) Ensure no leakage of Chemicals on the floor takes place during heavy rains, floods, earthquakes, cyclone etc.

IV. Emergency Co-Ordinator

a) On hearing about the emergency report at the control center and site controller.
b) He will maintain the communication link with the incident controller.
c) Based on the information received he will interact with site controller to decide and communicate the further action to the concerned.
d) Maintains contact with the firefighting crew, rescue team, security, first aid requirements, evacuation requirements, etc.
e) Maintain the inventory of items in the control center.
f) Ensures availability of runners in case of power failure.
g) He also obtains the prevailing meteorological data from the local offices.
h) He maintains log of the events.

V. Medical Officer/Para Medical Staff.

a) On receipt of information reports at first aid center.
b) Checks up and confirm availability of all essential medicines, dressings, stretchers, etc.
c) Arranges for necessary first aid for the injured.
d) Co-ordinates with the control centre and advises about persons requiring medical treatment.
e) Establishes contact with medical officers of Government and other private hospital and intimate them in advance about the injured people being sent to them.
f) Arranges for Antidotes, wherever necessary and ensures that this is made available to outside hospitals also in case they do not have stocks.

MOCK DRILL

In order to provide practice to all the key personnel and essential employees so that they will be able to tackle any emergency, mock drills are conducted regularly at least once in 6 months.

Various observers will be enlisted for assessing the effectiveness of different emergency functions like communications, reporting time, search, rescue and treatment, assembly point, transportation, etc. Based on the observation's discussions are held with the concerned officials and necessary corrections will be implemented. Emergency Co-Ordinator (Safety) will be responsible for organizing Mock Drills.









Table 7.21 List of Safety Equipment Available at Site – Section Wise

Section	Safety Equipment
Chlorine Filling	Four numbers of airline breathing mask with hose and filter. A FRP hood with adequate length of flexible hose connected to exhaust blower which can be used during leakage. 01 Chlorine Cylinder Emergency Kits to arrest leaks from ton containers. Self-Contained Breathing Apparatus of 45 minutes duration – 4 Nos. An axial fan to be used to divert the leakage and make approach easy for repair. 4 Nos of Chlorine sensor with alarm which will alert leakages in its early stage. 3 Nos of Chlorine sensors at Cubicle cabins and auto start the Emergency Scrubber at 5PPM and Cabin Sliding doors get closed with hooter. Push button to activate emergency siren. 02 Nos Emergency scrubber start-up push buttons. ELBA (Emergency Life Breathing Apparatus) – 6 Nos.
Chlorine Storage	Two number of compressed air line gas masks with regulators, filters, and hoses. 8 Numbers of funnels fitted with flexible hose to suck the leak and transfer it to the header leading to absorbing system. The storage is completely enclosed with brick walls on all sides and exhaust header is laid and connected to an absorbing system comprising of caustic circulation pumps, caustic holdup vessel and a vent header. Push button system to activate emergency siren. Each tank is provided with 2 numbers of safety valves and rupture discs. Four numbers of chlorine sensors are provided with auto start facility of Emergency Scrubbing system in case of Chlorine exceeds 5ppm Load cells for each tank are provided. Fifth Chlorine sensor is installed in ground floor hooked up with Emergency caustic scrubbing system for auto start in case of chlorine exceeds 5ppm.
Chlorine Compressor	03 Nos of Chlorine sensor with alarm which will alert leakages in its early stage. 4 Numbers of airline breathing masks with flexible air tubing. Emergency shower and eye-wash fountain. One number self-contained breathing set of 45 minutes duration. One number airline mask with hose is available in chlorine liquefier. Emergency Life Breathing Apparatus of 15 minutes duration 2 Nos
Cell House	Three numbers of airline breathing mask with flexible hose,

	regulators, and filters. One number of self-contained breathing apparatus. 5% Boric acid solution in 1/2 lit. Bottles. Emergency shower and eye-wash fountain
Dichlorination Plant	Four numbers of airline breathing connected to masks with flexible hose, regulators, and filters. 5% Boric acid solution in 1/2 lit. Bottles. Emergency shower and eye-wash fountain. – 3 Nos. Chlorine sensor at the top of D-603 (suction seal) vent top.
HCl Plant	Two numbers of airline breathing masks with flexible hose, regulators, and filters. Emergency shower and eye-wash fountain
Brine Plant	Emergency shower and eye-wash fountain
Caustic Evaporation Plant	5% Boric acid solution in 1/2 lit. Bottles. Emergency shower and eye-wash fountain. Face shield
Chlorine Drying	Three numbers of airline breathing masks with flexible hose, regulators, and filters
Hypo Section	Two numbers of airline breathing masks with flexible hose, regulators, and filters
O & F Plant	Face shields and helmets. Emergency shower and eye-wash fountain - 5 numbers. Safety goggles. Asbestos suit
Captive Power Plant	Ear muffs and Ear plugs. Electrically tested rubber gloves for 11 KV rating. PVC hand gloves and asbestos gloves
Chloromethanes Plant	Face shields and helmets. Emergency shower and eye-wash fountain - 5 numbers. Safety goggles. Self-Contained Breathing Apparatus of 45 minutes duration – 2 Nos. ELBA (Emergency Life Breathing Apparatus) – 4 Nos

Table 7.22 Locations of Sensors Available at Site

Chlorine Sensors
The four chlorine storage tanks are equipped with chlorine digital sensors individually & to auto start the emergency scrubber at 5PPm. (With audiovisual indicators parallel to the control room) and Fifth chlorine sensor is installed in ground floor hooked up with emergency scrubber system for auto start at 5PPM
In chlorine bottling section digital audiovisual alarm – 4 Nos. and additional 3 Nos of Cl_2 sensors at Cabins and auto starts the Emergency Scrubber
In Hypo plant chlorine sensor with digital audiovisual alarm
07 Nos of chlorine sensor from SRAAC to SRHH with digital indicator and Alarm system
02 nos. of chlorine sensors are installed at HCL plant blower & road side area with digital audiovisual alarm
Chlorine sensor near Security gate – West side
Chlorine sensor at De-chlorination plant suction seal vent
At Co-generation plant chlorine cylinder handling area (Old & new water clarifier) and Main Gate –3 Nos
In Cell house chlorine sensor with digital audiovisual alarm- 5nos.
In Chlorine plant chlorine sensor with digital audiovisual alarm- 4 nos.
In CMS plant Chlorine Thermal Reactor area sensor with digital audiovisual alarm- 2nos.
VOC Sensors
Shift tank area
Check tank area
Methanol tank area
Product Storage tank area

Details of Fire-Fighting System

1. Fire Hydrants - Ground -82 + Riser - 44
2. Delivery Canvas Hose pipes - 63 x 15 mts.-100Nos. + 63 x 7.5 mts.20 Nos.
3. Branch pipes 5/8″ - 68 Nos. + Fog Nozzle – 4 Nos.
4. Foam Making Branch Pipes - 3 Nos. + Foam Makers -05 (Tank)
5. Foam Compound - 2000 Lts.
6. Dividing Beaching - 1 No.
7. Fire water pump - Cap. 273 m^3/h. Pres. 7.5 kg/cm^2 Elect. Driven HP- 120 HP-1 No
8. Fire water pump - Cap. 273 m^3/h. Pres. 7.5 kg/cm^2 Diesel Driven HP- 120 HP-1 No
9. Jockey pump - Cap 10.8 m^3/h. Pres. 7.5 kg/cm^2 Driven HP 20 HP-2 Nos.

The jockey pump will maintain the header pressure and on drop in pressure the pressure switch will activate main pump and supply header pressure will be maintained at 7 kg/cm^2.

10. Static fire water storage tank - Cap. 700 m3 + 600 m^3.=1300 m3
11. Foam pourers on fuel oil tank - 05 Nos.

CHLOROMETHANES PLANT

1. Water + Foam monitors - 7 Nos
2. Water monitors - 4 Nos
3. Ground Hydrant - 16 Nos
4. Riser hydrants - 10 Nos
5. Fire water pump - Cap. 273 m^3/h. Pres. 7.5 kg/cm^2 Elect.Driven HP- 100 HP-2 Nos
6. Fire water pump - Cap. 273 m^3/h. Pres. 7.5 kg/cm^2 Diesel Driven HP- 100 HP-1 No
7. Jockey pump - Cap 10.8 m^3/h. Pres. 7.5 kg/cm^2 Driven HP 20 HP-1 No
8. Static fire water storage tank - 2 Nos. X 250 m3 = Cap. 500 m^3.

Water sprinklers (192 Nos) are provided for Methyl chloride process tanks and methanol storage tank.

IMPORTANT GENERAL TELEPHONE NUMBERS

DESIGNATION	TELEPHONE NO.
DISTRICT COLLECTOR	221306, 221307
JOINT COLLECTOR	220328
DIVISIONAL REVENUE OFFICER	221162
REVENUE DIVISIONAL OFFICER	220140
MANDAL REVENUE OFFICER, KURNOOL	220613
SUPERINTENDENT OF POLICE	221758
POLICE CONTROL ROOM	220100
WIRELESS	220092
TRAFFIC POLICE	221758
TALUQ POLICE STATION	220093
RAILWAY POLICE	220010
COMMANDANT APSP	220219, 221737
COMMISSIONER MUNICIPALITY	220051,221847, 221849, 221764
DM & HO	220133, 220134
HOSPITALS	220422, 220158, 220594, 220423,

	220424, 220657,220149, 220429, 220689, 221139, 220503.
MEDICAL COLLEGE	220160
COLLEGE OF NURSING	221426
REGIONAL TRANSPORT OFFICER	220348, 220196, 220307
RAILWAYS	220010, 220110
REGIONAL FIRE OFFICER	220101, 220161
DISTRICT MANAGER (TELEPHONES)	223050
ALL INDIA RADIO	222576
DOORDARSHAN	221649, 220237
SUPERINTENDING ENGINEER (APSEB)	221918, 221919, 221736
NEIGHBOURING INDUSTRIES	
SREE RAYALASEEMA HI-STRENGTH HYPO LTD UNIT-I, II, III	280065, 280066,280092, 280106
TGV PROJECTS & INVESTMENT (P) LTD.	280106
SREE RAYALASEEMA GALAXY INDUSTRIES LTD..	280065, 280066

8.0 PROJECT BENEFITS

8.0 Introduction *(Terms of Reference No. 2(iii))*

M/s. TGV SRAAC Limited located at Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh obtained environmental clearance vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 01.05.2018 for expansion of Chlor-Alkali plant and synthetic organic chemicals manufacturing unit subsequently the unit obtained name change in EC dated 01.05.2018 vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 28.09.2021 in an area of **152.4 ha**. The unit obtained consent for establishment (CFE) for expansion vide order no. APPCB/ KNL/ KNL/ 231/ CFE/ HO/2008 dated 23.05.2018. The previous expansion was implemented in phased manner, accordingly the unit obtained consent for operation (CFO) for caustic expansion and chloromethanes separately. It may be noted that the entire capacity mentioned in previous EC dated 01.05.2018 is currently in operation. It is proposed to expand the manufacturing capacity chlor-alkali and chloromethanes by 40% of existing capacity in phased manner with a capital cost of Rs. 280 cores.

8.1 Need of the Project

The proposed expansion involves a capital expenditure of Rs. 280 crores contributing to the local economy due to consumption of building construction materials from the surrounding areas and usage of construction labour from surrounding villages. The objective is to contribute the overall development of surrounding villages in the impact area and to support such schemes in the following areas; Health, Sanitation, Drinking water and Eco Development.

8.2 Improvement in Social Infrastructure

The employment potential from proposed expansion of the project is 150. This may also lead to in migration with increased pressure on social infrastructure like community halls, entertainment centres, etc. in the initial period, providing an opportunity to local

villagers to construct and operate the same. This in turn would generate additional indirect employment and increased demand for services. These developments would lead to increased taxes and royalties to local bodies.

8.3 Employment Potential

The proposed expansion will provide employment to 150 people. It will be spending approximately Rs. 90 lakhs of rupees every month on salaries providing bread and succour to 150 families additionally. The proposed expansion will also generate indirect employment to the locals during construction phase in the order of 100 people for a period of 12-18 months. The employers will contribute to the provident fund, ESI and provide facilities as per the relevant labour act.

8.4 Corporate Environment Responsibility

The ministry of Environment, Forest and Climate Change issued an office memorandum mandating corporate environment responsibility expenditure contingent on the capital cost of the project, in addition to the expenditure on environmental management. It is proposed to spent 220 lakhs towards corporate environment responsibility towards construction/upgradation/repairs of roads in villages, drinking water supply, avenue plantation etc.

Tax Income

The proposed capital expenditure of Rs. 280 crores include GST on various equipment and services to the tune of Rs. 35 crores from proposed expansion. The provision of employment also directly contributes to additional income tax and indirectly contributes to additional GST due to various transactions. The operation of the project also results in additional GST from revenue, additional income tax on profits and from employee salaries.

9.0 ENVIRONMENT COST BENEFIT ANALYSIS

The TOR Identification No. TO23A1601AP5456286E [F.No. J-11011/84/2016-IA II(I)] dated 15.03.2023, does not mention Environment Cost Benefit Analysis and hence the same was not conducted.

TGV SRAAC LIMITED

SY. NO. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, GONDIPARLA VILLAGE, KURNOOL MANDAL AND DISTRICT, ANDHRA PRADESH

ENVIRONMENT MANAGEMENT PLAN

Project No. 0823-13/21-01
August 2023

TGV SRAAC Limited
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SUBMITTED TO
MINISTRY OF ENVIRONMENT, FOREST, AND CLIMATE CHANGE
GOVERNMENT OF INDIA
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI

10.0 ENVIRONMENT MANAGEMENT PLAN

10.0 Introduction

Environment management plan can be effectively implemented to mitigate the pollution levels by observing the following; avoidance, source reduction, on site recycling, by product extraction, and offsite recycling as first choice followed by treatment, release, and disposal. The management plan elucidates measures proposed to be adopted for expansion in addition to the existing ones which include modification to engineering design, inclusion of new technology, change in work practices during operations and required personal protection equipment to minimize the residual impacts that are predicted, are presented in the previous chapters. Hence, it is necessary to balance development and sustainability by ensuring least change in baseline before and after proposed expansion, either by control, mitigation, or enhancement measures. Management commitment is key to the success of integrated approach to pollution prevention and control. Environment management must be viewed as a total commitment to the environment, and not just for compliance with legal or regulatory conditions.

10.1 Environment Management Plan

Environment management plan can be effectively implemented to mitigate the pollution levels by observing the following;

i Pollution will be prevented or reduced at source

ii Pollution that cannot be prevented will be recycled in an environmentally safe manner

iii Pollution that cannot be prevented or recycled will be treated in environmentally safe manner and

iv Disposal and other releases into the environment will be used "only as a last resort" and will be conducted in an environmentally safe manner

The environment management plan as prescribed by the EIA notification seeks a description of the administrative aspects of responsibility for implementing, monitoring, and establishing feedback loops for adaptive management. The environment management shall be entrusted to the environment management department of Environment, Safety and Health (ESH) division of M/s. TGV SRAAC Limited during operation phase and by a small team of safety, health and environment group during construction phase.

10.1 Environment, Safety and Health (ESH) Division

The proposed expansion related construction and erection works will be supervised by the existing ESH division of the unit. The operation phase shall require a larger department for environment, safety, and health headed by Environment Division (ED) head will report to the Executive Director (Tech.).

10.1.1 Qualification

The ED is assisted by 5 heads of department (HOD) of all divisions with at least a civil engineering or mechanical engineering or chemical engineering followed by shift in-charges/safety engineers with at least a polytechnic diploma in civil engineering or mechanical engineering or chemical engineering, operators, and chemists with B.Sc. in chemistry as a subject or post-graduation in chemistry (preferably analytical chemistry). This group may later be absorbed into the ESH department.

The ED (ESH) will be a senior person with post-graduation in engineering with at least 30 years of experience in safety, health, and environment departments of chlor-alkali industries. Head of department (HOD) of different sections will report to ED. The qualifications and experience of head of department (HOD) of different sections, shift in-charges/safety engineers, operators, and chemists are as mentioned in the previous paragraph. The organogram of environment, health and safety department is presented in Error! Reference source not found.

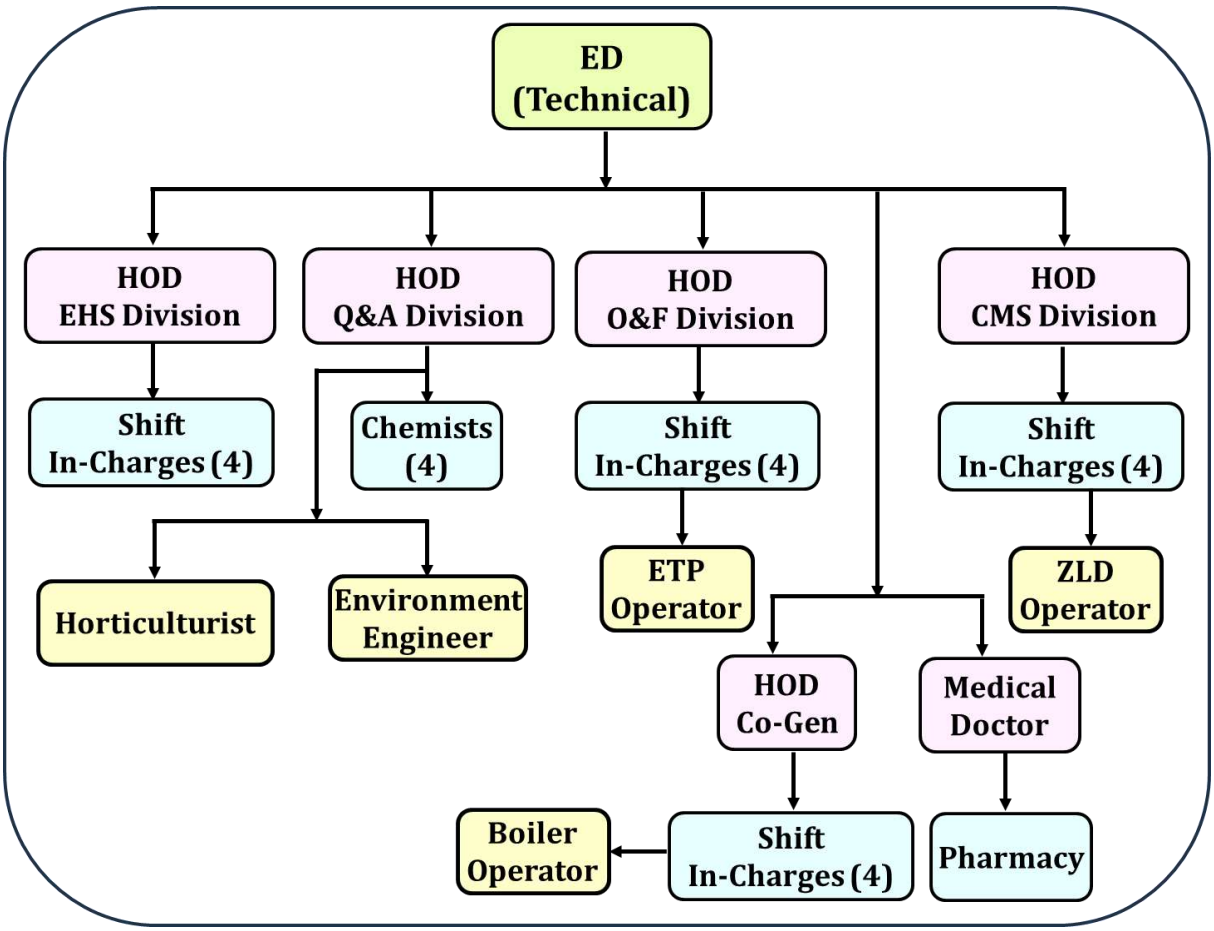


Fig 10.1 Organogram Environment, Safety and Health Division

The responsibility of environment department includes;

- Supervision and Monitoring of all environment management measures,
- Preparation of monitoring reports,
- Conducting environmental audit reports,
- Identification of innovative management measures for reducing wastes, recycling wastes, and or avoiding the wastes.
- Obtaining statutory approvals and submission of periodic compliance reports
- Monitoring of compliance of consents, Environmental clearance, and other authorizations.
- Co-ordinate in renewals of ISO 14001, 9001 and ISO 45001 certification
- Implementation of ISO 14001 and ISO 45001
- Conducting training programs of environment management to various divisions.

- Co-ordination with other divisions in ISO 9001 implementation
- Liaisoning with statutory organizations like APPCB, MoEFCC, CPCB etc.
- Co-ordinating with Director (operations) and Managing Director during plant upsets due to failure of pollution control measures.
- Co-ordinate with third party environmental consultants for expansion activities.

10.3 Environment Safety and Health Policy

The management of M/s. TGV SRAAC Limited commits to operate industry in an environmentally friendly manner, while protecting health and safety of its employees. The management is committed to prevention of pollution, injury and ill-health to its employees and member units. The following environmental policy is adopted;

TGV SRAAC LIMITED, KURNOOL

QESH POLICY

(Quality, Environment, Safety & Health Policy)

We at **TGV SRAAC LIMITED**, Gondiparla, Kurnool, are in the manufacturing and marketing of Caustic Soda, Potassium Hydroxide, Liquid Chlorine, Hydrochloric acid, Hydrogen Chloride Gas, Hydrogen Gas, Sodium Hypochlorite, Potassium Carbonate, Barium Sulphate, Methyl Chloride, Methylene Chloride, Chloroform, Carbon Tetrachloride, Hydro Chloric Acid (Organic origin), Sodium Sulphate, Refined Castor Oil, Hydrogenated Castor Oil, 12–Hydroxy Stearic Acid, Methyl 12 Hydroxy Stearate, Ricinoleic Acid, Distilled Fatty Acids, Refined Glycerin, Soap Noodles, Toilet Soaps, Bathing Bars including Captive Power Generation.

By implementation of Quality, Environmental, Health and Safety management systems, we are committed to:

- **Adhere to the requirements of Integrated Management system, customers, and interested parties and continually improve the effectiveness of the Integrated Management System thereby giving consistent quality and services, cost effective, and ensuring customer satisfaction.**
- **Contribute to sustainable development by promoting greater environmental, health and safety practices.**
- **Achieve sustainable growth through protection of environment, promoting pollution prevention practices and conserving resources with ecofriendly process.**
- **Create an injury free and healthy workplace by eliminating or reducing hazards, control of occupational, health, safety risks using the hierarchy of controls, training to enhance competency levels and promote wellness.**
- **Comply & satisfy all applicable legal & statutory requirements.**
- **Communicate the policy to all employees working in the organization.**
- **Implementing collective decision-making process in the Integrated Management System (I.M.S)**

Place: Kurnool
Date : 01-12-2021

C.SRINIVASA BABU
Executive Director (Tech.) & Occupier

The policy is made publicly available through www.tgvgroup.com and disclosed for all Interested parties as per requirement.

10.4 Mitigation Measures and Responsibility

The mitigation measures are explained in detail in **Chapter 4.** Salient features of mitigation measures at place/proposed are presented in **Table 10.1** and **10.2** for both construction and operation phases. The environment management department shall be responsible for monitoring the compliance and provide feedback to top management and also to the respective division. The responsibility of implementing the mitigation measures lies with respective division during operation phase, and project management division and contractors during construction phase.

Environment, Safety and Health (ESH) Division will be responsible for the compliance of the environmental conditions laid down in Environment Clearance and adhere to the Environmental Laws and Regulations. Six monthly compliance report with respect to the conditions stipulated by MoEFCC will be submitted regularly to the Regional Office of MoEFCC. Work instruction for reporting and addressing non-compliance related to EC/CTE/CTO conditions is laid down in Standard Operating Procedure (SOP). In case of any violation of any statutory conditions, the same will be reported to the Managing Director and subsequently to Board of Directors and other Stakeholders. The Board of Directors will review the non-compliance and its corrective actions. Incident reporting mechanism is shown in **Fig 10.2**

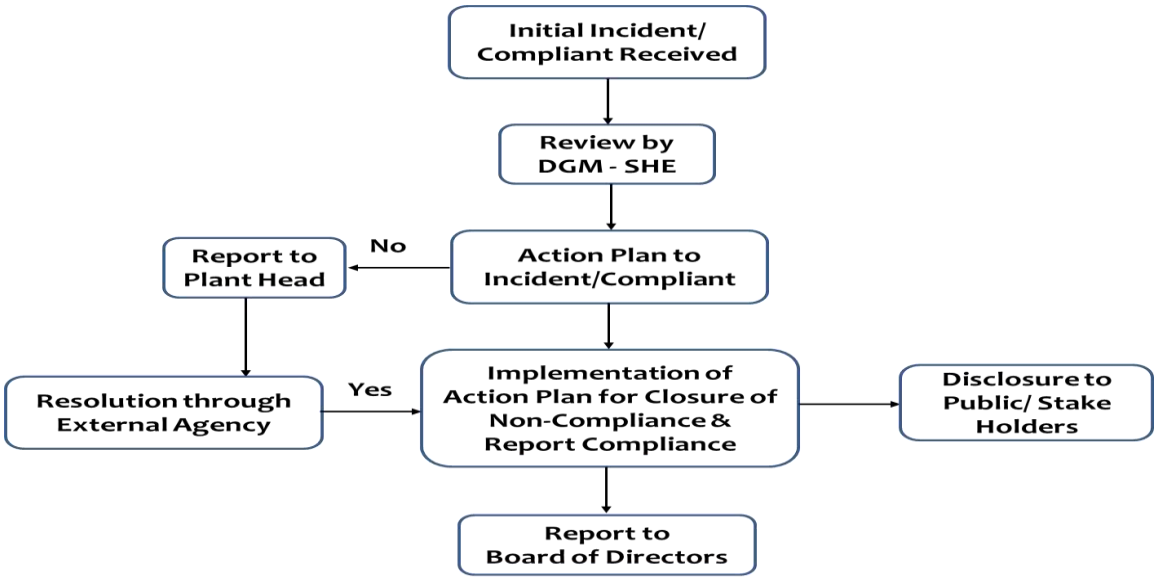


Fig 10.2 Reporting Mechanism for Non- Compliance

Table 10.1 Implementation and Monitoring of Mitigation Measures –Construction

Environmental Impacts	Mitigation/ Control Measures	Implementation responsibility	Monitoring Responsibility
Construction Phase			
Air pollution	Water sprinkling Reduction of drop height Avoidance of engine idling PPE provision PUC certification Barricading the site where ever possible with 3 m height MS sheets. Limit open stocking of material before transferring it to a confined storage Confining the excavated material within a barricaded area to avoid dust raise	Respective contractors	ESH department to ensure compliance, and handhold, if necessary, by providing guidance and training.
Water pollution	Water conservation Maintenance of existing drains Inlet and outlet locations to be connected at the end after ensuring no muck or sediment in the constructed drains Place storage areas for fuels and lubricants away from any drainage leading to water bodies Dispose any wastes generated by construction activities in designated sites	Respective contractors and project management department	ESH department to ensure compliance, and handhold, if necessary, by providing guidance and training.
Noise levels	Silencers/mufflers to equipment. Acoustic enclosures Periodic maintenance PPE Reduced drop height. Rubber padding at discharge point and at the impact point, Isolation of equipment, Antivibration pads Attenuating screens between operators and sources Enclosed operator room Training to workers	Respective contractors. Project management department to include in contract documents.	ESH department to ensure compliance, and handhold, if necessary, by providing guidance and training.
Solid waste	MSW segregation, storage, and disposal Construction and demolition waste storage and disposal Provision of storm water drains in the first stage of construction Avoid stockpiling any excess spoils Storage of hazardous materials like fuels, paints on paved area. Hazardous wastes such as oils, and lubricants shall be disposed to authorized recyclers Storage of wastes in labelled containers	Respective contractors. Project	ESH department to ensure compliance

Environmental Impacts	Mitigation/ Control Measures	Implementation responsibility	Monitoring Responsibility
	Avoidance of burning waste on site Biomedical waste disposal to CBMWTF		
Other enhancement measures	Enhancement of existing green belt	Horticulturists.	ESH department to ensure compliance

10.4.1 Operation Phase

During operation stage the major pollution from proposed expansion is from air pollution from process, utilities and or combustion of fuels/wastes and liquid effluents from process, utilities and domestic facilities, and. The management, mitigation and enhancement measures identified for significant impact sources are presented as follows;

Table 10.2 Impacts and Mitigation – Operational Stage

Source	Mitigation Measures	Budget Allocated (Rs. Lakhs)	Monitoring Responsibility
AIR			
Emissions from fuel combustion	Electro Static Precipitators (ESP) – 120 TPH (Proposed) ESP – 110 TPH; 100 TPH and 42TPH (Existing) Effective stack height – Standby DG sets Low ash and sulfur content fuel usage	220	Respective department and ESH department
Process emissions	Double stage scrubbing system Emergency, Tail gas Scrubbers Chlorine, HCl, Chloroform and Hydrogen sensors	175	ESH department followed by Process operators
Diffuse emissions	Closed transfer of raw materials/solvents Dual condensing system Vacuum Pumps Vent Condenser for low vapor pressure solvents Nitrogen blanketing, Breather valves, Safety relief valves, rupture discs to storage tanks Personal Protective Equipment (PPE)	118.8	ESH department followed by process engineer and operators
Fugitive Emissions	Spill control Periodic proactive maintenance Ventilation Personal Protective Equipment (PPE)	25	ESH department followed by maintenance engineer
Odor Nuisance	Closed transfer Good House-keeping Spill control	15.8	ESH department followed by House-keeping staff.
WATER			
Effluents from Chlor-Alkali Effluents from CMS Effluents from CPP	Treatment in ZLD based effluent treatment plant and treated wastewater as a process water and rejects sent for brine saturation.	95	ETP Manager, operators, and chemists

Domestic wastewater	Sent to Oil & Fatty division ETP and treated wastewater reused for greenbelt development		
NOISE AND VIBRATION			
Process area (Turbine)	Attenuating screens Personal Protective Equipment (PPE)	177.5	ESH department followed by DG sets operators and Co-generation power plant manager
Compressors and DG sets	Acoustic enclosure		
Equipment, motors, pumps	Casings and guard		
Transport	Limited vehicle movement in plant boundary		
SOLID WASTE			
Process and ETP sludge	In-house secured landfill Personal Protective Equipment (PPE)	55	ESH department followed maintenance staff
Ash from Boilers	Designated covered storage Disposal to Cement/Brick manufacturers Personal Protective Equipment (PPE)	20	
Coal Handling	Covered shed for coal storage	35	Boiler In-Charge
OTHERS			
Employee exposure to chemicals	Occupational Health Centre Self-contained breathing apparatus Standard operating procedure Health checkup on recruitment Periodic health checkup during employment Engineering controls like interlocking system, auto cut-off etc. Employee rotation Personal protective equipment Education, training and periodic mock drill	20	Medical officer followed by ESH department.
Regulatory compliance	Continuous monitoring Online connectivity to SPCB/CPCB	109	ESH department
Greenbelt	Horticulturist	19.3	ESH department

10.5 CREP Guideline and Compliance

CREP Guideline	Compliance
Complete recycling of mercury bearing effluent by December 2003.	Not Applicable, the unit adopted membrane cell technology-based process which does not use Mercury.
Installation of continuous on-line mercury analyzer by June2003.	Not Applicable
Treatment of cell-room ventilation gas – limit for mercury not to exceed 1 gm/t of product by December 2005.	Not Applicable
De-mercerisation of caustic soda & limit for mercury in caustic soda at 0.1 gm/of product by December 2004.	Not Applicable
Reduction of mercury in H2 gas at 0.5 gm/t by December 2004.	Not Applicable
Installation of common full-fledged salt washer unit at source by Dec. 2003.	Not Applicable
Capping existing completed disposal sites by June 2004 (Action plan to be submitted by June 2003).	Not Applicable
Brine sludge treatment and water leachable mercury content in brine mud at < 0.1 mg/l before disposal in Secured Landfill.	Not Applicable
Reduction of mercury consumption at < 50 gm/t of product by December 2005.	Not Applicable
Total mercury release to environment at < 2.0 gm/t of product by December 2005.	Not Applicable
The mercury cell plants will switch over to membrane cell Technology in a time bound manner for which action plan will be prepared by respective plants within six months.	Not Applicable
Industry to submit action plan covering the pollution and safety aspects for Cl_2 handling to prevent any accident/ release of Cl_2 within three months.	The onsite emergency management plan addressed the safety and pollution aspects of Cl_2 handling to prevent accident/release.

10.6 Other Management Practices

Proper housekeeping practices are adopted to maintain cleanliness and to minimize wastes and reduce pollution. Adequate parking place is provided within the site in an area of 2.4 acres for heavy vehicles to avoid any congestion or blocking of the roads. Road safety signage will be erected within the site to avoid road accidents. The drivers of vehicles transporting materials to and from the site are trained in defensive driving,

and managing exigencies due to spillage or accidents, immediately after informing the competent authorities.

The industry will maintain records as per the hazardous waste regulations and EPA regulations and apply for the annual consents for air and water, and renewal of authorization for the storage of hazardous waste as per Hazardous Waste (Handling & Management) Rules, 1989 and subsequent amendments. The records of hazardous waste manifest will be maintained.

The industry shall obtain the consent for operation (CFO) as required under section 25/26 of the Water Act, 1974 and under section 21/22 of Air Act, 1981 before trial production and commissioning from the State Pollution Control Board. The CFO will be renewed each year by the industry. The industry will obtain the necessary permissions under Hazardous Waste (Management and Handling) Rules 1989, and Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989, issued by the Ministry of Environment and Forests, New Delhi. The industry will submit environmental statement every year before September 30, and monthly water cess returns. The management ensures that it will comply with all the directions and regulations issued by the Ministry of Environment and Forests, New Delhi, State and Central Pollution Control Boards. The Consent for Establishment, Consent for Operation will be displayed in a conspicuous location for the information of the inspecting authorities of different departments.

10.7 Cost Estimate for Environment Management Plan

It is estimated that the total capital cost for implementing the Environment Management plan is Rs. 10.85 crores, while the annual recurring cost is Rs. 10.66 crores. The cost estimate is presented in **Table 10.3**. The item wise tentative capital cost estimate for environment management measures is presented in **Table 10.4.**

Table 10.3 Environment Management Cost estimate

S.No	Description	Capital	Recurring Cost
1	Air pollution Control	550	150
2	Water pollution Control	95	596.1
3	Noise pollution Control	177.5	15
4	Environment Monitoring and Management	109	10
5	Occupational Health	79.6	60
6	Green Belt	19.3	8
7	Others (S. Waste)	55	227.2
	Total (Lakhs)	**1085.4**	**1066.3**

Note: Value in Rs. Lakhs

Table 10.4 Item Wise Tentative Capital Cost Estimate for Environment Management

S.No	Description	Cost (Rs. Lakhs)
I	**Air pollution**	
	Electrostatic Precipitators (ESP)	220
	Scrubbers	175
	Condensers	100
	Coal handling system	35
	Ash handling system	20
	Total - I	**550.0**
II	**Process Safety**	
	Breather Valves	1.8
	Rupture disks	1.2
	Safety relief valves	4.8
	Sensors	15
	Fire extinguishers	1.2
	Fire buckets	0.6
	Total - II	**24.6**
III	**Occupational safety**	
	Occupational safety and health centre with facilities	20
	Self-contained breathing apparatus	20
	Personal protective equipment	5
	Eye wash and body wash showers	10
	Total - III	**55**
IV	**Water**	
	Storm water drains	15
	Effluent and sewage transfer lines	80
	Total - IV	**95**
V	**Noise**	
	Acoustic enclosures	87.5
	Guards, casing, attenuating screens	45
	Turbine Room	35
	Vibration control pads	10
	Total - V	**177.5**
VI	**Solid waste**	

	Storage area for hazardous waste	25
	Secured Landfill	20
	Detoxification area	10
	Total - VI	**55**
VII	**Green Belt**	19.3
	Total - VIII	**19.3**
VIII	**Environmental monitoring**	
	Continuous ambient air quality station	50
	Work place monitoring	9
	On line stack analyzers	50
	Total - VIII	**109**
	Total (I+II+III+IV+V+VI+VII+VIII)	**1085.4**

CHAPTER 11.0 SUMMARY AND CONCLUSION

11.0 Introduction

M/s. TGV SRAAC Limited located at Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh obtained environmental clearance vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 01.05.2018 for expansion of Chlor-Alkali plant and synthetic organic chemicals manufacturing unit subsequently the unit obtained name change in EC dated 01.05.2018 vide letter no. F. No. J-11011/84/2016-IA-II (I) dated 28.09.2021 in an area of 152.4 ha from the Ministry of Environment, Forest and Climate Change (MoEFCC). The unit obtained consent for establishment (CFE) for expansion vide order no. APPCB/ KNL/ KNL/ 231/ CFE/ HO/2008 dated 23.05.2018. The previous expansion was implemented in phased manner, accordingly the unit obtained consent for operation (CFO) for caustic expansion and chloromethanes separately. It may be noted that the entire capacity mentioned in previous EC dated 01.05.2018 is currently in operation. It is proposed to expand the manufacturing capacity chlor-alkali and chloromethanes by 40% of existing capacity in phased manner with a capital cost of Rs. 280 cores. The cost estimate for environment management is Rs. 10.85 crores with annual recurring expenditure of Rs. 10.66 crores.

The MoEFCC issued an office memorandum dt. 11.4.2022 detailing the guidelines for granting prior environmental clearance for expansion upto 50% vide 7 (ii) (a) of the EIA notification. The guidelines envisage issue of prior environmental clearance upto 40% of the capacity in 2 installments of 20% each, wherein the later expansion is allowed after satisfactory compliance of the environmental safe guard conditions issued initially. Accordingly Form I and prefeasibility reports were submitted to obtain terms for reference for preparation of environmental impact assessment report. The MoEFCC issued terms of reference vide letter no. F.No. J-11011/84/2016-IA II (I) dated 15.03.2023 as part of environmental clearance process.

11.1 Project Location

The plant site is located at Sy. No. Sy. No. Sy. No. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, Gondiparla village, Kurnool mandal and district, Andhra Pradesh in an area of 152.4 ha. The site is located at the intersection of 15^0 49′ 30″ (N) latitude and 78^0 4′ 30″ (E) longitude. The site elevation above mean sea level (MSL) is 300 m. The plant site is surrounded by open lands in east direction, Sree Rayalaseema Hi-Strength Hypo Limited (SRHHL) in north direction, Road connecting the NH-7 with Gondiparla village in the south and west directions. The nearest habitation from the plant is E. Tandrapadu village located at a distance of 0.5 km in northwest direction. The main approach road is NH-7 - Gondiparla village adjacent to the site in northwest direction. The nearest Town is Kurnool at a distance of 0.8 km in southwest direction, railway station is Kurnool located at a distance of 3.02 km in northwest direction and nearest airport is Kurnool located at a distance of 16.5 km in southeast direction. Tungabhadra River is flowing from northwest to southeast direction at a distance of 0.2 km in south direction. Interstate boundary between Telangana and Andhra Pradesh is at a distance of 1.3 km in northeast direction. There are two reserve forests in the study area. Gadidmadugu RF at a distance of 5.5 km in east direction. Pullaiah RF at a distance of 9.3 km in southwest direction. There is no National Park, sanctuary, and critically polluted area within the impact area of 10 km surrounding the site.

11.2 Product Profile

The manufacturing capacity after expansion is presented in **Table No. 11.1**

Table 11.1 Manufacturing Capacity

S. No.	Product Name	Unit	Capacity			
			Existing/ Permitted	Proposed		Total After Expansion
				Phase I	Phase II	
I. Chlor-Alkali Plant						
1	Caustic Soda Lye (Or) Flakes	TPD	1020	200	200	1420
	Potassium Hydroxide Lye (or) Flakes (100 % basis)	TPD				
2	Liquid Chlorine	TPD	600	120	120	840
II. Chloromethanes						
1	Methyl Chloride	TPD	1.2	0.24	0.24	1.68

2	Methylene Chloride	TPD	158	31.6	31.6	221.2
3	Chloroform	TPD	79	15.8	15.8	110.6
	Total – Chloromethanes		**238.2**	**47.64**	**47.64**	**333.48**
III. Chlorodifluoromethane						
1	Chlorodifluoromethane (R22)	TPD	10	2	2	14
IV. Captive Power Plant						
1	Captive Power Plant (Coal based)	MW	76	30	----	106
2	Power generation Furnace Oil#	MW	31		----	31
V. Castor Oil and Fatty Acid Plant						
1	Oil and Fatty Acid Products (Non-EC Products)	TPD	498	99.5	99.5	697
By-Products						
I. Chlor-Alkali Plant						
1	Hydrochloric Acid (100%)	TPD	313	56.05	56.05	425.1
2	Hydrogen Gas	Nm3	285600	55996	55996	397592
3	Sodium Hypochlorite (100% Cl_2 basis)	TPD	15	3	3	21
4	Barium Sulphate	TPD	10	----	----	----
5	Potassium Carbonate	TPD	50	----	----	50
6	Sodium Sulphate	TPD	10	2	2	14
7	Calcium Hypochlorite (100% Cl_2 basis)	TPD	10	----	----	----
8	Calcium Sulphate	TPD	2	----	----	----
II. Chloromethanes Plant						
1	Carbon tetrachloride*	TPD	12	2.4	2.4	16.8
2	Hydrochloric Acid (100 %)	TPD	47	9.4	9.4	65.8
III. Chlorodifluoromethane Plant						
1	Hydrochloric Acid (100 %)	TPD	8.27	1.65	1.65	11.57

** Carbon Tetrachloride (CCl4) generated will be sold as a feed stock to Authorized users/excess will be incinerated.*
 # Shall be kept as standby.

11.3 Manufacturing Process

Membrane technology which is environment friendly shall be adopted for Caustic soda manufacturing. The by-products are hydrogen and chlorine. Hydrochloric acid is manufactured using H_2 and Cl_2 (produced from cell house). The unit adopted Bipolar membrane technology for caustic manufacturing.

Chloromethanes (CMS) are manufactured by hydro chlorination of methanol in vapor phase in presence of catalyst followed by thermal chlorination of methyl chloride in vapor phase with chlorine followed by rectification, azeotrope separation and dehydration of the mixed products.

Steam turbines are used for power generation in cogeneration plant. Boilers of capacity 1 x 120 TPH @ 100 kg/cm²(g) pressure will be installed to cater the steam requirement after expansion of unit. The electricity generated in the cogeneration plant will be used for captive consumption for plant operations. Detailed manufacturing process of Chlor-alkali, Chloromethanes and Co-generation power plant are presented in Chapter 2 of EIA report.

11.4 Utilities

It is proposed to establish 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler for proposed expansion to meet the power and steam requirement and 1 x 55 lac K cal salt furnace in addition to the existing utility in Phase I. No additional utility required for Phase II expansion. The list of utilities is presented in **Table 11.2**.

Table 11.2 List of Utilities

S. No	Description	Units	Existing	Phase I	Phase II	After Expansion
1	Coal Fired Boiler	TPH	1 x 110	---	---	1 x 110
2	Coal Fired Boiler	TPH	1 x 100	---	---	1 x 100
3	Coal Fired Boiler	TPH	---	1 x 120		1 x 120
4	Coal Fired Boiler	TPH	1 x 42	---	---	1 x 42
5	Hydrogen gas fired boiler	TPH	---	1 x 20	---	1 x 20
6	Oil and H_2 fired boiler*	TPH	1 x 4	---	---	1 x 4
7	Oil fired Boiler*	TPH	1 x 3	---	---	1 x 3
8	Waste Heat Recovery Boiler (WHRB) connected to DG sets*	TPH	4 x 3	---	---	4 x 3
9	Oil fired boiler#	TPH	1 x 3	---	---	Dismantled
10	Husk Fired Boiler#	TPH	1 x 12	---	---	Dismantled
11	Thermo Pack unit	k.cal/hr	1 x 20 lac	---	---	1 x 20 lac
12	Thermo Pack unit	k.cal/hr	1 x 35 lac	---	---	1 x 35 lac
13	Salt Furnace	k.cal/hr	2 x 55 lac	1 x 55 lac	---	3 x 55 lac
14	Salt Furnace	k.cal/hr	2 x 15 lac	---	---	2 x 15 lac
15	DG Sets**	MW	4 x 6.2	---	---	4 x 6.2
		kVA	3 x 500	---	---	3 x 500
16	LPG/Hydrogen gas fired Incinerator	Kgs/hr	1 x 343	---	---	1 x 343

** Shall be kept as standby* *# Dismantled*

** DG sets will be used during load shutdown*

11.5 Water Requirement

The water required for the plant is mainly for Process, Scrubbers, washings, cooling tower makeup, steam generation and domestic purposes. The total water requirement shall increase from 15.167 MLD to 20.36 MLD. The fresh water consumption is optimized by reusing treated wastewater to an extent of 2.32 MLD, thus reducing fresh water consumption to 18.04 MLD during operation. The required water is drawn from Tungabhadra River through infiltration wells. The unit obtained permission to abstract water from Tungabhadra River in the order of 20 MLD against fresh water requirement of 18.04 MLD. The total water requirement for daily consumption is presented in **Table 11.3.**

Table 11.3 Water Requirement

S.No	Description	Quantity (KLD)			
		Existing/ Permitted	Proposed		Total After Expansion
			Phase I	Phase II	
Fresh Water					
1	Chlor-Alkali Plant	3228	347.9	347.9	3923.8
2	Chloromethanes & Chlorodifluoromethane	2115	60.5	60.5	2236
3	Co-generation Power Plant	8990	2445	-----	11435
4	Castor Oil and Fatty Acid Plant	317	62.2	62.2	441.4
	Total – I: Fresh Water	**14650**	**2915.6**	**470.6**	**18036.2**
Recycled Water					
1	Chlor-Alkali Plant	388	245.8	245.8	879.5
2	Chloromethanes & Chlorodifluoromethane	129	308	308	745
3	Co-generation Power Plant		604	-----	604
4	Castor Oil and Fatty Acid Plant		47.5	47.5	95
	Total – II: Recycled Water	**517**	**1205.25**	**601.25**	**2323.5**
	Grand Total (I + II)	**15167**	**4120.8**	**1071.8**	**20359.7**

11.6 Baseline Environmental Data

The baseline data was collected in the study area during December 2022 -February 2023. The baseline data includes 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 surface water quality analysis results show that the values are within the limits of IS: 2296-1982 standard and ground water quality is observed to be above the

limits for potable purpose when compared to the prescribed standards of IS: 10500 – 2012 at few locations.

11.7 Identification and Quantification of Impacts

The impact assessment report has identified various sources of pollution and quantified the pollution loads due to proposed project. The sources of pollution are air emissions from utilities and process; liquid effluents from process, utilities, and domestic usage; solid wastes from process, treatment systems and utilities; and noise pollution from utilities, and process equipment. A detailed impact assessment was made using rapid impact assessment matrix method. The salient features are presented as follows.

11.7.1 Air Environment

New sources of air pollution due to expansion are proposed 1 x 120 TPH coal fired boiler, 1 x 20 TPH hydrogen gas fired boiler and existing 1 x 42 TPH, 1 x 100 TPH, 1 x 110 TPH coal fired Boilers, DG sets and Incinerator in chloromethane plant. The existing boilers are provided with ESP as air pollution control equipment. The air pollution control equipment for proposed coal fired boiler is Electro static precipitators (ESP). DG sets shall be provided with stack heights based on the CPCB formula for effective stack height.

The gaseous emissions from Chlor-Alkali process are Chlorine and Hydrogen Chloride vapors. Scrubbers are provided to neutralize sniff gases effectively. Dilute Chlorine is reacted with caustic to obtain sodium hypochlorite which is a value-added product. Due to advancement of control checks and due to membrane cell electrolysis, possibility of chlorine emission to atmosphere is negligible. The second gaseous pollutant from chloro-alkali plant is hydrogen chloride gas emissions. To avoid emissions in the plant, tail gas vents are connected to a venturi scrubber and the lean acid formed is used for absorption of Hydrogen chloride gas in absorber.

The gaseous emission from Chloromethane plant is chlorine and hydrogen chloride vapours. Due to advancement of control checks and due to membrane cell electrolysis, possibility of chlorine emission to atmosphere is negligible. HCl gas produced from thermal chlorination unit is used to produce methyl chloride. Excess HCl available is

absorbed in HCl absorber to produce 32% HCl. To avoid emissions from HCl absorber, tail gas vents are connected to a tail gas tower followed by organic stripper to remove organics. The gaseous emission from Chlorodifluoromethane plant is HCl which is sent to Hydrochloric acid absorption system, to produce 28 to 30% HCl.

The impacts on air quality shall be due to the emissions from, proposed coal fired boiler. The incremental concentrations are quantified using ISC-AERMOD for proposed utility. The results indicate marginal increase in ambient air quality parameters and the cumulative concentrations of predicted values and baseline data are within the prescribed limits of CPCB. The highest predicted values for PM_{10}, $PM_{2.5}$, SO_2 and NO_x are 0.72, 0.32, 3.07 and 4.54 $\mu g/m^3$ respectively, and the maximum values are observed within the site area, and the cumulative values of baseline air quality combined with predicted values are found to be within the prescribed limits of National Ambient Air Quality Standards. The impacts on air quality are observed to be significantly negative due to increased ambient air quality concentrations in the impact area.

11.7.2 Water Environment

Water is essentially used for process and utilities and domestic purposes. The required water quantity will be met from Tungabadra River through infiltration wells in addition to recycled water.

There will be additional effluent generation due to expansion from the following sources; process, floor washings, blow downs from boiler and cooling tower and domestic effluents**.** Effluents from process, washings, utility blow downs and domestic wastewater of Chlor-Alkali, Castor Oil and fatty acid plant and co-generation power plant will be sent to the effluent recycling plant and low TDS water reused as process water. Effluent from chloromethanes and chloro-difluoromethanes are sent to effluent recycling plant followed by RO. RO permeate is reused for process and rejects recycled for brine saturation of Chlor-alkali plant. The total effluent generated, mode of treatment, and disposal is presented in Table **11.4.**

Table 11.4 Total Effluent Generated and Mode of Treatment

S. No	Description	Quantity (KLD)				Mode of Treatment/Disposal
		Existing/ Permitted	Proposed		After Expansion	
			Phase I	Phase II		
I	**Chlor-Alkali (Or) Potassium Hydroxide**					
1	Process	191.5	37.5	37.5	266.6	Sent to effluent recycling plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as process water and rejects sent for brine saturation.
2	Washings					
3	Gland Seal					
4	Cooling towers blow down	145.5	28.5	28.5	202.5	
5	Domestic	93	-----	-----	93	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
	Total - I	**430**	**66.1**	**66.1**	**562.1**	
II	**Chloromethanes and Chlorodifluoromethanes**					
1	Cooling towers blow down	114	22.8	22.8	159.6	Sent to effluent treatment plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as process water and rejects sent for brine saturation.
2	Scrubbers	40	8	8	56	Sent to Brine make-up in chlor-alkali plant.
3	Domestic	15	3	3	21	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
	Total – II	**169**	**33.8**	**33.8**	**236.6**	
III	**Co-Generation Power Plant**					
1	Floor Washings	30	-----	-----	30	Sent to effluent recycling plant of Chlor-alkali (ETP-1) followed by Ultra filtration and RO. Permeate reused as a process water and rejects sent for brine saturation.
2	Cooling towers blow down	600	200	-----	800	
3	DM Plant /RO Rejects	405	150	-----	555	
4	Domestic	50	-----	-----	50	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater

						reused for greenbelt development
	Total –III	**1085**	**350**	**-----**	**1435**	
IV	Non-EC Products (Castor Oil & Fatty Acids)	70	12.8	12.8	95.6	Sent to Castor Oil & Fatty acid plant effluent treatment plant (ETP-2), and treated wastewater reused for greenbelt development
Grand Total (I+II+III+IV)		**1754**	**462.7**	**112.7**	**2329.3**	

11.7.3 Noise and Vibration

The sources of noise levels from proposed expansion are mainly transport, material transfer, fans, motors, compressors, conveyors, turbines, and other rotating equipment resulting in continuous, intermittent, and impulse noise based on the activity. The sources of vibration are all rotating equipment including motors, fans, etc. The noise mitigation measures follow the principles of mitigation at source, control in the pathway, and control at the receptor. The noise mitigation measures include provision of attenuating screens, barriers, guard covers, equipment isolation, noise proofing in the control rooms, periodic maintenance, and personal protective equipment. The vibration levels are mitigated by identifying, replacing, or repairing the malfunctioning rotating equipment. Noise propagation model predicted noise levels ranging from 66 to 104 dB(A) within the project site. The employees shall be trained in the mitigation measures and personal protection measures to be taken to avoid noise-related health impacts as part of hearing conservation program.

11.7.4 Solid Waste

The solid wastes generated from brine preparation, utilities and effluent treatment plant may have significant negative impacts if disposed indiscriminately. Used silica gel, calcium chloride, Calcium Fluoride, Antominy Pentoxide and Spent Sulfuric Acid are the wastes generated from the process. These are generated from moisture removal steps of process. Used silica gel and calcium chloride sent to secured landfill within plant premises. Spent sulfuric acid sold as by-product and Calcium Fluoride sold to hydrogen fluoride manufacturers, while Antimony Pentoxide is recovered and reused. The

operational phase impacts shall be neutral due to effective implementation of mitigative measures in handling, storing, and transferring of solid wastes, effluents, and chemicals. The details of various sources and quantities of solid waste generated and disposal methods are presented in **Table 11.5.**

Table 11.5 Solid Waste Generation and Mode of Disposal

S. No	Description	Units	Existing/ Consented	Proposed		Total	Method of Disposal
				Phase I	Phase II		
Chloro-Alkali Plant							
1	Sludge from Pretreatment of brine on dry basis	TPD	25	5	5	35	Secured landfill within Plant premises
2	Barium Sulphate	TPD	10	---	---	---	Sold as By-Product
3	Sodium Sulphate	TPD	10	1.95	1.95	13.9	Sold as By-Product
Potassium Hydroxide							
1	Sludge	TPD	1.42	0.3	0.3	2	Secured landfill within Plant premise
Chloromethanes Plant							
1	Calcium Chloride	TPD	0.04	0.01	0.01	0.06	Secured landfill within Plant premises
2	Silica gel	TPD	0.036	0.005	0.005	0.05	
3	Bottom residue	TPD	0.5	0.1	0.1	0.7	Sent to In-house Incinerator
4	Spent Sulfuric acid (75-80%)	TPD	11.9	2.4	2.4	16.7	Sold as product
Chlorodifluoromethane (R22)							
1	Calcium Fluoride	TPD	1.2	0.25	0.25	1.7	Secured landfill within Plant premises / Sold to hydrogen fluoride manufacturers
2	Spent Sulfuric Acid (75%)	TPD	17.3	3.45	3.45	24.2	Sold as product
3	Antominy Pentoxide	TPD	0.2	0.04	0.04	0.28	Recovered & reused
Utilities							
1	Ash from Coal fired Boilers	TPD	570	192	---	762	Sold to Cement/ brick manufacturers
2	Ash from Husk fired boiler*	TPD	16.5	---	---	---	Sold to Brick manufacturers
3	Sludge from FO of DG sets*	KL	0.9	---	---	0.9	Sent to Authorized Recyclers
4	Sludge from ETP	Kg/ day	280	20	20	320	Landfill within Plant site
5	Waste Oils	TPA	0.3	---	---	0.3	Reused as

							secondary fuel
6	Used Batteries	TPD	35	---	---	35	Sent to Authorized Recyclers

11.7.5 Flora and Fauna

There are no endangered species of flora and fauna in the impact area. The impact on biotic environment is neutral with the effect confined mainly to the site area. The unit developed greenbelt in an area of 89.03 ha (58.42%) of site area. It is proposed to increase density to enhance environmental quality through mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, prevention of soil erosion, and creation of aesthetic environment. The budget allocated for greenbelt action plan is Rs. 19.27 lakhs.

11.7.6 Socio-Economic Environment

The proposed expansion will provide additional employment to 150 people. The proposed expansion project will also generate indirect employment to the locals during construction phase in the order of 100 people for a period of 12-18 months. The proposed expansion shall have positive impact on socioeconomic environment due to provision of employment both direct and indirect, in addition to the CER activities

11.7.7 Corporate Environment Responsibility

The ministry of Environment, Forest and Climate Change issued an office memorandum mandating corporate environment responsibility expenditure contingent on the capital cost of the project, in addition to the expenditure on environmental management. It is proposed to spend Rs. 220 lakhs towards corporate environment responsibility. Activities are identified to be implemented by the project proponent in consultation with local public representatives and revenue authorities.

11.8 Alternatives

The proposal is for expansion of manufacturing facility within existing site premises, which obtained environmental clearance. Hence there is no requirement of alternative site or additional site area. The membranes of electrolysis process are chosen based on the energy efficiency.

11.9 Environmental Monitoring Programme

It is proposed to monitor Ambient Air Quality (AAQ) for PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC, Cl_2 and HCl, while work room monitoring includes VOC, Cl_2 and HCl. Point source emissions of stacks of boilers are monitored monthly, while standby DG sets are monitored quarterly. Noise levels are monitored quarterly. Raw water and treated wastewater are monitored on daily basis, while Soil analysis is done once in a year.

Environmental monitoring for water and air quality, and noise level shall be conducted monthly either by in-house laboratory or through a third party. The unit is monitoring Ambient Air Quality (AAQ) PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC, Cl_2 and HCl, while work room monitoring includes VOC, Cl_2 and HCl. The unit installed online continuous management and monitoring system (OCMMS) and connected to SPCB/CPCB for 1 x 110 TPH; 1 x 100 TPH and 1 x 45 TPH coal fired boilers stacks and ambient air quality, to identify any upsets in the operations. The frequency of monitoring and the quality parameters shall be as mentioned in the environmental monitoring chapter and as suggested by the Ministry of Environment, Forest and Climate Change, Government of India. Environmental monitoring results will be evaluated to identify the problems/underperformance of the equipment. Necessary steps will be taken to rectify the identified problems/defects. M/s. TGV SRAAC limited assures to evaluate performance of pollution control measures and occupational safety measures, to assess its efficiency.

11.10 Additional Studies - Risk Assessment

Risk assessment was conducted and the toxic dispersion damage distance due to rupture of 400mm and 500mm chlorine lines are 82 and 104 m, and the same is within the plant premises. Heat radiation damage distances of pool fire in tank farm of chloromethanes was limited to 25 m for a heat radiation of 4 KW/m^2, and the same was within the plant premises.

11.11 Occupational Safety and Health

Direct exposure to chemicals or its raw materials may affect health of employees. Direct exposure to hazardous materials is eliminated by providing closed handling facilities.

Personal Protective Equipment (PPE)i.e., hand gloves, safety goggles, safety shoes, safety helmets, respiratory masks etc. are provided to all the employees working in the plant. Company has a policy of providing PPEs to all personnel including contract workers. Periodic medical checkup in addition to checkup during recruitment is adopted to monitor health status of employees. Online chlorine, HCl sensors will be installed to monitor the ambient air quality and work room air quality, while chlorine sensors are also used for identifying potential hazard areas.

11.12 Environment Management Plan

TGV SRAAC Limited is conscious of its responsibility at industrial park level towards creating, maintaining, contributing, and ensuring a safe and clean environment for sustainable development and continually enhancing its environmental performance as an integral part of its business philosophy and values, and head of department of Chlor-alkali, Chloromethanes, Power division and oil and fatty acid division are responsible to their plants.

11.13 Environment Management Cell

Environment management team is headed by Environment Division (ED) head will report to the Executive Director (Tech.) assisted by heads of department (HOD) of all divisions followed by enough employees in various fields ranging from horticulturists, environmental engineers, environmental chemists, fitters, supervisors, operators, and gardeners. Environment, Safety and Health **(**ESH) department is responsible for monitoring, supervising, evolving new mitigation measures, coordination between individual HODs and statutory authorities, compliance of various approvals, and overseeing for obtaining and implementation of ISO standards. The cost estimate for environment management is Rs. 12.63 lakhs.

CONCLUSION

The study was conducted during winter season of 2022. It is observed that negative impacts are anticipated on air quality, soil and water due to the emissions, effluents and other discharges both intended and unintended. It is observed that positive impacts are

anticipated on socio-economic status due to employment generation. The hierarchy of avoidance, reduction, reuse, recycle, treat, release, dispose was followed in preparing the management plan, with a provision for adaptive management, considering, changing statutory provisions, post project monitoring and post normal science paradigm of uncertainty, ambiguity, and ignorance.

The proponent assures to implement all the measures with an objective of ensuring least difference between pre and post project environmental scenarios. It may be concluded that the management measures proposed shall ensure mitigation of negative impacts and the resultant residual impacts.

CHAPTER 12.0 DISCLOSURE OF CONSULTANTS ENGAGED

Declaration by Experts Contributing to the EIA

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

EIA coordinator:

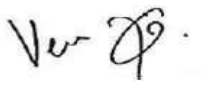
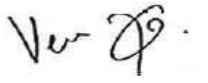
Name: **G. V. Reddy**

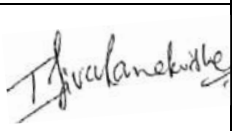
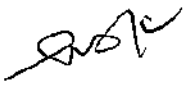
Signature and Date**: 16.08.2023**

Period of involvement: **January 2023**

Contact information: **Team Labs and Consultants, B115 - 117, 509, Aditya Enclave, Ameerpet, Hyderabad 500038**.

Functional area experts:

S. No.	Functional areas	Name of the expert/s	Involvement (period and task**) Period of involvement: January 2023 till date	Signature and date
1	AP	T. Ravi Kiran	Site visit, Design of AAQ network, supervision of AAQ monitoring, Compilation of emissions and characteristics, assessment of impacts due to the proposed expansion, identification of mitigation measures, preparation of EMP for AP, Preparation of monitoring plan for AP.	
2	WP	G.V. Reddy	Site visit, identification of monitoring stations, supervision of sampling, Characterization of effluent streams, segregation of effluent streams, ZLD for effluent treatment, assessment of impacts due to the proposed expansion, identification of mitigation measures, preparation of EMP for WP, Preparation of monitoring plan for WP.	
3	HW	G.V. Reddy	Site visit, Characterization of solid wastes, storage, and disposal plan for	

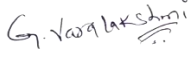
			various solid wastes, assessment of impacts due to the proposed expansion, identification of mitigation measures, preparation of EMP for SHW.	
4	SE	G.V. Reddy	Site visit, primary and secondary data collection of the impact area, assessment of impacts due to the proposed expansion on socio economic status and project economy, preparation of CER plan, Preparation of SE part of EIA report.	
5	EB	I. Sivarama Krishna	Site visit, primary and secondary data collection related to ecology and biodiversity, assessment of impacts based on IAIA guidelines, preparation of mitigation measures, preparation of green belt plan and cost estimate, preparation of EB part of EIA report.	
6	GEO & HG	G.V.A. Ramakrishna	Identification of water sheds of the area by preparing the drainage map, assessment of ground water potential of the site and impact area, preparation of rain water harvesting plan, assessment of impacts due to ground water abstraction and mitigation measures.	
7	Noise	S. Chandrasekhar Babu	Identification of monitoring stations. Identification of noise generating sources existing and due to the proposed expansion, identification of mitigation measures, preparation of EMP. Preparation of monitoring plan for Noise levels.	
8	AQ	M. Srinivasa Reddy	Assisting AP FAE in identifying the AAQ monitoring stations by providing normal climatological and other historical data, Identification of Micrometeorological data monitoring station, supervision of met data collection using Automatic weather station, Preparation of emission details, Air quality impact prediction modeling, Calculation of work room concentrations of solvents using box model, Assessment of results and	

			preparation of isopleths, assisting the AP FAE and EIA coordinator in preparation of EMP.	
9	LU	G.V.A. Ramakrishna	Preparation of land use land cover map using satellite imagery, ground truth study, assessing the impacts due to project. Preparation of FAE report.	
10	RH	S. Chandrasekhar Babu	Site visit, assessment of hazop reports, identification of sources of hazards, assessment of storages proposed expansion in comparison with statutory regulations and calculation of FETI to assess the scope of risk assessment, preparation of isopleths for various scenarios as part of consequence analysis, identification of mitigation measures preparation of disaster management plan.	
AP- Air Pollution Prevention, Monitoring and Control, WP- Water Pollution Prevention, Control and Prediction of Impacts, SHW- Solid Waste and Hazardous Waste Management, SE- Socio-Economics, EB- Ecology and Biodiversity, HG- Hydrology, Ground Water and Water Conservation, GEO- Geology, SC- Soil Conservation, AQ, Meteorology, Air Quality Modeling and prediction, LU- Land Use, RH- Risk Assessment & hazard Management				

List of software programmes Models for Environmental Studies

1. AEROMOD for Air Quality prediction
2. PHAST Model / ALOHA model for Risk Assessment
3. dhwaniPRO v4 – Noise propagation

Team Members/FAAs Involved

S. No.	Functional areas	Name of the expert/s	Period of involvement:	Role	Signature and date
1	AQ and WP	T. Ravi Kiran	January 2023 till date	Team Member	
2	RH	G Vara Lakshmi	January 2023 till date	Team Member	
3	AP	Dodda Laxmi Satya	January 2023 till date	FAA	

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

I, **G.V. Reddy**, hereby, confirm that the above-mentioned experts prepared the **EIA of TGV SRAAC Limited** and EIA Coordinator (EC) is fully aware of the content. The consultant organization shall be fully accountable for any mis-leading information. No unethical practices have been carried out and external data / text has not been used without proper acknowledgement, while preparing this EIA report.

Certificate of Plagiarism check	
Title of EIA Report:	Expansion of chlor-alkali, chloromethanes, and captive power plant by 40% of existing capacity in phased manner in existing site area.
Name of Accredited Organisation:	Team Labs and Consultants
Unique Identification Number:	0823-13/21-01
Name of EIA Co-ordinator:	G.V. Reddy
Name of the Software:	Plagiarism checker

Date and Sign of EIA Co-ordinator:

Name: **G.V. Reddy**

Designation: **Proprietor** Signature:

Date and Sign of Head of ACO / authorised person:

Name: **G.V. Reddy** Designation: **Proprietor**

Name of the EIA consultant organization: **Team Labs and Consultants**

NABET Certificate No. & Issue Date: NABET/EIA/2124/RA 0242, dt.13.07.2022

TGV SRAAC LIMITED

SY. NO. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, GONDIPARLA VILLAGE, KURNOOL MANDAL AND DISTRICT, ANDHRA PRADESH

CEERTFIED COMPLIANCE REPORT FOR CONDITIONS STIPULARED IN EXISTING ENVIRONENTAL CLEARANCE

File No. IRO/VIJ/EPA/EC-A/101/06-67/2022

Project No. 0823-13/21-01
August 2023

TGV SRAAC Limited
Gondiparla Village, Kurnool Mandal, and District,
Andhra Pradesh, Pin code-518 004
Phone :08518 280007, 280008
Mobile: +91 9848079064
E-mail: sraaclab@tgvmail.net

SUBMITTED TO
MINISTRY OF ENVIRONMENT, FOREST, AND CLIMATE CHANGE
GOVERNMENT OF INDIA
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI

Speed Post
E-mail

I/36447/2022

सत्यमेव जयते

भारत सरकार / Government of India
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest and Climate Change
एकीकृत क्षेत्रीय कार्यालय / Integrated Regional Office
ग्रीन हाउस, गोपालारेड्डी रोड, विजयवाड़ा, आंध्र प्रदेश – 520010
Green House, Gopalareddy Road,
Vijayawada, Andhra Pradesh-520010.

प्रकृतिः रक्षति रक्षितः
Nature Protects if She is Protected

Tel: +91 866 – 2419787, +91 866 – 2419788, E-mail: iro.vijayawada-mefcc@gov.in, suresh.pasupuleti@gov.in

File No. IRO/VIJ/EPA/EC-A/101/06-67/2022 Date: 15.12.2022

To

Shri A N Singh
Additional Director, Member Secretary (IND-2),
Ministry of Environment, Forest and Climate Change,
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110 003.
E-mail: aditya.narayan@nic.in

Sub: Issue of Certified Compliance Report in favor of Expansion of Chlor-Alkali Plant and Synthetic Organic Chemicals (Chloromethanes/ Chloro-difluoromethane) by M/s TGV SRAACL Ltd., at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62B, 63, 64, 70/C2, 72/P Village Gondiparla, Mandal and District Kurnool, Andhra Pradesh.- reg.

Ref: Ministry's Environmental Clearance No. J-11011/84/2016-IA.II(I) dated 01.05.2018 and 28.09.2021 (Transfer of EC).

Sir,

I am directed to draw your kind attention to the subject and reference letter cited above and to state that the above project has been monitored by undersigned on 10.10.2022 for issue of Certified Compliance Report. Based on the observations made while monitoring of project, the detailed Certified Compliance Report has been prepared and enclosed for kind information and further needful action.

भवदीय / Yours faithfully,

Encl: as above

Sd/-
(डॉ। सुरेश बाबु पसुपुलेटी)
(Dr. Suresh Babu Pasupuleti)
संयुक्त निदेशक (एस) / Joint Director (S)

Copy to:

1. **The Director,** M/s TGV SRAAC Limited, Gondiparla, Kurnool – 518 004, Andhra Pradesh. E-mail: sraaclab@rediffmail.com for kind information and further necessary action.

2. Guard File.

स्पीड पोस्ट

ई-मेल

भारत सरकार / Government of India
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest and Climate Change
एकीकृत क्षेत्रीय कार्यालय / Integrated Regional Office
ग्रीन हाउस, गोपालारेड्डी रोड, विजयवाड़ा, आंध्र प्रदेश – 520010
Green House, Gopalareddy Road,
Vijayawada, Andhra Pradesh-520010.

सत्यमेव जयते

Tel: +91 866 – 2419787, +91 866 – 2419788, E-mail: iro.vijayawada-mefcc@gov.in, suresh.pasupuleti@gov.in

फाइल संख्या: IRO/VIJ/EPA/EC-A/101/06-67/2022 दिनांक: 15.12.2022

सेवा में,

श्री ए एन सिंह
अतिरिक्त निदेशक, सदस्य सचिव (आईएनडी-2),
पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय,
इंदिरा पर्यावरण भवन, जोर बाग रोड,
अलीगंज, नई दिल्ली-110 003।
ई-मेल: aditya.narayan@nic.in

विषय: मैसर्स टीजीवी एसआरएएसीएल लिमिटेड, के पक्ष में प्रमाणित अनुपालन रिपोर्ट जारी करना|

संदर्भ: मंत्रालय की पर्यावरण मंजूरी पत्र संख्या- -11011/84/2016-IA.II(I) दिनांक 01.5.2018 **और** 28.09.2021 (Transfer of EC).

महोदय,

मुझे यह सूचित करने का निर्देश हुआ है कि उपरोक्त परियोजना में प्रमाणित अनुपालन रिपोर्ट जारी करने के लिए दिनांक 10.10.2022 को अधोहस्ताक्षरी द्वारा निगरानी की गई है। परियोजना की निगरानी के दौरान की गई टिप्पणियों के आधार पर, विस्तृत प्रमाणित अनुपालन रिपोर्ट तैयार की गई है और आवश्यक जानकारी और आगे की आवश्यक कार्रवाई के लिए संलग्न की गई है।

भवदीय,

संग्ल्नक: उपरोक्त

Sd/-
(डॉ। सुरेश बाबु पसुपुलेटी)
संयुक्त निदेशक (एस)

प्रतिलिपि :

1. निदेशक**, मैसर्स टीजीवी एसआरएएसी लिमिटेड**, **गोंडीपारला**, **कुरनूल** - 518 004, **आंध्र प्रदेश। ई-मेल**: sraaclab@rediffmail.com **तरह की जानकारी और आगे की आवश्यक कार्रवाई के लिए।**

I/36442/2022

2. **गार्ड फाइल।**

I/36448/2022

सत्यमेव जयते

भारत सरकार / Government of India
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest and Climate Change
एकीकृत क्षेत्रीय कार्यालय / Integrated Regional Office
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Green House, Gopalareddy Road,
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Tel: +91 866 – 2419787, +91 866 – 2419788, E-mail: iro.vijayawada-mefcc@gov.in, suresh.pasupuleti@gov.in

प्रमाणित अनुपालन रिपोर्ट / Certified Compliance Report

SN	Item	Details
1.	**परियोजना का प्रकार** **Type of Project**	Industry – II
2.	**परियोजना का नाम** **Name of Project**	Expansion of Chlor-Alkali Plant and Synthetic Organic Chemicals (Chloromethanes/ Chloro-difluoromethane) by M/s TGV SRAACL Ltd., at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62B, 63, 64, 70/C2, 72/P Village Gondiparla, Mandal and District Kurnool, Andhra Pradesh.
3.	**परियोजना प्राधिकरण का पता** **Address of project authorities**	The Director, M/s TGV SRAAC Limited, Gondiparla, Kurnool – 518 004, Andhra Pradesh.
4.	**पर्यावरणीय स्वीकृति पत्र सं0 एवं तिथी** **Env. Clearance Letter No. & Date**	J-11011/84/2016-IA.II(I) dated 1.05.2018 and 28.09.2021 (Transfer of EC)
5.	**क्षेत्रीय कार्यालयपत्र सं0** **Regional Office File No.**	IRO/VIJ/EPA/EC-A/101/06-67/2022
6.	**स्थल दौरातिथी** **Date of Site Visit**	10.10.2022
7.	**परियोजना की स्थिति** **Status of Project**	Operational

8. परियोजना की वर्तमान स्थिति / Present status of the Project:

The project was monitored by undersigned on 10.10.2022. During monitoring, Shri P. Raghavedra Reddy, VP (Q.A), Shri C. Srinivasa Babu, ED (Tech), Shri Vasthi Murali, GM, and other Officials were present. As per the discussions held with Project Authorities (PAs), it has been observed that the Plant is Chloro-Alkali Synthetic Organic Chemical Plant. The area of the plant is 152.94 ha.

As per the records, it has been observed that the following Clearances/Approvals were obtained by PAs:

Environmental Clearance (EC):

PAs have obtained following Environmental Clearances from Ministry:

SN	Project Name	Clearance No. & Date
1	Expansion of Chemical Manufacturing Unit at Gondiparla, Kurnool Andhra Pradesh by M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd.	J-11011/653/2007 – IA II (I) dated 26.12.2007
2	Expansion by adding Choloromethane Plant at Sy. No. 61, 62 B, 63 Village Gondiparla, Mandal Kurnool, District Kurnool, Andhra Pradesh by M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd.	J-11011/619/2009-IA II (I) dated 14.02.2012
3	Expansion of Chlor-Alkali Plant by M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd at village Gondiparla Mandal Kurnool, AP reg. Environmental clearance	J-11011/60/2001-IA.II (I) dated 12.04.2002
4	Expansion of Chlor-Alkali and Synthetic Organic Chemicals (Chloromethanes /Chloro-difluoromethane) by M/s Sree Rayalaseema Alkalies and Alied Chemicals Limited at 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Village Gondiparla, Manda and District Kurnool (Andhra Pradesh).	J-11011/84/2016 – IA II (I) dated 01.05.2018
5	Transfer of EC from M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited to M/s TGV SRAACL Ltd.	J-11011/84/2016 – IA II (I) dated 28.09.2021

Consent For Establishment (CFE):

It has been observed that the PAs have obtained the Consent For Establishment for Expansion project vide Order No. APPCB/KNL/KNL/231/CFE/HO/2008 dated 25.05.2018 for production of following:

SN	Products	Consented capacity as per CFO Orders dt: 26.02.2014 & 28.10.2015 (TPD)	Proposed capacity for expansion (TPD)	Total capacity after expansion (in TPD)
I. Chloro-Alkali Plant				
1.	Caustic Soda Lye (Or) Flakes Potassium Hydroxide Lye (Or) Flakes (100 % basis)	520	500	1020
2.	Potassium Carbonate	50	-	50
3.	Liquid Chlorine	300	300	600

4.	Hydrochloric Acid (100% Cl_2 basis)	186	127	313
5.	Barium Sulphate	5	5	10
6.	Sodium Hypochlorite (100% Cl_2 basis)	10	5	15
7.	Calcium Hypochlorite (100% Cl_2 basis)	10	-	10
8.	Calcium Sulphate	02	-	02
9.	Sodium sulphate	-	10	10
II. Chloromethanes				
1	Methyl Chloride	0.45	10	10.45
2	Methylene Chloride	61	61	122
3	Chloroform	56	46.45	102.45
By Products.				
4	Carbon tetrachloride	7.6	7.6	15.2
5	Hydrochloric Acid (100%)	23.5	23.5	47
III. Chlorodifluoromethane				
1	Chlorodifluoromethane (R22)	-	10	10
2.	Hydrochloric acid (100%)	-	8.27	8.27
IV. Captive Power Plant				
1	Captive Power Plant (Coal based)	76	-	76
2	Power generation (Furnace Oil) (Standby)	31	-	31
Carbon Tetrachloride (CCL_4) generated will be sold as a feed stack to Authorized users/excess will be incinerated.				

PAs have obtained the Consent For Establishment for change of product mix vide Order No. 266/APPCB/CFE/RO-NLR/HO/2021 dated 29.07.2022 for production of following:

SN	Products	Permitted addl. capacity as per CFE order dt.23.05.2018 (TPD)	Proposed capacity for CPM	After CFE CPM (in TPD)
II. Chloromethanes				
1	Methyl Chloride	10.45	-(9.25)	1.2
2	Methylene Chloride	122	+36	158
3	Chloroform	102.45	-(23.45)	79
By Products.				
4	Carbon tetrachloride	15.2	-(3.2)	12
5	Hydrochloric Acid	47	--	47

	(100%)			
III. Chlorodifluoromethane				
1	Chlorodifluoromethane (R22)	10	--	10
Total		**297.1**	**0.1**	**297.2**
2.	Hydrochloric acid (100%)	8.27	--	8.27

Consent for Operation (CFO) & Hazardous Waste Authorization (HWA):

CFO for Chloro-Alkali Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1274022/APPCB/KNL/KNL /CFO&HWA/HO/2022 dated 06.05.2022 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye (Or) Flakes	220
	Potassium Hydroxide Lye (Or) Flakes (100 % basis)	
2.	Liquid Chlorine	83
3.	Hydrochloric Acid (100% Cl_2 basis)	92
4.	Hydrogen gas	198747 m^3/day

The CFO is valid till 28.02.2023.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB / KNL/ KNL/16322/ CFO& HWA/ HO/1987 valid till 28.02.2026 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye	520
2.	Caustic Soda flakes	
3.	Potassium Hydroxide / Caustic soda	
4.	Potassium Carbonate	50
5.	Liquid Chlorine	300
6.	Hydrochloric Acid (100% Cl_2 basis)	186
7.	Barium Sulphate	05
8.	Sodium Hypochlorite (100% Cl_2 basis)	10
9.	Calcium Hypochlorite (100% Cl_2 basis)	10
10.	Calcium Sulphate	02
11.	Hydrogen	25.253 m^3/day
Oil and Fatty Acid Plant		
12.	Hydrogenated Castor Oil	100

13.	a. 12-Hydroxy Stearic Acid (or) b. Methyl 12-hydroxy stearate (or) c. Ricinolic Acid	60
14.	Dehydrated Castor oil	10
15.	NN BIS Amide	10
16.	Bio-Diesel	10
17.	a. Glycerine (crude) b. Glycerine refind and chemically pure	75
18.	Distilled Fatty Acid	20
19.	Stearic Acid	35
20.	Sodium Sulphate	06
21.	Soap Noodles	100
22.	Toilet soaps & Bathing Bars	50
23.	Captive Power Plant (D.G. Sets)	24.8 MW (4X6.2 MW) (Stand by)
24.	Electricity (power generation-coal based)	45 MW (21 MW + 24MW)

The CFO is valid till 28.02.2026.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.07.2021 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye (or) Flakes Potassium Hydroxide Lye (or) Flakes (100% basis)	280
2.	Liquid Chlorine	217
3.	Hydrochloric Acid (100% Cl_2 basis)	35
4.	Sodium Hypochlorite (100% Cl_2 basis)	05
5.	Barium Sulphate	05
6.	Sodium Sulphate	10

The CFO is valid till 31.05.2026.

CFO for Chloro Methanes Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1473568/APPCB/KNL/KNL/CFO&HWA/HO/2021 dated 20.12.2021 for production of following:

SN	Products	Quantity (TPD)
Chloro Methanes Plant:		
1.	Methyl Choride	10
2.	Methlylene Chloride	61
3.	Chloroform	46.45
By Products:		
4.	Carbon Tetrachloride	7.6
5	Hydrochloric acid	23.5

The CFO is valid till 31.10.2022.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.09.2021 for production of following:

SN	Products	Quantity (TPD)
Chloro Methanes Plant:		
1.	Methyl Choride	0.45
2.	Methlylene Chloride	61
3.	Chloroform	56
By Products:		
4.	Carbon Tetrachloride	7.6
5	Hydrochloric acid	23.5
Thermal Power Plant:		
6.	Electricity	31 MW (From existing 45 MW (21 + 24 MW) Coal based to 76 MW)

The CFO is valid till 31.08.2026.

Fire NOC:

PAs have obtained NOC from Government of Andhra Pradesh, State Disaster Response and Fire Services Department vide Rc.No. 3321/MSB/SR/KNL/2O21SDP dated 21.09.2O21. The NOC is valid for five years.

Public Liability Insurance Act, 1991:

PAs have obtained Public Liability Insurance from The New India Assurance Co. Ltd. vide dated 16.01.2022. The insurance is valid till 15.01.2023.

PAs have conducted “SAFETY AUDIT” in November, 2021 by M/s Rams Safety Consultants, Chennai.

PAs have prepared “ON-SITE EMERGENCY PLAN” for the year 2020.

PAs have conducted “HAZOP Study Report” in October, 2021 by M/s Rams Safety Consultants, Chennai.

The photographs of the project area are as follows:













I/36448/2022













I/36448/2022


OCCUPATIONAL HEALTH CENTER








EFFLUENT
TREATMENT PLANT
ON F DIVISION







The satellite image of the project location by google maps is as follows:



It has been observed that the Project Authorities (PAs) have complied or are in process of complying the conditions stipulated in EC. The detailed observations are as follows:

9. Stipulated Conditions:

A. Specific Conditions:

i. **Consent to Establish / Operate for the project shall be obtained from state pollution control board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the water (Prevention and Control of**

Pollution) Act, 1974.

Status: Being complied

Consent For Establishment (CFE):

It has been observed that the PAs have obtained the Consent For Establishment for Expansion project vide Order No. APPCB/KNL/KNL/231/CFE/HO/2008 dated 25.05.2018 for production of following:

SN	Products	Consented capacity as per CFO Orders dt: 26.02.2014 & 28.10.2015 (TPD)	Proposed capacity for expansion (TPD)	Total capacity after expansion (in TPD)
I. Chloro-Alkali Plant				
1.	Caustic Soda Lye (Or) Flakes / Potassium Hydroxide Lye (Or) Flakes (100 % basis)	520	500	1020
2.	Potassium Carbonate	50	-	50
3.	Liquid Chlorine	300	300	600
4.	Hydrochloric Acid (100% Cl_2 basis)	186	127	313
5.	Barium Sulphate	5	5	10
6.	Sodium Hypochlorite (100% Cl_2 basis)	10	5	15
7.	Calcium Hypochlorite (100% Cl_2 basis)	10	-	10
8.	Calcium Sulphate	02	-	02
9.	Sodium sulphate	-	10	10
II. Chloromethanes				
1	Methyl Chloride	0.45	10	10.45
2	Methylene Chloride	61	61	122
3	Chloroform	56	46.45	102.45
By Products.				
4	Carbon tetrachloride	7.6	7.6	15.2
5	Hydrochloric Acid (100%)	23.5	23.5	47
III. Chlorodifluoromethane				
1	Chlorodifluoromethane (R22)	-	10	10
2.	Hydrochloric acid (100%)	-	8.27	8.27
IV. Captive Power Plant				

1	Captive Power Plant (Coal based)	76	-	76
2	Power generation (Furnace Oil) (Standby)	31	-	31
Carbon Tetrachloride (CCL_4) generated will be sold as a feed stack to Authorized users/excess will be incinerated.				

PAs have obtained the Consent For Establishment for change of product mix vide Order No. 266/APPCB/CFE/RO-NLR/HO/2021 dated 29.07.2022 for production of following:

SN	Products	Permitted addl. capacity as per CFE order dt.23.05.2018 (TPD)	Proposed capacity for CPM	After CFE CPM (in TPD)
II. Chloromethanes				
1	Methyl Chloride	10.45	-(9.25)	1.2
2	Methylene Chloride	122	+36	158
3	Chloroform	102.45	-(23.45)	79
By Products.				
4	Carbon tetrachloride	15.2	-(3.2)	12
5	Hydrochloric Acid (100%)	47	--	47
III. Chlorodifluoromethane				
1	Chlorodifluoromethane (R22)	10	--	10
Total		**297.1**	**0.1**	**297.2**
2.	Hydrochloric acid (100%)	8.27	--	8.27

Consent for Operation (CFO) & Hazardous Waste Authorization (HWA):

CFO for Chloro-Alkali Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1274022/APPCB/KNL/KNL /CFO&HWA/HO/2022 dated 06.05.2022 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye (Or) Flakes	220
	Potassium Hydroxide Lye (Or) Flakes (100 % basis)	
2.	Liquid Chlorine	83
3.	Hydrochloric Acid (100% Cl_2 basis)	92
4.	Hydrogen gas	198747 m^3/day

The CFO is valid till 28.02.2023.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB / KNL/ KNL/16322/ CFO& HWA/ HO/1987 valid till 28.02.2026 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye	520
2.	Caustic Soda flakes	
3.	Potassium Hydroxide / Caustic soda	
4.	Potassium Carbonate	50
5.	Liquid Chlorine	300
6.	Hydrochloric Acid (100% Cl_2 basis)	186
7.	Barium Sulphate	05
8.	Sodium Hypochlorite (100% Cl_2 basis)	10
9.	Calcium Hypochlorite (100% Cl_2 basis)	10
10.	Calcium Sulphate	02
11.	Hydrogen	25.253 m^3/day
Oil and Fatty Acid Plant		
12.	Hydrogenated Castor Oil	100
13.	a. 12-Hydroxy Stearic Acid (or) b. Methyl 12-hydroxy stearate (or) c. Ricinolic Acid	60
14.	Dehydrated Castor oil	10
15.	NN BIS Amide	10
16.	Bio-Diesel	10
17.	a. Glycerine (crude) b. Glycerine refind and chemically pure	75
18.	Distilled Fatty Acid	20
19.	Stearic Acid	35
20.	Sodium Sulphate	06
21.	Soap Noodles	100
22.	Toilet soaps & Bathing Bars	50
23.	Captive Power Plant (D.G. Sets)	24.8 MW (4X6.2 MW) (Stand by)
24.	Electricity (power generation-coal based)	45 MW (21 MW + 24MW)

The CFO is valid till 28.02.2026.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.07.2021 for production of following:

SN	Products	Quantity for expansion (TPD)
Chloro-Alkali Plant:		
1.	Caustic Soda Lye (or) Flakes Potassium Hydroxide Lye (or) Flakes (100% basis)	280
2.	Liquid Chlorine	217
3.	Hydrochloric Acid (100% Cl_2 basis)	35
4.	Sodium Hypochlorite (100% Cl_2 basis)	05
5.	Barium Sulphate	05
6.	Sodium Sulphate	10

The CFO is valid till 31.05.2026.

CFO for Chloro Methane Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1473568/APPCB/KNL/KNL/CFO&HWA/HO/2021 dated 20.12.2021 for production of following:

SN	Products	Quantity (TPD)
Chloro Methanes Plant:		
1.	Methyl Choride	10
2.	Methlylene Chloride	61
3.	Chloroform	46.45
By Products:		
4.	Carbon Tetrachloride	7.6
5	Hydrochloric acid	23.5

The CFO is valid till 31.10.2022.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.09.2021 for production of following:

SN	Products	Quantity (TPD)
Chloro Methanes Plant:		
1.	Methyl Choride	0.45
2.	Methlylene Chloride	61
3.	Chloroform	56
By Products:		
4.	Carbon Tetrachloride	7.6
5	Hydrochloric acid	23.5
Thermal Power Plant:		
6.	Electricity	31 MW (From existing 45

		MW (21 + 24 MW) Coal based to 76 MW)

The CFO is valid till 31.08.2026.

ii. **As already committed by the project proponent, Zero liquid discharge shall be ensured and no Waste/treated water shall be discharged outside the premises.**

Status: Being complied

It has been observed that the PAs are maintaining zero liquid discharge system and no wastewater or treated water is being discharged outside the premises. The photographs of the ETP are as follows:











iii. **Necessary Authorization required under the hazardous and other wastes (Management and trans-Boundary movement) Rules, 2016, Solid Waste management Rules, 2016 shall be obtained and provisions contained in the rules shall be strictly adhered to.**

Status: Being complied

As per the Specific Condition No. I, it has been observed that the PAs have obtained necessary Authorization required under the hazardous and other wastes (Management and trans-Boundary movement) Rules, 2016, Solid Waste management Rules, 2016 from Andhra Pradesh Pollution Control Board. It has been observed that the PAs are in process of adhering the provisions contained in the rules. As per the information provided, details regarding Hazardous Waste Production and Disposal for last four years are as follows:

I/36448/2022

Form-IV

[see rules 6(5), 13(8), 16(6) and 20(2)]

Format for annual report on Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 to be submitted by occupier

[To be submitted to State Pollution Control Boards before 30th day of June of every year for the preceding period April to March]

1.	Name and address of facility	Sree Rayalaseema Alkalies & Allied Chemicals Ltd.,
2.	Authorization No. and Date of issue:	APPCB/KNL/KNL/16362/CFO&HWA/2014/6628 –
3.	Name of authorized person and full address with telephone, fax number and e-mail:	N. Jeswanth Reddy, Executive Director (T), 08518 280006, 7, email: sraaclab@rediffmail.com fax: 08518 280
4	Production during the year (product wise), wherever applicable	Enclosed.
	Part A. To be filled by hazardous waste generators.	
1.	Total quantity of waste generated category wise	
2.	Quantity disposed i. to disposal facility ii. to recycle or co-processors or pre-processor iii. others	3433 MT (On dry basis)
3.	Quantity utilized in-house, if any -	– NO –
4.	Quantity in storage at the end of the year -	3433 MT
	Part B, To be filled by Treatment, storage and disposal facility operators	
1.	Total quantity received-	
2.	Quantity in stock at the beginning of the year -	
3.	Quantity treated-	
4.	Quantity disposed in land fills as such and after treatment-	
5.	Quantity incinerated (if applicable)-	
6.	Quantity processed other than specified above-	
7.	Quantity in storage at the end of the year.	
	Part C. To be filled by recyclers or co-processors or other users	
1.	Quantity of waste received during the year – I. Domestic sources II. Imported (if applicable)	
2.	Quantity in stock at the beginning of the year -	
3.	Quantity recycled or co-processed or used -	
4.	Quantity of products dispatched (wherever applicable)-	
5.	Quantity of waste generated-	
6.	Quantity of waste disposal-	
7.	Quantity of re-exported (wherever applicable)-	
8.	Quantity in storage at the end of the year.	

Signature of occupier or
Operator of the disposal facility.

Date: 29/9/18

Place: KURNOOL

I/36448/2022

FORM - 4

DETAILS OF HAZARDOUS WASTE IN OUR INDUSTRY
APRIL 2019 - MARCH 2020

S.No.	Nature of Hazardous Waste	Physical form and contents	Chemical form	Total vol.of the haz, waste disposed with No.of packages Qty.inMT/KL	Mode of Transporta- tion to the site of disposal	Brief Description of the method of disposal
1	ETP Sludge	Wet cake	Mostly silt	16	By Tractor Trally	Secured land fill
2	Brine sludge	Wet cake	CaCO3, Mg(OH)2, silica etc.	3318	By Tractor Trally	Secured land fill
3	Spent Catalyst	Solid form	Nickel and Hydrogenated oil	Nil	Truck	To spent catalyst processor
4	Spent Earth	Solid form	Oil , Carbon earth	106.60	Truck	To reprocessor
5	Furnace oil sludge	Viscous liquid	Moisture, heavy ends of F.O., and inert	186.660	Through pipe line	To Boiler for steam generation
6	Waste Lube Oil	Viscous liquid	Contains hydrocarbon	1.889	Through pipe line	To Boiler alongwith F.O., sludge for steam generation
7	Fatty acid pitch & Residue	Viscous liquid	Oils, Residues and gums	630	Tanker	Sold as bi-product
8	Glycerine Pitch	Viscous liquid	Oils, Glycerine, Mong and ash.	1630	Drums	Burnt in Boiler
9	Fly ash	Fine Powder	-	43480	Tractor 'Trolly	Cement Industries and Brick manufacturers
10	Coarse ash	Powder	-	66205	Tractor 'Trolly	Land fill
11	e-waste	-	-	-	-	-

Name and Signature of the Head of the Facility

PLACE : KURNOOL

DATE 15.06.2020

Signature :

Name : N.Jeswanth Reddy

Designation : Executive Director (Tech)

I/36448/2022

FORM - 4

DETAILS OF HAZARDOUS WASTE IN OUR INDUSTRY
APRIL 2020 - MARCH 2021

S.No.	Nature of Hazardous Waste	Physical form and contents	Chemical form	Total vol.of the haz, waste disposed with No.of packages Qty.inMT/KL	Mode of Transporta-tion to the site of disposal	Brief Description of the method of disposal
1	ETP Sludge	Wet cake	Mostly silt	17	By Tractor Trally	Secured land fill
2	Brine sludge	Wet cake	CaCO3, Mg(OH)2, silica etc.	4585	By Tractor Trally	Secured land fill
3	Spent Catalyst	Solid form	Nickel and Hydrogenated oil	6.990l	Truck	To spent catalyst processor
4	Spent Earth	Solid form	Oil , Carbon earth	76.680	Truck	To reprocessor
5	Furnace oil sludge	Viscous liquid	Moisture, heavy ends of F.O., and inert	2.280	Through pipe line	To Boiler for steam generation
6	Waste Lube Oil	Viscous liquid	Contains hydrocarbon		Through pipe line	To Boiler along with F.O., sludge for steam generation
7	Fatty acid pitch & Residue	Viscous liquid	Oils, Residues and gums	833	Tanker	Sold as bi-product
8	Glycerine Pitch	Viscous liquid	Oils, Glycerine, Mong and ash.	1581	Drums	Burnt in Boiler
9	Fly ash	Fine Powder	-	30961	Tractor 'Trolly	Cement Indus-tries & Brick manufacturers
10	Coarse ash	Powder	-	37841	Tractor 'Trolly	Land fill
11	e-waste	-	-	-	-	-

Name and Signature of the Head of the Facility
Signature :

PLACE : KURNOOL

DATE: 24.05.2021

Name : N.Jeswanth Reddy
Designation : Executive Director (Tech)

FORM - 4

DETAILS OF HAZARDOUS WASTE IN OUR INDUSTRY
APRIL 2021 - MARCH 2022

S.No.	Nature of Hazardous Waste	Physical form and contents	Chemical form	Total vol.of the haz, waste disposed with No.of packages Qty.inMT/KL	Mode of Transporta-tion to the site of disposal	Brief Description of the method of disposal
1	ETP Sludge	Wet cake	Mostly silt	15	By Tractor Trally	Secured land fill
2	Brine sludge	cake	CaCO3, Mg(OH)2, silica etc.	2210	By Tractor Trally	Secured land fill
3	Spent Catalyst	Solid form	Nickel and Hydrogenate d oil	0.889	Truck	To spent catalyst processor
4	Spent Earth	Solid form	Oil , Carbon earth	19.06	Truck	To reprocessor
5	Furnace oil sludge	Viscous liquid	Moisture, heavy ends of F.O., and inert	2.590	Through pipe line	To Boiler for steam generation
6	Waste Lube Oil	Viscous liquid	Contains hydrocarbon		Through pipe line	To Boiler along with F.O., sludge for steam generation
7	Fatty acid pitch & Residue	Viscous liquid	Oils, Residues and gums	356	Tanker	Sold as bi-product
8	Glycerine Pitch	Viscous liquid	Oils, Glycerine, Mong and ash.	854	Drums	Burnt in Boiler
9	Fly ash	Fine Powder	-	58012	Tractor 'Trolly	Cement Indus-tries & Brick manufacturers
10	Coarse ash	Powder	-	87017	Tractor 'Trolly	Land fill
11	e-waste	-	-	Nil	-	-

Name and Signature of the Head of the Facility

PLACE : KURNOOL

P. Raghavendra Reddy
Vice President (QA)

The above information is being submitted to Andhra Pradesh Pollution Control Board.

iv. **National emission standards for organic chemicals Manufacturing industry issued by the ministry vide G.S.R. 608 (E) dated 21st July, 2010 and amended from time to time shall be followed.**

Status: Being complied

It has been observed that the PAs are in process of complying the National emission standards for organic chemicals Manufacturing industry issued by the ministry vide G.S.R. 608 (E) dated 21st July, 2010 and amended from time to time.

v. **To control source and the fugitive emissions, suitable pollution control devices shall be installed to meet the prescribed norms and/or the NAAQS. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/SPCB guidelines**

Status: Being complied

It has been observed that the PAs are in process of controlling the emissions at the source and fugitive emission by installing suitable pollution control devices to meet the prescribed norms and/or the NAAQS. As per the discussions held, it has been observed that the PAs have installed automatic interlocks on chlorine storage tanks, chlorine sensors for leak detection, HCl scrubbers for CMS, tail gas scrubber and emergency chlorine scrubber were provided to mitigate fugitive emissions.

vi. **Solvent management shall be carried out as follows:**
- **Reactor shall be connected to Chilled brine condenser system.**
- **Reactor and solvent handling pump shall have mechanical seals to prevent leakage.**
- **The condenser shall be provided with sufficient HTA and residence time so as to achieve more than 98% recovery.**
- **Solvents shall be stored in a separate space specified with all safety measures.**
- **Proper earthling shall be provided in all the electrical equipment whenever solvent handling is done.**
- **Entire plant shall be flame proof. The solvent storage tanks shall be provided with breather valve to prevent losses.**
- **All the solvent storage tanks shall be connected with vent condenser with chilled brine circulation.**

Status: Being complied

It has been observed that the PAs are in process of following measures for solvent management in the process:

- All the reactors in the plant were provided with chilled brine and cooling water circulation.
- The industry maintains closed piping system to solvent tanks and every pump has mechanical seal.
- The industry provided condensers with sufficient HTA and residence

time so as to achieve more than 98% recovery.
- Separate space is provided for solvent storage
- Proper earthling is provided to all electrical equipment.
- Where ever applicable the plant was made flame proof. Storage tanks are being provided with breather valves.
- All the solvent storage tanks vents are connected with chilled brine circulation.

vii. **Total fresh water requirement shall not exceed 15167 cum/day to be met from Tungabhadra River through infiltration wells. Prior permission in this regard shall be obtained from the concerned regulatory authority/ CGWA.**

Status: Partially complied

As per the discussions held, it has been informed that the present water consumption is as per the quantity mentioned in CFO. We have obtained permission from Water resource department for withdraw of 20 MLD of water.

Total fresh water requirement shall not exceed 15167 cum/day to be met from Tungabhadra River through infiltration wells. Prior permission in this regard shall be obtained from the concerned regulatory authority/ CGWA.

viii. **Process Effluent/any waste water shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.**

Status: Being complied

It has been observed that the process effluent and wastewater streams are being transferred to effluent collection tank with dedicated pipelines.

ix. **Hazardous chemicals shall be stored in tanks, tank farms, carboys etc. Flame arresters shall be provided on tank farm, and solvent transfer though pumps.**

Status: Being complied

It has been observed that the hazardous chemicals stored in tanks, tank farms and drums. Flame arresters provided on tank farm and solvent transfer through pumps and pumps are connected to the earth pit.

x. **Process organic residue and spent carbon, if any, shall be sent to the cement industries. ETP Sludge, process inorganic & evaporation salt shall be disposed off to the TSDF.**

Status: Partially complied

It has been observed that the process organic residue is being sent to in-house

incinerator. ETP sludge, process inorganic & evaporation salts are being sent to In-House secured land fill. No spent carbon generated anticipated.

It is required to send the process organic residue and spent carbon, if any, to the cement industries. ETP Sludge, process inorganic & evaporation salt should be disposed off to the TSDF.

xi. **The company shall strictly comply with the rules and guidelines under manufacture, Storage and import of hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. All the transportation of Hazardous Chemicals Shall be as per the Motor Vehicle Act (MVA), 1989.**

Status: Being complied

It has been observed that the PAs are in process of complying the rules and guidelines under manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. Annual safety audit conducted during 2021 by third party and submitted the report to factories department and APPCB. HAZOP study of entire complex was carried out in 2021. Quantitative Risk Assessment was carried out in 2022. Provided necessary arrangements for transportation of hazardous chemicals.

xii. **The Company shall Undertake the waste minimization measures as below**

- **Metering and control of quantities of active ingredients to minimize waste**
- **Reuse of by-products from the process as raw materials or as raw material substitutes in other processes**
- **Use of automated filling to minimize spillage**
- **Use close feed system in to batch reactors**
- **Venting equipment through vapor recovery system**
- **Use of high pressure hoses for equipment cleaning to reduce waste water generation**

Status: Being Complied.

It has been observed that the PAs are in process of undertaking the following waste minimization measures for existing facility:

- All the raw material quantities are controlled by analysing process parameters to minimize waste.
- Liquid raw materials are being transferred through closed system with DCS control.
- No batch processes.
- Equipment's are being fitted with proper condensers.
- High pressure pump is being used for cleaning equipment to reduce waste water generation.

xiii. **The green belt of at least 5-10 m width shall be developed in more than**

33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the state forest department.

Status: Being complied

It has been observed that the PAs have developed an adequate green belt in and around the plant area. As per the information provided, PAs have planted around 2,23,575 saplings in an area of 89.03 ha i.e., 58.42% of total area. The photographs are as follows:






xiv. **All the commitments made regarding issues raised during the public hearing/consultation meeting held on 29th November, 2017 shall be satisfactorily implemented.**

Status: Being complied

As per the discussions held, it has been observed that the PAs are in process of implementing all the commitments made regarding issues raised during the public hearing/consultation meeting held on 29th November, 2017. The major issues discussed during public hearing are pertaining to local employment, drinking RO plants, CSR and Pollution control measures. Implemented ZLD system and APC provided to emissions sources. Rs. 237.29 Lakhs spent

during 2018-2021 towards installation of drinking RO, Health camps, sanitization etc.

xv. **At least 2.5% of the total project cost shall be allocated for Enterprise social commitment based on the hearing issues and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry Regional Office.**

Status: Being complied

As per the discussions held, it has been observed that the PAs are in process of undertaking socio-economic development activities in the surrounding villages by providing RO plants etc. CSR activities (plantation around the road) are undertaken by involving local villages and administration. As per the information provided, the following CSR activities has undertaken by PAs in surrounding village areas for last three years are as follows:

2021-2022:

SN	CSR Project of activity identified	Amount spent (in Rs.)
1	Drinking water	43,29,036
2	Social Project (Covid-19 related)	19,55,149
3	Social Project (Health)	32,65,302
4	Environmental Stability (Sanitation)	18,50,047
5	Eradication of poverty (Old age pension)	13,02,545
6	Sports Education	5,52,720
7	Protection of National Heritage	9,25,231
Total		1,41,80,030

2020-2021:

SN	CSR Project of activity identified	Amount spent (in Rs. Lakhs)
1	Drinking water	37.86
2	Social Project (Temple Renovation)	15.22
3	Social Project (Health and wellbeing)	118.68
4	Environmental Stability (Sanitation)	25.16
5	Eradication of poverty (Old age pension)	3.60
6	Sports Education	0.96
7	Construction of women Police Station	0.13
Total		201.61

2019-2020:

SN	CSR Project of activity identified	Amount spent (in Rs. Lakhs)
1	Drinking water	14.65

2	Education to nearby people	19.52
3	Community and village development	15.00
4	Environmental Stability (Sanitation)	6.83
5	Eradication of poverty (Old age pension)	1.07
6	Sports Education	2.97
7	Construction of women Police Station	5.00
Total		65.04

xvi. **For the DG sets, emission limits and the stack height shall be in conformity with the exact regulations and the CPCB guidelines. Acoustic enclosure shall be provided to DG set for controlling the noise pollution.**

Status: Being complied

It has been observed that the PAs have provided minimum of 10 m height for silencers (Acoustic enclosure) to mitigate noise levels.

xvii. **The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Firefighting system shall be as per norms.**

Status: Being complied

It has been observed that the PAs are in process of making adequate arrangements for protection of possible fire hazards during manufacturing process in material handling. Sufficient firefighting equipment's and fire hydrant system is being provided the industry. PAs have obtained NOC from Government of Andhra Pradesh, State Disaster Response and Fire Services Department vide Rc.No. 3321/MSB/SR/KNL/2O21SDP dated 21.09.2O21. The NOC is valid for five years.

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

Status: Being complied

It has been observed that the PAs are conducting occupational health check-up on yearly basis to all employees and records are being maintained. OHS center is equipped with a doctor, supporting staff and facilities. The photographs of Occupational Health Center in the plant premises are as follows:







xix. **Storage of raw materials shall be either stored in silos or in covered area to prevent dust pollution and other fugitive emissions.**

Status: Being complied

It has been observed that the PAs are storing raw material in silos and covered area to prevent dust pollution and other fugitive emissions. Raw Salt and coal are being stored under covered shed with concrete platform. Fly ash is being stored in silos. The photographs are as follows:









xx. **Continuous online (24x7) monitoring system for stack emission shall be installed for measurement of flue gasses discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For Online continuous monitoring of effluent, the unit shall install the web camera with night vision capability and the flow meters in the channel/drain carrying effluent within the premises.**

Status: Being complied

As per the discussions held, it has been observed that the PAs have installed Continuous online (24x7) monitoring system for stack emissions for the stacks: Stack 1 - Connected 100 TPH Boiler, Stack 2 - Connected 110 TPH Boiler and Stack 3 - Connected 45 TPH Boiler. As per the information provided, the stack emissions for the period January – September, 2022 is as follows:

Month	Level	Stack Connected to		
		Stack - 1 Connected to 100 TPH Boiler	Stack - 2 Connected to 100 TPH Boiler	Stack - 3 Connected to 45 TPH Boiler
Particulate Matter (mg/m³)				
January, 2022	Min	52.96	0.00	0.00
	Max	58.65	18.94	54.54
	Avg	56.17	1.38	45.43
February, 2022	Min	46.28	0.00	43.13
	Max	60.75	0.00	56.35
	Avg	56.47	0.00	52.32
March, 2022	Min	51.63	0.00	53.08
	Max	59.34	0.00	59.63
	Avg	55.02	0.00	55.69
April, 2022	Min	51.45	0.00	12.79
	Max	59.04	0.00	57.88
	Avg	55.73	0.00	51.79
May, 2022	Min	59.61	0.00	54.29
	Max	64.63	0.00	59.15

	Avg	61.81	0.00	56.01
June, 2022	Min	52.04	0.00	0.00
	Max	60.35	24.95	60.36
	Avg	55.65	6.79	45.07
July, 2022	Min	57.51	22.81	0.00
	Max	65.62	26.17	60.68
	Avg	61.70	24.70	23.97
August, 2022	Min	54.92	23.14	0.00
	Max	65.62	26.77	0.00
	Avg	61.67	25.80	0.00
September, 2022	Min	0.00	18.55	0.00
	Max	62.82	28.43	48.78
	Avg	49.64	27.13	9.66
SOx (mg/m³)				
January, 2022	Min	255.59	0.00	0.00
	Max	295.96	147.92	293.08
	Avg	284.61	10.53	254.61
February, 2022	Min	188.34	0.00	186.69
	Max	283.66	0.00	298.57
	Avg	273.14	0.00	274.37
March, 2022	Min	272.01	0.00	254.85
	Max	286.50	0.00	298.40
	Avg	280.32	0.00	279.11
April, 2022	Min	277.87	0.00	63.67
	Max	290.83	0.00	294.62
	Avg	284.58	0.00	261.14
May, 2022	Min	272.51	0.00	247.29
	Max	283.64	0.00	282.54
	Avg	279.22	0.00	267.36
June, 2022	Min	259.84	0.00	0.00
	Max	283.59	151.36	278.20
	Avg	276.10	45.26	205.18
July, 2022	Min	270.63	116.37	0.00
	Max	279.97	150.23	292.73
	Avg	274.10	131.14	114.36
August, 2022	Min	240.59	111.08	0.00
	Max	278.40	143.67	0.00
	Avg	274.09	133.29	0.00
September, 2022	Min	0.00	95.37	0.00
	Max	274.77	142.6	285.09
	Avg	224.30	137.01	56.25
NOx (mg/m³)				
January, 2022	Min	181.83	0.00	0.00
	Max	201.3	126.73	133.64
	Avg	191.01	9.08	117.82
February, 2022	Min	140.63	0.00	123.99
	Max	207.05	0.00	147.09

	Avg	194.86	0.00	138.14
March, 2022	Min	196.82	0.00	145.91
	Max	218.84	0.00	161.12
	Avg	207.36	0.00	150.37
April, 2022	Min	198.18	0.00	38.24
	Max	218.10	0.00	165.57
	Avg	207.43	0.00	154.31
May, 2022	Min	205.75	0.00	160.81
	Max	219.54	0.00	166.61
	Avg	211.06	0.00	163.83
June, 2022	Min	200.54	0.00	0.00
	Max	216.01	146.23	164.43
	Avg	208.81	38.61	122.26
July, 2022	Min	215.29	145.56	0.00
	Max	231.64	176.44	169.54
	Avg	220.35	159.19	67.21
August, 2022	Min	216.11	116.47	0.00
	Max	259.51	195.32	0.00
	Avg	240.53	143.48	0.00
September, 2022	Min	0.00	94.14	0.00
	Max	249.38	147.42	113.87
	Avg	198.17	129.42	22.59

PAs have installed web camera to effluent lines and connected to SPCB/CPCB.

B. General Conditions:

i. **The project authorities must strictly adhere to the stipulations made by the state pollution control board (SPCB), State government and /or any other statutory authority.**

Status: Being complied

It has been observed that the PAs are in process of adhering to the stipulations made by the Andhra Pradesh Pollution Control Board, State Government and Other Statutory Authority. As stated above, the following CFE and CFO are obtained from Andhra Pradesh Pollution Control Board:

Consent For Establishment (CFE):

It has been observed that the PAs have obtained the Consent For Establishment for Expansion project vide Order No. APPCB/KNL/KNL/231/CFE/HO/2008 dated 25.05.2018.

PAs have obtained the Consent For Establishment for change of product mix vide Order No. 266/APPCB/CFE/RO-NLR/HO/2021 dated 29.07.2022.

Consent for Operation (CFO) & Hazardous Waste Authorization (HWA):

CFO for Chloro-Alkali Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1274022/APPCB/KNL/KNL /CFO&HWA/HO/2022 dated 06.05.2022. The CFO is valid till 28.02.2023.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB / KNL/ KNL/16322/ CFO& HWA/ HO/1987 valid till 28.02.2026. The CFO is valid till 28.02.2026.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.07.2021. The CFO is valid till 31.05.2026.

CFO for Chloro Methanes Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1473568/APPCB/KNL/KNL/CFO&HWA/HO/2021 dated 20.12.2021. The CFO is valid till 31.10.2022.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.09.2021. The CFO is valid till 31.08.2026.

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

Status: Assured to comply

As per the discussions held, it has been observed that, no further expansion or modifications in the plant shall be carried out without prior approval of the Ministry.

PAs have assured that, in case of deviations are alterations in the project proposal from those submitted to this ministry, a fresh reference shall be made to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.

As per the information provided, the production and raw material usage details for last four years are as follows:

Product	2018 - 19	2019 - 20	2020 - 21	2021 - 22
Products				
Caustic Soda Lye	134935	120066	117434	144535
Caustic Soda Flakes	55862	51951	57264	60614
Caustic Potash Lye	19316	24706	31685	28467
Caustic Potash Flakes	12377	20593	25563	22464
Liq. Chlorine	111094	129487	144336	163897
Hydro chloric Acid	32745	28604	35578	37171
Sodium Hypo	28972	25000	20399	24165
Potassium Carbonate	1240	1317	2460	1751
Sodium Sulphate	61	1142	1411	1392
MDC	18899	18669	19321	21856
Chloroform	17350	17139	17738	21022
Carbon tetra chloride	1544	1749	1679	2423
Power	16.333	13.013	23.949	18.477
Raw Material				
Salt	304365	276647	291445	333092
Methanol	14065	13709	14030	20682
Coal	275860	270128	364033	313682

iii. **The locations of ambient air quality monitoring station shall be decided in consultation with the state pollution control board (SPCB) and it shall be ensured that at least one station is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.**

Status: Partially complied

It has been observed that the PAs have installed continuous ambient air quality monitoring stations at near main gate and monitoring PM_{10}, $PM_{2.5}$, SO_2, NOx and VOC. As per the information provided, the AAQ levels for the period January, 2021 to December, 2021 are as follows:

Month	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	VOC ($\mu g/m^3$)
January - 2021.	57.76	9.46	0.72	7.71	0
February - 2021.	39.48	18.08	0.73	12.44	2.03
March - 2021.	23.7	11.24	0.74	6.7	1.72
April - 2021.	39.78	5.17	0.72	15.56	0.07
May - 2021.	47.98	4.41	0.71	16.58	0.12
June - 2021.	43.07	8.37	0.72	7.73	0.12
July - 2021.	29.55	2.02	0.72	6.82	0.29
August - 2021.	26.91	3.58	0.7	5.83	0.26
Spetember - 2021.	56.6	3.55	0.72	3	0.3
October - 2021.	35.52	6.23	0.72	0.68	0.31
November - 2021.	27.88	5.52	0.72	3.34	0.27
December - 2021.	48.69	12.94	0.72	7.62	0.25

As per records, the monitoring reports of AAQ at various locations are not

being submitted to Ministry's Integrated Regional Office, Vijayawada.

It is required to monitor all environmental parameters viz., Stack Emissions, Ambient Air Quality (AAQ), Work Zone Emissions, Noise levels, Water Quality, etc by MoEFCC/NABL accredited laboratory on monthly basis and the monitoring reports to be submitted along with six monthly compliance reports to Ministry's Integrated Regional Office, Vijayawada by E-mail (eccompliance-ap@gov.in). It requires immediate action.

iv. **The National Ambient Air Quality Standards issued by the Ministry vide. G.S.R. No. 826(E) dated 16th November, 2009 shall be complied with.**

Status: Partially complied

It has been observed that the PAs are in process of complying the National Ambient Air Quality Standards issued by the Ministry vide. G.S.R. No. 826(E) dated 16th November, 2009. It has been observed that the PAs have installed continuous ambient air quality monitoring stations at near main gate and monitoring PM_{10}, $PM_{2.5}$, SO_2, NOx and VOC. As per the information provided, the AAQ levels for the period January, 2021 to December, 2021 are as follows:

Month	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	VOC ($\mu g/m^3$)
January - 2021.	57.76	9.46	0.72	7.71	0
February - 2021.	39.48	18.08	0.73	12.44	2.03
March - 2021.	23.7	11.24	0.74	6.7	1.72
April - 2021.	39.78	5.17	0.72	15.56	0.07
May - 2021.	47.98	4.41	0.71	16.58	0.12
June - 2021.	43.07	8.37	0.72	7.73	0.12
July - 2021.	29.55	2.02	0.72	6.82	0.29
August - 2021.	26.91	3.58	0.7	5.83	0.26
Spetember - 2021.	56.6	3.55	0.72	3	0.3
October - 2021.	35.52	6.23	0.72	0.68	0.31
November - 2021.	27.88	5.52	0.72	3.34	0.27
December - 2021.	48.69	12.94	0.72	7.62	0.25

As per records, the monitoring reports of AAQ at various locations are not being submitted to Ministry's Integrated Regional Office, Vijayawada.

It is required to monitor all environmental parameters viz., Stack Emissions, Ambient Air Quality (AAQ), Work Zone Emissions, Noise levels, Water Quality, etc by MoEFCC/NABL accredited laboratory on monthly basis and the monitoring reports to be submitted along with six monthly compliance reports to Ministry's Integrated Regional Office, Vijayawada by E-mail (eccompliance-ap@gov.in). It requires immediate action.

v. **The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including**

acoustic hoods, silencers, enclosures etc. on all the sources of the noise generation. The ambient noise levels shall conform to the standards prescribed under environment (Protection) Act, 1986 rules, 1989 viz. 75 d BA (day time) and 70 dBA (night time).

Status: Partially complied

It has been observed that the PAs are in process of controlling the overall noise levels in and around the plant area well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all the sources of the noise generation. As per the discussions held, it has been stated that the ambient noise levels are being conform to the standards prescribed under environment (Protection) Act, 1986 rules, 1989 viz. 75 d BA (day time) and 70 dBA (night time). However, the monitoring reports are not being submitted to Ministry's Integrated Regional Office.

It is required to monitor all environmental parameters viz., Stack Emissions, Ambient Air Quality (AAQ), Work Zone Emissions, Noise levels, Water Quality, etc by MoEFCC/NABL accredited laboratory on monthly basis and the monitoring reports to be submitted along with six monthly compliance reports to Ministry's Integrated Regional Office, Vijayawada by E-mail (eccompliance-ap@gov.in). It requires immediate action.

vi. **The company shall Harvest rain water from the roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for the different industrial operations within the plant.**

Status: Being complied

It has been observed that the PAs are harvesting rain water from the roof tops of the building and storm water drains to recharge the ground water and utilize the same for the different industrial operations within the plant.

vii. **Training shall be imparted to all employees on the safety health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all the employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.**

Status: Being complied

As per the discussions held, it has been observed that the PAs are providing training to employees on safety and health aspects of chemicals handling based on MSDS. Pre-employment check-up and annual health check-up is being under taken for all employees.

viii. **The Company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the ministry. All the recommendations made in the EIA/EMP in respect of environment management, risk mitigation measures and public hearing**

shall be implemented.

Status: Being complied

As per the discussions held, it has been observed that the PAs are in process of complying all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry, all the recommendations made in the EIA/EMP in respect of environment management, risk mitigation measures and public hearing.

It is required to provide the detailed compliance status of all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry, all the recommendations made in the EIA/EMP in respect of environment management, risk mitigation measures and public hearing.

ix. **The company shall undertake all measures for improving socio-economic conditions of the surrounding area. CSR activities shall be undertaken by involving local villagers, administration and other stake holders. Also, eco-developmental measures shall be undertaken for overall improvement of the environment.**

Status: Being complied

As per the discussions held, it has been observed that the PAs are in process of undertaking socio-economic development activities in the surrounding villages by providing RO plants etc. CSR activities (plantation around the road) are undertaken by involving local villages and administration. As per the information provided, the following CSR activities has undertaken by PAs in surrounding village areas for last three years are as follows:

2021-2022:

SN	CSR Project of activity identified	Amount spent (in Rs.)
1	Drinking water	43,29,036
2	Social Project (Covid-19 related)	19,55,149
3	Social Project (Health)	32,65,302
4	Environmental Stability (Sanitation)	18,50,047
5	Eradication of poverty (Old age pension)	13,02,545
6	Sports Education	5,52,720
7	Protection of National Heritage	9,25,231
Total		1,41,80,030

2020-2021:

SN	CSR Project of activity identified	Amount spent (in Rs. Lakhs)
1	Drinking water	37.86
2	Social Project (Temple Renovation)	15.22
3	Social Project (Health and wellbeing)	118.68
4	Environmental Stability (Sanitation)	25.16
5	Eradication of poverty (Old age pension)	3.60
6	Sports Education	0.96
7	Construction of women Police Station	0.13
Total		201.61

2019-2020:

SN	CSR Project of activity identified	Amount spent (in Rs. Lakhs)
1	Drinking water	14.65
2	Education to nearby people	19.52
3	Community and village development	15.00
4	Environmental Stability (Sanitation)	6.83
5	Eradication of poverty (Old age pension)	1.07
6	Sports Education	2.97
7	Construction of women Police Station	5.00
Total		65.04

x. **A Separate environmental management cell equipped with full-fledged laboratory facilities shall be set up to carry out the Environmental management and monitoring functions.**

Status: Being complied

It has been observed that the PAs have established a separate environmental cell has been established. All equipment's and full-fledged laboratory facilities are available to carry out the environment and monitoring functions. R& D center of our company is recognized by Department of Science and Industrial Research, Ministry of Science and Technology, Govt., of India.

xi. **The company shall earmark sufficient funds towards capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management / pollution control measures shall not be diverted for any other purpose.**

Status: Partially complied

As per the discussions held, it has been informed that around Rs. 35 crores was spent for implementation environment protection measures and to

operate pollution control equipment and to monitoring the same continuously and recurring is about 10 crores/year. It has been stated that the funds so earmarked for environment management / pollution control measures shall not be diverted for any other purpose. However, the details regarding item wise expenditure incurred for environment management / pollution control measures is not being submitted along with six monthly compliance reports to Ministry's Regional Office.

It is required to submit the details regarding expenditure incurred for implementation of environmental protection measures along with all monitoring reports on regular basis to Integrated Regional Office (IRO), Vijayawada by E-mail (eccompliance-ap@gov.in).

xii. **A copy of clearance letter shall be sent by the project proponent to the concerned Panchayat, Zila Parisad/Municipal Corporation, Urban Local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.**

Status: Complied

As per the discussions held, it has been informed that a copy of the Environmental Clearance letter had circulated to the Gondiparla Gram Panchayat, Kurnool Zilla Parishad, Municipal Corporation and Urban local body.

xiii. **The project proponent shall also submit six monthly reports on the status of the compliance of the stipulated environmental clearance conditions including results of monitored data (both in the hard copies as well as in the e-mail) to the respective Regional Office of MoEF&CC, the respective zonal office of CPCB and SPCB. A Copy of Environmental clearance and six-monthly compliance status reports shall be posted on the website of the company.**

Status: Partially complied

As per the records, it has been observed that the PAs are irregular in submission of six monthly compliance reports to Ministry's Regional Office.

It is required to submit the six monthly compliance reports in respect of the terms and conditions stipulated in Environmental Clearance along with all monitoring reports on regular basis to Integrated Regional Office (IRO), Vijayawada by E-mail (eccompliance-ap@gov.in). It is also required to uploaded the same in the website of the project and updated periodically. It requires immediate action.

xiv. **The Environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed under the environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of**

the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective regional offices of MoEF&CC by e-mail.

Status: Partially complied

As per the discussions held, it has been informed that the PAs are regularly submitting the Environmental Statement to APPCB, Kurnool. However, the same is not being submitted to Ministry's Regional Office and not uploaded in the website of company.

It is required to submit the Environmental Statement in Form - V on regular basis to Integrated Regional Office (IRO), Vijayawada by E-mail (eccompliance-ap@gov.in). It is also required to uploaded the same in the website of the project and updated periodically. It requires immediate action.

xv. **The project proponent shall inform the public that the project has been accorded environment clearance by the ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at the website of the ministry at http:moef.nic.in. This shall be advertised within seven days from date of issue of the clearance letter, at least in two local newspaper that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional office of the Ministry.**

Status: Complied

As per the records, it has been observed that the details regarding the grant of EC to the project in two newspapers viz., "The New Indian Express" (English) on 08.05.2018 and "Andhra Prabha" (Telugu) on 06.05.2018.

xvi. **The ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not found to be satisfactory.**

Status: Being complied

It has been observed that the condition has complied with.

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

Status: Being complied

It has been observed that the condition has complied with.

xviii. **The above conditions will be enforced, inter-alia under the provisions of**

the water (prevention and control of pollution) Act, 1974, The Air (prevention and control of water pollution) Act, 1981, the environment (Protection) Act, 1986, the hazardous waste (management, handling and Trans-boundary Movement) Rules, 2016 and the public liability insurance Act, 1991 read with subsequent amendments therein.

Status: Being complied

As per the records, it has been observed that the following Clearances/Approvals were obtained by PAs:

Environmental Clearances (EC):

The following EC's granted to the project by MoEF&CC, New Delhi are as follows:

SN	Project Name	Clearance No. & Date
1	Expansion of Chemical Manufacturing Unit at Gondiparla, Kurnool Andhra Pradesh by M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd.	J-11011/653/2007 – IA II (I) dated 26.12.2007
2	Expansion by adding Choloromethane Plant at Sy. No. 61, 62 B, 63 Village Gondiparla, Mandal Kurnool, District Kurnool, Andhra Pradesh by M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd.	J-11011/619/2009-IA II (I) dated 14.02.2012
3	Expansion of Chlor-Alkali and Synthetic Organic Chemicals (Chloromethanes /Chloro-difluoromethane) by M/s Sree Rayalaseema Alkalies and Alied Chemicals Limited at 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Village Gondiparla, Manda and District Kurnool (Andhra Pradesh).	J-11011/84/2016 – IA II (I) dated 01.05.2018
4	Transfer of EC from M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited to M/s TGV SRAACL Ltd.	J-11011/84/2016 – IA II (I) dated 28.09.2021

Consent For Establishment (CFE):

It has been observed that the PAs have obtained the Consent For Establishment for Expansion project vide Order No. APPCB/KNL/KNL/231/CFE/HO/2008 dated 25.05.2018.

PAs have obtained the Consent For Establishment for change of product mix vide Order No. 266/APPCB/CFE/RO-NLR/HO/2021 dated 29.07.2022.

Consent for Operation (CFO) & Hazardous Waste Authorization (HWA):

CFO for Chloro-Alkali Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1274022/APPCB/KNL/KNL /CFO&HWA/HO/2022 dated 06.05.2022. The CFO is valid till 28.02.2023.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB / KNL/ KNL/16322/ CFO& HWA/ HO/1987 valid till 28.02.2026. The CFO is valid till 28.02.2026.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.07.2021. The CFO is valid till 31.05.2026.

CFO for Chloro Methanes Plant:

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. 1473568/APPCB/KNL/KNL/CFO&HWA/HO/2021 dated 20.12.2021. The CFO is valid till 31.10.2022.

PAs have obtained CFO & HWA for Chloro-Alkali Plant from Andhra Pradesh Pollution Control Board vide Consent Order No. APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021 dated 16.09.2021. The CFO is valid till 31.08.2026.

Fire NOC:

PAs have obtained NOC from Government of Andhra Pradesh, State Disaster Response and Fire Services Department vide Rc.No. 3321/MSB/SR/KNL/2O21SDP dated 21.09.2O21. The NOC is valid for five years.

Public Liability Insurance Act, 1991:

PAs have obtained Public Liability Insurance from The New India Assurance Co. Ltd. vide dated 16.01.2022. The insurance is valid till 15.01.2023.

10. Observations:

The PAs have complied or are in process of complying the conditions stipulated by the Ministry. In this context, information/action plans have been sought on following points.

1. Total fresh water requirement shall not exceed 15167 cum/day to be met from Tungabhadra River through infiltration wells. Prior permission in this regard shall be obtained from the concerned regulatory authority/ CGWA.
2. It is required to send the process organic residue and spent carbon, if any, to the cement industries. ETP Sludge, process inorganic & evaporation salt

should be disposed off to the TSDF.

3. It is required to monitor all environmental parameters viz., Stack Emissions, Ambient Air Quality (AAQ), Work Zone Emissions, Noise levels, Water Quality, etc by MoEFCC/NABL accredited laboratory on monthly basis and the monitoring reports to be submitted along with six monthly compliance reports to Ministry's Integrated Regional Office, Vijayawada by E-mail (eccompliance-ap@gov.in). It requires immediate action.
4. It is required to provide the detailed compliance status of all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry, all the recommendations made in the EIA/EMP in respect of environment management, risk mitigation measures and public hearing.
5. It is required to submit the details regarding expenditure incurred for implementation of environmental protection measures along with all monitoring reports on regular basis to Integrated Regional Office (IRO), Vijayawada by E-mail (eccompliance-ap@gov.in).
6. It is required to submit the six monthly compliance reports in respect of the terms and conditions stipulated in Environmental Clearance along with all monitoring reports and Environmental Statement in Form - V on regular basis to Integrated Regional Office (IRO), Vijayawada by E-mail (eccompliance-ap@gov.in). It is also required to uploaded the same in the website of the project and updated periodically. It requires immediate action.

11. Recommendations:

This project can be put up in the following tick-marked category of compliance status.

- Compliance status could not be judged as the project was shut down / not in operational during the site visit.
- No non-compliances detected. No any further action is required.
- √ ***Minor non-compliances detected (not of immediate danger to health & safety of the people). Letter issued to project authorities for taking corrective measures.***
- Serious non-compliances detected. Recommended to issue a Show-Cause Notice to Project Authorities.

Sd/-
(डॉ। सुरेश बाबु पसुपुलेटी)
(Dr. Suresh Babu Pasupuleti)
संयुक्त निदेशक (एस) / Joint Director (S)

TGV SRAAC LIMITED

SY. NO. 61/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62B/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72, 73, 27, 28 and 66, GONDIPARLA VILLAGE, KURNOOL MANDAL AND DISTRICT, ANDHRA PRADESH

ANNEXURES

Project No. 0823-13/21-01
August 2023

TGV SRAAC Limited
Gondiparla Village, Kurnool Mandal, and District,
Andhra Pradesh, Pin code-518 004
Phone :08518 280007, 280008
Mobile: +91 9848079064
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STUDIES AND DOCUMENTATION BY
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SUBMITTED TO
MINISTRY OF ENVIRONMENT, FOREST, AND CLIMATE CHANGE
GOVERNMENT OF INDIA
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI

डा० ए० दुरईसामी
निदेशक
A. DURAISAMY
DIRECTOR

सत्यमेव जयते

जय हिन्द

भारत सरकार
पर्यावरण, वन एवं
जलवायु परिवर्तन मंत्रालय
ओज़ोन सेल
OZONE CELL
MINISTRY OF ENVIRONMENT,
FORESTS & CLIMATE CHANGE
GOVERNMENT OF INDIA

CERTIFICATE OF REGISTRATION

	Name of the Registering Authority	:	Ozone Cell, Ministry of Environment, Forests & Climate Change Government of India
1.	Registration Number	:	ODS/CS/17/2(1)/2014 -OC
2.	Date of Registration	:	25/11/2014
3.	Name of the Enterprise	:	M/s. Sree Rayalaseema Alkalies And Allied Chemicals Limited,
4.	Address of Registered Office	:	Gondiparla, Kurnool- 518004, Tehsil Kurnool, Andhra Pradesh.
5.	Particulars of Factories	:	

Sr. No.	Name of Ozone Depleting Substance	Address of factory where Ozone Depleting Substance is produced	Date of incorporation of registration	Date of commencement of commercial production
1.	Carbon Tetrachloride (CCL4) (As a feedstock)	Sree Rayalaseema Alkalies And Allied Chemicals Ltd., Gondiparla, Kurnool-518004	24-06-1981	Expected to be commissioned by 31.03.2015

6.	Name of Business house/ Group to which the enterprise belong	:	T.G.V group
7.	Name of Managing Director / Chief Executive	:	Mr. N.Jeswanth Reddy, Executive Director (Technical)

This certificate is in accordance with the Ozone Depleting Substances (Regulation and Control) Rules, 2000 vide notification number S.O. 670 (E) dated the 19th July, 2000 and its Amendments.

Signature and Seal of Registering Authority

(डा० ए० दुरईसामी)
(Dr. A. DURAISAMY)
निदेशक / DIRECTOR
पर्यावरण, वन मंत्रालय एवं जलवायु परिवर्तन
MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
भारत सरकार / GOVT. OF INDIA
नई दिल्ली / NEW DELHI

जोन चार बी, द्वितीय मंजिल,
इंडिया हैबिटाट सैंटर लोदी रोड,
नई दिल्ली–110003
CORE-4B, 2ND FLOOR, INDIA HABITAT
CENTRE, LODHI ROAD, NEW DELHI-110003

SAVE OUR OZONE LAYER

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www.envfor.nic.in

F.No. J-11011/84/2016- IA II(I)
Government of India
Ministry of Environment, Forest and Climate Change
(IA-II Division)

Indira Paryavaran Bhawan
Jorbagh Road, New Delhi - 3
Dated: 1st May, 2018

To,

M/s Sree Rayalaseema Alkalies and Allied Chemicals Ltd,
Gondiparla,
Kurnool (Andhra Pradesh)

Sub: Expansion of Chlor-Alkali Plant and Synthetic Organic Chemicals (Chloromethanes/ Chloro-difluoromethane) by M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited at Sy. No. 51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Village Gondiparla, Mandal and District Kurnool (Andhra Pradesh) - Environmental Clearance - reg.

Ref.: Online proposal No. IA/AP/IND2/50625/2016 dated 15th February, 2018

Sir,

This has reference to your online proposal No. IA/AP/IND2/50625/2016 dated 15th February, 2018 for environmental clearance to the above project, along with the documents including Form-1, Terms of Reference (ToR), EIA/ EMP report containing the public hearing proceedings/details.

2. The Ministry of Environment, Forest and Climate Change has examined the proposal for environmental clearance to the project for expansion of Chlor-Alkali Plant from 820 TPD to 1620 TPD and Synthetic Organic Chemicals (Chloromethanes/Chloro-difluoromethane) from 117.45 TPD to 244.90 TPD by M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited in a total area of 152.4 ha at Sy. No.51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Village Gondiparla, Mandal and District Kurnool (Andhra Pradesh), with the details as under: -

S. No.	Product	Unit	Production Capacity		
			Existing	Proposed	Total
I. Chlor-Alkali Plant					
1	Caustic Soda Lye (Or) Flakes Potassium Hydroxide Lye (or) Flakes (100 % basis)	TPD	520	500	1020
2	Liquid Chlorine	TPD	300	300	600
II. Chloromethanes					
1	Methyl Chloride	TPD	0.45	10	10.45
2	Methylene Chloride	TPD	61	61	122
3	Chloroform	TPD	56	46.45	102.45
III. Chlorodifluoromethane					
1	Chlorodifluoromethane (R22)	TPD	--	10	10
IV. Captive Power Plant					
1	Captive Power Plant (Coal based)	MW	76	--	76
2	Power generation Furnace Oil**	MW	31	--	31
V. Oil and Fatty Acid Division					
1	Oil and Fatty Acid Products (Non EC Products)	TPD	498	--	498

** *Shall be kept as standby.*

S. No.	By-product	Unit	Production Capacity		
			Existing	Proposed	Total
I. Chlor-Alkali Plant					
1	Hydrochloric Acid (100%)	TPD	173	140	313
2	Sodium Hypochlorite (100% Cl_2 basis)	TPD	8	7	15
3	Barium Sulphate	TPD	5	5	10
4	Potassium carbonate	TPD	50	--	50
5	Sodium Sulphate	TPD	--	10	10
II. Chloromethanes					
1	Carbon tetrachloride*	TPD	7.6	7.6	15.2
2	Hydrochloric Acid (100 %)	TPD	23.5	23.5	47
III. Chlorodifluoromethane					
1	Hydrochloric Acid (100 %)	TPD	--	8.27	8.27

**Carbon Tetrachloride (CCl_4) generated will be sold as a feed stack to Authorized users/excess will be incinerated.*

3. The project cost is estimated to be Rs.360 crores. The capital cost earmarked for pollution control measures is Rs.8 crores and the recurring cost (operation and maintenance) would be about Rs.6.52 crores per annum. It is proposed to allocate Rs.9 crores @ 2.5% towards Corporate Social Responsibility. Greenbelt has been developed in an area of 89.03 ha, thus covering 58.42% of the total project area. There are no national parks, wildlife sanctuaries, Biosphere Reserves, Tiger/Elephant Reserves, Wildlife Corridors etc. within 10 km.

4. The total water requirement is estimated to be 15167 KLD, out of which fresh water demand of 14650 KLD shall be met from Tungabadra river through infiltration wells. Remaining 517 KLD shall be obtained from recycled water.

Total effluent generated from different industrial operations is estimated to be 1754 KLD, which will be taken to the Effluent Treatment plant for treatment. The treated water shall be reused for process units and greenbelt development. There will be no discharge of treated/untreated waste water from the unit, and thus conforming to Zero Liquid Discharge.

5. After expansion, power requirement shall be 125 MW proposed to be met from AP Transco and captive power plant. The details of sources of air emissions namely coal fired boilers, DG sets and oil and H_2 fired boiler are as under:-

S.No	Description	Existing	Proposed	Total after expansion	Stack height (m)
1	Coal Fired Boiler*	110 TPH	-	110 TPH	89
		100 TPH	-	100 TPH	69
		45 TPH	-	45 TPH	55
2	DG Sets	5 x 6.2 MW	-	5 x 6.2 MW	-
		1 x 160 kVA	-	1 x 160 kVA	3
		1 x 285 kVA	-	1 x 285 kVA	3
		1 x 400 kVA	-	1 x 400 kVA	4
		1 x 500 kVA	1 x 500 kVA	2 x 500 kVA	5
3	Oil and H_2 fired boiler**	3 TPH	-	3 TPH	-
4	WHRB connected to DG sets**	3 TPH	-	3 TPH	-
5	Oil fired boiler**	3 TPH	-	3 TPH	-

**Electro Static Precipitators with appropriate stack height shall be installed to control the particulate emissions within statutory limit of 115 mg/Nm^3.*

*** DG sets will be used during load shut down by AP TRANSCO*

6. Details of Process emissions generation and its management:

The gaseous emissions from Chlor-Alkali process are Chlorine and Hydrogen Chloride vapors. Scrubbers are provided to neutralize sniff gases effectively. The secondary gaseous pollutant from chloro-alkali plant is hydrogen chloride gas emissions. To avoid emissions in the plant, tail gas vents are connected to a water scrubber and the lean acid formed is used for absorption of Hydrogen chloride gas in absorber.

The gaseous emission from Chloromethane plant is chlorine and hydrogen chloride vapours. HCl gas produced from thermal chlorination unit shall be used to produce methyl chloride. Excess HCl available is absorbed in HCl absorber to produce 32% HCl. To avoid emissions from HCl absorber, tail gas vents are connected to a tail gas tower followed by organic stripper to remove organics. The gaseous emission from Chlorodifluoromethane plant is HCl which would be sent to Hydrochloric acid absorption system, to produce 28 to 30% HCl.

Details of solid waste/Hazardous waste generation and its management:

Sludge is generated during brine purification stage. Barium sulfate is being recovered presently and it is proposed to recover sodium sulfate additionally, which are sold as by products. The sludge generated form effluent treatment plant shall be disposed to landfill which contains mostly inorganics. Used silica gel, calcium chloride, Calcium Fluoride, Antimony Pentoxide and Spent sulfuric acid are the wastes generated from the Chloromethane and Chlorodifluoromethane process. Used silica gel and calcium chloride are sent to secured landfill within plant premises. Spent sulfuric acid sold as by-product and Calcium Fluoride is sold to hydrogen fluoride manufacturers. Waste oil and used batteries from the DG sets shall be sent to authorized recyclers. Other solid wastes expected from the unit are containers, empty drums which shall be returned to the product seller or sold to authorized buyers after detoxification. Coal ash from boiler shall be sold to brick manufacturers.

7. The project/activity is covered under category A of item 4(d) 'Chlor-Alkali industry' and 5(f) 'Synthetic organic chemicals industry' of the Schedule to the Environmental Impact Assessment Notification, 2006, and requires appraisal at Central level by the sectoral EAC in the Ministry.

8. The ToR for the project was granted on 21st June, 2016. Public hearing was conducted by the SPCB on 29th November, 2017.

9. The proposal was considered by the Expert Appraisal Committee (Industry-2) in its 35th meeting held during 27-28 March, 2018. The project proponent and their accredited consultant M/s Team Labs and Consultants, presented the EIA / EMP report as per the ToR. The Committee found the EIA / EMP Report to be satisfactory and complying with the ToR. The Committee has recommended the proposal for grant of environmental clearance.

10. Based on the proposal submitted by the project proponent and recommendations of EAC (Industry-2), the Ministry of Environment, Forest and Climate change hereby accords environmental clearance to the project ***'Expansion of Chlor-Alkali Plant from 820 TPD to 1620 TPD and Synthetic Organic Chemicals (Chloromethanes/Chloro-difluoromethane) from 117.45 TPD to 244.90 TPD'*** by M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited at Sy. No.51/1, 2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, 1A, 1B, 62A, 62 B, 63, 64, 70/C2, 72/P, Village Gondiparla, Mandal and District Kurnool (Andhra Pradesh),

under the provisions of the EIA Notification, 2006, subject to the compliance of terms and conditions as below:

(i) Consent to Establish/Operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.

(ii) As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste/treated water shall be discharged outside the premises.

(iii) Necessary authorization required under the Hazardous and Other Wastes (Management and Trans-Boundary Movement) Rules, 2016, Solid Waste Management Rules, 2016 shall be obtained and the provisions contained in the Rules shall be strictly adhered to.

(iv) National Emission Standards for Organic Chemicals Manufacturing Industry issued by the Ministry vide G.S.R.608(E) dated 21st July, 2010 and amended from time to time shall be followed.

(v) To control source and the fugitive emissions, suitable pollution control devices shall be installed to meet the prescribed norms and/or the NAAQS. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/SPCB guidelines.

(vi) Solvent management shall be carried out as follows:
- (a) Reactor shall be connected to chilled brine condenser system.
- (b) Reactor and solvent handling pump shall have mechanical seals to prevent leakages.
- (c) The condensers shall be provided with sufficient HTA and residence time so as to achieve more than 98% recovery.
- (d) Solvents shall be stored in a separate space specified with all safety measures.
- (e) Proper earthing shall be provided in all the electrical equipment wherever solvent handling is done.
- (f) Entire plant shall be flame proof. The solvent storage tanks shall be provided with breather valve to prevent losses.
- (g) All the solvent storage tanks shall be connected with vent condensers with chilled brine circulation.

(vii) Total fresh water requirement shall not exceed 15167 cum/day to be met from Tungabadra river through infiltration wells. Prior permission in this regard shall be obtained from the concerned regulatory authority/CGWA.

(viii) Process effluent/any wastewater shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.

(ix) Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc. Flame arresters shall be provided on tank farm, and solvent transfer through pumps.

(x) Process organic residue and spent carbon, if any, shall be sent to cement industries. ETP sludge, process inorganic & evaporation salt shall be disposed off to the TSDF.

(xi) The Company shall strictly comply with the rules and guidelines under Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. All transportation of Hazardous Chemicals shall be as per the Motor Vehicle Act (MVA), 1989.

(xii) The company shall undertake waste minimization measures as below:-
(a) Metering and control of quantities of active ingredients to minimize waste.
(b) Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.
(c) Use of automated filling to minimize spillage.
(d) Use of Close Feed system into batch reactors.
(e) Venting equipment through vapour recovery system.
(f) Use of high pressure hoses for equipment clearing to reduce wastewater generation.

(xiii) The green belt of at least 5-10 m width shall be developed in more than 33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.

(xiv) All the commitments made regarding issues raised during the public hearing/ consultation meeting held on 29th November, 2017 shall be satisfactorily implemented.

(xv) At least 2.5% of the total project cost shall be allocated for Enterprise Social Commitment based on public hearing issues and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.

(xvi) For the DG sets, emission limits and the stack height shall be in conformity with the extant regulations and the CPCB guidelines. Acoustic enclosure shall be provided to DG set for controlling the noise pollution.

(xvii) The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire fighting system shall be as per the norms.

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

(xix) Storage of raw materials shall be either stored in silos or in covered areas to prevent dust pollution and other fugitive emissions.

(xx) Continuous online (24x7) monitoring system for stack emissions shall be installed for measurement of flue gas discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For online continuous monitoring of effluent, the unit shall install web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises. In case of the treated effluent to be utilized for irrigation/gardening, real time monitoring system shall be installed at the ETP outlet.

10.1 The grant of Environmental Clearance is further subject to compliance of other generic conditions as under:-

(i) The project authorities must strictly adhere to the stipulations made by the state Pollution Control Board (SPCB), State Government and/ or any other statutory authority.

(ii) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change. In *case* of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall

be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.

(iii) The locations of ambient air quality monitoring stations shall be decided in consultation with the State Pollution Control Board (SPCB) and it shall be ensured that at least one stations each is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.

(iv) The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 shall be complied with.

(v) The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).

(vi) The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for different industrial operations within the plant.

(vii) Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.

(viii) The company shall comply with all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing shall be implemented.

(ix) The company shall undertake all measures for improving socio-economic conditions of the surrounding area. CSR activities shall be undertaken by involving local villagers, administration and other stake holders. Also eco-developmental measures shall be undertaken for overall improvement of the environment.

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

(xi) The company shall earmark sufficient funds towards capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/ pollution control measures shall not be diverted for any other purpose.

(xii) A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zila Parisad/ Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.

(xiii) The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard

copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal office of CPCB and SPCB. A copy of Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.

(xiv) The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional offices of MoEF&CC by e-mail.

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

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

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

13. The above conditions will be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 read with subsequent amendments therein.

1/5/2018

(S. K. Srivastava)
Scientist E

Copy to: -

1. The Principal Chief Conservator of Forests (HoFF), Government of Andhra Pradesh, Aranya Bhavan, Sankurathri Residency, Agathavarappadu, Mahatma Gandhi Inner Ring Road, Peda kakani Mandal, **Guntur** - 522509 (Andhra Pradesh)
2. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (SEZ), I and II Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, **Chennai** - 34
3. The Member Secretary, Central Pollution Control Board, Parivesh Bhavan, East Arjun Nagar, **Delhi** - 32
4. The Member Secretary, Andhra Pradesh Pollution Control Board, Paryavaran Bhavan, A-III, Industrial Estate, Sanath Nagar, **Hyderabad** (Andhra Pradesh)
5. Monitoring Cell, Ministry of Environment, Forest and Climate Change, **New Delhi**
6. Guard File/Monitoring File/Record File

1/5/2018

(S. K. Srivastava)
Scientist E

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No. 33-26-14 D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamalavari Street, Kasturibaipet, Vijayawada – 520010.

Website :www.appcb.ap.nic.in

CONSENT ORDER FOR ESTABLISHMENT

Order No.APPCB/KNL/KNL/231/CFE/HO/2008 **Dt: 23.05.2018**

Sub: APPCB – CFE - **M/s. Sree Rayalaseema Alkalies and Allied Chemicals Limited, Sy.No.51/1,2A etc., Gondiparla (V), Kurnool (M), Kurnool District** – Consent for Establishment of the Board for **expansion** under Sec.25 of Water (P & C of P) Act, 1974 and Under Sec.21 of Air (P&C of P) Act, 1981 - Issued - Reg.

Ref:
1) CFE order dt. 10.04.2012.
2) CFO & HWA order dt: 26.02.2014.
3) E.C. dt. 01.05.2018 issued by MOEF&CC, GoI, New Delhi.
4) Industry's application received through APOCMMS on 29.04.2018.
5) R.O's inspection report dt. 11.05.2018.
6) CFE Committee meeting held on 17.05.2018.
7) Industry's Lr. dt. 17.05.2018.

1. In the reference 4th cited, an application was submitted to the Board seeking Consent for Establishment (CFE) for **expansion** to produce the following products with installed capacities as mentioned below, with an additional investment of Rs. 360 Crores.

Sl.No.	Products	Consented capacity as per CFO Orders dt: 26.02.2014 & 28.10.2015 (TPD)	Proposed capacity for expansion (TPD)	Total capacity after expansion (in TPD)
I.Chloro-Alkali Plant				
1.	Caustic Soda Lye (Or) Flakes Potassium Hydroxide Lye (Or) Flakes (100 % basis)	520	500	1020
2.	Potassium Carbonate	50	-	50
3.	Liquid Chlorine	300	300	600
4.	Hydrochloric Acid (100% Cl_2 basis)	186	127	313
5.	Barium Sulphate	5	5	10
6.	Sodium Hypochlorite (100% Cl_2 basis)	10	5	15
7.	Calcium Hypochlorite (100% Cl_2 basis)	10	-	10
8.	Calcium Sulphate	02	-	02
9.	Sodium sulphate	-	10	10
II. Chloromethanes				
1	Methyl Chloride	0.45	10	10.45
2	Methylene Chloride	61	61	122
3	Chloroform	56	46.45	102.45
By Products.				
4	Carbon tetrachloride	7.6	7.6	15.2
5	Hydrochloric Acid (100%)	23.5	23.5	47
III. Chlorodifluoromethane				
1	Chlorodifluoromethane (R22)	-	10	10
2.	Hydrochloric acid (100%)	-	8.27	8.27
IV. Captive Power Plant				
1	Captive Power Plant (Coal based)	76	-	76
2	Power generation (Furnace Oil) (Standby)	31	-	31
Carbon Tetrachloride (CCL_4) generated will be sold as a feed stack to Authorized users/excess will be incinerated.				

2. As per the application, the above expansion activity is to be located within the existing plant premises located at Sy.No.51/1,2A, 2B, 2C1, 2C2, 2C3, 56/1, 58/1, 59/1, 60, 62/3/2D2, 2C1/A2, 2C1/A3, 2C2/C, 2G/1, 2E, 2F, A1A,1B, 62A, 62B, 63, 64, 70/C2 & 72/P, Gondiparla (V), Kurnool (M), Kurnool District in an area of 152.4 Ha.

3. The above site was inspected by the Environmental Engineer & Asst. Environmental Engineer, Regional office, A.P Pollution Control Board, Kurnool on 09.05.2018 and found that the site is surrounded by

North	**:**	M/s SRHHL
South	**:**	Road connecting NH - 44 to Gondiparla village.
East	**:**	Open lands belonging to the industry followed by M/s. Sri Rayalaseema Paper Mill Ltd.,
West	**:**	Open lands.

4. The Board, after careful scrutiny of the application, verification report of Regional Officer and recommendation of the CFE Committee hereby issues **CONSENT FOR ESTABLISHMENT FOR EXPANSION** to the project under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under. **This order is issued to manufacture the products as mentioned at para (1) only.**

5. This Consent Order now issued is subject to the conditions mentioned in Annexure.

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

7. This order is valid for period of 7 years from the date of issue.

Encl: Annexure.

MEMBER SECRETARY

To

M/s Sree Rayalaseema Alkalies & Allied Chemicals Ltd, (expn)
Gondiparla (V),
Kurnool District.
sraaclab@rediffmail.com

Copy to: 1. The JCEE, Z.O., Kurnool for information and necessary action.
2. The E.E., R.O, Kurnool for information and necessary action.

ANNEXURE

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

2. The applicant shall provide separate energy meters for Effluent Treatment Plant (ETP) and Air pollution Control equipments to record energy consumed. An alternative electric power source sufficient to operate all pollution control systems shall be provided.

3. The industry shall construct separate storm water drains and provide rain water harvesting structures. No effluents shall be discharged in to the storm water drains.

Water:

4. The source of water is Infiltration well from Thungabhadra River and the maximum permitted water consumption is as following:

Sl. No.	Purpose	Existing consumption as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional consumption for expansion	Total capacity after expansion (KLD)
Chlor-Alkali Plant:				
a)	Process	730	700	1430
b)	Floor washings	40	10	50
c)	Pump Gland Cooling	60	40	100
d)	Cooling make up	1050	488	1538
e)	Domestic	100	10	110
	Total	**1980 KLD**	**1248 KLD**	**3228 KLD**

Fresh water – 3228 KLD; Recycled water - 388 KLD; Total water - 3616 KLD

Chloromethanes & Chlorodifluro Methane:

Sl. No.	Purpose	Existing consumption as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional consumption for expansion	Total capacity after expansion (KLD)
a)	Process – CMS	20	20	40
b)	Process – CDFM	--	420	420
c)	Scrubbers	20	20	40
d)	Cooling make up	800	800	1600
e)	Domestic	10	5	15
	Total	**850 KLD**	**1265 KLD**	**2115 KLD**

Fresh water – 2115 KLD, Recycled water -129 KLD, Total water- 2244 KLD

Co-Generation Power Plant:

Sl. No.	Purpose	Existing consumption as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional consumption for expansion	Total capacity after expansion (KLD)
a)	Floor Washings	30	--	30
b)	DM Plant and Boiler Feed	1000	--	1000
c)	Cooling make up	7900	--	7900
d)	Domestic	60	--	60
	Total	**8990 KLD**	**--**	**8990 KLD**

Fresh water – 8990 KLD, Recycled water –Nil, Total water: 8990 KLD
Water requirement for Castor oil unit –317 KLD.

Total quantity of water required is 15167 KLD. (Fresh –14650 KLD + Recycled-517 KLD)

5. The maximum waste water generation shall not exceed the following for the proposed expansion:

Sl. No.	Purpose	Existing qty. as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional qty. for expansion (KLD)	Total qty. after expansion (KLD)
Chlor-Alkali Plant:				
a)	Process, washings & Gland Seal	97.5	94	191.5
b)	Cooling towers blow down	82.5	63	145.5
c)	Pump Gland Cooling	--		
d)	Domestic	85	8	93
	Total	**265 KLD**	**165 KLD**	**430 KLD**

Chloromethanes & Chlordifluro Methane

Sl. No.	Purpose	Existing qty. as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional qty. for expansion (KLD)	Total qty. after expansion (KLD)
a)	Cooling Towers blow down	57	57	114
b)	Scrubbers		20	20
c)	Domestic	10	5	15
	Total	**67 KLD**	**82 KLD**	**149 KLD**

Co-Generation Power Plant

Sl. No.	Purpose	Existing qty. as per CFO Order dt: 26.02.2014 (KLD)	Proposed additional qty. for expansion (KLD)	Total qty. after expansion (KLD)
a)	Floor washings	30	--	30
b)	Cooling Towers blow down / Chelating tower rejects/land seal	600	--	600
c)	Boiler blow down/regeneration water	405		405
	Total	**1035 KLD**	**Nil**	**1035 KLD**

Treatment & disposal:

After Expansion:

Effluent source	Treatment provided	Mode of final disposal
Chloro Alkali Division:	The industry shall construct the ETP of capacity 300 KLD consisting of treatment units equalization tank, acid tank, acid tank, alkali tank, pre settling tank, flocculant storage tank, Flocculant mixer, secondary clarifier, clarified treatment effluent storage tank, and **new RO system of capacity 300 KLD.**	After treatment in ETP, the treated waste water shall be further treated in the UF-RO plant. After treatment in the RO system, the permeate shall be recycled into the process and RO Rejects shall be utilized for brine makeup.
Chloromethanes & Chlordifluro Methane:	Waste water shall be collected in existing 2 No's of acid proof brick lined tanks of capacity 35 KL and 45 KL. The effluents from the chloro methanes plant shall be pumped to the ETP of chloro Alkali division for further treatment and disposal.	After collection, the effluents from Chloro methanes plant shall be pumped to the ETP of Chloro alkali plant for further treatment and disposal.

Domestic	**The industry shall treat the domestic waste water in 400 KLD capacity ETP of Oils & Fats division temporarily, as the waste water generated from the Oils & Fats division is less than 200 KLD. If the waste water exceeds 200 KLD, the industry shall install and commission separate STP.**	**After treatment, the treated waste water shall be used for on land for gardening within the premises.**

For Power plant:

Source of effluent	Treatment	Mode of final disposal
DM Plant regeneration/RO Rejects	Acid dosing tank, Caustic dosing tank, Neutralization tank & Treated effluent tank.	After pre-treatment, about 330 KLD is reused for brine make up for chloro-alkali plant and 75 KLD is used for green belt development.
Floor washing, boiler blow down, cooling tower bleed off	Acid dosing tank – 200lts, Caustic dosing tank – 200lts, Neutralization tank-10x10x1mt & Treated effluent tank -10x10x1mt	After treatment, the treated waste water is being used for On land for gardening and ash quenching
Domestic waste water	**The industry shall treat the domestic waste water in 400 KLD capacity ETP of Oils & Fats division temporarily, as the waste water generated from the Oils & Fats division is less than 200 KLD. If the waste water exceeds 200 KLD, the industry shall install and commission separate STP.**	**After treatment, the treated waste water shall be used for on land for gardening within the premises.**

6. The Effluent Treatment Plant (ETP) shall be operated regularly. All the units of the ETP shall be impervious to prevent ground water pollution.

7. The effluents shall be treated to the on land for irrigation standards, as stipulated under Schedule-VI of Environment (Protection) Rules, 1986, notified by Ministry of Environment and Forests, Government of India vide G.S.R.422 (E), dt.19.05.1993 and its amendments thereof.

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

9. Floor washing shall be admitted into the effluent collection system only and shall not be allowed to find their way in storm drains or open areas. All pipe valves, sewers, drains shall be leak proof.

10. The industry shall install and connect online effluent quality monitoring system at the outlet of ETP as per CPCB directions.

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

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

Air:

12. The proponent shall comply with the following for controlling air pollution:

Existing:

Stack No	Source of Pollution	Control equipment provided	Stack height in (m) – above GL
Chloro alkali unit:			
1	Attached to Oil / H_2 fired thermax boiler – 4 TPH and Oil fired boiler of capacity – 3 TPH	Dust collector	20 m
2	Attached to 4 x 3 TPH Waste Heat Recovery Boiler attached to D.G – 4 x 6.2 MW	Bag filters	3 x 36 each
3	Attached to Husk fired boiler – 12 TPH	Bag filters	---
4	Attached to Oil fired AIEC boiler – 3 TPH	Dust collector (suitably converted for incineration of glycerin pitch)	20
5.	Attached to Coal fired boiler of capacity – 42 TPH	ESP	56
6.	Attached to Coal fired boiler – 100 TPH	ESP	67
7.	Attached to Salt furnace – 15 Lakh K.Cal/hr x 2 Nos.	---	30 m each
8.	Attached to Thermo pack unit – 20 Lakh K.Cal./hr.	Dust collector followed by bag filter	30 m
9.	D.Gset – 500 KVA – 2 Nos	Acoustic enclosures	5 m
10.	Tail vents (Chlorine & HCl)	The sniff Cl_2 from different Cl_2 handling sections is collected under suction and sent to CL_2 neutralisation section. The Cl_2 gas is scrubbed in dilute Sodium Hydroxide solution in two absorption towers to make sodium Hypo chlorite. A closed circuit scrubbing system installed to take care of any accidental leakage from chlorine storage and filling area. Cl_2 sensors are to be provided at Cl_2 handling section. Water scrubber is installed to scrub the tail gas vents of HCl Plant.	
Chloro methane plant:			
1.	Stack Attached to LPG/Hydrogen gas fired incinerator of capacity – 343 Kgs/hr	Scrubber	12 m with 0.6 m dia
Power plant:			
1.	Stack Attached to coal fired boiler of capacity – 100 TPH	Dust collector followed by ESP	80.5 m with 2.2 m dia

Proposed:

Sl.No	Details of Stack	Stack 1	Stack 2	Stack 3	Stack 4
a)	Attached to	DG Set	DG Set	DG Set	DG Set
b)	Capacity	500 KVA	160 KVA	285 KVA	400 KVA
c)	Name of the Fuel	HSD	HSD	HSD	HSD
d)	Stack height above ground (m.)	4.4 m	2.5 m	3.4 m	4.0 m
e)	Air Pollution Control Equipment	Silencer with acoustic enclosures	Silencer with acoustic enclosures	Silencer with acoustic enclosures	Silencer with acoustic enclosures

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

    i) Chilled brine circulation shall be carried out to effectively reduce the solvent losses into the atmosphere.
    ii) Transfer of solvents shall be done by using pumps instead of manual handling.
    iii) Closed centrifuges shall be used to reduce solvent losses.
    iv) The reactor vents shall be connected with primary & secondary condensers to catch the solvent vapours.
    v) All the solvent storage tanks shall be connected with vent condensers to prevent solvent vapours.

14. Use of halogenated solvents shall be avoided and shall be phase out from process.

15. The industry shall properly maintain online continuous stack emission monitoring system (CSEMS) and CAAQM stations along with web camera facilities as per the directions of CPCB. The industry shall ensure that they should be connected to APPCB / CPCB websites as per CPCB directions.

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

17. A sampling port with removable dummy of not less than 15 cm diameter shall be provided in the stack at a distance of 8 times the diameter of the stack from the nearest constraint such as bends etc. A platform with suitable ladder shall be provided below 1 meter of sampling port to accommodate three persons with instruments. A 15 AMP 250 V plug point shall be provided on the platform.

Solid Waste:

18. The proponent shall comply with the following for the proposed expansion:

Sl. No	Solid Waste generated from	Existing Quantity	Proposed Quantity	Total after expansion	Disposal Option
Chloro – Alkali Plant					
1	Sludge from Pretreatment of brine on dry basis	16 TPD	16 TPD	32 TPD	To secured landfill within Plant premises
2.	Barium Sulphate	5 TPD	5 TPD	10 TPD	Sold as By- Product
3.	Sodium Sulphate	---	10 TPD	10 TPD	Sold as By- Product
Chloromethanes Plant (R22)					
1..	Calcium Chloride	0.02 TPD	0.02 TPD	0.04 TPD	To secured Landfill within premises.
2.	Silica gel	0.018 TPD	0.018 TPD	0.036 TPD	
3.	Bottom residue	0.5 TPD	---	0.5 TPD	To be incinerated on sight incinerator
3.	Spent Sulfuric acid (75-80%)	---	11.9 TPD	11.9 TPD	To be sold as By – product
	Chlorodifluoromethane (R22)				
1.	Calcium Fluoride	--	1.2 TPD	1.2 TPD	To secured Landfill within premises.
2.	Spent Sulfuric Acid (75%)	---	17.3 TPD	17.3 TPD	To be sold as By – product
3.	Antominy Pentoxide	---	0.2 TPD	0.2 TPD	To be recovered and Reused.
	Utilities				
1.	Ash from Coal fired boilers	570 TPD	---	570 TPD	To cement and brick manufactures
2.	Ash from Husk fired boiler	16.5 TPD	---	16.5 TPD	To cement and brick manufactures
3.	Sludge from Furnace Oil of DG sets	0.750 TPD	0.15 TPD	0.90 TPD	To Authorized Recyclers

4.	Sludge from Effluent Treatment Plant	0.140 TPD	0.140 TPD	0.28 TPD	To secured Landfill within premises.
5.	Waste Oils	0.15 TPD	0.15 TPD	0.30 TPD	To be reused as secondary fuel
6.	Used Batteries	20 TPD	14 TPD	35 TPD	To Authorized Recyclers.

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

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

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

    a) Hazardous waste and other wastes (Management and Transboundary Movement) Rules, 2016.
    b) Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
    c) Fly Ash Notification, 2016.
    d) Batteries (Management & Handling) Rules, 2010.
    e) E-Waste (Management) Rules, 2016.
    f) Construction and Demolition waste Management Rules, 2016.
    g) Solid Waste Management Rules, 2016.

Other Conditions:

22. The green belt of at least 5 – 10 m width shall be developed in more than 33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department as stipulated in EC order dt. 01.05.2018.

23. Existing Green belt shall not be disturbed in the proposed expansion activity. The total area of the green belt shall not be less than 33%.

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

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

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

MEMBER SECRETARY

To
M/s Sree Rayalaseema Alkalies & Allied Chemicals Ltd, (expn)
Gondiparla (V),
Kurnool District.
sraaclab@rediffmail.com

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No.33-26-14D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamavari Street, Kasturibaipet, Vijayawada – 520 010
Phone. No.0866-2436200, Website: www.pcb.ap.gov.in

RED CATEGORY
Renewal of Consent & Hazardous Waste Authorization

Consent Order No:APPCB/KNL/KNL/16322/CFO&HWA/HO/1987
01/04/2021

CONSENT is hereby renewed for Operation under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21 of Air (Prevention & Control of Pollution) Act 1981 and amendments thereof and Authorization under Rule 6 of the Hazardous & Other Wastes (Management and Transboundary, Movement) Rules, 2016 and the rules and orders made there under (hereinafter referred to as 'the Acts', `the Rules') to:

M/s. TGV SRAAC Limited
(Formerly M/s. Sree Rayalaseema Alkalies and Allied Chemicals Limited)
Gondiparla (V), Kurnool (M), Kurnool District.
E mail: sraaclab@rediffmail.com, sraaclab@tgvmail.net

(Hereinafter referred to as 'the Applicant') authorizing to operate the industrial plant to discharge the effluents from the outlets and the quantity of emissions per hour from the chimneys as detailed below:

I. Out lets for discharge of effluents:

Sl. No.	Purpose	Total waste water generation (KLD)	Disposal option
Chlor-Alkali Plant:			
a.	Process & washings	97.5	After treatment in ETP / STP, the treated effluents shall be used onland for irrigation, within the premises (BOD - 30 mg/l).
b.	Cooling Tower blow down/ chelating tower rejects/gland seal	82.5	
c.	Domestic	85	
Castor oil & Fatty Acid Plant:			
a.	Process & washings	50	After treatment in ETP the treated effluents shall be used onland for irrigation, within the premises (BOD - 100 mg/l)
b.	Cooling Tower blow down / chelating tower rejects & boiler blow down	120	
Co-Gen plant:			
a.	Process & washings	220	After treatment in ETP the treated effluents shall be used onland for irrigation, within the premises
b.	Cooling Tower blow down/gland seal	150	

c.	Boiler blow down/re-generation water	50	(BOD - 100 mg/l) / processed through new ERP and recycle into process.
d.	DM plant for generation/RO Plant	330	Recycle back into the process for brine make up.

II. Emissions from chimneys:

Chimney No.	Description of Chimney
1.	Attached to Oil / H_2 fired Thermax boiler – 4 TPH
2.	Attached to Oil fired boiler of capacity – 3 TPD
3.	Attached to 4 x 3 TPH Waste Heat Recovery Boiler attached to D.G. set – 4 x 6.2 MW
4.	Attached to Husk fired boiler – 12 TPH
5.	Attached to Oil fired AIEC boiler – 3 TPH
6.	Attached to Coal fired HLL boiler - 42 TPH
7.	Attached to Coal fired boiler – 100 TPH
8.	Attached to Salt furnace – 15 Lakh K.Cal/hr x 2 Nos.
9.	Attached to Thermo pack unit – 20 Lakh K.Cal./hr.
10.	Attached to D.G. Sets 500 KVA – 2 Nos.
11.	Tail vents (Chlorine & HCl)

III. HAZARDOUS WASTE AUTHORISATION (FORM – II) [See Rule 6 (2)]

M/s. TGV SRAAC Limited (Formerly M/s. Sree Rayalaseema Alkalies and Allied Chemicals Limited) Gondiparla (V), Kurnool (M), Kurnool District is hereby granted an authorization to operate a facility for collection, reception, storage, treatment, transport and disposal of hazardous wastes namely:

- **Hazardous waste with disposal option:**

Sl. No	Name of the Hazardous waste	Stream	Quantity	Disposal Option
1	Process (brine sludge)	16.3 of Schedule-1	16 TPD	Shall send to onsite secured landfill complying with CPCB guidelines (as landfillable waste)
2.	ETP (Sludge)	35.3 of Schedule -I	68 TPA	Shall send to onsite secured landfill complying with CPCB guidelines (as landfillable waste)
3.	Glycerin Pitch (generated in Oils & Fat division)	36.1 of Schedule -I	10 TPD	Incineration in furnace followed by Boiler at temperature above 1050^0C / Shall be routed through M/s. APEMC, so as to send to authorized cement plants for co-processing (as utilisable waste).

- **Hazardous waste with Recycling option:**

Sl.	Name of the	Stream	Quantity	Disposal Option

No	Hazardous waste			
1.	Process (Spent Catalyst)	36.2 of Schedule - I	1 TPD	Shall be routed through M/s. APEMC, so as to sent back to the manufacturers for reprocessing (as recylable waste) / TSDF, Nellore (as landfillable waste).
2.	Process (Spent earth)	36.2 of Schedule - I	2 TPD	Shall be routed through M/s. APEMC, so as to sent to Authorised recyclers / re-processors (as recyclable waste)
3.	Fatty acids pitch & residue	36.1 of Schedule - I	7.5 TPD	
4.	Furnace oil sludge	5.2 of Schedule -I	31.68 TPA	Incineration in furnace followed by boiler at a temperature above 1050^0C / Shall be routed through M/s. APEMC, so as to send to authorized cement plants for co-processing (as utilisable waste).
5.	Waste oil	5.1 of Schedule -I	3.0 TPA	Shall be routed through M/s. APEMC, so as to sent to Authorised recyclers / re-processors (as recyclable waste)
6.	Used Batteries	17 of Schedule -IV	150 No's/annum	Shall be routed through M/s. APEMC, so as to dispose to authorized dealers on buy back basis. (as recyclable waste)

This consent order is valid for manufacturing the following products with quantities mentioned below only**.**

Sl. No.	Name of the products and By-products	Quantity (in TPD)
	Chlor-Alkali Plant	
1.	Caustic soda lye	520
2.	Caustic soda flakes	
3.	Potassium Hydroxide / Caustic soda	
4.	Potassium Carbonate	50
5.	Liquid chlorine	300
6.	Hydrochloric Acid (100% C12 basis)	186
7.	Barium sulphate	05
8.	Sodium hypochloride (100% C12 basis)	10
9.	Calcium Hypochlorite (100% C12 basis)	10
10.	Calcium sulphate	02
11.	Hydrogen	25,253m^3/day

Oil and Fatty Acid Plant		
12.	Hydrogenated Castor oil	100
13.	a. 12-Hydroxy Stearic Acid (or) b. Methyl 12-hydroxy stearate (or) c. Ricinolic Acid	60
14.	Dehydrated Castor oil	10
15.	NN BIS Amide	05
16.	Bio-Diesel	10
17.	a. Glycerine (crude) b. Glycerine refind and chemically pure	75
18.	Distilled Fatty Acid	20
19.	Stearic Acid	35
20.	Sodium Sulphate	06
21.	Soap Noodles	100
22.	Toilet soaps & Bathing Bars	50
23.	Captive power plant (D.G sets)	24.8 MW (4X6.2 MW) (Stand by)
24.	Electricity (power generation-coal based)	45MW (21 MW + 24MW)

This order is subject to the provisions of `the Acts' and the Rules' and orders made thereunder and further subject to the terms and conditions incorporated in the schedule A, B & C enclosed to this order.

This order of consent is valid for a period ending with **28.02.2026.**

DR. B.MADHUSUDHANA RAO, JCEE(MSRB), O/o JOINT CHIEF ENVIRONMENTAL ENGINEER4-APPCB

To
M/s. TGV SRAAC Limited
(Formerly M/s. Sree Rayalaseema Alkalies and Allied Chemicals Limited)
Gondiparla (V), Kurnool (M), Kurnool District.

Copy to:

1. The Joint Chief Environmental Engineer, Zonal Office, Kurnool for information and necessary action.
2. The Environmental Engineer, Regional Office, Kurnool for information and necessary action.

SCHEDULE – A

1. Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.
2. The industry should carryout analysis of waste water discharges or emissions through chimneys for the parameters mentioned in this order on

quarterly basis and submit to the Board.

3. All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.
4. The industry should put up two sign boards (6x4 ft. each) at publicly visible places at the main gate indicating the products, effluent discharge standards, air emission standards, hazardous waste quantities and validity of CFO and exhibit the CFO order at a prominent place in the factory premises.
5. Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Acts by the Board.
6. The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board.
7. The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof.
8. The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.
9. The industry should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.
10. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.
11. The industry shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other competent authority as per the Rules in vogue.
12. The industry may explore the possibility of tapping the solar energy for their energy requirements.
13. The industry should educate the workers and nearby public of possible accidents and remedial measures.

SCHEDULE - B

1. The industry shall comply with the following non-compliances as mentioned in the Bank Guarantee, failing which the Bank guarantee of Rs. 4 Lakhs will be forfeited without any notice:
    i. The industry has manufactured the hydrogen gas - 1,55,662 m3/day against the consented capacity of 25,253 m3/day and the industry shall obtain amendment for increase in production of Hydrogen gas

ii. The industry has installed new salt furnaces 55 lakhs K.cal/hr x 2 Nos. (Fuel Hydrogen), Thermo pack unit – 20 Lakh K.Cal./hr & DG Set of Capacity – 500 KVA without obtaining CFE and CFO of the Board and the industry shall obtain CFE / CFO for new salt furnaces.

Water Pollution:

2. The project authority shall take steps to reduce water consumption to the extent possible and consumption should NOT exceed the quantities mentioned below:

S.No.	Purpose	Chloro Alkali Plant (in KLD)	Castor oil/ Fatty acid plant (in KLD)	Co-gen plant (in KLD)
1.	Process & washing	342.5	85	--
2.	DM water including DM Plant for regeneration water and filter back wash	387.5	--	360
3.	Floor washings	40	6	30
4.	Pump Gland Cooling	60	10	--
5.	Cooling (makeup) / humidification / water spraying)	1050	210	6050
6.	Domestic	100	6	60
	Total	**1980 KLD**	**317 KLD**	**6500 KLD**

3. The industry shall maintain separate water flow meters for assessing the quantity of water used for each of the purposes and maintain records.
4. The effluent discharged should not contain constituents in excess of the tolerance limits mentioned below:

Outlet	Parameter No.	Limiting Standards
Chloro Alkali Pant	Suspended solids	200 mg/l
	pH Value	5.5 to 9.0
	Oil and grease	10 mg/l
	Biochemical Oxygen demand 1 [3 days at 27 oC]	30 mg/l
	Arsenic (as As)	0.2 mg/l
	Chemical Oxygen Demand	250 mg/l
	Cyanide (as CN)	0.2 mg/l
	Fecal Coliform (FC) (Most Probable number per 100 milliliter, MPN/100 ml)	<1000 MPN/100 ml
Castor oil & Fatty Acid Plant & Co-Gen Plant	Suspended solids	200 mg/l
	pH	5.5 to 9.0
	Oil and grease	10 mg/l
	Biochemical Oxygen demand 1 [3 days at 27 oC]	100 mg/l
	Chemical Oxygen Demand	250 mg/l
	Fecal Coliform (FC) (Most Probable number per	<1000 MPN/100

	100 milliliter, MPN/100 ml)	ml

AIR POLLUTION:

4. The emissions should not contain constituents in excess of the prescribed limits mentioned in below

S.No	Parameters	Emission standards
1 to 6	SPM	115 mg/Nm^3
7	SPM	100 mg/Nm^3
8	SPM HCl mist Chlorine	115 mg/Nm^3 35 mg/Nm^3 15 mg/Nm^3
9 & 10	SPM	115 mg/Nm^3
11	Tail vents (Chlorine & HCl)	The sniff Cl_2 from different chlorine handling sections is collected under suction and sent to Cl_2 neutralization section. The Cl_2 gas is scrubbed in dilute sodium Hydroxide solution in two absorption towers to make sodium Hypo chlorite. A Closed circuit scrubbing system installed to take care of any accidental leakage from chlorine storage and filling area. Cl_2 sensors are also provided at Cl_2 handling section. Water scrubber is installed to scrub the tail gas vents of HCl plant.

5. The industry shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10 microns) - 100 micro gram/ m3; PM2.5 (Particulate Matter size less than 2.5 microns) - 60 micro gram/ m3; SO2 - 80 micro gram/ m3; NOx - 80 micro gram/m3, Ammonia – 400 micrograms /m3; Chlorine - 15 mg/Nm^3 ; HCl mist - 35 mg/Nm^3

outside the factory premises at the periphery of the industry. Standards for other parameters as mentioned in the National Ambient Air Quality Standards CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009.

6. The industry shall comply with the Noise Pollution (Control and Regulation) Rules, 2000 as follows:

   Noise Levels: Day time (6 AM to 10 PM) - 75 dB (A)
   Night time (10 PM to 6 AM) - 70 dB (A)

7. The industry should comply with emissions limits for DG sets up to 800 KW as per the Notification G.S.R.520(E), dated 01.07.2003 under the Environment (protection) Amendment Rules, 2003 and G.S.R.448 (E), dated 12.07.2004 under the Environment (Protection) Second Amendment Rules, 2004, In case of DG sets more than 800 KW should comply with emission limits as per the Notification G.S.R.489 (E),dated 09.07.2002 at serial no.96, under the Environment (Protection) Act,1986.
8. The industry shall ensure compliance of the National Ambient Air quality standards notified by MoE&F, GoI vide notification GSR 826(E), dt. 16.11.2009 at the boundary of the premises during construction and regular operational phase of the project.

GENERAL:

9. The industry shall not manufacture any product, other than those mentioned in this order.
10. The industry shall maintain continuous monitoring system to air pollution control equipment and connect the data to APPCB website.
11. The industry shall maintain closed sheds for storing of Coal, Husk and Husk ash.
12. The industry shall not discharge any effluents/ treated effluents outside drains.
13. The industry should not produce beyond the permitted capacity as mentioned in this order, without obtaining prior CFE & CFO of the Board.
14. The industry shall maintain and operate continuous temperature recorder with recording facility for recording temperature of Furnace provided for incineration of Glycerin pitch. Records shall be submitted to the RO, Kurnool.
15. The industry shall transfer the leachate of landfill to ETP for treatment and disposal through pumping facility.
16. The industry shall earmark an amount of Rs.1.29 crores per annum (I.e. 0.2% of project cost) for 10 years towards the Enterprise social responsibility (ESR) activities and spend the amount in local area.
17. The industry shall conduct HAZOP studies & HAZID studies and submit report to the Board regularly.
18. The industry shall maintain peizometeric wells around the secured landfill site. Proper records shall be maintained and shall submit the records to RO, Kurnool on half yearly basis.
19. The industry shall maintain closed sheds for storing of raw materails.
20. The industry is permitted to store treated waste water in guard ponds during rainy season/unavoidable circumstances only. The guard pond should have proper lining away from river Tungabhadra towards northern direction.
21. The industry shall maintain chlorine sensors near cylinder storage and filling sections.
22. The industry should regularly carry out ground water quality monitoring around the landfill and submit the reports every months to RO, Kurnool.
23. The waste water generation for tonne of caustic soda produced should not exceed more than 1 m3 (Excluding cooling tower blow down).
24. Thick green belt should be developed and maintained by the industry with tall growing trees in the vacant spaces of the unit as per the norms.
25. The industry shall maintain Rain Water Harvesting structure for the percolation of rain water from the roof of the fatty acid & caustic division administration buildings.
26. The applicant should submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof.
27. The industry shall maintain the following records and the same shall be made available to the inspecting officers of the Board.

a. Daily production details (ER-I Central Excise Returns)
b. Quantity of Effluents generated, evaporated in MEE, recycled / reused.
c. Log books for pollution control systems.
d. Characteristics of effluents and emissions.
e. Hazardous / non – Hazardous sold waste generated and diposed.
f. Inspection book.
g. Manifest copies of effluents / hazardous waste.

28. The industry shall submit the information regarding usage of Ozone Depleting Substance once in six months to the Board.

29. The following rules and regulations notified by the MoEF&CC, GoI shall be implemented.
a. Regulation of Persistent Organic Pollutants Rules, 2018.
b. Hazardous waste and other wastes (Management and Transboundary Movement) Rules, 2016.
c. Plastic Waste Management Rules, 2016.
d. Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
e. Fly Ash Notification, 2016.
f. Batteries (Management & Handling) Rules, 2010.
g. E-Waste (Management) Rules, 2016.
h. Construction and Demolition waste Management Rules, 2016.
i. Solid Waste Management Rules, 2016.
30. The industry shall update the information in OCEMS - Industry Information Data Entry Software for Compliance Reporting Protocol in PART-II (Sections F & G) Every Quarter on 1st January, 1st April, 1st July and 1st October through this software system.
31. The industry shall take all safety measures and provide firefighting equipment in the plant.
32. The industry shall comply with the conditions stipulated in EC and CFE orders.
33. Any other directions / circulars / notices issued by CPCB, MoEF&CC and APPCB shall be followed from time to time.

Special conditions:

34. The industry shall submit Risk analysis and risk assessment covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system.
35. The industry shall inventorize the storage quantities of hazardous chemicals (raw materials), products, as per the hazard nature of reactivity / toxicity / flammability / explosive stored/handling in the premises as defined in the Management of Storage, Import of Hazardous Chemicals (MSIHC) Rules, 1989 and the details shall be furnished to the Factories Department and to the Regional Office, APPCB on monthly basis duly certifying the same.
36. The industry shall identify major accident hazard chemicals & list out the hazardous chemicals endangered to human health & environment and the details shall be furnished to the Factories Department and to the Regional Office, APPCB time to time duly certifying the same by the industry.
37. The industry shall extend training to the working personnels while handling hazardous chemicals for prevention of accidents and necessary antidotes to ensure the safety, as per the MSIHC Rules, 1989.
38. The industry shall submit the copy of the safety audit report and On-Site / Off Site Emergency Plans as applicable after being certified by the Factories Department to the APPCB, Regional Office from time to time, if the storage quantity of hazardous chemicals is equal to or, in excess of the threshold quantities specified in schedule 2 & 3 of MSIHC Rules, 1989.
39. The industry shall carryout calibration of safety equipment and leak detection systems at regular intervals and shall certify the same with the Factories Department. That certified copy shall be submitted to the APPCB, Regional Office. The industry shall install fluorescent Wind Vane at the highest point in the industry premises.
40. The industry shall inventorize the hazardous wastes and its quantities stored within the industry premises as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (HOWM

Rules, 2016) and shall furnish the details to Regional Office, APPCB on monthly basis duly certifying the same by the industry.

SCHEDULE – C

[See rule 6(2)]

[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]

1. The authorised person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.
2. The authorisation shall be produced for inspection at the request of an officer authorised by the State Pollution Control Board.
3. The person authorised shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorisation.
4. Any unauthorised change in personnel, equipment or working conditions as mentioned in the application by the person authorised shall constitute a breach of his authorisation.
5. The person authorised shall implement Emergency Response Procedure (ERP) for which this authorisation is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;
6. The person authorised shall comply with the provisions outlined in the Central Pollution Control Board guidelines on “Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty”.
7. It is the duty of the authorised person to take prior permission of the State Pollution Control Board to close down the facility.
8. An application for the renewal of an authorisation shall be made as laid down under these Rules.
9. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.

Specific Conditions:

10. The industry shall enter an agreement with the Cement industries for disposal of incinerable waste or shall dispose to Alternative Fuel Raw material facility (AFRF) OR to TSDF for co-incineration.
11. The industry shall comply with the provisions of HWM Rules, 2016 in terms of interstate transport of Hazardous Waste and manifest document prescribed Under Rule 18 and 19 of the HWM Rules, 2016.
12. The industry shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management &Transboundary Movement) Rules, 2016.
13. The industry shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.
14. The industry shall transport the hazardous waste to cement industries only through vehicle fitted with GPS tracking system.
15. The industry shall maintain 7 copy manifest system for transportation of waste generated and a copy shall be submitted to concerned Regional Office of APPCB. The driver who transports Hazardous Waste should be well acquainted about the procedure to be followed in case of an emergency during transit. The transporter should carry a Transport Emergency (TREM) Card.

16. The industry shall maintain proper records for Hazardous and Other Wastes stated in Authorisation in Form-3 i.e., quantity of Incinerable waste, land disposal waste, recyclable waste etc., and file annual returns in Form-4 as per Rule 20 (2) of the Hazardous and Other Wastes (Management &Transboundary Movement) Rules, 2016.
17. Annual return shall be filed by June 30th for the period ensuring 31st March of the year.

The project authority shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent for Establishment (CFE) and Consent for Operation (CFO) through website i.e., https://pcb.ap.gov.in by 1st of January and 1st July of every year. The first half yearly compliance reports shall be furnished by the project authority and second half yearly compliance reports shall be the audited through MoEF&CC recognized and National Accreditation Board for Laboratory Testing (NABL) accredited third party.

DR. B.MADHUSUDHANA RAO, JCEE(MSRB), O/o JOINT CHIEF ENVIRONMENTAL ENGINEER4-APPCB

To
M/s. TGV SRAAC Limited
(Formerly M/s. Sree Rayalaseema Alkalies and Allied Chemicals Limited)
Gondiparla (V), Kurnool (M), Kurnool District.
E mail: sraaclab@rediffmail.com, sraaclab@tgvmail.net

ANDHRA PRADESH POLLUTION CONTROL BOARD
Paryavaran Bhavan, APIIC Colony Road,
Gurunanak Colony, Autonagar, Vijayawada- 520007
Phone. No.0866-2463200, Website :
https://pcb.ap.gov.in/

RED CATEGORY

RENEWAL OF CONSENT TO OPERATE & AUTHORISATION ORDER

Consent Order No:1274022/APPCB/KNL/CTO/HO/2023- 09/06/2023

CONSENT is hereby granted for Operation under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21/22 of Air (Prevention & Control of Pollution) Act 1981 and amendments thereof and Authorisation under Rule 6 of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules 2016 and the rules and orders made there under (hereinafter referred to as 'the Acts', `the Rules') to:

M/s. TGV SRAAC Limited,
Chlor-Alkali Plant, (Phase-II),
(Formerly known as M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited), Gondiparla (V),
Kurnool (M), Kurnool District – 517541.
Email: sraaclab@rediffmail.com ; sraaclab@tgvmail.net

(Hereinafter referred to as 'the Applicant') authorizing to operate the industrial plant to discharge the effluents from the outlets and the quantity of emissions per hour from the chimneys as detailed below:

i. **Out lets for discharge of effluents:**

Outlet No.	Outlet Description	Max Daily Discharge (for expansion)	Point of Disposal
1	Process, washings	41 KLD	To be treated through new ERP and permeate quantity shall be recycled back into the process and rejects shall be used for Brine makeup purpose in chloroalkali division.
2	Cooling towers blow down / pump gland cooling	28 KLD	
3	Pump Gland Cooling		
4	Domestic wastewater	3 KLD	After treatment onland for gardening within the premises.
	TOTAL	**72 KLD**	

ii) Emissions from chimneys:

Chimney No.	Description of Chimney
1.	Stack Attached to Salt furnace Capacity - 1 Nos X 55 Lakh K.Cal/hr
2.	Stack Attached to Salt furnace Capacity - 1 Nos X 55 Lakh K.Cal/hr
3.	Stack Attached to Thermo pack unit Capacity - 1 x 35 Lakh K.Cal./hr

4.	Stack Attached to DG Set of Capacity of 500 KVA

iii) HAZARDOUS WASTE AUTHORISATION (FORM – II) [See Rule 6 (2)]:

M/s. TGV SRAAC Limited (Formerly known as M/s Sree Rayalaseema Alkalies and Allied Chemicals Limited), Gondiparla (V), Kurnool (M), Kurnool District hereby granted an authorization to operate a facility for collection, reception, storage, treatment, transport and disposal of Hazardous Wastes namely:

- **HAZARDOUS WASTES WITH DISPOSAL OPTION:**

S. No.	Name of the Haz.waste	Stream	Quantity of Haz waste (for Expansion)	Disposal Option
1.	Sludge from Pretreatment of brine on dry basis	16.2 of Schedule-I	7 TPD	Shall be disposed in the secured landfill within in the Plant premises

This consent is valid for manufacture of quantities of each product as mentioned below only.

S. No.	Name of the products	Quantity for expansion
Chloro-Alkali Plant:		
1.	Caustic Soda Lye(or) Flakes	220 TPD
	Potassium Hydroxide Lye (or) Flakes (100% basis)	
2.	Liquid Chlorine	83 TPD
3.	Hydrochloric Acid (100% basis)	92 TPD
4.	Hydrogen gas	198747 m3/day

This order is subject to the provisions of `the Acts' and the Rules' and orders made there under and further subject to the terms and conditions incorporated in the schedule A, B & C enclosed to this order.

This combined order of consent & Hazardous Waste Authorisation shall be valid for a period ending with the **28.02.2026.**

B SREEDHAR IAS, MS(BS), O/o MEMBER SECRETARY-APPCB

To
M/s. TGV SRAAC Limited,
Chlor-Alkali Plant, (Phase-II),
(Formerly known as M/s. SreeRayalaseema Alkalies
and Allied Chemicals Limited), Gondiparla (V),
Kurnool (M), Kurnool District – 517541.
Email: sraaclab@rediffmail.com ; sraaclab@tgvmail.net
Copy to:

1. The JCEE, Zonal Office, Kurnool for information.
2. The EE, Regional Office, Kurnool for information and necessary action.

S C H E D U L E – A

1. Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.
2. The industry should carryout analysis of waste water discharges or emissions through chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.
3. All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.
4. The industry should put up two sign boards (6x4 ft. each) at publicly visible places at the main gate indicating the products, effluent discharge standards, air emission standards, hazardous waste quantities and validity of CFO and exhibit the CFO order at a prominent place in the factory premises.
5. Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Acts by the Board.
6. The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board.
7. The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof.
8. The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.
9. The industry should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.
10. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.
11. The industry shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other

competent authority as per the Rules in vogue.

12. The industry may explore the possibility of tapping the solar energy for their energy requirements.
13. The industry should educate the workers and nearby public of possible accidents and remedial measures.

SCHEDULE - B

WATER POLLUTION:

1. The source of water is infiltration wells from Thungabhadra river. The following is the permitted water consumption:

Sl. No	Purpose	TOTAL Quantity after expansion (KLD)
1.	Process	310
2.	Floor washings	5
3.	Pump Gland Cooling	15
4.	Cooling make up	213
5.	Domestic	5
	Total	**548**

2. The industry shall maintain properly the separate flow meters for assessing the quantity of water used for the above purposes and shall maintain the records.
3. The effluent discharged shall comply with the tolerance limits mentioned below:

Outlet	Parameter No.	Limiting Standards
1	pH	5.50 – 9.00
	Total Suspended Solids (TSS at 103 – 1050C)	<100.00 mg/l
	Oil and Grease	10.00 mg/l
	Biochemical Oxygen Demand (BOD3 at 270C)	30.00 mg/l

4. The industry shall provide flow meters with totalizers at the inlet and outlet of Effluent Recycling Plant and at treated water utilization sources.
5. The industry shall not discharge any waste water outside the premises and shall maintain Zero Liquid Discharge system.
6. The Container & Container liners shall be detoxified at the specified covered platform with dyke walls and the wash wastewater shall be routed to low TDS collection tank for treatment and disposal.

AIR POLLUTION:

7. The emissions shall not contain constituents in excess of the prescribed limits mentioned below:

Chimney No.	Parameter	Emission Standards
1 to 3	Particulate Matter	115 mg/Nm^3

8. The industry shall regularly operate the air pollution control equipments provided to the existing boilers of capacity 42 TPH, 100 TPH & 110 TPH and meet the standards prescribed in the CFO& HWA orders.
9. The industry shall comply with ambient air quality standards of of PM10 - 100 micro grams/ m3; PM2.5 - 60 micro grams/ m3; SO2 - 80 micro grams/ m3; NOx – 80 micro grams/m3, (day average standards).

The industry shall comply with National Ambient Air Quality Standards stipulated

in CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009 and also the
Noise Levels: Day time (6 AM to 10 PM) - 75 dB (A)
Night time (10 PM to 6 AM) - 70 dB (A)

10. The industry shall comply with emission limits for DG sets of capacity upto 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 and G.S.R.448(E), dated 12.07.2004 under the Environment (Protection) Act Rules. In case of DG sets of capacity more than 800 KW shall comply with emission limits as per the Notification G.S.R.489 (E), dated 09.07.2002 at serial no.96, under the Environment (Protection) Act, 1986.

GENERAL:

11. The industry shall not manufacture any product, other than those mentioned in this order, without CFE & CFO of the Board. The industry shall not increase the capacity beyond the permitted capacity mentioned in this order, without obtaining CFE & CFO of the Board.
12. The industry shall install and operate multi stage scrubbers for scrubbing of process emissions at all emission sources. The details of chemicals consumption used in the scrubber should be recorded and kept accessible for the inspecting officials of the Board.
13. The industry shall regularly operate scrubbers for scrubbing of Chlorine emissions generated from cell house, dechlorination unit, chorine liquefaction & chlorine storage and filling areas of Chloro alkali division.
14. The industry shall maintain the following records and the same shall be made available to the inspecting officers of the Board:

a. Daily production details (ER-1 Central Excise Returns).
b. Characteristics of effluents and emissions.
c. Quantity of Effluents generated, evaporated in MEE, recycled/reused.
d. Log Books for pollution control systems.
e. Hazardous/non hazardous solid waste generated and disposed.
f. Manifest copies of effluents / hazardous waste.
g. Inspection book.

18. The industry shall submit compliance report on the conditions mentioned in the consent order every 6 months to the Regional Office/Zonal Office.
19. The industry shall comply with the Task Force directions issued by the Board vide order dt. 18.12.2014 & 24.02.2015.
20. The industry shall comply with the conditions stipulated in the CFO & HWA order dt. 26.02.2014 and shall submit the updated compliance report to RO and ZO, Kurnool, immediately.
21. The industry shall comply with the conditions stipulated in the CFE order dt. 23.05.2018.
22. The industry shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent for Establishments (CFE) and Consent for Operation (CFO) through website i.e., https://pcb.ap.gov.in by 1st of January and 1st July of every year. The first half yearly compliance reports shall be furnished by the industry and second half yearly compliance reports shall be the audited through NABL accredited third

party.

Special Conditions:

23. The industry shall possess valid NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) and submit a copy at concerned Regional Office, APPCB within a month.
24. The industry shall install Emergency visual indicators at main gate and other important points/places so that critical information is available within 2 minutes of declaring emergency.
25. The industry shall inventorize the storage quantities of hazardous chemicals (raw materials), products, as per the hazard nature of reactivity/ toxicity/flammability/ explosive materials stored/handling in the premises as defined in the MSIHC Rules, 1989 and the details shall be furnished to the Factories Department and to the Regional Office, APPCB on monthly basis duly certifying the same.
26. The industry shall identify major accident hazard chemicals & list out the hazardous chemicals endangered to human health & environment and the details shall be furnished to the Factories Department and to the Regional Office, APPCB time to time duly certifying the same by the industry. Further the industry shall extend training to the working personnel's while handling hazardous chemicals for prevention of accidents and necessary antidotes to ensure the safety, as per the MSIHC Rules, 1989.
27. The industry shall submit the copy of the safety audit report and On-Site/ Off Site Emergency Plans as applicable after being certified by the Factories Department to the APPCB, Regional Office from time to time, if the storage quantity of hazardous chemicals is equal to or, in excess of the threshold quantities specified in schedule 2 & 3 of MSIHC Rules, 1989.
28. The industry shall carryout calibration of safety equipments and leak detection systems at regular intervals and shall certify the same with the Factories Department. That certified copy shall be submitted to the APPCB, Regional Office. The industry shall install fluorescent Wind Vane at the highest point in the industry premises.
29. The industry shall inventorize the hazardous wastes and its quantities stored within the industry premises as per the Hazardous and Other Wastes(Management and Transboundary Movement) Rules, 2016 (HOWM Rules, 2016)and shall furnish the details to Regional Office, APPCB on monthly basis duly certifying the same by the industry.

SCHEDULE – C

[See rule 6(2)]

[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]

1. The authorized person shall comply with the provision of the Environment (Protection) Act, 1986, and the rules made there under.
2. The authorization shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.
3. The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.

4. Any authorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.
5. The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;
6. The person authorized comply with the provisions outline in the Central Pollution Control Board guidelines on “Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty”.
7. It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.
8. An application for the renewal of an authorization shall be made as laid down under these Rules.
9. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.

Specific Conditions:

10. The industry shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
11. The industry shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.
12. The industry shall maintain 7 copy manifest system for transportation of waste generated and a copy shall be submitted to concerned Regional Office of APPCB.
13. The industry shall maintain proper records for Hazardous Wastes stated in Authorisation in FORM-3 i.e., quantity of Incinerable waste, land disposal waste, recyclable waste etc., and file annual returns in Form- 4 as per Rule 20(2) of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.

B SREEDHAR IAS, MS(BS), O/o MEMBER SECRETARY-APPCB

To
M/s. TGV SRAAC Limited,
Chlor-Alkali Plant, (Phase-II),
(Formerly known as M/s Sree Rayalaseema Alkalies
and Allied Chemicals Limited), Gondiparla (V),
Kurnool (M), Kurnool District – 517541.

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No.33-26-14D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamalavari Street, Kasturibaipet, Vijayawada – 520 010
Phone. No.0866-2463200, Website : https://pcb.ap.gov.in/

RED CATEGORY
RENEWAL OF CONSENT & AUTHORISATION ORDER
Consent Order No : APPCB/KNL/KNL /16332/ CFO&HWA/HO/ 2021- 16/07/2021

CONSENT is hereby granted for Operation under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21/22 of Air (Prevention & Control of Pollution) Act 1981 and amendments thereof and Authorisation under Rule 6 of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules 2016 and the rules and orders made there under (hereinafter referred to as 'the Acts', `the Rules') to:

M/s. TGV SRAAC Limited (Expansion)
(Formerly known as M/s SreeRayalaseemaAlkalies and Allied Chemicals Limited),
Gondiparla (V), Kurnool (M), Kurnool District

(Hereinafter referred to as 'the Applicant') authorizing to operate the industrial plant to discharge the effluents from the outlets and the quantity of emissions per hour from the chimneys as detailed below:

i. **Out lets for discharge of effluents:**

Outlet No.	Outlet Description	Max Daily Discharge	Point of Disposal
1	Process, washings & Gland Seal	53 KLD	The industry shall treat the effluents in ETP, after treatment in the ETP (300 KLD) of Chloro Alkali Division, the treated effluents shall be further treated in the UF-RO plant and the RO permeate shall be recycled into the process and RO Rejects shall be utilized for brine makeup.
2	Cooling towers blow down	35 KLD	
3	Pump Gland Cooling		
4	Domestic wastewater	5 KLD	Septic tank followed by soak pit

ii) Emissions from chimneys: Nil

iii) HAZARDOUS WASTE AUTHORISATION (FORM – II) [See Rule 6 (2)]:

M/s. TGV SRAAC Limited (Formerly known as M/s SreeRayalaseemaAlkalies and Allied Chemicals Limited), Gondiparla (V), Kurnool (M), Kurnool District hereby granted an authorization to operate a facility for collection, reception, storage, treatment, transport and disposal of Hazardous Wastes namely:

- **HAZARDOUS WASTES WITH DISPOSAL OPTION:**

S. No.	Name of the Haz.waste	Quantity of Haz waste	Stream	Disposal Option
1.	Sludge from Pretreatment	9 TPD	16.2 of	Shall be disposed in the secured

	of brine on dry basis		Schedule-I	landfill within in the Plant premises

This consent is valid for manufacture of quantities of each product as mentioned below only:

S.No.	Name of the products	Quantity (TPD)
1. 1	Caustic Soda Lye(or) Flakes	280
	Potassium Hydroxide Lye(or) Flakes (100% basis)	
2.	Liquid Chlorine	217
3.	Hydrochloric Acid (100% basis)	35
4.	Sodium Hypochloride (100% C12 basis)	5
5.	Barium Sulphate	5
6.	Sodium Sulphate	10

This order is subject to the provisions of `the Acts' and the Rules' and orders made there under and further subject to the terms and conditions incorporated in the schedule A, B & C enclosed to this order.

This combined order of consent & Hazardous Waste Authorisation shall be valid for a period ending with the **31.05.2026**

DR. B.MADHUSUDHANA RAO, JCEE(MSRB), O/o JOINT CHIEF ENVIRONMENTAL ENGINEER4-APPCB

To
M/s. TGV SRAAC Limited (Expansion)
(Formerly known as M/s SreeRayalaseemaAlkalies and Allied Chemicals Limited), Gondiparla (V), Kurnool (M), Kurnool District.
E Mail: **sraaclab@rediffmail.com, sraaclab@tgvmail.net**

Copy to:

1. The JCEE, Zonal Office, Kurnool for information.
2. The Environmental Engineer, Regional Office, Kurnool for information and necessary action.

SCHEDULE – A

1. Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.
2. The industry should carryout analysis of waste water discharges or emissions through chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.
3. All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.
4. The industry should put up two sign boards (6x4 ft. each) at publicly visible places at the main gate indicating the products, effluent discharge standards, air emission standards, hazardous waste quantities and validity of CFO and exhibit the CFO order at a prominent place in the factory premises.
5. Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein

above and to make such variations as deemed fit for the purpose of the Acts by the Board.

6. The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board.
7. The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof.
8. The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.
9. The industry should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.
10. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.
11. The industry shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other competent authority as per the Rules in vogue.
12. The industry may explore the possibility of tapping the solar energy for their energy requirements.
13. The industry should educate the workers and nearby public of possible accidents and remedial measures.

SCHEDULE - B

1. The Board vide order dated 07.08.2018 issued CFO (Expansion) to the industry to manufacture Chlor-Alkali Chemicals i.e., Caustic Soda lye (or) Flakes or Potassium Hydroxide Lye (or) Flakes (100% basis) – 280 TPD, Barium Sulphate – 5 TPD and Sodium Sulphate – 10 TPD which was valid upto 31.05.2019 and the validity of CFO (Expansion) was extended through auto renewal on 15.04.2019 for a period upto 31.05.2021. The industry also obtained CFO (amendment) on 28.08.2018 for inclusion of Liquid Chlorine – 217 TPD, Hydrochloric Acid (100% basis) – 35 TPD, Sodium Hypochloride (100% C12 basis) – 5. Now the industry applied for renewal of CFO (Expansion), for a period upto 31.05.2026, for a total project cost of Rs. 109.6 Crs, with a total area of 376.58 acres. The issue of CFO was placed in the CFO committee meeting held on 05.05.2021 and the committee observed 6 non-compliance. The committee recommended to issue Renewal of CFO & HWA (Expansion) order to the industry for a period up-to 28.02.2026, so as to tally the date with the existing CFO order, with time bound conditions for the non-compliances, subject to submission of Bank Guarantee of Rs. 2 Lakhs towards compliance of time bound conditions for the following non-compliances: 1) As informed by the industry, the industry shall apply

CFE & CFO of the Board for the new salt furnaces 55 lakhs K.cal/hr x 2 Nos. (Fuel-Hydrogen), Thermo pack unit – 20 Lakh K.Cal./hr& DG Set of Capacity – 500 KVA, by 12.05.2021 and 2) As informed by the industry, the industry shall install fluorescent wind vane at the highest point in the industry premises so as to escape, chlorine leakages occurs (if any), in the opposite direction to avoid adverse impacts on the workers and surrounding residents, by 05.06.2021

2. The industry shall comply with the following conditions within time limits stipulated, failing which the bank guarantee of Rs. 2 lakhs submitted by the industry will be forfeited without any notice:
    i. The industry has installed new salt furnaces 55 lakhs K.cal/hr x 2 Nos. (Fuel-Hydrogen), Thermo pack unit – 20 Lakh K.Cal./hr& DG Set of Capacity – 500 KVA in addition to the air pollution sources permitted in the CFO order dated.26.02.2014 and the industry has not obtained CFE and CFO of the Board. The industry shall obtain CFE & CFO of the Board for the new salt furnaces 55 lakhs K.cal/hr x 2 Nos. (Fuel- Hydrogen), Thermo pack unit – 20 Lakh K.Cal./hr& DG Set of Capacity – 500 KVA, immediately.
    ii. The industry shall install fluorescent wind vane at the highest point in the industry premises so as to escape, in the opposite direction to avoid adverse impacts on the workers and surrounding residents, in case of any chlorine leakages occurs. As informed by the industry, the industry shall install fluorescent wind vane at the highest point in the industry premises so as to escape, chlorine leakages occurs (if any), in the opposite direction to avoid adverse impacts on the workers and surrounding residents, immediately.
3. On 12.04.2021, the Regional office, Kurnool verified the Real Time Data generated online continuous Effluent & Emission Monitoring Systems pertaining to M/s.TGV SRAAC Ltd., from website of appcb.glensserver.com to know the HCL & Chlorine emission values for the last one year i.e., from 01.01.2020 to 12.04.2021, As per the data captured from this website, it is noted that, from 01.01.2020 to 12.04.2021, with regard HCL emission, the data displayed only in 7 months and with regard to total chlorine emissions no values were recorded in Real time data and showing as NA for last one year four months. The industry has not justified the reasons for no display of values and also industry has not rectified lapses related to process emissions monitoring system. The industry shall maintain the process emissions monitoring system, ensure the data will always be displayed properly and submit the compliance report to RO, Kurnool
4. Not complied with the condition of "The industry shall not store the treated/untreated effluents in the unlined lagoons and to empty the unlined lagoons and dismantle the unlined lagoons within one month" and the industry storing the unlined lagoons belongs to their sister concern unit namely M/s SRHHL. The industry shall not store the treated/untreated effluents in the unlined lagoons. The updated compliance report on emptying and dismantle of unlined lagoons shall be submitted to RO and ZO Kurnool.
5. The industry has to take up the following mitigation measures (Where significant adverse effects are identified, description of the remedial measures to be taken to avoid, reduce those effects):
    i. The industry has to take up regular preventive maintenance to check the functioning of chlorine sensors and also install additional sensors to identify the fugitive emissions/ leakages of chlorine and HCL within the plant premises & outside the plant premises i.e., near the habitation and maintain the records for the same.

ii. The industry shall install leak proof pipe valves etc.,to avoid leakages and shall carryout regular preventive measures.
iii. The industry shall operate the 4 MLD Effluent Recycling plant continuously and effectively to cater all the effluents generated from Chloro alkali, Oil & fatty acid division & Power plant and shall not discharge any waste water to outside the factory premises as Tunghabadra river is at distance of 600mtrs.
iv. Chemical drums and other drums shall be stored in closed roof and on the concrete platform only. The Platform shall be provided with sufficient dyke wall and effluent collection system.
v. The industry shall give more emphasis on improving housekeeping all around the unit.
vi. The industry shall implement all the recommendations made in the Safety Audit report and other required measures to avoid accidents, Environmental Damages.
vii. The industry shall update the onsite and offsite emergency plans, risk analysis reports periodically and shall comply the MSIHC Rules 1989, carryout calibration of safety equipments and leak detection system at regular intervals and shall certify the same with Factories Department and submit the certified copies to the Board office, Zonal and Regional offices on regular basis.

The industry shall take up the above mitigation measures (Where significant adverse effects are identified, description of the remedial measures to be taken to avoid, reduce those effects) and submit the compliance report to RO and ZO, Kurnool

6. Not complied with the condition of "The Expert committee will study the issue of transferring waste stored in the pits to the newly constructed landfill. The industry shall comply with the recommendations of the committee" and no expert Committee was visited the industry to study the issue of transferring waste stored in the pits to the newly constructed landfill. As per the records industry has not submitted any compliance report with regard to the committee and its recommendations. The Expert committee will study the issue of transferring waste stored in the pits to the newly constructed landfill. The industry shall comply with the recommendations of the committee. The industry shall submit compliance report with regard to the committee and its recommendations to RO, Kurnool.
7. Not uploaded the six monthly compliance reports in APPCB Website. The industry shall upload the six monthly compliance reports in APPCB Website, immediately and thereafter once in six months.

WATER POLLUTION:

1. The source of water is infiltration wells from Thungabhadra river. The following is the permitted water consumption:

Sl. No	Purpose	Quantity (KLD)
1.	Process	390
2.	Floor washings	5
3.	Pump Gland Cooling	25
4.	Cooling make up	275
5.	Domestic	5
	Total	**700**

2. The industry shall maintain properly the separate flow meters for assessing the quantity of water used for the above purposes and shall maintain the records.
3. The industry shall provide flow meters with totalizers at the inlet and outlet of Effluent Recycling Plant and at treated water utilization sources.

4. The industry shall not discharge any waste water outside the premises and shall maintain Zero Liquid Discharge system.
5. The Container & Container liners shall be detoxified at the specified covered platform with dyke walls and the wash wastewater shall be routed to low TDS collection tank for treatment and disposal.

AIR POLLUTION:

6. The industry shall regularly operate the air pollution control equipments provided to the existing boilers of capacity 42 TPH, 100 TPH & 110 TPH and meet the standards prescribed in the CFO& HWA orders.
7. The industry shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10mm) - 100 mg/ m3; PM2.5 (Particulate Matter size less than 2.5 mm) - 60 mg/ m3; SO2 - 80 mg/ m3; NOx - 80 mg/m3, outside the factory premises at the periphery of the industry.

Standards for other parameters as mentioned in the National Ambient Air Quality Standards CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009.

Noise Levels: Day time (6 AM to 10 PM) - 75 dB (A)
Night time (10 PM to 6 AM) - 70 dB (A)

8. The industry shall comply with emission limits for DG sets of capacity upto 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 and G.S.R.448(E), dated 12.07.2004 under the Environment (Protection) Act Rules. In case of DG sets of capacity more than 800 KW shall comply with emission limits as per the Notification G.S.R.489 (E), dated 09.07.2002 at serial no.96, under the Environment (Protection) Act, 1986.

GENERAL:

9. The industry shall not manufacture any product, other than those mentioned in this order, without CFE & CFO of the Board. The industry shall not increase the capacity beyond the permitted capacity mentioned in this order, without obtaining CFE & CFO of the Board.
10. The industry shall install and operate multi stage scrubbers for scrubbing of process emissions at all emission sources. The details of chemicals consumption used in the scrubber should be recorded and kept accessible for the inspecting officials of the Board.
11. The industry shall regularly operate scrubbers for scrubbing of Chlorine emissions generated from cell house, de-chlorination unit, chorine liquefaction & chlorine storage and filling areas of chloro alkali division.
12. The industry shall maintain the following records and the same shall be made available to the inspecting officers of the Board:

a. Daily production details (ER-1 Central Excise Returns).
b. Characteristics of effluents and emissions.
c. Quantity of Effluents generated, evaporated in MEE, recycled/reused.
d. Log Books for pollution control systems.
e. Hazardous/non hazardous solid waste generated and disposed.
f. Manifest copies of effluents / hazardous waste.
g. Inspection book.

13. The industry shall submit compliance report on the conditions mentioned in the consent order every 6 months to the Regional Office/Zonal Office.
14. The industry shall comply with the Task Force directions issued by the Board vide order dt. 18.12.2014 & 24.02.2015:
15. The industry shall comply with all the conditions stipulated in the CFO & HWA

order dt. 26.02.2014 and shall submit the updated compliance report to RO and ZO Kurnool, immediately.

16. The industry shall comply with the conditions stipulated in the CFE order dt. 23.05.2018.

SCHEDULE – C

[See rule 6(2)]

[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]

1. The operator should follow the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 notified by the Ministry of Environment & Forests, Government of India.
2. The industry shall not store hazardous waste for more than 90 days as per the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016.
3. The industry shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.
4. The industry shall maintain 6 copy manifest system for transportation of waste generated and a copy shall be submitted to concerned Regional Office of APPCB. The driver who transports Hazardous Waste should be well acquainted about the procedure to be followed in case of an emergency during transit. The transporter should carry a Transport Emergency (TREM) Card.
5. The industry shall maintain proper records for Hazardous Wastes stated in Authorisation in FORM-3 and file annual returns in Form- 4 as per Rule 20(2) of the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016.

DR. B.MADHUSUDHANA RAO, JCEE(MSRB), O/o JOINT CHIEF ENVIRONMENTAL ENGINEER4-APPCB

To
M/s. TGV SRAAC Limited (Expansion)
(Formerly known as M/s SreeRayalaseemaAlkalies and Allied Chemicals Limited), Gondiparla (V), Kurnool (M), Kurnool District

Copy to:

1. The JCEE, Zonal Office, Kurnool for information.
2. The Environmental Engineer, Regional Office, Kurnool for information and necessary action.

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No.33-26-14D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamalavari Street, Kasturibaipet, Vijayawada – 520 010
Phone. No.0866-2436217, **Website : https://pcb.ap.gov.in**

RED CATEGORY
CONSENT & HW AUTHORISATION ORDER

Consent Order No : 1473568/APPCB/KNL/KNL/CFO&HWA/HO/2022- 16/11/2022

CONSENT is hereby granted for Operation under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21/22 of Air (Prevention & Control of Pollution) Act 1981 and amendments thereof and Authorisation under Rule 6 of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules 2016 and the rules and orders made there under (hereinafter referred to as 'the Acts', `the Rules') to:

M/s. TGV SRAAC Limited, (Change of Product Mix)
Sy. No.61, 62A, 62B, 63&64,
Gondiparla (V), Kurnool (M),
Kurnool District.
E-mail: sraaclab@rediffmail.com / sraaclab@tgvmail.net

(Hereinafter referred to as 'the Applicant') authorizing to operate the industrial plant to discharge the effluents from the outlets and the quantity of emissions per hour from the chimneys as detailed below:

i. **Out lets for discharge of effluents:**

Chloromethanes & Chlorodifluro Methane section:

Outlet No.	Outlet Description	Max Daily Discharge (KLD)	Point of Disposal
1.	Cooling tower blow down	114	The industry shall treat the effluents in the Effluent Recycling Plant (ERP) including with two RO plants. The permeate quantity shall be recycled in to the process and the rejects shall be used for brine make up purpose in Chloro Alkali division.
2.	Scrubber	40	
3.	Domestic	15	After treatment, treated waste water shall be used for on land for gardening within the premises.
	Total:	**169 KLD**	

31 MW Power Plant:

Outlet No.	Outlet Description	Max Daily Discharge (KLD)	Point of Disposal
4.	Boiler blow down & Cooling tower bleed off-180 KLD +	255 KLD	After treatment, shall be used Onland for irrigation duly meeting the Boards discharge standards.

	Washings DM plant & RO rejects – 75 KLD		

ii. **Emissions from chimneys:**

S.No.	Source of Pollution	Quantity of Emissions at peak flow (m^3/hr)
Power plant:		
1.	Stack attached to coal fired boiler of capacity – 110 TPH	---
Chloro methane plant:		
2.	Stack attached to LPG/Hydrogen gas fired incinerator of capacity – 343 Kgs/hr	---

iii) HAZARDOUS WASTE AUTHORISATION (FORM – II) [See Rule 6 (2)]:

M/s. TGV SRAAC Limited, Gondiparla (V), Kurnool (M), Kurnool District hereby granted an authorization to operate a facility for collection, reception, storage, treatment, transport and disposal of Hazardous Wastes namely:

- **HAZARDOUS WASTES WITH DISPOSAL OPTION:**

Sl. No	Solid Waste generated from	Stream	Quantity of Hazardous waste (after CPM)	Disposal Option
Chloromethanes Plant				
1..	Calcium Chloride	16.2 of sch-1	0.04 TPD	Proposed to be disposed to their own secured Landfill within premises.
2.	Silica gel	16.2 of sch-1	0.036 TPD	
3.	Bottom residue	20.3 of Sch -I	0.5 TPD	Is being incinerated on sight incinerator
4.	Spent Sulfuric acid (75-80%)	---	11.9 TPD	Sold as By - product
Chlorodifluoromethane				
1.	Calcium Fluoride	--	1.2 TPD	Disposed to their own secured Landfill within premises.
2.	Spent Sulfuric Acid (75%)	--	17.3 TPD	Sold as By - product
3.	Antominy Pentoxide	---	0.2 TPD	Recovered and Reused.

CFO&HWA order dated.16.09.2021 for Chloromethanes Plant with a validity upto 31.08.2026 stands cancelled from date of issue of this order. This consent is valid for manufacture of quantities of each product as mentioned below only:

S. No.	Name of the products	Quantity (TPD)

Chloro Methanes Plant:		
1.	Methyl Chloride	1.2
2.	Methylene Chloride	158
3.	Chloroform	79
By-Products:		
4.	Carbon Tetrachloride	12
5.	Hydrochloric acid	47
	Total:	297.2
Chlrodifluoromethane Plant:		
1.	Chlorodifluoromethane (R22)	10
2.	Hydrochloric acid (100%)	8.27
Thermal Power plant		
1.	Electricity	31 MW* (From existing 45 MW (21+24MW) Coal based to 76 MW

*There shall not be any additional generation of Thermal Power. The existing 31 MW furnace oil gas based generator sets shall be kept as standby and the equivalent 31 MW shall be generated as coal based turbine.

This order is subject to the provisions of `the Acts' and the Rules' and orders made there under and further subject to the terms and conditions incorporated in the schedule A, B & C enclosed to this order.

This combined order of Consent & Hazardous Waste Authorisation shall be valid for a period ending with the **31.08.2026.**

VIJAY KUMAR GSRKR IAS, MEMBER SECY(GSRKRVK), O/o MEMBER SECRETARY-APPCB

To
M/s. TGV SRAAC Limited, (Change of Product Mix)
Sy. No.61, 62A, 62B, 63&64,
Gondiparla (V), Kurnool (M),
Kurnool District.
E-mail: sraaclab@rediffmail.com / sraaclab@tgvmail.net

Copy to:

1. The JCEE, Zonal Office, Kurnool for information.
2. The EE, Regional Office, Kurnool for information and necessary action.

S C H E D U L E – A

1. Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.
2. The industry should carryout analysis of waste water discharges or emissions through

chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.

3. All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.
4. The industry should put up two sign boards (6x4 ft. each) at publicly visible places at the main gate indicating the products, effluent discharge standards, air emission standards, hazardous waste quantities and validity of CFO and exhibit the CFO order at a prominent place in the factory premises.
5. Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Acts by the Board.
6. The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board.
7. The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof.
8. The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.
9. The industry should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.
10. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.
11. The industry shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other competent authority as per the Rules in vogue.
12. The industry may explore the possibility of tapping the solar energy for their energy requirements.
13. The industry should educate the workers and nearby public of possible accidents and remedial measures.

SCHEDULE - B

The industry shall comply with the following:

1. The industry shall provide additional closed shed for coal unloading from rail racks and shall be completed within six months.

WATER POLLUTION:

2. The source of water is infiltration wells from Thungabhadra river. The following is the

permitted water consumption:

Sl. No.	Purpose	Chloro Methanes & Chlorodifluoromethane Plant Quantity (KLD)	Power plant Quantity (KLD)
1.	Process – CMS	40	--
2.	Process – CDFM	420	--
3.	Scrubber	40	--
4.	Cooling makeup	1600	1850
5.	Boiler feed	--	640
6.	Domestic	15	--
	Total:	2115 KLD	2490 KLD

3. The industry shall provide separate meters with necessary pipe-line for Chloro Methane Plant, Chlorodifluoromethane Plant and Power plant for assessing the quantity.
4. The industry shall maintain digital flow meters with totalizers at inlet and outlet of RO plants to verify the quantity of effluent treated and operation hours and data transmitted to APPCB website without interruption.
5. Effluents shall not be discharged onland or any water bodies or aquifers or outside under any circumstances. Floor washings shall be admitted into effluent collection system only and shall not be allowed to find their way into storm water drains or open areas.
6. The industry shall construct rainwater runoff tank for collection and storage of first flush storm water. The industry shall maintain dry condition outside drains in non-rainy season.
7. The effluent discharged shall not contain constituents in excess of the tolerance limits mentioned below:

Outlet No.	Parameter	Limiting Standards
3 & 4	pH	5.5 – 9.0
	Suspended Solids	200.0mg/l
	Oil & Grease	10.0 mg/l
	Biochemical Oxygen Demand (BOD)	30.0 mg/l

8. The industry shall maintain online effluent quality monitoring system at the outlet of ETP as per CPCB directions and same connected to APPCB website.

AIR POLLUTION:

9. The emissions shall not contain constituents excess of the prescribed limits mentioned below:

Chimney	Parameter	Emission Standards	Sampling Duration
1	Particulate matter	50 mg/Nm^3	For 30 hours
	HCl	50 mg/Nm^3	For 30 hours
	SO2	200 mg/Nm^3	For 30 hours
	CO	100 mg/Nm^3 50 mg/Nm^3	For 30 hours For 24 hours
	Total Organic Carbon	20 mg/Nm^3	For 30 hours

	HF	4 mg/Nm^3	For 30 hours
	NOx (NO and NO2 expressed as NO2)	400 mg/Nm^3	For 30 hours
	Total dioxins and furans	0.1 ng TEQ/NM3	For 8 hours
	Cd + Th + their compounds	0.05 mg / Nm3	For 2 hours
	Hg and its compounds	0.05 mg /Nm3	For 2 hours
	Cd+As+Pb+Co+Cr+Cu+Mn+Ni+V+V their compounds	0.50 mg/Nm^3	For 2 hours

Note: All values corrected to 11% oxygen on a dry basis.

10. The industry shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10 micro grams) - 100 micro gram/ m3; PM2.5 (Particulate Matter size less than 2.5 micro grams) - 60 micro gram/ m3; SO2 - 80 micro gram/ m3; NOx - 80 micro gram/m3, Ammonia – 400 micro gram/ m3; Benzene- 5 micro gram/ m3; outside the factory premises at the periphery of the industry.

    Standards for other parameters as mentioned in the National Ambient Air Quality Standards CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009

    Noise Levels: Day time - (6 AM to 10 PM) - 75 dB (A)

    Night time - (10 PM to 6 AM) - 70 dB (A).

11. The industry shall comply with emission limits for DG sets of capacity upto 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 and G.S.R.448(E), dated 12.07.2004 under the Environment (Protection) Act Rules. In case of DG sets of capacity more than 800 KW shall comply with emission limits as per the Notification G.S.R.489 (E), dated 09.07.2002 at serial no.96, under the Environment (Protection) Act, 1986.
12. The industry shall provide a sampling port with removable dummy of not less than 15 cm diameter in the stack at a distance of 8 times the diameter of the stack from the nearest constraint such as bends etc. A platform with suitable ladder shall be provided below 1 meter of sampling port to accommodate three persons with instruments. A 15 AMP 250 V plug point shall be provided on the platform.
13. The industry shall properly operate and maintain the monitoring system to all the stacks / vents in the plant. Regular monitoring shall be carried out and report shall be submitted to the Regional officer.
14. The industry shall provide online stack monitoring systems to the major stacks viz., Boiler of capacity more than 10 TPH and connect the monitoring data to the website of APPCB and CPCB.
15. The industry shall provide separate energy meters to the air pollution control equipment and maintain the records properly.

GENERAL:

16. The industry shall not manufacture new products and not increase the capacity beyond the permitted capacity mentioned in this order.
17. The industry shall store the hazardous waste in the closed sheds.
18. All the internal roads shall be of cement concrete / bitumen to reduce fugitive dust due to the movement of vehicles.
19. The industry shall not cause any air pollution / odour nuisance in the surrounding environment.
20. The industry shall maintain the following records and the same shall be made available to the inspecting officers of the Board:

i. Daily production details, RG-1 records and central Excise Returns.
ii. Quantity of Effluents generated treated and recycled.
iii. Log books for pollution control systems.

21. System of leak detection and repair of pump / pipeline shall be installed in the plant and immediate response team shall be identified for preventive maintenance.
22. The industry should submit mock drill report carried out at least once in six months, as required under the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.
23. The industry shall develop thick green belt with native species to cover atleast 33% of the total area.
24. The industry shall comply with SoPs issued by CPCB time to time for all the wastes.
25. The industry should maintain good housekeeping within the plant premises.
26. The industry shall install digital display boards at publicly visible places at the main gate indicating the products manufactured Vs permitted quantities, Treated effluent concentrations Vs discharge standards, Stack emission & AAQ concentrations Vs standards, hazardous waste generation, disposed, stock Vs permitted quantities and validity of CFO; and exhibit the CFO order at a prominent place in the factory premises, as per Hon'ble Supreme Court order
27. The industry shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent for Establishment (CFE) and Consent for Operation (CFO) through website i.e., https://pcb.ap.gov.in by 1st of January and 1st July of every year. The first half yearly compliance reports shall be furnished by the industry and second half yearly compliance reports shall be the audited through MoEF&CC recognized and National Accreditation Board for Laboratory Testing (NABL) accredited third party.
28. The industry shall maintain valid PLI policy which includes Environmental Relief Fund (ERF) and submit copy to RO, Kurnool on yearly base.
29. Any other directions / circulars / notices issued by CPCB, MoEF&CC and APPCB shall be followed from time to time.
30. The Board reserves its right to modify above conditions or stipulate any further conditions and to take action including revoke of this order in the interest of protection of public health and environment.
31. The conditions stipulated are without prejudice to the rights and contentions of this Board in any Hon'ble Court of Law.

Special conditions:

32. The industry shall submit a copy of the NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) at concerned Regional Office, APPCB.
33. The industry shall prepare a safety report and carry out an independent safety audit report of the respective industrial activities including chemical storages / isolated storages by an expert not associated with such industrial activity as required under Rule 10 of MSIHC Rules, 1989 and get it approved by the Factories Dept., and submit the compliance along with copy of the safety report, safety audit report and safety certificate at concerned Regional Office, APPCB.
34. The industry shall identify major accident hazard chemicals & list out the hazardous chemicals endangered to human health & environment, and the details shall be furnished to the Factories Department and the Regional Office, APPCB time to time duly certifying the same by the industry. Further, the industry shall extend training to the working personnel while handling hazardous chemicals for the prevention of accidents and necessary antidotes to ensure safety, as per the MSIHC Rules, 1989.
35. The industry shall carryout calibration of safety equipment and leak detection systems at regular intervals and shall certify the same with the Factories Department. That

certified copy shall be submitted to the APPCB, Regional Office. The industry shall install fluorescent Wind Vane at the highest point in the industry premises.

36. The industry shall inventory the hazardous wastes and its quantities stored within the industry premises as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 (HOWM Rules, 2016) and shall furnish the details to Regional Office, APPCB on a monthly basis duly certifying the same by the industry.
37. The industry shall submit Risk analysis and risk assessment covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system.
38. The industry shall inventorize the storage quantities of hazardous chemicals (raw materials), products, as per the hazard nature of reactivity / toxicity / flammability / explosive stored/handling in the premises as defined in the Management of Storage, Import of Hazardous Chemicals (MSIHC) Rules, 1989 and the details shall be furnished to the Factories Department and to the Regional Office, APPCB on monthly basis duly certifying the same.
39. The industry shall submit the copy of the safety audit report and On-Site / Off Site Emergency Plans as applicable after being certified by the Factories Department to the APPCB, Regional Office from time to time, if the storage quantity of hazardous chemicals is equal to or, in excess of the threshold quantities specified in schedule 2 & 3 of MSIHC Rules, 1989.
40. VOC meters with real time data transmission facility through internet of things (IoT) shall be installed near the production blocks and near the chemical storage tanks and link to the servers of APPCB and CPCB.
41. The industries and isolated storages that are storing hazardous chemicals less than the threshold quantities mentioned under MSIHC Rules, 1989 shall submit safety certificate to the concerned Regional Office, APPCB.

SCHEDULE – C

[See rule 6(2)]

[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]

1. The authorized person shall comply with the provision of the Environment (Protection) Act, 1986, and the rules made there under.
2. The authorization shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.
3. The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.
4. Any authorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.
5. The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;
6. The person authorized comply with the provisions outline in the Central Pollution Control Board guidelines on “Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty”.
7. It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.
8. An application for the renewal of an authorization shall be made as laid down under

these Rules.

9. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.
10. The industry shall dispose of e-waste to the authorized recyclers only.

Specific Conditions:

11. The industry shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
12. The industry shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.
13. The industry shall maintain 7 copy manifest system for transportation of waste generated and a copy shall be submitted to concerned Regional Office of APPCB.
14. The industry shall maintain proper records for Hazardous Wastes stated in Authorisation in FORM-3 i.e., quantity of Incinerable waste, land disposal waste, recyclable waste etc., and file annual returns in Form- 4 as per Rule 20(2) of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.

VIJAY KUMAR GSRKR IAS, MEMBER SECY(GSRKRVK), O/o MEMBER SECRETARY-APPCB

To
M/s. TGV SRAAC Limited, (Change of Product Mix)
Sy. No.61, 62A, 62B, 63&64,
Gondiparla (V), Kurnool (M),
Kurnool District.
E-mail: sraaclab@rediffmail.com / sraaclab@tgvmail.net

F.No. IA3-22/10/2022-IA.III [E 177258]

Government of India
Ministry of Environment, Forest and Climate Change
(IA Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi – 110003

Dated: 11th April, 2022

OFFICE MEMORANDUM

Sub: Guidelines for granting Environmental Clearance (EC) under para 7(ii)(a) of EIA Notification, 2006, for expansion up to 50%, within the existing premises/ mine lease area, without additional land acquisition – reg.

Expansion or modernization of existing projects or activities listed in the Schedule to the EIA notification 2006 entailing capacity addition with change in process or technology and/or product mix shall be undertaken only after obtaining prior Environmental Clearance (EC).

2. Para 7(ii) of EIA Notification 2006, *inter-alia* provides that:

a. Projects seeking prior EC for expansion with increase in the production capacity beyond the capacity for which prior environmental clearance was granted [with increase in lease area or production capacity in mining projects] shall be considered by the concerned Expert Appraisal Committee [or SEAC, as the case may be] to decide whether Environment Impact Assessment and public consultations need to be carried out for grant of EC.
b. Expansion of existing projects [listed in item numbers 2, 3, 4 and 5 of the Schedule having Prior Environmental Clearance] with no increase in pollution load shall be exempt from the requirement of prior EC (derived on the basis of such prior EC).
c. Any change in configuration of the plant or activity from the EC conditions during execution of the project, shall not require prior EC, if there is no change in production capacity and there is no increase in pollution load.

3. The Ministry has been continuously making efforts to streamline the procedure for projects seeking prior Environmental Clearance (EC) under the different provisions of para 7(ii) of the EIA Notification 2006. Vide O.M. No. J-11015/224/2015-IA.II(M) dated 15.09.2017, the Ministry provided certain guidelines for expansion of Coal mining projects up to 40% capacity in two-three phases subject to certain conditions. Subsequently, vide OM No. IA3-22/23/2021-IA.III [E167077] dated 20.10.2021, the Ministry also issued guidelines for expansion of Iron, Manganese, Bauxite and Limestone mining projects upto 20% capacity, subject to certain conditions.

4. The aforesaid matters have been further examined in the Ministry with the objective of bringing about uniformity and consistency in consideration of projects under Para 7(ii)(a) by concerned Expert Appraisal Committee (EAC)/ State level EACs across all states. Accordingly, the Ministry deems it necessary to issue a guideline to deal with expansion proposals which are received under para 7(ii)(a) of EIA Notification, 2006 in respect of the developmental projects listed in the Schedule to the said notification seeking prior-EC involving expansion with increase in production capacity within the existing premises/ mine lease area; or expansion due to modernization of an existing unit through change in process and or technology or involving a change in the product–mix; or enhancement of cargo handling capacity in ports & harbors, widening of roads; or enhancement in built-up area, subject to the fulfilment of the following criteria:

i. The project should have gone through the public hearing process, at least once, for its existing EC capacity on which expansion is being sought, except those category of projects which have been exempted as per para 7 III (i) of EIA Notification 2006 and its amendments.
ii. There should not be change in Category of the project from 'B2' to 'B1' or 'A' due to proposed modernisation or expansion.
iii. There is no additional land acquisition or forest land diversion involved for the proposed expansion or there is no increase in lease area with regard to mining vis-à-vis the area mentioned in the EC, based on which public hearing has been held earlier.
iv. The proposed expansion shall not be more than 50% of production capacity as mentioned in the prior EC, issued on the basis of public hearing held and the same shall be allowed in minimum three phases.
v. Predicted environmental quality parameters arising out of proposed expansion/modernization shall be within the prescribed norms and the same shall be maintained as per prescribed norms.
vi. The proposed expansion should not result in reduction in the greenbelt area as stipulated in the earlier EC, or if the existing ratio of greenbelt is more than 33%, after expansion it should not reduce below 33%.
vii. The project proponent should have satisfactorily complied the conditions stipulated in the existing EC(s) and satisfactorily fulfilled all the commitments made during the earlier public hearing/consultation proceedings and also the commitments given while granting previous expansion, as may be applicable. This shall be duly recorded in the certified compliance report issued by the IRO/CPCB/SPCB, which should not be more than one year old at the time of submission of application.
viii. Public Consultation shall be undertaken [if applicable as per table below] by obtaining response in writing, as per para 7 III (ii) (b) of EIA Notification 2006, except those category of projects which have been exempted as per para 7 III (i) of EIA Notification 2006 and its amendments.
ix. Effluent monitoring including air quality monitoring systems as specified in the existing EC, if stipulated, should have been installed.

5. Subject to the fulfilment of the conditions at Para 4 (i) to (viii) above, following procedure shall be adopted for processing the application for considering expansion of proposed project up to 50% of capacity as mentioned in the existing EC, in minimum three phases under para 7(ii)(a) of EIA Notification, 2006.

Scenario	Intended change through modernization/ change of product mix/ expansion	Requirement of revised EIA/ EMP report	Requirement of Certified Compliance Report	Requirement of fresh Public Consultation	Whether reference to Appraisal Committee is required
I	Projects which involve modernization/change of product mix without increase in production capacity but with increase in pollution load.	Yes	Yes	No	Yes
II	Up to 20 percent based on environmental safeguards conditions.	Yes	Yes	No	Yes
III	Up to 40 percent based on successful compliance of previous environmental safeguard conditions related to expansion of 20 percent.	Yes	Yes	No	Yes
IV	More than 40 percent but less than 50 Percent based on successful compliance of previous environmental safeguard conditions related to expansion of 40 percent.	Yes	Yes	Yes	Yes

6. Project Proponent shall apply in the requisite form on the PARIVESH Portal under para 7(ii) of EIA Notification 2006, along with EIA/ EMP reports based on standard ToRs and Public consultation report, if applicable. The concerned EAC/SEAC shall appraise the project proposal and it may prescribe additional sector specific and/or other environmental safeguards after due diligence, as required.

7. Other statutory requirements like Consent to Establish/Operate, Clearance from CGWA, approval of Mining Plan, Mine Closure Plan, Mine Closure Status Report, approval of DGMS, Forest Clearance, Wildlife Clearance, etc., if applicable, are to be satisfactorily fulfilled at the time of application.

8. The projects that do not qualify with the above requirement shall continue to be considered on a case-to-case basis by the concerned EAC/ SEAC as per the provisions of para 7(ii)(a) who will decide whether Environment Impact Assessment and public consultations need to be carried out.

9. Those projects which involve modernization/change of product mix with increase in production capacity shall be considered as per Scenarios-II to IV of the table above.

10. This O.M. is issued in supersession of OM J-11015/224/2015-IA.II (M) dated 15.09.2017 and O.M. No. IA3-22/23/2021-IA.III[E167077] dated 20.10.2021 and with the approval of the Competent Authority.

(A.K. Agrawal)
Director

To

1. Chairman, Central Pollution Control Board (CPCB).
2. Chairman of all the Expert Appraisal Committees
3. Chairperson/Member Secretaries of all the SEIAAs/SEACs
4. Chairpersons/Member Secretaries of all SPCBs/UTPCCs
5. All the Officers of I.A. Division

Copy for information to:

1. PS to Hon'ble Minister for Environment, Forest and Climate Change
2. PS to Hon'ble MoS (EF&CC)
3. PPS to Secretary (EF&CC)
4. PPS to DGF&SS (EF&CC)
5. PPS to AS(TK)/PPS to JS (SKB)
6. Website, MoEF&CC/Guard file.

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TEST REPORT

SOIL ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-138	**10065**
Date of Reporting: 20.02.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of Sample received: 11.02.2023
Sample Particulars: Soil Samples	Date of Analysis Completion: 18.02.2023
Sample Registration Number: TLC/23/S-010-021	

ANALYSIS DATA

Parameter	Unit	S-1	S-2	S-3	S-4	S-5
pH	-	7.75	7.78	7.61	7.56	6.1
Electrical Conductivity (EC)	dS/m	0.549	0.297	0.22	0.52	0.346
Bulk Density	g/cc	1.11	1.11	1.18	1.05	1.18
Cation-Exchange Capacity (CEC)	Col (+)/kg	6.5	9.8	8.7	7.2	9.5
Infiltration rate	mm/hour	27	17	18	26	17
Porosity	%	58	58	56	60	56
Water Holding Capacity	%	7.82	5.59	4.71	7.63	4.37
Moisture	%	8.49	5.92	4.95	8.27	4.56
Organic Matter	%	0.55	0.80	0.84	0.36	1.36
Carbonates	%	Nil	Nil	Nil	Nil	Nil
Sand	%	78	36	42	74	32
Silt	%	9	44	38	13	48
Clay	%	13	20	20	13	20
Organic Carbon	%	0.94	1.38	1.44	0.63	2.35
Nitrogen (as N)	%	0.089	0.067	0.066	0.072	0.084
Carbon / Nitrogen Ration (C/N)	-	10.6	20.6	21.8	8.8	28.0
Phosphorus (as P)	%	0.072	0.113	0.086	0.099	0.122
Potassium (as K)	mg/kg	190	174	196	216	234
Sodium (as Na)	mg/kg	150	144	178	196	210
Calcium (as Ca)	mg/kg	554	347	218	208	317
Magnesium (as Mg)	mg/kg	373	168	211	132	156
Calcium/Magnesium ratio	-	1.49	2.07	1.03	1.58	2.03
Chlorides (as Cl)	mg/kg	175	439	472	526	351
Sulphates (as SO_4)	mg/kg	41	26	16	64	57
Zinc (as Zn)	mg/kg	6.2	5.1	4.9	4.2	5.7
Texture	-	Sandy loam	Loam	Loam	Sandy loam	Loam

S1- Site, S2- E-Tandrapadu, S3- Gondiparla, S4- Basavapuram, S5- Bhairapuram

M. Lavanya
Verified by
M. Lavanya
Environmental Chemist

TEAM LABS & CONSULTANTS
Authorized by
A. Ravi Pavan
Technical Manager

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TEST REPORT

SOIL ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-138	**10065**
Date of Reporting: 20.02.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of Sample received: 11.02.2023
Sample Particulars: Soil Samples	Date of Analysis Completion: 18.02.2023
Sample Registration Number: TLC/23/S-010-021	

ANALYSIS DATA

Parameter	Unit	S-6	S-7	S-8
pH	-	7.35	7.24	7.39
Electrical Conductivity (EC)	dS/m	0.29	0.349	0.385
Bulk Density	g/cc	1.11	1.18	1.05
Cation-Exchange Capacity (CEC)	Col (+)/kg	11.2	7.7	12.9
Infiltration rate	mm/hour	16	25	15
Porosity	%	58	56	60
Water Holding Capacity	%	5.29	6.18	5.11
Moisture	%	5.58	6.59	5.39
Organic Matter	%	0.47	0.64	0.47
Carbonates	%	Nil	Nil	Nil
Sand	%	37	72	32
Silt	%	41	9	52
Clay	%	22	19	16
Organic Carbon	%	0.82	1.10	0.82
Nitrogen (as N)	%	0.061	0.075	0.098
Carbon / Nitrogen Ration (C/N)	-	13.4	14.7	8.4
Phosphorus (as P)	%	0.167	0.234	0.131
Potassium (as K)	mg/kg	190	256	244
Sodium (as Na)	mg/kg	170	224	214
Calcium (as Ca)	mg/kg	139	198	208
Magnesium (as Mg)	mg/kg	90	114	132
Calcium/Magnesium ratio	-	1.54	1.74	1.58
Chlorides (as Cl)	mg/kg	386	342	263
Sulphates (as SO_4)	mg/kg	24	36	52
Zinc (as Zn)	mg/kg	6.7	3.9	1.1
Texture	-	Loam	Sandy loam	Silt loam

S6- Panchalingala, S7- Padidempadu and S8-Kurnool

M. Lavanya
Verified by
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TEAM LABS & CONSULTANTS HYDERABAD
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Technical Manager

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TEST REPORT

WATER ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-138	**10066**
Date of Reporting: 20.02.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of Sample received: 11.02.2023
Sample Particulars: Ground Water	Date of Analysis Completion: 18.02.2023
Sample Registration Number: TLC/23/W-010-021	

ANALYSIS DATA

Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	Units
Temperature	29	28	29	29	28	29	29	28	^{o}C
Colour	3.0	2.0	5.0	3.0	5.0	5.0	3.0	2.0	Hazen
Turbidity	0.20	0.70	0.50	0.30	0.27	0.62	0.75	0.53	NTU
pH @25.1^{0}C	7.25	7.37	7.32	6.87	6.92	6.9	7.1	7.51	-
Total Solids	350	300	391	906	415	228	875	308	mg/l
Total Dissolved Solids	347	298	389	901	412	226	872	306	mg/l
Total Suspended Solids	3.0	2.0	2.0	5.0	3.0	2.0	3.0	2.0	mg/l
Total Hardness (as $CaCO_3$)	182	172	270	601	191	151	485	209	mg/l
Calcium (as Ca)	40	41	37.0	120	37	29	97	59	mg/l
Magnesium (as Mg)	20	17	43	73	24	19	59	15	mg/l
Sodium (as Na)	40	27	19	92	50	11	111	13	mg/l
Potassium (as K)	0.61	0.52	0.3	0.81	0.98	0.87	2.5	0.51	mg/l
Total Alkalinity (as $CaCO_3$)	99	79	99	317	69	74	311	79	mg/l
Chloride (as Cl)	60	53	88	232	46	42	187	65	mg/l
Sulphate (as SO_4)	80	69	77	94	130	28	87	58	mg/l
Nitrate Nitrogen (as NO_3)	3.7	3.5	4.1	22	3.1	23	25	3.9	mg/l
Silica (as SiO_2)	5.6	6.1	7.6	18	23.0	0.81	25	6.4	mg/l
Fluoride (as F)	0.13	0.25	0.28	0.21	0.13	0.17	0.11	0.19	mg/l
Boron (as B)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/l
Manganese (as Mn)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l
Zinc (as Zn)	0.17	0.15	0.12	0.25	0.13	0.28	0.11	0.18	mg/l

GW1- site, GW2-E-Tandrapadu, GW3-Gondiparla, GW4-Basavapuram, GW5-Bhairapuram, GW6-Panchalingala, GW7-Padidempadu and GW8-Kurnool

Note: 1. Above all standard values are mentioned as per IS 10500:2012 (RA 2019), Drinking water specifications.
Limit1- Requirement (Acceptable Limit) and Limit-2- Permissible Limit in the Absence of Alternate Source.
2. NS- No Specification, NR- No Relaxation and A-Absent.
3. All samples collected as per IS 3025 part-1:2003 (RA 2019)

M. Lavanya
Verified by
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Environmental Chemist

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METHOD OF ANALYSIS AND STANDARD VALUES

Method of Analysis	IS 10500:2012 Standard	
	Limit-1	Limit-2
IS 3025 (part 09):1984 (RA:2017)	NS	NS
IS 3025 (Part 4): 2021	5	15
IS 3025 (part 10):1984 (RA:2017)	1	5
IS 3025 (part 11) :2022	6.5-8.5	NR
IS 3025 (part 15):1984 (RA:2019)	NS	NS
IS 3025 (part 16):1984 (RA:2017)	500	2 000
IS 3025 (Part 17): 2022	NS	NS
IS 3025 (part 21):2009 (RA:2019)	200	600
IS 3025 (part 40):1991 (RA:2019)	75	200
IS 3025 (part 46):1994 (RA:2019)	30	100
IS 3025 (part 45):1993 (RA:2019)	NS	NS
IS 3025 (part 45):1993 (RA:2019)	NS	NS
IS 3025 (part 23):1986 (RA:2019)	200	600
IS 3025 (part 32):1988 (RA:2019)	250	1 000
IS 3025 (Part 24/Sec 1): 2022	200	400
IS 3025 (Part 34):1988 (RA:2019)	45	NR
IS 3025 (part 35):1988 (RA:2019)	NS	NS
IS:3025 part 60:2008 (RA:2019)	1	1.5
APHA-4500B: 2017	0.5	1
APHA-3111B: 2017	0.1	0.3
IS 3025 (part 49):1994 (RA:2019)	5	15

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TEST REPORT

AMBIENT AIR QUALITY DATA

Report Format No. TLC/L/GF/RF-138	**10066**
Date of Reporting: 25.03.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Monitoring: 01.12.2022 to 28.02.2023	Date of Analysis Completion: 21.03.2023
Duration of Monitoring: 24 Hrs	
Sample Registration Number: TLC/21/TGVSRL/AAQ/219 – 03/2023	

ANALYSIS DATA

Pollutant	Maximum	Minimum	Mean	98 percentiles
1) Site				
PM_{10}	52	37	46.6	52
$PM_{2.5}$	27	15	22.7	27
SO_2	14	9	11.7	14
NO_x	26	9	22.8	26
VOC (in PPM)	0.2	0.1	0.25	0.35
2) E-Tandrapadu				
PM_{10}	41	32	36.2	41
$PM_{2.5}$	19	15	16.1	19
SO_2	11	8	9.7	11
NO_x	12	8	10.6	12
VOC (in PPM)	BDL	BDL	BDL	BDL
3) Gondiparla				
PM_{10}	42	34	36.5	42
$PM_{2.5}$	22	19	20.3	22
SO_2	13	8	10.5	13
NO_x	15	9	13.1	15
VOC (in PPM)	BDL	BDL	BDL	BDL

Note: Pollutant concentrations except for VOC are presented in µg/m³. *BDL: Below detectable limit*

Parameter	Test Method	Standard
PM10	IS 5182 (Part 23): 2006 (RA: 2022)	100
PM2.5	IS 5182 (Part 24): 2019	60
SO2	IS 5182 (Part 2): 2001 (RA: 2017)	80
NOx	IS 5182 (Part 6): 2006 (RA: 2017)	80

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TEST REPORT

AMBIENT AIR QUALITY DATA

Report Format No. TLC/L/GF/RF-138	**10066**
Date of Reporting: 25.03.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Monitoring: 01.12.2022 to 28.02.2023	Date of Analysis Completion: 21.03.2023
Duration of Monitoring: 24 Hrs	
Sample Registration Number: TLC/21/TGVSRL/AAQ/219 – 03/2023	

ANALYSIS DATA

Pollutant	Maximum	Minimum	Mean	98 percentiles
4) Basavapuram				
PM_{10}	39	30	35.8	39
$PM_{2.5}$	18	13	14.1	18
SO_2	10	7	9.5	10
NO_x	12	7	8.7	12
VOC (in PPM)	BDL	BDL	BDL	BDL
5) Bhairapuram				
PM_{10}	40	27	36.1	40
$PM_{2.5}$	17	12	13.5	17
SO_2	9	8	8.6	9
NO_x	11	9	9.9	11
VOC (in PPM)	BDL	BDL	BDL	BDL
6) Panchalingala				
PM_{10}	41	28	34.8	41
$PM_{2.5}$	19	12	14.6	19
SO_2	11	10	10.3	11
NO_x	13	9	11.5	13
VOC (in PPM)	BDL	BDL	BDL	BDL
HCl	BDL	BDL	BDL	BDL

Note: Pollutant concentrations except for VOC are presented in µg/m³. *BDL: Below detectable limit*

Parameter	Test Method	Standard
PM10	IS 5182 (Part 23): 2006 (RA: 2022)	100
PM2.5	IS 5182 (Part 24): 2019	60
SO2	IS 5182 (Part 2): 2001 (RA: 2017)	80
NOx	IS 5182 (Part 6): 2006 (RA: 2017)	80

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TEST REPORT

AMBIENT AIR QUALITY DATA	
Report Format No. TLC/L/GF/RF-138	**10066**
Date of Reporting: 25.03.2023	Report Number: 0123-51-049
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Duration of Monitoring: 01.12.2022 to 28.02.2023	Date of Analysis Completion: 21.03.2023
Duration of Monitoring: 24 Hrs	
Sample Registration Number: TLC/21/TGVSRL/AAQ/219 – 03/2023	

ANALYSIS DATA

Pollutant	Maximum	Minimum	Mean	98 percentiles
7) Padidempadu				
PM_{10}	38	25	33.6	38
$PM_{2.5}$	18	14	15.8	18
SO_2	10	7	8.7	10
NO_x	12	9	10.8	12
VOC (in PPM)	BDL	BDL	BDL	BDL
8) Kurnool				
PM_{10}	49	42	45.3	49
$PM_{2.5}$	24	18	20.0	24
SO_2	14	11	11.9	14
NO_x	15	10	13.2	15
VOC (in PPM)	BDL	BDL	BDL	BDL

Note: Pollutant concentrations except for VOC are presented in µg/m³. BDL: Below detectable limit

Parameter	Test Method	Standard
PM10	IS 5182 (Part 23): 2006 (RA: 2022)	100
PM2.5	IS 5182 (Part 24): 2019	60
SO2	IS 5182 (Part 2): 2001 (RA: 2017)	80
NOx	IS 5182 (Part 6): 2006 (RA: 2017)	80

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TEST REPORT

AMBIENT NOISE QUALITY	
Date of Reporting: 20.02.2023	Report Number: 0123-51-049
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Monitoring: 01.12.2022 to 28.02.2023	Date of Analysis Completion: 21.03.2023
Duration of Monitoring: 24 Hrs	

ANALYSIS DATA

Location Name	Distance (Km)	Equivalent Noise Levels dB(A)	
		Leq_{day}	Leq_{night}
Site	-	52	40
E - Tandrapadu	0.6	49	37
Gondiparla	1.8	50	42
Basavapuram	2.7	48	37
Bhairapuram	4.1	51	39
Panchalingala	4.5	49	38
Padidempadu	4.15	48	37
Kurnool	1.4	56	45

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TEST REPORT

STACK ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-138	**10240**
Date of Reporting: 20.02.2023	Report Number: 0123-51-050
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of monitoring: 09.02.2023
Date of Analysis completion: 17.02.2023	Time of monitoring: 12.30 PM
Sample Registration Number: TLC/23/ST-010-022	

DETAILS OF STACK

1	Stack attached to	Coal fired Boiler 110 TPH
2	Stack diameter (m)	2.9
3	Stack Cross Section Area (m^2)	6.60
4	Flue gas temperature (^oC)	185
5	Exit Velocity of Flue Gas (m/s)	16
6	Quantity of Flue gas (m^3 / hr)	380509

EMISSION DATA

S.No	Parameter	Result	Standard	Method of Analysis
1	Particulate matter (mg / N m^3)	75	115	IS:11255 Part 1:1985 (RA 2009)
2	Sulphur dioxide (mg/Nm^3)	68	--	IS:11255 Part 2:1985 (RA 2009)
3	NOx (as NO2) (AT 15% O2), dry basis, in ppmv	142	-	IS:11255 Part 7:2005 (RA 2012)

Equipment: Stack Monitoring Kit: (Lata Enviro Tech APM 160) Valid up to 07.05.2023.

Sample condition: Sample condition is good, sample collected and analysis done as per IS: 11255 standard methods

*** End of Report***

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TEST REPORT

STACK ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-139	**10241**
Date of Reporting: 20.02.2023	Report Number: 0123-51-051
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of monitoring: 09.02.2023
Date of Analysis completion: 17.02.2023	Time of monitoring: 01.30 PM
Sample Registration Number: TLC/23/ST-011-023	

DETAILS OF STACK

1	Stack attached to	Coal fired Boiler 100 TPH
2	Stack diameter (m)	2.5
3	Stack Cross Section Area (m^2)	4.90
4	Flue gas temperature (^oC)	180
5	Exit Velocity of Flue Gas (m/s)	11.2
6	Quantity of Flue gas (m^3 / hr)	197946

EMISSION DATA

S.No	Parameter	Result	Standard	Method of Analysis
1	Particulate matter (mg / N m^3)	72	115	IS:11255 Part 1:1985 (RA 2009)
2	Sulphur dioxide (mg/Nm^3)	54	--	IS:11255 Part 2:1985 (RA 2009)
3	NOx (as NO2) (AT 15% O2), dry basis, in ppmv	114	-	IS:11255 Part 7:2005 (RA 2012)

Equipment: Stack Monitoring Kit: (Lata Enviro Tech APM 160) Valid up to 07.05.2023.

Sample condition: Sample condition is good, sample collected and analysis done as per IS: 11255 standard methods

*** End of Report***

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TEST REPORT

STACK ANALYSIS REPORT

Report Format No. TLC/L/GF/RF-140	**10242**
Date of Reporting: 20.02.2023	Report Number: 0123-51-052
Issued to: **M/s. TGV SRAAC Limited.** Gondiparla village, Kurnool mandal and district, Andhra Pradesh.	Issued By: **A. Ravi Pavan** Lab-In-Charge/ Technical Manager
Duration of Sampling: 10.02.2023	Date of monitoring: 09.02.2023
Date of Analysis completion: 17.02.2023	Time of monitoring: 01.00 PM
Sample Registration Number: TLC/23/ST-012-042	

DETAILS OF STACK

1	Stack attached to	Coal fired Boiler 42TPH
2	Stack diameter (m)	1.37
3	Stack Cross Section Area (m^2)	1.47471
4	Flue gas temperature (^oC)	131
5	Exit Velocity of Flue Gas (m/s)	6.02
6	Quantity of Flue gas (m^3 / hr)	31960

EMISSION DATA

S.No	Parameter	Result	Standard	Method of Analysis
1	Particulate matter (mg / N m^3)	61	115	IS:11255 Part 1:1985 (RA 2009)
2	Sulphur dioxide (mg/Nm^3)	42	--	IS:11255 Part 2:1985 (RA 2009)
3	NOx (as NO2) (AT 15% O2), dry basis, in ppmv	106	-	IS:11255 Part 7:2005 (RA 2012)

Equipment: Stack Monitoring Kit: (Lata Enviro Tech APM 160) Valid up to 07.05.2023.

Sample condition: Sample condition is good, sample collected and analysis done as per IS: 11255 standard methods

*** End of Report***

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Safety Data Sheet
CHLORINE

Update: 11th January 2019

1. Identification

Product identifiers

Product name: CHLORINE**>99.5%**

Indication in other: **CAS #:**7782-50-5 **EC/EINECS:** 231-959-5 **RTECS#:** FO 2100000
UN#:1017 **EC Index #:**017-001-00-7

Manufacturer Info:

Aditya Birla Chemicals (Thailand) Co., Ltd (Chlor Alkali Division)
3 Soi G-2, Prakornsongkrorad Rd, Tambol HuayPong Amphur Muang Rayong, Rayong 21150

- Tel. +66-3868-7356-9
- Fax +66-3868-5074
- **Emergency contact numbers: +66-3868-7354 (Thailand)**

2. Hazards Identification

GHS Classification of the substance or mixture

Oxidising gases	Category 1
Gases under pressure	Compressed gas
Acute toxicity (Inhalation)	Category 2
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - single exposure (respiratory system, nervous system)	Category 1
Specific target organ toxicity – repeat exposure (respiratory system, olfactus organ)	Category 1
Acute aquatic toxicity	Category 1

Label elements



Signal word DANGER

Hazard statement(s)

- **H270** May cause or intensify fire; oxidizer
- **H280** Contains gas under pressure; may explode if heated
- **H331** Toxic if inhaled.
- **H314** Causes severe skin burns and eye damage
- **H370** Cause damage to organs
- **H372** Cause damage to organs through prolonged or repeated exposure
- **H373** May cause damage to organs through prolonged or repeated exposure.
- **H400** Very toxic to aquatic life.

Precautionary statement(s)

- **P261** A void breathing vapours, gas
- **P280** Wear protective gloves, respiratory and eye protection/face protection.
- **P403+P233** Store in well-ventilated place. Keep container tightly closed.
- **P220** Keep/Store away from clothing/ combustible materials.
- **P273** Avoid release to the environment.

Other hazards which do not result in classification – none

3. Composition/Information on Ingredients

Substances

Product name: Liquid Chlorine, Chlorine
Common Name: Liq. Chlorine
Synonyms: Chlorine gas
Molecular Formula: Cl_2
Molecular Weight: 70.91 g/mol

Component	CAS No	Wt.%
Chlorine	7782-50-5	99.5
Inert Ingredient	-	0.5

4. First Aid Measures

Inhalation Move victim to fresh air. If not breathing, give artificial respiration. If there is difficulty in breathing, provide oxygen and get medical attention immediately.

Skin contact Wash off with soap and plenty of water. Get medical attention immediately.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, keeping eyelids open. Get medical attention immediately.

Ingestion Give small amounts of water. Get medical attention immediately

Most important symptoms and effects, both acute and delayed

If inhaled : Cause severe irritation of mucous membranes of the nose throat, and respiratory tract followed by coughing and feeling of suffocation.

Skin contact: Cause serious burns, blistering and tissue destruction.

Eye contact: Cause severe eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision.

Direct contact of the eyes with liquid chlorine will produce serious eye burns even blindness.

If swallowed : Ingestion of liquid chlorine may result in severe irritation or ulceration of the mouth, throat and digestive tract which may be displayed by nausea, pain, vomiting, and , in severe cases can collapse, get medical attention immediately.

Indication of any immediate medical attention and special treatment needed: Treat symptomatically.

5. Fire Fighting Measures

Suitable extinguishing media

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

None

Special protective equipment and precautions for fire-fighters

Wear full chemical resistant clothing with self-contained breathing apparatus for firefighting.

Use water to keep fire-exposed containers cool and continue until well after fire is out.

If it is necessary to stop the flow of gas, use water curtain to prevent gas escaping.

6. Accidental Release Measure

Personal precautions

- In event of leak or spill, keep upwind
- Evacuate personnel to safe areas.
- Avoid inhalation of vapors, gas
- Ensure adequate ventilation.

Protective equipment

- Wear a full-face respirator with respirator cartridges.
- Wear impervious protective clothing, including boots, gloves.

Environmental precautions

Do NOT let this chemical enter the environment.

Methods and materials for containment and cleaning up

- Wear chemical protection suit including self-contained breathing apparatus.
- Use water spray to reduce vapor but DO NOT apply water to point leak or spill area.
- If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air.

7. Handling and Storage

Precautions for safe handling

- Avoid contact with skin and eyes.

- Provide adequate ventilation during use.
- Avoid breathing vapors or gas.
- Use a suitable hand truck for cylinder movement. Never attempt to lift a cylinder by its valve protection cap.
- Secure cylinders in place in an upright position at all times.
- Do not drop cylinders or permit them to strike each other.
- Never apply flame or localized heat directly to any part of the cylinder.

Conditions for safe storage, including any incompatibilities

- Store chlorine containers in well ventilated areas of low fire potential, away from incompatible materials and away from sources of heat and ignition. Store in cool place.
- Store cylinders upright on a level floor secured in position and protected from physical damage.

8. Exposure Controls/Personal Protection

Control parameters

IDLH:	10 ppm	(NIOSH 2012)
REL-ST	0.5 ppm	(NIOSH 2012)
PEL – Ceiling	1 ppm	(OSHA 2012)
TLV – TWA	0.5 ppm	(ACGIH 2012).
TLV – STEL	1 ppm	(ACGIH 2012).

Appropriate engineering controls

- Ensure ventilation is adequate.
- Use enclosed, isolated processing and handling whenever possible.

Personal protective equipment

		
Hand Protection	Respiratory Protection	Eye Protection

Work / Hygienic Practices:

- Wash contaminated clothing prior to reuse.
- Always wash hands before smoking, eating, drinking or using the toilet.
- Do not eat, drink, or smoke during work

9. Physical and Chemical Properties

1.)	Appearance	Green to yellow compressed liquefied gas
2.)	Odour	Pungent
3.)	Odour Threshold	0.2-0.4 ppm
4.)	pH	5.5 @ 0.7% Solution
5.)	Melting point/freezing point	-101 °C
6.)	Boiling point	-34 °C
7.)	Flash point	Not Applicable
8.)	Evaporation rate	No data available
9.)	Flammability (solid, gas)	No data available
10.)	Upper/lower flammability or explosive limits	No data available
11.)	Vapour pressure	678kPa at 20 °C
12.)	Vapour density (Air =1)	2.5
13.)	Relative density	1.5 g/cm^3 at 15 °C
14.)	Water solubility	0.7 g/100ml (20°C)
15.)	Partition coefficient: n-octanol/water log Pow	No data available
16.)	Auto ignition temperature	Not Applicable
17.)	Decomposition temperature	No data available
18.)	Viscosity	0.34 cP @ 20°C

10. Stability and Reactivity

Reactivity
Reacts with hydrogen sulfide and water forming hydrochloric acid. It combines with carbon monoxide and sulfur dioxide to form phosgene and sulfonyl chloride, respectively, which are toxic and corrosive substances.
Reacts violently with bases, combustible, reducing materials, organic and inorganic compounds
Chemical stability
Stable under normal ambient handling conditions.
Possibility of hazardous reactions
Hazardous polymerization will not occur.
Conditions to avoid
Moisture, Heat, Sunlight
Incompatible materials
Acetylene, turpentine and other hydrocarbons, ammonias, hydrogen, ether, powered metals, sulfur, and aluminum.
Hazardous decomposition products
Hydrogen chloride may form from chlorine in the presence of water vapor.

11. Toxicological Information

Inhalation: Cough, Sore throat, Shortness of breath, Wheezing and Labored breathing.
Skin contact: Redness, Burning sensation, Pain, Skin burns.
Eye contact: Causes watering of the eyes, Redness, Pain and Burns.
Ingestion: Ingestion of liquid chlorine may result in severe irritation or ulceration of the mouth, throat and digestive tract which may be displayed by nausea, pain, vomiting, cyanosis (lack of oxygen in the blood), and, in severe cases, collapse, shock and death.
Symptoms related to the physical, chemical and toxicological characteristics:
Rapid evaporation of the liquid may cause frostbite. Inhalation may cause asthma-like reactions. Inhalation may cause pneumonitis. Inhalation may cause lung edema, but only after initial corrosive effects on eyes and/or airways have become manifest.
Immediate effects:

- Corrosive to eyes, skin and respiratory tract.
- Corrosive on ingestion, inflammation and edema of the bronchi, pneumonitis, pulmonary edema.

Chronic effects
The substance may have effects on the respiratory tract and lungs, resulting in chronic inflammation and impaired functions. The substance may have effects on the teeth, resulting in dental erosion.
Numerical measures of toxicity
Acute toxicity
LC50 Oral – rat: 293 mg/kg
LC50 Inhalation – rat: 300 ppm
Skin Corrosion/Irritation:
Causes severe skin burn and eye damage.
Serious eye damage/irritation:
Causes severe eye burns and can cause serious eye damage.
Specific target organs/systemic toxicity following single exposure
It was classified into Category 1 (respiratory systems, nervous systems) based on the description that it causes pneumonia, pulmonary edema, bronchitis, tracheal ulcer, decrease of lung function, asthma and asthmatic symptoms and it causes vomiting, headache, sense of uneasiness, syncope, fatigue, etc. and also causes photosensitivity enhancement and direct effect to the cerebral cortex in humans .
Specific target organs/systemic toxicity following repeat exposure
It was classified in Category 1 (respiratory systems ,olfactus organ) based on the description that it causes bronchus disease and pulmonary hemorrhage in humans and biochemical changes which indicates the effects on kidney function. It was classified into Category 2 based on that a disorder is done to a tooth.

12. Ecological Information

Eco toxicity

Fish : Oncorhynchus mykiss (rainbow trout) LC50	0,014 mg/l - 96 h
Crustacea: Daphnia magnaEC 50 :	0.085 mg/l – 48 h
Persistence and degradability	Rapid degradability
Bio-accumulative potential	Not Bio-accumulative
Mobility in soil	No data available
Other adverse effects	highly toxic to water bodies, kills bacteria

13. Disposal Considerations

Waste treatment methods

Waste treatment should be managed in an appropriate and approved waste facility. Dispose of all contained and contaminated spill residue in accordance with local/regional/national/international regulations.

Contaminated packaging

Dispose of as unused product

14. Transport Information

UN number	1017
UN proper shipping name	CHLORINE
Transport hazard class (es)	2.3 **Sub risk:** 5.1,8
Packaging group	none

ADR

14.1 UN Number:	1017
14.2 UN Proper Shipping Name:	CHLORINE
14.3 Transport Hazard Class (es)	
Class:	2
Label(s):	2.3, 5.1, 8
Hazard No. (ADR):	265
Tunnel restriction code:	(C/D)
Emergency Action Code:	2XE
14.4 Packing Group:	–
14.5 Environmental hazards:	Environmentally Hazardous
14.6 Special precautions for user:	–

RID

14.1 UN Number:	1017
14.2 UN Proper Shipping Name	CHLORINE
14.3 Transport Hazard Class (es)	
Class:	2
Label(s):	2.3, 5.1, 8
14.4 Packing Group:	–
14.5 Environmental hazards:	Environmentally Hazardous
14.6 Special precautions for user:	–

IMDG

14.1 UN Number:	1017
14.2 UN Proper Shipping Name:	CHLORINE
14.3 Transport Hazard Class (es)	
Class:	2.3
Label(s):	2.3, 5.1, 8
EmS No.:	F-C, S-U
14.3 Packing Group:	–
14.5 Environmental hazards:	P
14.6 Special precautions for user:	–

IATA

14.1 UN Number: 1017
14.2 Proper Shipping Name: Chlorine
14.3 Transport Hazard Class (es):
Class: 2.3
Label(s): –
14.4 Packing Group: –
14.5 Environmental hazards: Environmentally Hazardous
14.6 Special precautions for user: –
Other information
Passenger and cargo aircraft: Forbidden.
Cargo aircraft only: Forbidden.
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: not applicable
Additional identification: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

15. Regulatory Information

Thailand Regulations:

- Act Armament Control, 1987, announced by the Ministry of Defense. Ammunition Type 2.3
- Hazardous Substances Act: Class of Hazardous Substance: Type 3 and List 5.1
- Hazardous Substances: (Ministry of Labor)
- Quantities of dangerous concentrations of chemicals (Ministry of Labor)

International Laws/Regulations:

- CLP: Annex VI (CLP Regulation)

U.S. Regulations:
SARA TITLE III of the Emergency Planning and Community Right-To Know Act (EPCRA) of 1986 and of 40 CFR 372:
Section 302 Extremely Hazardous Substance (EHS): CAS # 7782-50-5 100 Lbs. (45.4 Kilograms) (8.77Gals.) Threshold Planning Quantity (TPQ)
Section 304 Extremely Hazardous Substance (EHS): CAS # 7782-50-5 10 Lbs. (4.54 Kilograms) (0.877Gals.) Reportable Quantity (RQ).

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
29 CFR Parts 1910.119: Process Safety Management of Highly Hazardous Chemicals. Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals, listed on Appendix A of the standard

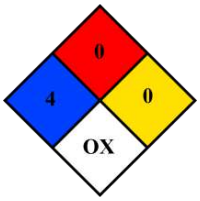
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: T, N
Risk Phrases:

- **R23** Toxic by inhalation.
- **R36/37/38** Irritating to eyes, respiratory system and skin.
- **R50** Very toxic to aquatic organisms.

Safety Phrases:

- **S1/2** Keep locked up Keep out of the reach of children.
- **S 9** Keep container in a well-ventilated place.
- **S45** In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- **S61** Avoid release to the environment. Refer to special instructions/ Safety data sheets.

Label:
NFPA 704:



GHS:



16. Other Information

The information in this SDS was obtained from sources which we believe are reliable. However, the Information is provided without any warranty, expressed or implied, regarding its accuracy and/or completeness. User should consult experts in their review of this SDS prior to use of the product.

1. The National Institute for Occupational Safety and Health(NIOSH):NIOSH Pocket Guide to Chemical Hazardshttp://www.cdc.gov/niosh/npg/npgdcas.html
2. United Nations Recommendations on the Transport of Dangerous Goods (UNRTDG): http://www.unece.org/trans/danger/publi/unrec/rev14/English/05E_Index.pdf
3. Department of industrial work; Thailand : http://ghs.diw.go.th:8080/GHSThaiUser/servlet/ChemServlet?action=QCL

Material Safety Data Sheet

Chloroform

1 . Product and company identification

Product name : Chloroform

Product code : CX1050

Supplier : EMD Chemicals Inc.
480 S. Democrat Rd.
Gibbstown, NJ 08027
856-423-6300 Technical Service
Monday-Friday: 8:00 -5:00 PM

Synonym : Trichloromethane

Material uses : Other non-specified industry: Analytical reagent.

Validation date : 4/2/2009.

In case of emergency : 800-424-9300 CHEMTREC (USA)
613-996-6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

2 . Hazards identification

Emergency overview : WARNING!

HARMFUL IF INHALED OR SWALLOWED.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
SUSPECT CANCER HAZARD - MAY CAUSE CANCER.
MAY CAUSE DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, LIVER, HEART, SKIN, EYES, CENTRAL NERVOUS SYSTEM.

WARNING: This product contains a chemical known to the State of California to cause cancer.

Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Physical state : Liquid. [Colorless.]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Toxic by inhalation. Irritating to respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Toxic if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Irritating to skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Target organs : May cause damage to the following organs: kidneys, liver, heart, skin, eyes, central nervous system (CNS).

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Continued on next page

3 . Composition/information on ingredients

Name	CAS number	% by weight
Chloroform	67-66-3	100

4 . First aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Emits very toxic fumes when heated to decomposition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container.

Continued on next page

7 . Handling and storage

Handling : Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container, protected from direct sunlight. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Chloroform	**ACGIH (United States, 1996).** TWA: 49 mg/m³ **OSHA (United States, 1989).** TWA: 9.78 mg/m³ **ACGIH TLV (United States, 1/2008).** TWA: 10 ppm 8 hour(s). TWA: 49 mg/m³ 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 2 ppm 8 hour(s). TWA: 9.78 mg/m³ 8 hour(s). **NIOSH REL (United States, 6/2008).** STEL: 2 ppm 60 minute(s). STEL: 9.78 mg/m³ 60 minute(s). **OSHA PEL (United States, 11/2006).** CEIL: 50 ppm CEIL: 240 mg/m³

Consult local authorities for acceptable exposure limits.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: Viton

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. Recommended: splash goggles

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Recommended: lab coat

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Continued on next page

9 . Physical and chemical properties

Physical state	:	Liquid. [Colorless.]
Color	:	Colorless.
Odor	:	Pleasant. Ethereal.
Molecular weight	:	119.37 g/mole
Molecular formula	:	CHCl3
pH	:	Not available.
Boiling/condensation point	:	60.5°C (140.9°F)
Melting/freezing point	:	-63°C (-81.4°F)
Critical temperature	:	263.3°C (505.9°F)
Relative density	:	1.49
Vapor pressure	:	22.3 kPa (167 mm Hg)
Vapor density	:	4.1 [Air = 1]
Volatility	:	100% (v/v)
Odor threshold	:	205 ppm
Evaporation rate	:	10.2 (Butyl acetate. = 1)
VOC	:	100 (%)
Solubility	:	Partially soluble in the following materials: water

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	Avoid exposure - obtain special instructions before use. Do not swallow.
Materials to avoid	:	Reactive or incompatible with the following materials: oxidizing materials, metals and alkalis.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	:	Emits very toxic fumes when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Test	Route	Species	Result
Chloroform	LD50	Intraperitoneal	Rat	894 mg/kg
	LD50	Oral	Rat	695 mg/kg
	LD50	Oral	Rat	300 mg/kg
	LD50	Oral	Mouse	36 mg/kg
	LD50	Dermal	Rabbit	>20 g/kg
	LD50	Oral	Rat	1250 mg/kg
	LDLo	Oral	Man	2514 mg/kg
	LDLo	Oral	Rabbit	500 mg/kg
	TDLo	Oral	Rat	0.5 mL/kg
	TDLo	Oral	Rat	14.9 mg/kg
	TDLo	Oral	Rat	119.37 mg/kg
	TDLo	Intraperitoneal	Rat	0.5 mL/kg
	TDLo	Intraperitoneal	Rat	180 mg/kg
	LC50	Inhalation Vapor	Rat	6000 mg/m3
	LC50	Inhalation	Rat	47702 mg/m3

Continued on next page

11 . Toxicological information

	Vapor		
LC50 Inhalation Vapor	Rat		47702 mg/m³

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Chloroform	A3	2B	-	+	Possible	-

May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity

No known significant effects or critical hazards.

Teratogenicity

No known significant effects or critical hazards.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Chloroform	Acute EC50 950 mg/L	Algae	48 hours
	Acute EC50 560 mg/L	Algae	48 hours
	Acute LC50 81.5 to 106 mg/L Marine water	Crustaceans - Northern pink shrimp - Penaeus duorarum - 35 to 50 mm	48 hours
	Acute LC50 65.7 mg/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 17.1 mg/L	Fish	96 hours
	Acute LC50 16.2 mg/L	Fish	96 hours
	Acute LC50 15.1 mg/L	Fish	96 hours
	Acute LC50 13.3 mg/L	Fish	96 hours
	Acute LC50 17.1 ppm Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
	Acute LC50 16.2 ppm Fresh water	Fish - Bluegill - Lepomis macrochirus	96 hours
	Acute LC50 15.1 ppm Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
	Acute LC50 13.3 ppm Fresh water	Fish - Bluegill - Lepomis macrochirus	96 hours
	Acute LC50 13300 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 17.1 cm - 126.4 g	96 hours
	Acute LC50 758000 to 850000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Young - <=24 hours	48 hours
	Acute LC50 353000 to 512000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <12 hours	48 hours
	Acute LC50 290000 to 512000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate - <12 hours	48 hours
	Acute LC50 66800 to 71900 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours
	Acute LC50 66500 to 78500 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours
	Acute LC50 16200 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 16.9 cm - 129.9 g	96 hours
	Acute LC50 63800 to	Daphnia - Water flea -	48 hours

Continued on next page

12 . Ecological information

78000 ug/L Fresh water	Daphnia magna - Neonate	
Acute LC50 15100 to 22100 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
Acute LC50 29000 to 47000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <24 hours	48 hours
Acute LC50 15100 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling) - 11.5 cm - 16.8 g	96 hours
Acute LC50 17100 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling) - 8.8 cm - 7.6 g	96 hours
Acute LC50 13300 to 20800 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus	96 hours

Environmental effects : No known significant effects or critical hazards.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national and local laws and regulations.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1888	CHLOROFORM	6.1	III		**Reportable quantity** 10 lbs. (4.54 kg)

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Toxic material
Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.
TSCA 8(d) H and S data reporting: Chloroform : 1987

TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

SARA 302/304/311/312 extremely hazardous substances: Chloroform
SARA 302/304 emergency planning and notification: Chloroform
SARA 302/304/311/312 hazardous chemicals: Chloroform
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Chloroform : Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: Chloroform

Clean Water Act (CWA) 311: Chloroform

Continued on next page

15 . Regulatory information

Clean Air Act (CAA) 112 accidental release prevention: Chloroform

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: Chloroform

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Chloroform	67-66-3	100
Supplier notification :	Chloroform	67-66-3	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

Massachusetts Substances : This material is listed.

New Jersey Hazardous Substances : This material is listed.

New York Acutely Hazardous Substances : This material is listed.

Pennsylvania RTK Hazardous Substances : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Chloroform	Yes.	No.	20 µg/day (ingestion) 40 µg/day (inhalation)	No.

Canada

WHMIS (Canada) : Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canadian lists : **CEPA Toxic substances:** This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

CEPA DSL / CEPA NDSL : This material is listed or exempted.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

EU regulations

Hazard symbol or symbols :



Risk phrases : R40- Limited evidence of a carcinogenic effect.
R22- Harmful if swallowed.
R48/20/22- Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R38- Irritating to skin.

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15 . Regulatory information

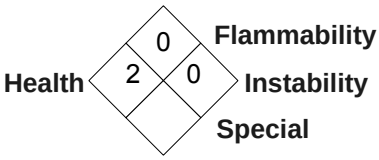
Safety phrases : S2- Keep out of the reach of children.
S36/37- Wear suitable protective clothing and gloves.

International regulations

International lists : **Australia inventory (AICS):** This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory (ENCS): This material is listed or exempted.
Japan inventory (ISHL): Not determined.
Korea inventory (KECI): This material is listed or exempted.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.

16 . Other information

National Fire Protection Association (U.S.A.) :



Other special considerations : Contains stabilizer. (<1% wt/wt)

Notice to reader

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

Hydrochloric Acid MSDS

Effective Date: December 03, 2012
24 Hour Emergency Contact:
ChemTel: (800)255-3924
www.pioneerforensics.com

1. PRODUCT AND COMPANY IDENTIFICATION

Product:	**Hydrochloric Acid**
Product Number(s):	PF021, PF022
CAS#:	7647-01-0
Synonyms:	Muriatic acid; Hydrogen chloride, aqueous; Chlorohydric acid
Manufacturer:	Pioneer Forensics, LLC 804 E. Eisenhauer Blvd. Loveland, CO 80537 Ph: (970) 292-8487
Emergency Number:	(800) 255-3924 (CHEM-TEL)
Customer Service:	(970) 292-8487

2. HAZARDS IDENTIFICATION

Emergency Overview: DANGER! Corrosive. Causes severe skin, eye, and digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.

Safety Ratings: Health: 3, Severe; Reactivity: 1, Slight; Flammability: 0, None; Contact: 4, Extreme

OSHA Regulatory Status: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Acute Health Effects:

Routes of Exposure: Inhalation, ingestion, skin contact, eye contact

Inhalation: Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.

Ingestion: Corrosive. Harmful if swallowed. May produce burns to the lips, oral cavity, upper airway, esophagus and digestive tract.

Skin Contact: Corrosive. Causes severe burns.

Eye Contact: Corrosive. Causes severe burns. Vapor or spray may cause eye damage, impaired sight or blindness.

Target Organs: Skin, respiratory system, eyes, lungs

Chronic Health Effects: Corrosive. Prolonged contact causes serious tissue damage.

Aggravation of:
Medical Conditions: Repeated or prolonged exposure to the substance can produce target organs damage. Persons with pre-existing skin disorders or eye problems may be more susceptible to the effects of the substance.

Potential Environmental Effects: May affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS#	Chemical Formula	Formula Weight	Hazardous	% by Weight
Hydrochloric Acid	7647-01-0	HCl	36.46	Yes	36.5 - 38.0
Water	7732-18-5	H_2O	18.02	No	62.0 - 63.5

4. FIRST AID MEASURES

First Aid Procedures:

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Get medical attention immediately.

Ingestion: Do not induce vomiting. If vomiting occurs, keep head low so that vomit does not enter lungs. Never give anything by mouth to an unconscious person. GET MEDICAL ATTENTION IMMEDIATELY.

Skin Contact: Flush affected area with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention immediately.

Eye Contact: Check for and remove contact lenses. Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

General Advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

Notes to Physician: Treat symptomatically. Keep victim under observation.

5. FIRE FIGHTING MEASURES

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 1

Flammable Properties: The material is not flammable.

Flash Point: Not applicable

Auto-ignition Temp: Not applicable

Flammable Limits in Air (% by volume): Not applicable

Suitable Extinguishing Media: Water, dry powder, foam, carbon dioxide

Unsuitable Extinguishing Media: No information found

Hazardous Combustion Products:	Hydrogen chloride. Chlorine. May decompose upon heating to produce corrosive and/or toxic fumes.
Specific Hazards:	Fire may produce irritating, corrosive, and/or toxic gases.
Special Protective Equipment For Firefighters:	As in any fire, wear MSHA/NIOSH approved (or equivalent) self-contained positive pressure or pressure-demand breathing apparatus and full protective gear.
Specific Methods:	Use water spray to cool unopened containers. Cool containers exposed to flames with flooding quantities of water until well after the fire is out. In the event of fire and/or explosion do not breathe fumes.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Ventilate area of leak or spill. Isolate hazard area and keep unnecessary and unprotected personnel away from the area of the leak or spill. Keep upwind. Keep out of low areas. Wear appropriate personal protective equipment as specified in the Exposure Control and Personal Protection Section 8. Avoid contact with eyes, skin, and clothing.
Environmental Precautions:	Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground. In case of large spill, dike if needed.
Methods for Containment:	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.
Methods for Cleaning Up:	Absorb spill with an inert material (e.g. vermiculite, dry sand, earth, cloth, fleece), and place in a suitable non-combustible container for reclamation or disposal. Do not use combustible materials, such as sawdust. Clean contaminated surface thoroughly. Neutralize spill area and washings with soda ash or lime. Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations.

7. HANDLING AND STORAGE

Handling:	Wear personal protective equipment (see section 8). Use only in well-ventilated areas. Provide sufficient air exchange and/or exhaust in work rooms. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Do not ingest. When using, do not eat, smoke, or drink. Keep away from incompatible materials. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly after handling. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquids). Observe all warnings and precautions listed for the product Use caution when combining with water. DO NOT add water to acid. ALWAYS add acid to water while stirring to prevent release of heat, steam, and fumes.
Storage:	Store in a cool, dry, ventilated area away from incompatible materials. Store in original container. Keep containers tightly closed and upright. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

Exposure Limits:	ACGIH:	Ceiling: 2 ppm
	OSHA:	Ceiling: 5 ppm 7 mg/m^3
Engineering Controls:	Ensure adequate ventilation. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls	

to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal Protective Equipment:

Eye/Face Protection: Wear safety glasses with side shields or goggles and a face shield.

Skin Protection: Wear appropriate chemical resistant clothing (with long sleeves) and appropriate chemical resistant gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with acid gas cartridge. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General Hygiene Considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Provide eyewash station and safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Transparent
Color:	Colorless
Odor:	Pungent, irritating
Molecular Formula:	HCl
Molecular Weight:	36.46
pH:	0.1 (1.0 N Solution)
Specific Gravity:	1.18
Freezing/Melting Point:	-25 °C (-13 °F)
Boiling Point:	50.5 °C (123 °F)
Flash Point:	Not applicable
Auto Ignition Temperature:	Not applicable
Flammable Limits in Air (% by Volume):	
Upper:	Not applicable
Lower:	
Solubility:	Miscible with water
Vapor Pressure:	25 kPa at 25°C (estimate)
Vapor Density:	1.3 (estimate)
Odor threshold (ppm):	0.25-10 ppm
Evaporation Rate:	No information found
Partition Coefficient (n-octanol/water):	No information found

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: Incompatibles

Incompatible Materials: Bases, metals, oxidizing agents, acids, amines, reducing agents, organic materials

Hazardous Decomposition Products:	Hydrogen chloride, chlorine. May decompose upon heating to product corrosive and/or toxic fumes.
Possibility of Hazardous Reactions:	Can react vigorously, violently or explosively with incompatible materials listed above.
Hazardous Polymerization:	Will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological Data:

Oral Rat LD50:	240 mg/kg (estimate)
Oral Rabbit LD50:	900 mg/kg
Inhalation Rat LC50:	3124 mg/L 1 H

Acute Effects: Strongly corrosive. May cause deep tissue damage. Harmful if swallowed.

Local Effects: Causes severe burns. Mist or vapor extremely irritating to eyes and respiratory tract.

Sensitization: Not a skin sensitizer.

Chronic Effects: Corrosive. Prolonged or repeated skin contact causes serious tissue damage.

Carcinogenic Effects: This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

ACGIH:	A4 – Not classifiable as a human carcinogen
IARC:	3 – Not classifiable as to carcinogenicity of humans

Skin Corrosion/Irritation: Corrosive to skin and eyes.

Epidemiology: No epidemiological data is available for this product.

Mutagenicity: No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Neurological Effects: No information found.

Reproductive Effects: Contains no ingredient listed as toxic to reproduction.

Teratogenic Effects: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Target Organs and Symptoms: Corrosive effects. Mucus membranes, skin, eyes, kidneys, liver, respiratory tract

12. ECOLOGICAL INFORMATION

Ecotoxicological Data: LC50 Western mosquitofish (Gambusia affinis): 282 mg/L 96 H

Ecotoxicity: This product may affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

Environmental Effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and Degradability: Expected to be readily biodegradable.

Partition Coefficient (n-octanol/water): No information found.

13. DISPOSAL INFORMATION

Disposal Instructions: Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

Waste Codes: D002: Waste corrosive material (pH ≤ 2 or pH ≥12.5, or corrosive to steel)

14. TRANSPORT INFORMATION

DOT:

UN Number: UN1789

Proper Shipping Name: Hydrochloric Acid

Hazard Class: 8

Packaging Group: II

ERG Number: 157

15. REGULATORY INFORMATION

U.S. Federal Regulations:

OSHA: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Inventory: Hydrochloric Acid; Water

U.S. EPCRA (SARA Title III):

Sections 311/312:

Hazard Categories	List (Yes/No)
Section 311 – Hazardous Chemical	Yes
Immediate Hazard	Yes
Delayed Hazard	No
Fire Hazard	No
Pressure Hazard	No
Reactivity Hazard	No

Section 302:

Extremely Hazardous Substance:	Hydrochloric Acid
Reportable Quantity:	5000 lbs
Threshold Planning Quantity:	500 lbs

Section 313: Toxic chemical or category: Hydrochloric Acid

	De minimis concentration:	1.0%
CERCLA:	Hydrochloric Acid:	5000 lbs

International Inventories:

Country(s) or Region	Inventory Name	On Inventory (Yes/No)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes

*A "Yes" indicates that the listed component(s) of this product comply with the inventory requirements administered by the governing country(s)

16. OTHER INFORMATION

Product Use: Laboratory and/or field reagent

Disclaimer: Pioneer Forensics LLC provides the information in this Material Safety Data Sheet in the belief that it is reliable but assumes no responsibility for its completeness or accuracy. The physical properties reported in this MSDS are obtained from the literature and do not constitute product specifications. Pioneer Forensics LLC makes and gives no representations or warranties with respect to the information contained herein or the product to which it refers, whether express, implied, or statutory, including without limitation, warranties of accuracy, completeness, merchantability, non-infringement, performance, safety, suitability, stability, and fitness for a particular purpose. No warranty against infringement of any patent, copyright or trademark is made or implied. This MSDS is intended only as a guide to the appropriate handling of the material by a properly trained person. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. Accordingly, Pioneer Forensics LLC assumes no liability whatsoever for the use of or reliance upon this information including results obtained, incidental or consequential damages, or lost profits.

Issue Date: 12/03/2012

Reason for Revision: Not applicable

SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Carbon tetrachloride**

Cat No. : **AC148170000; AC148170010; AC148170025**

Synonyms Tetrachloromethane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute Inhalation Toxicity - Vapors	Category 3
Carcinogenicity	Category 2
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Liver.	

Label Elements

Signal Word
Danger

Hazard Statements
Toxic if swallowed

Toxic in contact with skin
Toxic if inhaled
May cause cancer
Causes damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects
Harms public health and the environment by destroying ozone in the upper atmosphere
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Carbon tetrachloride	56-23-5	>95

4. First-aid measures

Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation	Remove to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Drowsiness. Dizziness. Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	982 °C / 1799.6 °F
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Phosgene. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Avoid contact with skin and eyes. Keep people away from and upwind of spill/leak.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not let this chemical enter the environment.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.
Storage.	Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Incompatible Materials. Strong oxidizing agents. Fluorine. Metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Carbon tetrachloride	TWA: 5 ppm STEL: 10 ppm Skin	(Vacated) TWA: 2 ppm (Vacated) TWA: 12.6 mg/m³ Ceiling: 25 ppm TWA: 10 ppm	IDLH: 200 ppm STEL: 2 ppm STEL: 12.6 mg/m³	TWA: 5 ppm STEL: 10 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-23 °C / -9.4 °F
Boiling Point/Range	76 °C / 168.8 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	121 mbar @ 20 °C
Vapor Density	No information available
Specific Gravity	1.594
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	982 °C / 1799.6 °F
Decomposition Temperature	> 100°C
Viscosity	0.97 mPa.s at 20 °C
Molecular Formula	C Cl4
Molecular Weight	153.82

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Fluorine, Metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Phosgene, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Carbon tetrachloride	LD50 = 2350 mg/kg (Rat)	LD50 = 5070 mg/kg (Rat)	LC50 = 8000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Carbon tetrachloride	56-23-5	Group 2B	Reasonably Anticipated	A2	X	A2

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause

long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Carbon tetrachloride	Not listed	LC50: 36.3 - 47.3 mg/L, 96h flow-through (Pimephales promelas) LC50: 9.68 - 11.3 mg/L, 96h static (Pimephales promelas) LC50: 23 - 33 mg/L, 96h static (Lepomis macrochirus)	EC50 = 34 mg/L 10 min EC50 = 5.6 mg/L 5 min	EC50: = 29 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Carbon tetrachloride	2.75

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Carbon tetrachloride - 56-23-5	U211	-

14. Transport information

DOT

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

TDG

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

IATA

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

IMDG/IMO

UN-No UN1846
Proper Shipping Name CARBON TETRACHLORIDE
Hazard Class 6.1
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Carbon tetrachloride	56-23-5	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Carbon tetrachloride	56-23-5	X	-	200-262-8	X	X	X	X	X	KE-04756

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Carbon tetrachloride	56-23-5	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Carbon tetrachloride	X	10 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Carbon tetrachloride	X	X	-

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Carbon tetrachloride	10 lb 1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Carbon tetrachloride	56-23-5	Carcinogen	5 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Carbon tetrachloride	X	X	X	X	X

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Carbon tetrachloride	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Carbon tetrachloride	56-23-5	Listed	Not applicable	Annex I (Group IV substance) : ODP = 1.1 Annex B - Group II : ODP = 1.1	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Carbon tetrachloride	56-23-5	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

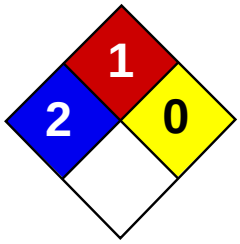
Creation Date 24-Nov-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS







Material Safety Data Sheet
Methylene chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methylene chloride

Catalog Codes: SLM2398, SLM3772, SLM1297, SLM2677, SLM4054

CAS#: 75-09-2

RTECS: PA8050000

TSCA: TSCA 8(b) inventory: Methylene chloride

CI#: Not available.

Synonym: Dichloromethane

Chemical Name: Methylene Chloride

Chemical Formula: C-H2-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methylene chloride	75-09-2	100

Toxicological Data on Ingredients: Methylene chloride: ORAL (LD50): Acute: 1600 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator). Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by OSHA. Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, mucous membranes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 556°C (1032.8°F)

Flash Points: Not available.

Flammable Limits: LOWER: 12% UPPER: 19%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/ fumes/ vapor/spray. 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.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 50 from ACGIH (TLV) [United States] TWA: 174 from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 84.93g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 39.75°C (103.5°F)

Melting Point: -96.7°C (-142.1°F)

Critical Temperature: Not available.

Specific Gravity: 1.3266 (Water = 1)

Vapor Pressure: 46.5 kPa (@ 20°C)

Vapor Density: 2.93 (Air = 1)

Volatility: Not available.

Odor Threshold: 214 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility: Easily soluble in methanol, diethyl ether, n-octanol, acetone. Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 1600 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 52000 1 hours [Rat].

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by OSHA. Classified 2B (Possible for human.) by IARC. Causes damage to the following organs: lungs, the nervous system, liver, mucous membranes, central nervous system (CNS).

Other Toxic Effects on Humans: Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Dichloromethane UNNA: 1593 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Methylene chloride California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Methylene chloride Pennsylvania

RTK: Methylene chloride Massachusetts RTK: Methylene chloride TSCA 8(b) inventory: Methylene chloride SARA 313 toxic chemical notification and release reporting: Methylene chloride CERCLA: Hazardous substances.: Methylene chloride

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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DEEPAK FERTILISERS AND PETROCHEMICALS CORPRN.LTD.

MATERIAL SAFETY DATA SHEET

Methanol

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Chemical Name	:	Methanol
Chemical Formula	:	CH_3OH
CAS Number	:	67-56-1
Synonyms	:	Methyl alcohol,methyl hydrate,wood spirit,methyl hydroxide
General Use	:	Solvent,fuel,feedstock
Manufacturer's Name	:	Deepak Fertilisers and Petrochemicals Corprn. Ltd.
Address :	:	Plot K-1, MIDC Indl Area, Taloja A.V., Dist: Raigad
Telephone no. for info.	:	+91-022-67684000

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

Composition	:	Methyl alcohol
ACGIH TLV	:	200ppm (TWA), 250ppm (STEL)

SECTION 3 - HAZARDS IDENTIFICATION

Primary Entry Routes	:	Inhalation, skin, eyes and ingestion
Acute Effects	:	Inhalation of high air born concentration can also irritate mucous membranes,cause headache,nausea,sleepiness,confusion, loss of consciousness,digestive and visual disturbances,and even death.
Carcinogenicity	:	Not available.
Chronic Effects	:	Repeated exposure by inhalation or absorption may cause systemic poisoning,brain disorders,impaired vision and blindness. Inhalation may worsen conditions such as emphysema or bronchitis. Repeated skin contact may cause dermal irritation,dryness and cracking.
NFPA rating	:	Health – 2; Fire – 3; ` Reactivity - 0

SECTION 4 - FIRST AID MESURES

Eyes	:	Immediately flush eyes with plenty of water for at least 15 minutes,keeping eyelids open .cold water may be used. Get medical attention immediately.
Skin	:	Immediate flush skin with plenty of water at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used .Get medical attention immediately.
Inhalation	:	Remove affected person to fresh air. ;If not breathing, give artificial respiration. Get medical attention immediately.
Ingestion	:	Swallowing methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion.If conscious and medical aid is not immediately available,do not induce vomiting. Get medical attention.

MATERIAL SAFETY DATA SHEET

SECTION 5 - FIRE FIGHTING MEASURES

Flash point	:	11 ^{0}C
Flash point method	:	Closed cup
Auto ignition temp.	:	385 ^{o}C
L E L	:	6.00%
U E L	:	36.00%
Flammability classifn.	:	Flammable
Extinguishing media	:	Small fire: Dry Chemicals,Water spray. Large fire:AFFF(R)(Aqueous film forming foam(alcohol resistance)type with either a 3% or 6% foam proportioningsystem.
Hazardous combustion products	:	Toxic gases and vapours;oxides of carbon and formaldehyde .

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Small Spills	:	Soak up spill with non-combustible absorbent material. Recover methanol and dilute with water to reduce fire hazard. Prevent spilled methanol from entering sewers,confined spaces,drains ,or waterways. Restrict access to unprotected personnel.
Large Spills	:	If necessary,contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapour and fire hazard. Maximize methanol recovery for recycling or reuse. Collect liquid with explosive proof pump.
Clean up	:	Wash the area with water.

SECTION 7 - HANDLING AND STORAGE

Handling Precautions	:	Keep away from heat,spark and flame & sources of ignition. Ground all equipment containing material. Do not breath gas fumes,vapor or spray. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents,metals,acids.
Storage Requirements	:	Store in a cool,well ventilated area away from sources of ignition. Store and handle in accordance with all current regulation and standards. Use explosion proof electrical equipment. Ensure proper electrical grounding procedure are in place.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls	:	Provide exhaust ventilation or other engineering control to keep the air born concentration of vapour below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Respiratory Protection	:	If exposure limit is exceeded, use respiratory protection
Protective Clothing / Equipment	:	Wear impervious protective clothing including boots, gloves, Splash goggles. Full Suit. Self contained breathing apparatus.
	:	Safety shower,Eye wash fountain.

MATERIAL SAFETY DATA SHEET

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State	:	Liquid
Appearance & Odour	:	Clear,Colorless liquid with Mild characteristic alcohol odor
Vapor Pressure	:	12.8 kPa @20 ^{0}C
Specific Gravity	:	0.7915 (Water =1)
Water Solubility	:	Easily soluble in cold and hot water.
Boiling Point	:	64.7 ^{0}C @101.3 kPa
Freezing Point	:	(-)97.8 ^{0}C
Vapor Density	:	1.105 @ 15 ^{0}C
Critical Temperature	:	239.4 ^{0}C

SECTION 10 - STABILITY AND REACTIVITY

Stability	:	Product is stable.
Chemical incompatibilities	:	Reactive with oxidizing agents,metal,acids.
Conditions to Avoid	:	Heat, flames, ignition sources.
Hazardous Decomposition product	:	Formaldehyde,carbon dioxide,and carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Toxic-Inhalation	:	Hazardous in case of skin contact(irritant),of ingestion,of inhalation.
Chronic Effects	:	Mutagenic for mammalian somatic cells,Mutagenic for bacteria and/or yeast. Passes through the placental barrier.May affect genetic material. May cause birth defects and adverse reproductive effects(Paternal and maternal effect and fetotoxicity)based on animal study.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental toxicity	:	Methanol in fresh or salt water may have serious effects on aquatic life. A study on methanol's toxic effect on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down into carbon dioxide and water.
Biodegradability	:	Biodegrades easily in water.

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal	:	Waste must be disposed of in accordance with state and local environmental control regulations.

DEEPAK FERTILISERS AND PETROCHEMICALS CORPRN.LTD.

MATERIAL SAFETY DATA SHEET

SECTION - 14 - TRANSPORT INFORMATION

DOT Classification	:	CLASS 3 : Flammable liquid
Identification	:	Methanol, Methyl alcohol.
Special provisions for Transport.	:	Not available.

SECTION 15 - REGULATORY INFORMATION

Methyl alcohol lllinois toxic substances,flammable liquid.

SECTION 16 - OTHER INFORMATION

Prepared by	:	Deepak Fertilisers and Petrochemicals Corporation Ltd.

Disclaimer : This MSDS and the information it contains is offered to you in good faith as accurate. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individual and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents.

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TGV SRAAC LIMITED

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