Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/GJ/IND2/292720/2022
Compliance ID	639121178
Compliance Number(For Tracking)	EC/M/COMPLIANCE/639121178/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	27-11-2025
RO/SRO Name	Dr G Trinadh Kumar
RO/SRO Email	agmu174.ifs@nic.in
State	GUJARAT
RO/SRO Office Address	Integrated Regional Offices, Gandhi Nagar
Note:- SMS and E-Mail has been sent to Dr G Trinadh Kumar, GUJARAT with Notification to Project Proponent.	

adani

Ref: MPL/ENV/MoEF&CC/2025 –November/02 **Date: 27th November, 2025**

To,
Shri Trinadh Kumar Goripati, IFS (Addl. Charge)
Inspector General of Forests (C),
Ministry of Environment, Forest and Climate Change,
Regional Office, Gandhinagar,
"Karmayogi Bhawan", Block-3, F-2 Wing, 5th Floor, Near CH-3 Circle,
Sector-10A, Gandhinagar – 382 010
E-mail : iro.gandhingr-mefcc@gov.in

Subject: Six monthly compliance report (April, 2025 to September, 2025) of Environment Clearance (EC) for the project activities "VCM–2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat" by M/s Mundra Petrochem Limited.

Reference : 1). EC Identification No. - EC22A020GJ133762, File No. IA-J-11011/149/2021-IA II(I) dated 31/08/2022.
2). F.No.J-11011/149/2021 – IA – II(I) Dated 27/12/2022.
3). Compliance ID: 127619778, Compliance No.: EC/M/COMPLIANCE/127619778/2025 Submission Date: 22/05/2025 for the reporting period Oct, 2024 – March–2025.

Respected Sir,

With reference to above subject, MoEF&CC vide above refer letter dated 31/08/2022 has granted environment clearance for the project activities "VCM–2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Adani Enterprises Limited". Followed by MoEF&CC vide above refer letter dated 27/12/2022 has transferred the Environment Clearance on the name of M/s Mundra Petrochem Limited from M/s Adani Enterprises Limited.

The proposed PVC project is currently in the final design, detailed engineering, and procurement stage with construction activities are ongoing at the site. We are hereby submitting a soft copy of the six-monthly EC compliance report for the period April to September, 2025.

We hope you will find the above in order.

Thanking you,
Yours faithfully,

Mundra Petrochem Limited

Vinay Kumar Singh
CSO & BU Environment Head

Copy to : 1. Reginal Directorates, CPCB, Vadodara : arvindjha.cpcb@gov.in
2. Member Secretory, GPCB : ms-gpcb@gujarat.gov.in
3. Regional Office, GPCB (Kutch East): ro-gpcb-kute@gujarat.gov.in

Mundra Petrochem Limited
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: U23209GJ2021PLC122112

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

MUNDRA PETROCHEM LIMITED

Six Monthly EC Compliance Report

April – September, 2025

ENVIRONMENTAL CLEARANCE

FOR

The project activities "VCM–2002 KTPA,
PVC–2000 KTPA, Ethylene Glycol– 400 KTPA at
Mundra, Kutch
Gujarat

EC IDENTIFICATION NO. EC22A020GJ133762 DATED 31/08/2022

Mundra Petrochem Limited
Adani Corporate House, Shantigram, Near
Vaishnodevi Circle, S G Highway, Ahmedabad-
382421, Gujarat

Mundra Petrochem Limited

Introduction:

Mundra Petrochem Limited, wholly owned stepdown subsidiary of Adani Enterprises Limited (AEL) intends to setup a PVC Project at Mundra, Kachchh, Gujarat. The overall PVC Production capacity of the proposed project is 2000 KTPA (Kilo Tons Per Annum). PVC grades such as Suspension PVC (Resin), Chlorinated PVC (C-PVC), Mass PVC (bulk) and Emulsion PVC (paste) would be produced at the PVC Project.

For the implementation of this project, various units are proposed to be established, including a Semi-Coke Plant, Calcium Carbide Plant, Acetylene Plant, Caustic Soda (Chlor-Alkali process) Plant, VCM Plant, PVC Plant, Ethylene Glycol Plant, and Clinker & Cement Plant.

PVC produced from the facility will serve the domestic market, thereby reducing reliance on imports. The products and by-products from the plant will be marketed domestically or internationally based on prevailing market conditions.

Ministry of Environment Forest and Climate Change has granted Environment Clearance for proposed project "Poly-Vinyl Chloride (PVC) comprising of IND-I projects i.e. Semi Coke– 2030 KTPA, Cement–6 MTPA; Clinker–4 MTPA, IND-II projects i.e. VCM– 2002 KTPA, PVC– 2000 KTPA, Ethylene Glycol–400 KTPA and IND-III projects i.e. Acetylene–860 KTPA & Caustic Soda–1310 KTPA) and Calcium Carbide–2900 KTPA (Not Specified in EIA Notification)) in land notified as Industrial area of APSEZ, Ta-Mundra, Dist-Kachchh, Gujarat." vide –

Industry – I activity: EC identification no. EC22A009GJ154137 and file no. IA-J-11011/423/2021-IA-II(IND-I) dated 26/09/2022.

Industry – II activity: EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022.

Industry – III activity: EC Identification No. - EC22A013GJ127411, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022.

As part of the company's long-term business strategy, the proposed project activities have been transferred from M/s Adani Enterprises Limited (AEL) to M/s Mundra Petrochem Limited (MPL). MPL, a wholly owned subsidiary of AEL, was incorporated under the provisions of the Company Act, 2013 to undertake various business activities related to Semi-Coke, Calcium Carbide, Cement & Clinker, VCM, PVC, Ethylene Glycol, Chlor-alkali, acetylene plants, and associated products in a phased manner. Further above granted Environment Clearances have been transferred in the name of M/s Mundra Petrochem Limited (MPL) by Ministry of Environment Forest and Climate Change (MOEFCC) vide their letter no.

1. **Industry – I activity: - File no. IA-J-11011/423/2021-IA-II(IND-I) Dated 23/12/2022.**
2. **Industry – II activity: - File no. J-11011/149/2021-IA-II(I) Dated 27/12/2022.**
3. **Industry – III activity: - File no. IA-J-11011/149/2021-IA-II(I) Dated 28/11/2022.**

Further, the Consent to Establish (CTE) is granted by the Gujarat Pollution Control Board (GPCB) vide order CTE-59301 dated 13/12/2022 and same was transferred in the name of Mundra Petrochem Limited on dated 12/04/2023.

The PVC project is currently in the final design, detailed engineering, and procurement stage with construction activities are ongoing at the site. The latest progress status of site construction activities is attached as **Annexure – I.**

Point wise Compliance of Environmental Clearance for Industrial activity-II- Proposed VCM–2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA vide EC Identification No: EC22A020GJ133762 File No: IA-J-11011/149/2021-IA-II(I) Date: 31/08/2022 & subsequent EC Transfer vide File no. J-11011/149/2021-IA-II(I) Dated 27/12/2022.

S. No	Conditions	Status
A	**Specific Condition**	
(i)	The project proponent shall abide by all orders and judicial pronouncements made from time to time in the case related to public hearing and land which is pending with Gujarat High court	Agreed with requirements.
(ii)	3D studies of risk assessment shall be carried out for all hazardous chemicals and submitted to MoEF&CC within three (03) months. Recommendations of mitigation measures from possible accident shall be implemented based on advanced risk Assessment studies conducted for worst case scenarios using latest techniques.	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Currently, HAZOP review for the process plants is conducted for all units within the PVC complex to identify potential hazards and operability problems. The review assesses associated risks and safeguards, along with risk reduction measures using guide words in a structured approach. Furthermore, a Quantitative Risk Assessment and 3D (Three-dimensional) Risk Assessment study i.e a comprehensive Risk Assessment study covering the entire complex has been completed by a reputable agency. Recommendations for mitigation measures from various risk assessments are being incorporated into project design, engineering, and construction for on-site implementation. Accordingly, an Emergency Preparedness Plan and Disaster Management Plan are currently being developed for future execution/implementation. Copy of the 3D Consequence Analysis is enclosed as **Annexure – II**.
(iii)	PP shall conduct monitoring of site-specific meteorological data & air quality modelling for winter season after commissioning of	Noted and shall be complied with the requirements.

S. No	Conditions	Status
	plant and submit the report to the Regional Office of MoEF&CC.	Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Site specific meteorological data & air quality modelling for winter season will be conducted after commissioning of plant and same will be submitted to regional office of MoEF&CC.
(iv)	SO_2 emission standard from coal fired steam boilers within the projects is proposed to be within 100 mg/Nm3 that shall be achieved by installing suitable APCD such as Flue Gas Desulphurization for reduction of SOx emissions. The National Emission Standards for Petrochemical (Basic & Intermediates) issued by the Ministry vide G.S.R. 820 (E) dated 9th November 2012 as amended time to time shall be followed.	Noted and shall be complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. However, suitable APCD will be installed to control the SOx emission level within the stipulated norms.
(v)	Incinerator of VCM Plant shall be constructed as per regulatory requirements under The Environment (Protection) Rules, 1986 for incinerator facility. VCM monitoring in ambient air shall be conducted online at 4-5 locations within plant and at AAQM monitoring locations within the study area also. Dioxins and furan emissions shall be controlled by providing proper control systems including chillers, carbon and lime dosing and running the process as per the CPCB guidelines. Monthly VOC monitoring shall be done at vulnerable points.	Noted and shall be complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. However, necessary arrangements will be made according to stipulated norms to construct the VCM incinerator and control dioxins and furan emissions. The engineering design of the VCM incinerator will comply with the applicable rules as amended in the Environment (Protection) Rules, 2010 (G.S.R.608 (E), dated 21st July 2010). Furthermore, during operations, monitoring of relevant VOCs and VCM will be conducted on a monthly basis as required.
(vi)	Properly designed and appropriate air pollution control equipment shall be attached to flue gas stacks of PVC plant, VCM plant and Ethylene Glycol Unit and flare stacks as mentioned in the environment management plan. Emission control measures shall be taken to ensure air emission standards and norms as	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Necessary APC equipment will be attached to flue gas stacks of PVC plant, VCM plant

S. No	Conditions	Status
	prescribed by CPCB and SPCB are strictly followed.	and Ethylene Glycol Unit and flare stacks as mentioned in the environment management plan for ensuring the emission level well within the stipulated norms by CPCB and SPCB.
(vii)	The company/PP shall ensure that there will be no impact on mangroves plantation present in study area due to the construction and operation phase of the project activities.	Noted and being complied with. Remark: Presently, the PVC project is under detailed engineering & procurement stage including simultaneous construction activities are in progress at site. The highest priority is being given to the conservation and protection of the nearby mangrove forest. Moreover, this degree of priority will continue to be maintained throughout the operational stage
(viii)	Conservation plan as submitted and approved by Chief Wildlife Warden, Gandhinagar vide letter no. WLP/32/C/297-298/2022-2023 dated 18/06/2022 shall be followed and budget earmarked shall be invested within the given time frame.	Noted and being complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Further, activities for the wildlife conservation plan have been completed. The review and maintenance of the plan are being conducted in consultation with the Forest Department, Kachchh, Bhuj. Details of activities performed according to the approved site-specific wildlife conservation/management plan are attached as **Annexure – III**. A copy of the report is being furnished to the Regional Office of the MoEF&CC along with the six-monthly compliance report.
(ix)	10% of total power requirement with respect to PVC, VCM, & Ethylene glycol process in overall PVC project will be met by purchasing renewable energy through DISCOM from suitable renewable energy generator or alternate sources.	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Further, the project has already planned to utilize more than 10% of electricity from renewable sources such as solar and wind, which will help in reductions in GHG emissions during operation phase.

S. No	Conditions	Status
(x)	There will be no groundwater extraction for this project. The total water requirement for PVC, VCM, Ethylene Glycol process will be 29,040 m3/day and for other common utilities will be 65,948 m3/day and will be met from APSEZL Seawater Desalination plant. Necessary permission in this regard shall be obtained from the concerned regulatory authority. The project proponent will treat and reuse the treated water within the factory and no waste or treated water shall be discharged outside the premises. Also, company shall explore possibility of optimizing and reducing the water consumption during detailed engineering and operational stage to reduce the OPEX for De-saline water.	Noted and shall be complied with the requirements. Remark: Water needed for construction is currently supplied by the Seawater Desalination Plant, and this source will continue to be used throughout the operations phase. There is no groundwater extraction taking place, nor are there any plans for it in the future. Further, this project is based on "Zero Liquid (Effluent) Discharge" concept. So, there will be no untreated water discharge outside the premises. Further, possibilities are being explored for optimizing and reducing the water consumption in detailed engineering based on technical feasibilities. Also, water conservation initiatives will further be explored during operational stage to reduce the OPEX for De-saline water.
(xi)	Comprehensive water audit to be conducted on annual basis and report to the concerned Regional Office of MOEF&CC. Outcome from the report to be implemented for conservation scheme. Performance assessment of pollution control systems/ devices shall be done annually.	Noted and shall be complied with. Remark: Comprehensive water audit will be conducted on an annual basis during the plant operation phase and the report for the same will be furnished to Regional Office, MoEF&CC. Further, outcomes of the water audit will be implemented for conservation scheme and performance assessment of pollution control systems/ devices will also be done annually during operation phase.
(xii)	Industrial waste water shall be treated in ETP followed by RO and MEE. Treated water shall be reused back as cooling tower make up water and boiler feed water. Domestic sewage shall be treated in STP, and treated water shall be reused in gardening. No any untreated water shall be disposed of outside the plant area to avoid impact on surface water quality and Zero effluent Discharge concept shall be followed. Online flow meters shall be installed at inlet and outlet of the ETPs. Use of PPE's shall be mandatory while handling the chemicals in ETP to avoid spillage	Noted and shall be complied with. Remark: This project is based on "Zero Liquid (Effluent) Discharge" Concept and there will be no untreated water discharge outside the plant premises. Further, adequate capacity of wastewater treatment system will be installed to achieve the Zero Liquid (Effluent) Discharge". Treated water will be reused for cooling tower make up water and/or for other suitable activities inside the plant premises. Moreover, required online flow meters will be installed to measure the ETPs flow and adequate measures will be

S. No	Conditions	Status
		ensured while handling the chemicals in ETP to avoid spillage. In addition to this, STP has been set up for necessary treatment of domestic wastewater during construction activities. Environment Monitoring Report is enclosed as **Annexure - IV**.
(xiii)	Company shall provide extended aeration system in the ETP scheme for removal of total Ammonical nitrogen. The existing ammonia tower in ETP scheme shall be used only for removal of free ammonia from incoming effluent.	Noted and shall be complied with. Remark: ETP shall be designed considering the nature of effluent and all requisite arrangement will be provided in the ETP to control the Ammonical Nitrogen as well as free Ammonia in the effluent (if any).
(xiv)	Process effluent/any wastewater shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond. Oil catchers/oil traps shall be provided at all possible locations in rain/ storm water drainage system inside the factory premises	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. However, a separate storm water drainage system will be provided to prevent the mixing of wastewater with storm water. In addition, Guard ponds will be adequately provided to manage the initial storm runoff during rain. Additionally, oil catchers and oil traps will be installed at all feasible locations within the rain and storm water drainage system inside the factory premises.
(xv)	For safety and control of risk of any leakage from Anhydrous HCl pipeline, the pipeline shall be built using a seamless pipe with no flanges in between. Periodic Leak check with ammonia torch shall be carried out to detect the leak point along the pipeline. Toxic Leak detectors shall be installed and regularly tested at appropriate detection levels as per industry norms. Regular pipeline thickness measurements and maintenance shall be ensured. Continuous monitoring of pressure of HCl pipeline with high priority alarms, Pressure drop detection shall be monitored for promptly addressing of any leak. SCADA system shall be installed for the pipelines and interlocking shall be done. Chlorine storage tank shall be provided with safety measures such as level	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. All mandatory sensors and leak detectors will be installed according to established safety standards to mitigate the risk of leakages from the anhydrous HCl pipeline. Additionally, continuous monitoring of the HCl pipeline's pressure with high-priority alarms and pressure drop detection will be implemented to promptly address any leaks. A SCADA system will be installed for the pipelines, with appropriate interlocking mechanisms. Furthermore, the chlorine

S. No	Conditions	Status
	indicators with alarm, chlorine gas detector, chlorine sensors and emergency blower suction hoods with storage tank, rupture disc and remotely operated auto valves.	storage tank will be equipped with comprehensive safety measures, including level indicators with alarms, chlorine gas detectors, chlorine sensors, emergency blower suction hoods, rupture discs, and remotely operated automatic valves.
(xvi)	The total ash generated from the coal fired boilers shall be utilized in proposed inhouse cement manufacturing unit.	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site.
(xvii)	Public Hearing issues raised by the local people shall be addressed as per the budget and timeline submitted.	Noted and being complied with the requirements. Remarks – The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. The action plan addressing issues identified during the public hearing, as well as socio-economic concerns within the study area, is being executed concurrently with ongoing project activities at the site.MPL has initiated CER activities across all villages within the project area. During the reporting period, total CER expenditure on various community welfare and eco-development initiatives amounted to INR 232.713 lakhs. Cumulative CER spending up to the end of the reporting period stands at approximately INR 1533.713 lakhs, reflecting in line with progress of the project. The details of CER activities with expenditures are summarized in CER report enclosed as **Annexure – V.**
(xviii)	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 and	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site.

S. No	Conditions	Status
	risk mitigation measures relating to the project shall be implemented.	The project site has implemented several environmental protection measures and safeguards in line with the EMP, fulfilling relevant regulatory requirements and using the best available technologies. These measures include water sprinkling on roads to reduce dust, enforcing speed limits to control airborne particulate matter, and transporting materials either in bulkers or covered with tarpaulin sheets. Report with Photographs of the same is enclosed as **Annexure – VI.**
(xix)	Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc. Flame arresters shall be provided on tank farm, and solvent transfer to be done through pumps.	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Safe storage practices will be implemented for hazardous chemicals. Additionally, in the interest of risk management, flame arresters will be installed in the tank farm, and solvent transfer will be conducted using appropriate equipment and pumps.
(xx)	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.	Noted and shall be complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Disposal of hazardous waste /organic residue and spent carbon etc. will be done through co-processing in cement industries after obtaining necessary authorization. Further, evaporation salt will be disposed off to the TSDF during operation phase.
(xxi)	The oily sludge shall be subjected to melting pit for oil recovery and the residue shall be bio – remediated. The sludge shall be stored in HDPE lined pit with proper leachate collection system	Noted and shall be complied with. Remark: Adequate arrangements shall be provided for collection, oil recovery and storage of oily sludge.

S. No	Conditions	Status
(xxii)	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 vapor recovery system. (f) Use of high-pressure hoses for equipment cleaning etc. to reduce wastewater generation.	Noted and shall be complied with the requirements. Remarks- However, the Environmental Management Plan during construction phase with incorporating of waste minimization practices has already been prepared and construction activities are being carried out accordingly. Best available practices including suggested measures will be adopted for waste minimization.
(xxiii)	The green belt of 5-10 m width shall be developed in at least 33% of the total project area of Pocket 1, mainly along the plant periphery, in downward wind direction, and along roadsides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department. Total 33% of the greenbelt shall be design so that thickness of the greenbelt is increased on downwind side of the project in comparison to other sides. Additionally, 20-meter wide shall be developed in the plant side adjacent to the Mangrove Forest.	Noted and shall be complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. A greenbelt of adequate width will be established in phases, primarily along the plant perimeter, in the direction of prevailing winds, and alongside roads. The selection of plant species will be carried out in consultation with the State Forest Department. The adequate area is already allocated for developing & maintaining greenbelt as per the prevailing statutory/regulatory requirements. Tree plantation activities in nearby community villages, including roadside plantations, are being carried out in consultation with the local forest department. A copy of the implementation report is enclosed as **Annexure – VII** with photographs of the plantation activity.
(xxiv)	As per the Ministry's OM dated 30.09.2020 superseding the OM dated 01.05.2018 regarding the Corporate Environmental Responsibility, and as per the action plan proposed by the project proponent to address the socio-economic and	Noted and being complied with the requirements. Remarks – The PVC project is currently in the final design, detailed engineering, and

S. No	Conditions	Status
	environmental issues in the study area, the project proponent, as committed, shall provide education funds in technical training centers/ support in nearby village's schools, support in health care facilities, drinking water supply and funds for miscellaneous activities like solar street lights, battery, solar panel etc., in the nearby villages. The action plan shall to be completed within time as proposed.	procurement stage With construction activities are ongoing at the site. The action plan addressing issues identified during the public hearing, as well as socio-economic concerns within the study area, is being executed concurrently with ongoing project activities at the site. MPL has initiated CER activities across all villages within the project area. During the reporting period, total CER expenditure on various community welfare and eco-development initiatives amounted to INR 232.713 lakhs. Cumulative CER spending up to the end of the reporting period stands at approximately INR 1533.713 lakhs, reflecting in line with progress of the project. The details of CER activities with expenditures are summarized in CER report enclosed as **Annexure – V**.
(xxv)	The project proponent shall ensure 70% of the employment to the local people, as per the applicable law. The project proponent shall set up a skill development center/provide skill development training to village people	Noted and being complied with the requirements. Remark: Priority will be given to local people on skill basis as per the applicable law for employment. Skill development activities have already been started to impart necessary training to village people as part of Corporate Environmental Responsibility.
(xxvi)	A separate Environmental Management Cell (having qualified person with Environmental Science / Environmental Engineering / specialization in the project area) equipped with full-fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions. EMC head shall report directly to Head of Organization / Managing Director / CEO as per company hierarchy	The PVC project is currently in the final design, detailed engineering, and procurement stages. With construction activities are ongoing at the site A separate Environmental Management Cell, staffed with qualified individuals specializing in Environmental Science and Engineering, has been established. The head of the EMC EMC i.e CSO & BU Environment Head reports directly to the CEO according to the company's hierarchy. Furthermore, full-fledged environment management cell cum laboratory will also be developed at site for day-to-day environment management including

S. No	Conditions	Status
		carrying out the environmental monitoring activities as per the operational phase environment management plan.
(xxvii)	The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Firefighting system shall be as per the norms.	Noted and shall be complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Adequate Firefighting system / arrangement for protection of possible fire hazards during manufacturing process in material handling will be done as per the norms.
(xxviii)	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. In case of the treated effluent to be utilized for irrigation/gardening, real time monitoring system shall be installed at the ETP outlet	Noted and shall be complied with the requirements. Remark: Continuous online (24x7) monitoring system for stack emissions will be installed for measurement of flue gas discharge and the pollutants concentration as per CPCB Guideline and necessary arrangements will be made for transmission of data to the CPCB / SPCB server during operation phase. Further, as this project is on "Zero Liquide Discharge" Concept, real time monitoring system will be installed at the ETP outlet as per CPCB Guideline.
(xxix)	PP to set up occupational health Centre for surveillance of the worker's health within and outside the plant on a regular basis. The health data shall be used in deploying the duties of the workers. All workers & employees shall be provided with required safety kits/mask for personal protection.	Noted and shall be complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stages. With construction activities are ongoing at the site. Regular health check-up is being done and fitness reports of workers / employees during construction phase are maintained. Furthermore, once operations commence, routine occupational health monitoring of employees will be implemented, with all records maintained in accordance with established protocols. Further, it will be ensured that workmen are equipped with all necessary PPEs for

S. No	Conditions	Status
		Personal protection during construction as well as operational activities.
(xxx)	PP shall sensitize and create awareness among the people working within the project area as well as its surrounding area on the ban of Single Use Plastic in order to ensure the compliance of Notification published by MOEFCC on 12th August 2021. A report along with photographs on the measures taken shall also be included in the six-monthly compliance report being submitted to concerned authority.	Noted and being complied with the requirements. Remarks: Regular awareness programs are being conducted in nearby community areas to promote the ban on single-use plastics along with other important environmental conservation issues. A copy of this information is enclosed as **Annexure - VIII**.
B	**General Conditions**	
(i)	No further expansion or modifications in the plant, other than mentioned in the EIA Notification, 2006 and its amendments, shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change/SEIAA, as applicable. 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/SEIAA, as applicable, to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	Agreed with requirement. An application under Para 7 (ii) (c) of the EIA notification vide reference SW/265935/2025 dated 19/11/2025 has been submitted at PARIVESH portal for change in plant configuration during execution of the project as outcome of detailed engineering and process design, without change in production capacity and no increase in pollution load (NIPL) in line with the MoEF&CC notification vide reference S.O. 980(E) 2nd March 2021. A certificate of "no increase in the pollution load (NIPL)" for the proposed changes is obtained from the reputed State-Owned Public-Sector agency i.e. M/s Gujarat Industrial and Technical Consultancy Organization Ltd. (GITCO), also a recognized Schedule-I Environmental Auditor by the GPCB. The Acknowledgement copy from the PARIVESH Portal in respect of No change in production capacity and No increase in pollution load for the project proposal NIPL for Coal to Poly - vinyl Chloride (PVC) complex under the provisions of para 7(ii) c

S. No	Conditions	Status
		of EIA Notification and its subsequent amendment S.O.980-(E), dated 2nd March 2021 is attached as **Annexure-IX**.
(ii)	The energy source for lighting purpose shall be preferably LED based, or advanced having preference in energy conservation and environment betterment.	Noted and being complied with the requirements. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Energy efficiency measures are being integrated into the project design and engineering. High-quality LED lighting equipment will be installed in offices and residential areas for energy conservation and environment betterment.
(iii)	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 the Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (Day time) and 70 dBA (Nighttime).	Noted and being complied with. Remark: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. Additionally, ambient noise quality monitoring (ANQM) is being conducted at designated locations within the project site and surrounding villages by an independent NABL accredited laboratory. The results of the ANQM adhere to the standards specified under the E(P)A Rules, 1986. The Environment Monitoring report is attached as **Annexure – IV**.
(iv)	The company shall undertake all relevant measures for improving the socio-economic conditions of the surrounding area. CER activities shall be undertaken by involving local villages and administration and shall be implemented. The company shall undertake eco-developmental measures including community welfare measures in the project area for the overall improvement of the environment.	Noted and being complied with the requirements. Remark: A range of eco-development initiatives, as well as community welfare programs, are being carried out in stages to improve the socio-economic status of the region. These efforts fall under Corporate Environmental Responsibility (CER) and involve collaboration with local villages and authorities. To understand the current social status and needs of the local community, a "Baseline & Need Assessment Study" was

S. No	Conditions	Status
		conducted by a third-party professional agency, involving various stakeholders such as local villagers and administration. The recommendations from this study have been incorporated into the CER plan for phased implementation. MPL has initiated CER activities across all villages within the project area. During the reporting period, total CER expenditure on various community welfare and eco-development initiatives amounted to INR 232.713 lakhs. Cumulative CER spending up to the end of the reporting period stands at approximately INR 1533.713 lakhs, reflecting in line with progress of the project. The details of CER activities implemented during the reporting period along with expenditures are summarized in CER report enclosed as **Annexure – V**.
(v)	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.	Noted and shall be complied with the requirements. Remarks- The PVC project is currently in the final design, detailed engineering, and procurement stage with, construction activities are ongoing at the site. Adequate funds for EMP / environment management / pollution control measures as part of CAPEX & OPEX have been kept for implementing and complying the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as the state Government.
(vi)	A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zilla Parishad / Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions / representations, if any, were received while processing the proposal.	Environmental Clearance letter has been submitted to concerned panchayats (all 15 villages) & The Taluka Development Officer (Rural Local Body), The District Development Officer, District Industries Center, and the local NGO / trust from whom suggestions / representations received during public hearing. Letters no. are as under and reference Ack. copy of submission is enclosed as **Annexure - X.**

S. No	Conditions	Status
		1). AEL/MPL/ENV/EC/2022-September/01 Dated 02/09/2022. 2). AEL/MPL/ENV/EC/2022- September/03 Dated 02/09/2022. 3). AEL/MPL/ENV/EC/2022-September/06/01 to 15 Dated 02/09/2022.
(vii)	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.	As per MoEF&CC Office Memorandum dated 14th June, 2022, Six monthly compliance report of stipulated environment clearance conditions including results of monitored data being uploaded on PARIVESH Portal & company's website i.e https://www.adanienterprises.com.
(viii)	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.	The PVC project is currently in the final design, detailed engineering, and procurement stages. With construction activities are ongoing at the site However, Environmental Statement for the year 2024-25 have been Submitted to the Gujarat Pollution Control Board and IRO, Gandhinagar through vide our letter no. MPL/ENV/GPCB – Form – V/ 2025 – May/02 dated 12/05/2025 i.e within stipulated time period and same is also available on Companay's Website i.e https://www.adanienterprises.com. Copy of the submission is enclosed as **Annexure – XI**.

S. No	Conditions	Status
(ix)	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 and at https://parivesh.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.	The advertisement stating "the project has been accorded environmental clearance by MoEF&CC and also displayed on company website" have been published on following news papers on 5th September, 2022. (i.e within 7 days of grant of Environmental Clearance). 1. Kutch Mitra (Gujarati Language) 2. Gujarat Samachar (Gujarati Language) 3. The Times of India (English Language). Copies of the same have already been submitted to concerned authorities through vide our letter no. AEL/MPL/ENV/MoEF&CC/2022 – September/05 dated 06/09/2022. Copy enclosed as **Annexure – XII**."
(x)	The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.	Noted and complied. The requisite information is being submitted to authorities as part of six-monthly EC compliance report. Remarks: The PVC project is currently in the final design, detailed engineering, and procurement stage With construction activities are ongoing at the site. The date of financial closure is 25th April 2024 when MPL signed the financing documents with the lead banks. The commencement of land development including earth work preparation, piling for foundation/construction activities have been initiated after award of consent of establishment (CTE) from the state pollution control board i.e. 13th Dec. 2022 after obtaining necessary environmental clearance from the MoEF&CC. As per schedule, the production/commercial operation of all the proposed units is expected by 1st October 2027.
(xi)	This Environmental clearance is granted subject to final outcome of Hon'ble Supreme Court of India, Hon'ble High Court, Hon'ble NGT and any other Court of Law, if any, as may be applicable to this project.	Agreed with requirement.

Annexures

Annexure No.	Name
I	Progress Status (Photographs) of Site construction activities.
II	Consequence analysis Report
III	Activities as per approved "Wildlife Conservation Plan".
IV	Environment Monitoring Report.
V	CER Activities.
VI	Photographs of Water Sprinkling and APC measures.
VII	Tree Plantation Activities.
VIII	Awareness Program on "Ban on Single use Plastic".
IX	Ack. Copy for NIPL Application.
X	Letter for Submission of EC copy to Concern Local Authorities.
XI	e-mail copy of submission of Environment Statement – Form – V.
XI	Letter for submission of News paper and EC copy to concern authorities.

Annexure – I

Construction activities for the PVC Project at Vill: Vandh & Tunda, Ta: Mundra Dist: Kutch.

PVC Unit

Os&Us Area – Non Metallic Tank Erection

Os&Us Area – PVC Bagging Warehouse

PVC Plant – Stripping Column

VCM Plant

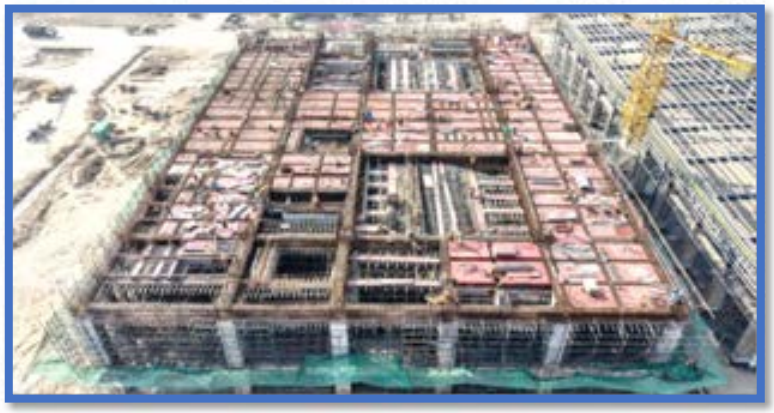
VCM Plant Train - 2

Acetylene Plant

Acetylene Plant Gas Holder

CaC2 Plant Furnace#6 Workshop

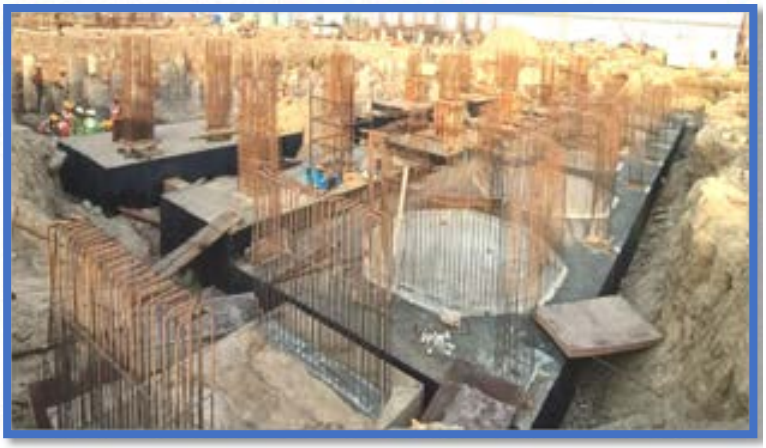
CaC2 Plant – Semi Coke Dryer



CaC2 Plant Furnace #5 Workshop

Chlor Alkali Plant – Rectifier Substation

Chlor – Alkali Plant – HCl Desorption Train #2



Chlor – Alkali Plant – Waste Gas Treatment

Green PVC Project	MUNDRA PETROCHEM LIMITED		
adani Petrochemicals / thyssenkrupp / fluidyn	3D Consequence Analysis Report for Green PVC Facilities	Doc No:	MG000-HSE-000-QB-7001
		Rev. No:	03

3D CONSEQUENCE ANALYSIS FOR GREEN PVC COMPLEX (Phase - I) @ MUNDRA, GUJARAT

For	M/s Mundra Petrochem Ltd. Aravalli, Shantigram, Near Vaishnodevi Circle, S G Highway, Ahmedabad-382421, Gujarat, India
Number of Pages	123

DOCUMENT HISTORY

Rev. No.	Date	Status Code	Status Description	Prepared By	Checked By	Approved By	AC Code
03	*13.11.25*	*IFR*	*Inclusion of Overpressure results + Comments*	*SKR*	*MK*	*KP*	
02	*22.08.25*	*IFR*	*Additional Scenario*	*SKR*	*MK*	*KP*	
01	*21.05.25*	*IFR*	*Incorporated MPL Comments*	*SKR*	*MK*	*KP*	
00	*16.04.25*	*IFR*	*Draft Report issued for Review*	*SKR*	*MK*	*KP*	

Revision History				
Sl. No.	**Rev. No.**	**Date**	**Details of changes**	**Reason for Changes**
1	*00*	16.04.25	*First Issue*	
2	01	*21.05.25*	*Incorporating MPL Comments*	*Post Review*
3	02	22.08.25	*Inclusion of additional scenario*	*Critical Scenario from each of the 6 units were identified and simulated*
4	03	13.11.25	*Included Overpressure outputs; other minor corrections based on MPL comments*	*Explosion simulations outputs were not ready during previous revision*

Table of Contents

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List of Acronyms

%v/v	Percentage Volume Fraction
agl	Above Ground Level
3D-CFD	3 Dimensional Computational Fluid Dynamics
FWG	French Working Group (for 3D CFD modelling guidelines)
INERIS	The French National Institute for Industrial Environment and Risks (L'Institut national de l'environnement industriel et des risques)
BLEVE	Boiling Liquid Expanding Vapour Explosion
EPC	Engineering Procurement and Construction
IDLH	Immediately Dangerous to Life or Health
LFL	Lower Flammability Limit (v/v)
LOC	Loss of Containment
MCA	Maximum Credible Accident Scenario
MMTPA	Million Metric Tonnes Per Annum
QRA	Quantitative Risk Assessment
UFIP	L'Union Française des Industries Pétrolières
UVCE	Unconfined Vapour Cloud Explosion
ERPG	Emergency Response Planning Guidelines
VCM	Vinyl Chloride Monomer
PVC	Poly Vinyl Chloride
O & U	Offsites and Utilities

I. INTRODUCTION

I.1 PREAMBLE

This work has been carried out by FLUIDYN in the context of 3D Consequence Analysis, for Green PVC Complex located at Mundra proposed by M/s Mundra Petrochem Limited, Gujarat, India using *fluidyn* tools.

M/s Mundra Petrochem Limited (MPL), a fully owned stepdown subsidiary of Adani Enterprises Limited, plans to establish a PVC project in Mundra, Gujarat. The Green PVC Complex is a "Green Field Project" for production of Poly Vinyl Chloride (PVC) through Semicoke route. This project will involve setting up of Calcium Carbide Plant, Acetylene Plant, Caustic Soda Plant, VCM Plant and PVC Plant with all Utilities, Off Sites and associated warehouse for storage of raw material (Semi coke, limestone & Salt) intermediate and finished product storage, necessary switchyard for power supply to the plant and entire Green PVC Complex. The intended production capacity in the Phase-I would be 1 MMTPA of PVC. The purpose of this 3D Consequence Analysis study is to identify and quantify the hazards due to the identified failure events in the Phase-I facilities (1MMTPA) of the complex.

Aerial View of the plant facilities in the vicinity of Green PVC complex is shown in *Figure 1*.

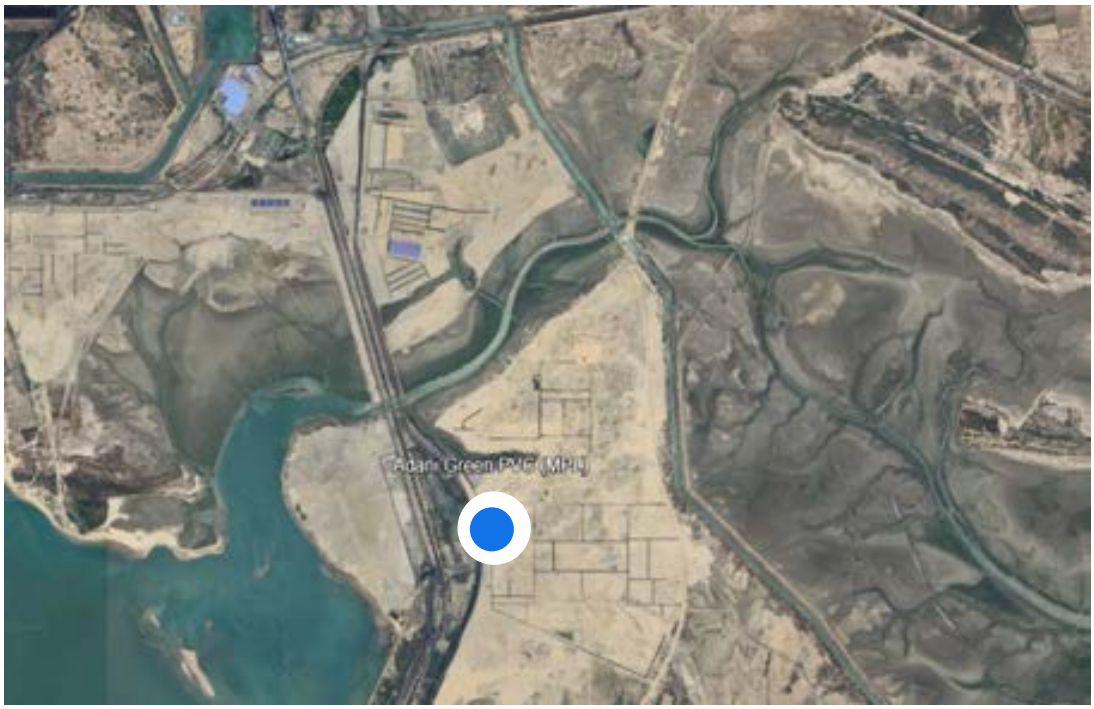


Figure 1: Satellite image of the Green PVC plant location at Mundra, Gujarat

Figure 2: 3D View of the digitized Plant facilities at Mundra, Gujarat

I.2 CONTEXT

The proposed green field project will involve setting up of Green PVC Complex comprising of 6 Units namely Calcium Carbide plant (Unit – 300), Acetylene plant (Unit – 500), Offsites and Utilities (Unit-800), Chloro-Alkali (Unit- 400), VCM (Unit – 600) plant and PVC (Unit – 700). The ultimate capacity would be of 1 MMTPA of PVC. The Green PVC Complex would have an envisaged capacity of 1 MMTPA PVC with all Utilities, offsites and associated warehouse for storage of raw material (coal, limestone & salt), intermediate and finished product storage, necessary switchyard for power supply to the plant and entire Green PVC Complex.

The consequence analysis, for the scenario identified based on their criticality across all process plant/units, O&U's facilities and interconnecting facilities of Pocket 1, is intended to identify the impact zones and adopt the mitigation measures as deemed necessary.

I.3 PHILOSOPHY OF RISK ASSESSMENT

Industries have a wide variety of process involving consumption, production and storage of chemicals. The condition that contributes to the danger, by these chemicals, are when some loss of containment of hazardous chemicals occur resulting in consequences such as toxic or flammable

clouds under different worst case atmospheric conditions, fire or explosion. Release of such chemicals during transportation, unloading or operations would result in flammable / explosive cloud, toxic gas cloud, liquid pool etc...,. Under these circumstances, it is essential to achieve and maintain high standards of plant integrity through good design, management and operational controls.

However, accidents do occur and these can cause serious injuries to employees or the public, and damage to property. The public concern at such events invariably leads to call for additional control at national and international levels. It is against this background that various Rules and Guidelines formulated by the local regulatory agencies which mandate requirements for a safe and reliable working of an industry. They require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as “Risk Assessment Studies”. This chapter explains the basis of Risk Assessment and its objectives.

Major hazard installations have to be operated to a very high degree of safety; this is the core responsibility of the management. In addition, management holds a key role in the organization in the implementation of a major hazard control systems. In particular, the management has the responsibility to:

1. Provide the information required to identify major hazard installations.
2. Carry out hazard/risk assessment.
3. Report to the authorities on the results of the hazard / risk assessment.
4. Conceive Disaster Management plans and carryout “MOCK DRILLS” on the scenarios envisaged.
5. Adequately inform the Vulnerability status of the company to district management.
6. Undertake measures to in-plant safety assurance systems.

In order to fulfil the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents. In order to control a major hazard successfully, the Management must have answers to the following questions:

- Do toxic, explosive or flammable substances in our facility constitute a major hazard?
- Which failures or errors can cause abnormal conditions leading to a major accident?
- If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?
- What can Management do to prevent these accidents from happening?
- What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand, why accidents occur and how they can be avoided or at least mitigated. A properly conducted RISK assessment will therefore:

- Analyze the existing safety concept or develop a new one;
- Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

I.4 STUDY OBJECTIVES

Following are the objectives to be considered for the study:

- Determination of the potential size and effects of the consequences. Compare the CFD simulation results with threshold values and acceptance criteria based on standard guidelines like IOGP, CPQRA, TNO Purple Book, API-752, API 753 and other applicable industrial references. Hazards to be considered shall include:
  - Explosion (Gas cloud, VCE and BLEVE)
  - Fire (Pool, Flash and Jet)
  - Toxic effects
- Generation of credible and worst-case scenarios for accidental release of hazardous chemicals in the Green PVC Plant
- Parts Count, Failure frequency analysis and Event tree analysis (carried out in 2D QRA)
- Determination of the potential size and effects of the consequences (inclusive Fire and Explosion risk Analysis, Dispersion Analysis etc.)
- Identification of key risk contributors including assessment of the controls available to prevent an MAH or mitigate its consequences should it occur. (carried out in 2D QRA)
- Quantification of risk through individual and societal risk figures based on manning and population data. (carried out in 2D QRA)
- Assessment of individual and societal risk against the risk acceptability criteria relevant to the situation. (carried out in 2D QRA)
- Geometry model to be created from scratch for simulations in the CFD software tool itself based on available facility data.

- Flammable / Toxic Gas dispersion simulations to be carried out based on transient leaks, process conditions, inventory, weather parameters etc.
- Explosion simulations to be carried out, wherever found necessary, based on flammable gas dispersion and dust entrainment cases determining the explosion loads on facility buildings and surroundings
- Fire simulations for identified cases to assess the radiation loads on support structure and facility buildings
- Suggest necessary recommendations / mitigation whenever warranted based on advanced risk assessment latest techniques and sensitivity analysis

II. METHODOLOGY

Consequence analysis is carried out to quantify the severity and extent of the damages due to eventual accidents. Damages may be to people, environment, assets or business reputation. This study is specifically concerned with damage to the occupants and facilities due to the hazards associated with storage and handling of hazardous materials along the process streams.

The following steps are involved in 3D consequence analysis:

- Study of the plant facilities and systems
- Construction of 3D geometrical model of the site facilities along with surround land cover features
- Identification of the MCA scenario to be considered for a detailed 3D analysis based on 2D QRA
- Simulation of local micro-scale wind flow along with vertical stratification using micro-meteorological models
- Estimation of the consequences for the selected scenario
- Proposal mitigation systems proposed based on baseline scenario consequences

II.1 CONSEQUENCE ANALYSIS

Consequence analysis for the selected failure scenarios is carried out using 3D consequence modelling tools of FLUIDYN for selected failure scenarios as below:

- Dispersion of hazardous clouds to define threshold / flammable concentration levels
- Heat radiation intensity due to pool fire and jet fire [limited to proximal facilities]
- Explosion overpressure

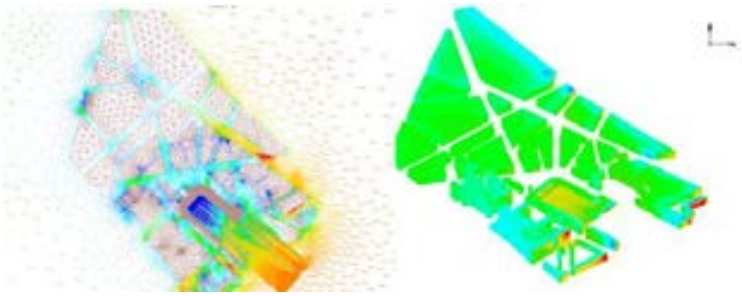
II.2 3D TOOLS EMPLOYED FOR CONSEQUENCE MODELLING

II.2.1 *Fluidyn* –PANEPR: 3D CFD Dispersion Modelling Software

PANEPR is dedicated software for 3D simulation of dispersion from different sources such as industrial sites, stacks, accidental leaks, etc. It analyses the consequences of accidental dispersion of pollutant discharge in process industries due to rupture or leaks and combustion bi-products due to fires.

It can be used to plan anticipatory measures and solve problems in case of industrial accidents. It integrates the 3D modelling characteristics such as wind, turbulence and pollutant transport and takes into account the influence of topography, obstacles, buildings, influence of vegetation and terrain on dispersion, solar radiation effects and ambient atmospheric conditions. It can simulate

transient effects of the following physical phenomena: compressible flow, buoyancy effects, atmospheric release interactions and variable source time.



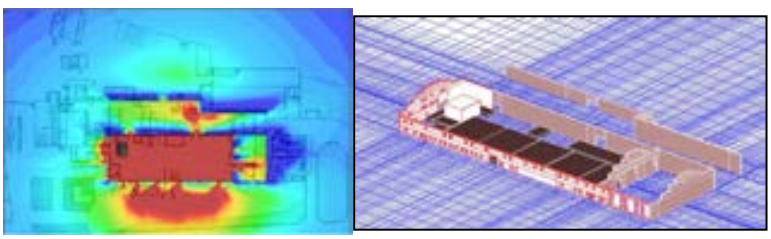
It can be applied to different scenarios such as:

Gas release from a pressurised storage tank or pipe: two-phase (particles or droplets) with variable rate or liquid release

- Dense gas dispersion with or without high momentum release
- Multiple pollutant sources such as stacks and storage leaks
- Interaction with structures such as tanks and ground
- Exact simulation of flow between obstacles and processing units by curvilinear mesh and a second order solver
- Analysis of risks from threshold database (calculation for SEI, SEL and SELS thresholds & flammable volume) and determination of plume opacity
- Dispersion of an explosive cloud (UVCE): Cloud volume and mass flammability limits (for UVCE or ATEX calculations)

II.2.2 *Fluidyn* – PANFIRE: 3D Fire Radiation Evaluation Software

It is a dedicated software tool for 3D simulation of fire accidents - combustion of solid products and liquid pool. It calculates the heat fluxes generated by the combustion of the products such as hydrocarbon, papers, plastics, cartons, alcohols, etc. under selected weather conditions. It helps to establish a 3D estimate of the heat radiation generated by fires and combustion thereby allowing comparisons with the statutory thresholds by taking into account the material (nature, combustion rate and proportion), 3D geometry of the warehouses and mitigation measures (firewalls, sprinklers and obstacles).



It has many integrated models to calculate heat flux adaptable to different scenarios:

- Solid, dry bulk or rack fires
- Pool fires in retention bunds
- Fires inside buildings

Some of the salient features of PANFIRE include:

- Simple to complex configuration of the site under consideration
- Multiple fire sources with collapsing / non-collapsing walls
- Mixture of storage materials with individual burning characteristics
- Modules to determine the flame geometry (form and height) using fuel characteristics
- User control of initial flux values
- 3D radiation using advanced view factor methods

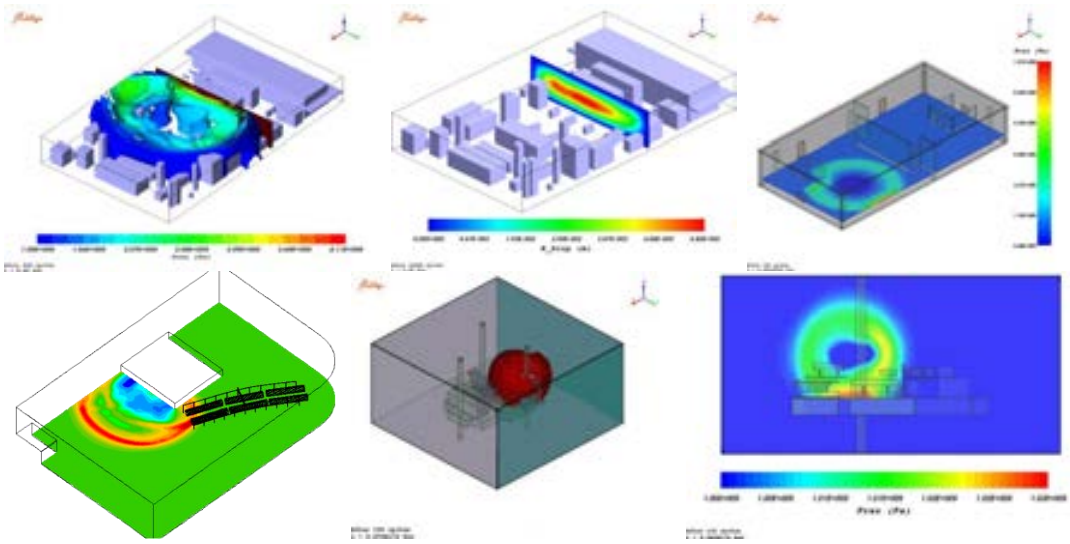
PANFIRE finds its application in several contexts:

- Consequence of heat radiation due to fire in storage yards on the occupants
- Occurrence of domino effect due to fire
- Design of fire walls – their strength and position
- Effectiveness of safety measures such as sprinklers or water curtains etc..
- Site layout planning in terms of storage of different combustible materials, their separation etc.
- Identification of safe zones, escape routes etc.. in case of fire accidents

II.2.3 *Fluidyn* – VENTEX for Confined and Semi-Confined Explosion Modelling

fluidyn-**VENTEX** is a *fluidyn* **-VENTIL** module dedicated to the simulation of explosions in open, confined and semi-confined spaces. It models by solving explosion and (optionally) its effect on structures by **simultaneously** solving fluid mechanics and stress analysis equations. It consists of three modules, used according to the requirement:

1. For gas accumulation before deflagration, it may use VENTCLIM derived from PANEPR
2. For explosion- deflagration or detonation, it uses *fluidyn* – ESR solvers
3. For structural integrity, it uses VENTSTRESS module, having **explicit** FE solver of *fluidyn* –FSI



Applications:

- It can be used for oil & gas- both onshore and offshore explosion studies
- It can used to analyse the accidental explosion of solid fuels, liquid fuels or gas clouds and also for solid-gas mixture (dust clouds).
- Single or multiple simultaneous explosions can be simulated.
- It can be used as a design tool for the constructions of blast walls
- It also determines zones of lethal effects and irreversible effects associated to pressure wave fronts.

II.2.4 *Fluidyn* – ASSESSRISK for Risk Consequence Analysis and LoC Evaluation

Software for Risk and Consequences Analysis for Chemical & Petrochemical sites *fluidyn* **-ASSESS RISK** is a Software Package designed for Risk Analysis and Planning of Petrochemical Refineries and Bulk storage installations.

fluidyn - **ASSESS-RISK** is based on **UFIP** (Union Francaise d'Industrie Petroliere) methodology and is a result of participant's exercises. The Techniques imposed for Risk Assessment are based on qualitative methods, semi-quantitative criteria or quantitative methods and validated by **INERIS**.

The objective is to identify the critical systems to avoid major-accident hazards and to limit their consequences to environment and Productivity of the Plants. They are:

- Identification of the safety relevant sections of the establishment
- Identification of critical systems at the origin of potential major accidents.
- Determining the magnitude of potential major accidents.

- Assignment and assessment of the prevention, control and mitigation measures.
- The definitions of the emergency plan distances. (Evacuation of the population)
- Increasing the units' operation reliability.

II.3 ELEMENTS OF THE RISK ANALYSIS STUDY

II.3.1 STORAGE AND HANDLING OF HAZARDOUS CHEMICALS:

Identification, analysis and assessment of hazard and risk are very useful in providing information to risk management. It provides basis for what should be the type and capacity of its preparedness, on-site and off-site emergency plans. Risk analysis is carried out considering storage and handling of various hazardous raw materials, manufacturing process and storage of hazardous finished goods.

II.4 CONSEQUENCE CALCULATIONS

Consequence analysis is carried out using different models / approaches to simulate the physical effects of an accident (spill of hazardous material) and to evaluate the impacts (lethality, injury, material destruction) of the accident. Accidental release of hazardous materials can result in severe consequences.

The methodology is broadly enumerated under three phases:

a. Determination of the source strength parameters;
b. Determination of the consequential effects;
c. Determination of the damage or damage distances

II.4.1 SOURCE STRENGTH PARAMETERS

- Calculation of the outflow of liquid vapours out of a vessel/tank or a pipe, in case of rupture. In addition, two-phase outflow can be calculated.
- Calculation, in case of liquid outflow, of the instantaneous flash evaporation and of the dimensions of the remaining liquid pool.
- Calculation of the evaporation rate, as a function of volatility of the material, pool dimensions and wind velocity.
- Source strength equals pump capacities, etc. in some cases.

II.4.2 CONSEQUENTIAL EFFECTS

- Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
- Intensity of heat radiation [in kW/ m^2] due to a fire, as a function of the distance to the source.

- Energy of vapour cloud explosions [in bar], as a function of the distance to the distance of the exploding cloud.
- Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

II.5 SELECTION OF DAMAGE CRITERIA

The damage criteria give the relation between the extents of the physical effects (exposure) and the effect of consequences. For assessing the effects on human beings, consequences are expressed in terms of injuries and the effects on equipment / property in terms of monetary loss. In consequence analysis studies, in principle three types of hazardous effects are considered:

- Dispersion of vapours of hazardous substances resulting in:
  - Toxic effects, from toxic materials usually in terms of IDLH (or ERPG1 in the absence of IDLH)
  - Flammable / Explosive cloud
- Heat radiation due to fires - in this study, the concern is that of Jet fires and pool fires & Damage caused by heat radiation on material and people
- Explosions of Flammable Clouds & Damage caused by explosion on structure and people

The knowledge about these relations depends strongly on the nature of the exposure. Following are the criteria selected for damage estimation:

Dispersion of Hazardous Vapours:

Any hazardous material having tendency to vapourise would disperse in the environment due to atmospheric wind and turbulence and thus posing threat in terms of toxicity and flammability. The criteria, depending on the type of hazardous material, considered for the level of impacts are as listed in Table 1.

Table 1: Hazardous Gas exposure criteria – Threshold values

Material	IDLH (PPM)	LFL % v/v	
		100%	50%
Anhydrous HCl	50	-	-
Cl2	10	-	-
Propane	2100	2.1	1.05
VCM	20000 [ERPG3]	3.6	1.8
Acetylene	-	2.5	1.25
Carbon Monoxide	1200	12.5	6.25
Methane	-	5	2.5

Heat Radiation:

The effect of fire on a human being is in the form of burns. There are three categories of burn such as first degree, second degree and third degree burns. The consequences caused by exposure to heat radiation are a function of:

- The radiation energy onto the human body [kW/m^2];
- The exposure duration [sec];
- The protection of the skin tissue (clothed or naked body);

Table 2: Effects due to incident radiation intensity

Incident Radiation (kW/m^2)	Type of Damage
37.5	Significant chance of fatality for people exposed instantaneously and damage to process equipment.
12.5	Sufficient to cause third degree burn in a person if unable to reach for cover within 20 seconds. Minimum energy required for piloted ignition of wood, melting of plastic tubing. Thin steel with insulation on the side away from the fire may reach thermal stress level high enough to cause structural failure.
6.3	Pain within approximately 10 seconds; rapid escape only is possible
4.0	Maximum radiant heat intensity in areas where emergency actions lasting 2 min to 3 min can be required by personnel without shielding but with appropriate clothing.

Reference: CCPS, Guidelines for Chemical Process Quantitative Risk Analysis

The actual results would be less severe due to the various assumptions made in the models arising out of the flame geometry, emissivity, angle of incidence, view factor and others. The radiation output of the flame would be dependent upon the fire size, extent of mixing with air and the flame temperature.

As per the guidelines of CPR 18 E Purple Book:

- The lethality of a jet fire and pool fire is assumed to be 100% for the people who are caught in the flame. Outside the flame area, the lethality depends on the heat radiation distances.
- For the flash fires lethality is taken as 100% for all the people caught outdoors and for 10% who are indoors within the flammable cloud. No fatality has been assumed outside the flash fire area.

Explosions:

Table 3: Damage due to overpressures

Overpressures		Damage to people	Damage to Asset
barg	psig		
1	14.7	Fatal wounds in more than 50% of the cases because of shock waves, splinters, collapse of construction Lung Burst (Lethality threshold 1% by direct effects)	• Very serious damage to main structures, nearing total destruction. • Rupture of vertical pressurized vessels and tank spheres. • Complete destruction of any type of building (non-blast proof).
0.6	8.8	Risk of lethal wounds because of splinters or debris, people being thrown by shock waves onto hard surface. Possibility of ear drum burst.	• Serious damage of main structures. • Rupture of horizontal pressurized vessels. • Unit moves and pipes break. Heat exchanger overturns or destroyed. • Chemical reactor destroyed.
0.3	4.4	Very serious wounds (Possibly fatal) caused by missile debris, people thrown by shock wave on angular surfaces. Possibility of temporary deafness	• Fired Heater overturns or destroyed. Pipe support deforms. Debris missile damage occurs. • Total destruction of steel frame / Metal siding pre- engineered building. Total destruction of steel or concrete frame / unreinforced masonry infill or cladding. • Grave structural damages to oil storage tanks. Light walls in industrial buildings destroyed. • Industrial steel self-framing structure collapsed. Cladding of light industry building ripped off. Cracking in empty oil storage tanks. Slight deformation of a pipe bridge
0.2	2.9	Possibility of a serious wounding by missile debris, broken glass, people thrown by shock waves on angular	• Lower limit of serious structural damage 50% destruction of brickwork of houses. • Heavy machines in industrial buildings suffer little damage: Steel frame

Overpressures		Damage to people	Damage to Asset
barg	psig		
		surfaces. Lethality threshold 5%	buildings distorted and pooled away from foundations
0.14	2	Possibility of serious wounding by missile debris, broken glass Lethality threshold - 1%	• Average Damage (Roofs, doors, windows). • Window and Gauges break. Control house concrete roof collapses Roof Slab collapses (steel / concrete frame/ unreinforced masonry infill and cladding. • Partly collapse of roofs and walls of the building. Fibro cement plates destroyed. • Connections between steel and aluminum undulated plates have failed. • Partial roof failures, 25% of the walls have failed, serious damage to the remaining carrying elements. Damages to the window-frames and doors
0.05	0.73	Possibility of wounding by missile debris, broken glass Significant wounds threshold	• Light Damage (Large windows) Instruments and switchgear of control house are damaged from roof collapse. • Minor damage to house structures Slight structural damages to housing

CPR 18 E guidelines on explosion say:

- Overpressure more than 0.3 bar corresponds approximately with 50% lethality.
- An overpressure above 0.2 bar would result in 10% fatalities.
- An overpressure less than 0.1 bar would not cause any fatalities to the public.
- 100% lethality is assumed for all people who are present within the flammable cloud.

III. CONSEQUENCE MODELING – MODEL SET UP

To meet the objective of evaluating consequences on the onsite & offsite facilities in terms of toxicity, heat radiation and impulse effects due to hazardous vapour releases, 3D simulations for dispersion were carried out using FLUIDYN tools. This model assesses the location and intensity of impacts like heat radiation, overpressure, and hazardous exposure by utilising simulation results from dispersion and fluid dynamics assessments. The model precisely defines areas of possible harm by combining empirical data, defined impact thresholds, and sensitivity factors. This makes it possible to evaluate the risks to human health, and environmental effects. The model also makes it easier to integrate scenarios with many hazards, enabling thorough risk assessments under various variables including temperature, wind speed, and release parameters. The results of the same are presented in this section.

III.1 DISPERSION SIMULATIONS

Physical model (GIS - CAD) of the site for dispersion simulations was done based on the site drawings (2D and 3D) and geo-positioning was carried out upon Google Earth. Source estimation for the release rate was done using *fluidyn* – ASSESSRISK, a tool for scenario quantification and 2D risk estimates. The identified critical scenario were then subjected to detailed 3D consequence modelling using CFD based tools – PANEPR (dispersion), PANFIRE(fire radiation) & VENTEX(explosion) wherever applicable.

III.1.1 Numerical Model of Terrain:

Dispersion of gases in the atmosphere is largely influenced by the topography of the site under consideration. The terrain elements such as undulations (hills, valley), land cover (vegetation, water bodies etc..), urban canopy (heat island, roughness) and significantly the obstacles (buildings, process units, ground level tanks etc..) in the vicinity of release points. Wind flow over each of such terrain elements shall be disturbed in terms of drag (boundary layer phenomena) and turbulence (mixing). Thus the significant topographical features, in this case mainly semi-enclosed & fully opaque buildings / facilities within the site, were digitised to create numerical terrain model.

The terrain model created for MPL plant is shown in the *Figure 4*. This includes the site process units belonging to six plants (PVC, VCM, Chloro Alkali, Calcium Carbide, Acetylene and O & U). While the opaque structures (buildings, tanks, reactors) were modelled as solid obstacles, other process units with structures and pipe networks were represented with volumetric obstructions with partial porosity. Care was taken to reproduce the significantly large facilities close to the leakage sources, which would act as blockage to the wind flow and dispersion.

Keeping in view of the inventory size and also the targeted facilities, a domain of size 5500 m x 5500 m was considered for the simulations with a height of 300 m above ground level. While *Figure 3*

depicts comprehensive view of the domain features with digitized topographical elements, close up view of the site facilities are presented in *Figure 4*. An overall roughness of 0.01m was considered for the study. The selected domain size would intend to adequately cover the whole footprint of the upstream plant facilities, including operating zones, possible emission sources, and nearby locations that might be impacted by the plant's operations. The simulation records not only the direct emissions but also the dispersal patterns impacted by regional air conditions, topography, and surface roughness by making sure the domain transcends the immediate operating boundaries. The main reason a bigger domain is not taken into consideration is that it would necessitate a significant increase in time and processing resources without yielding any additional insights. Furthermore, boundary criteria may become less applicable or more difficult to establish precisely if the domain is too big, which could have an impact on the calibre of the results. Rather, the emphasis is on selecting a domain that is about the right size not too vast to hinder performance, but big enough to reduce boundary effects on the region of interest. While maximizing computational resources, proper domain sizing guarantees accurate simulations.

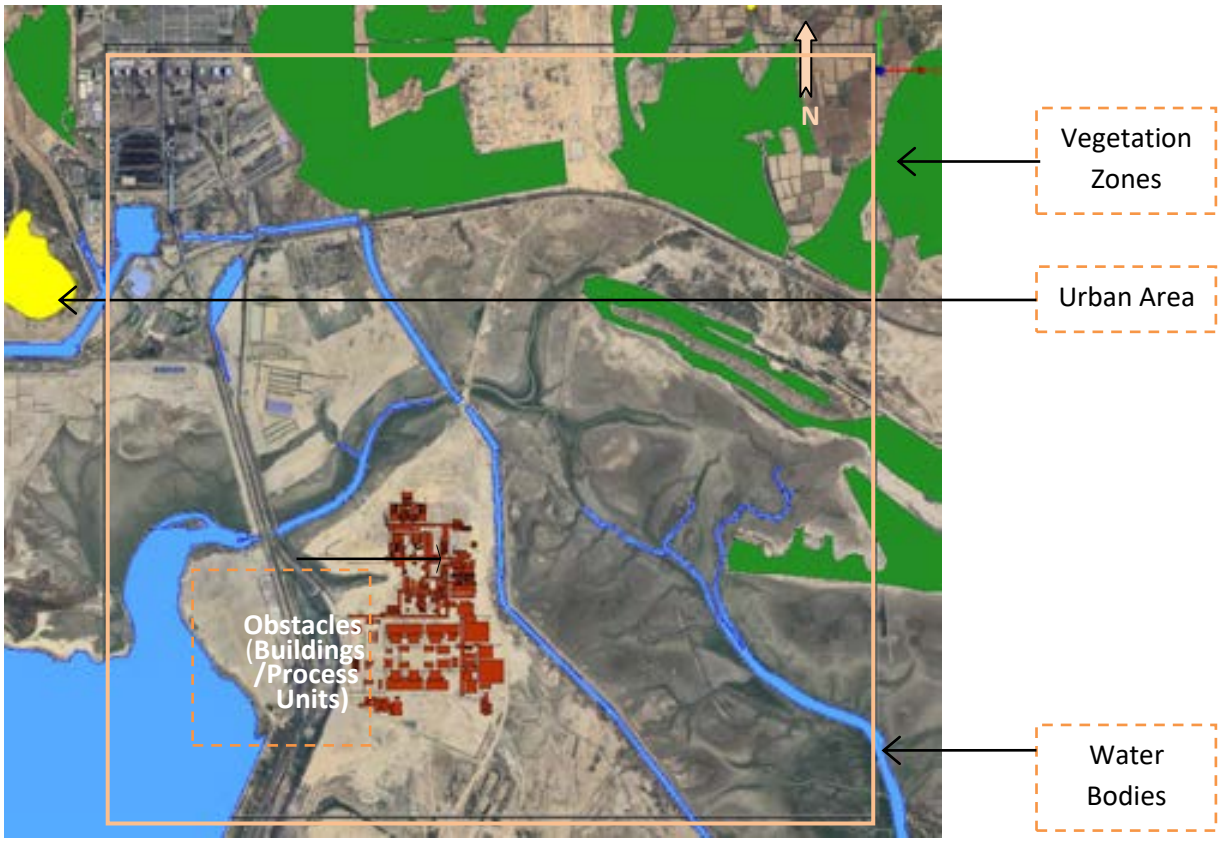


Figure 3: Numerical Terrain Model generated using PANEPR

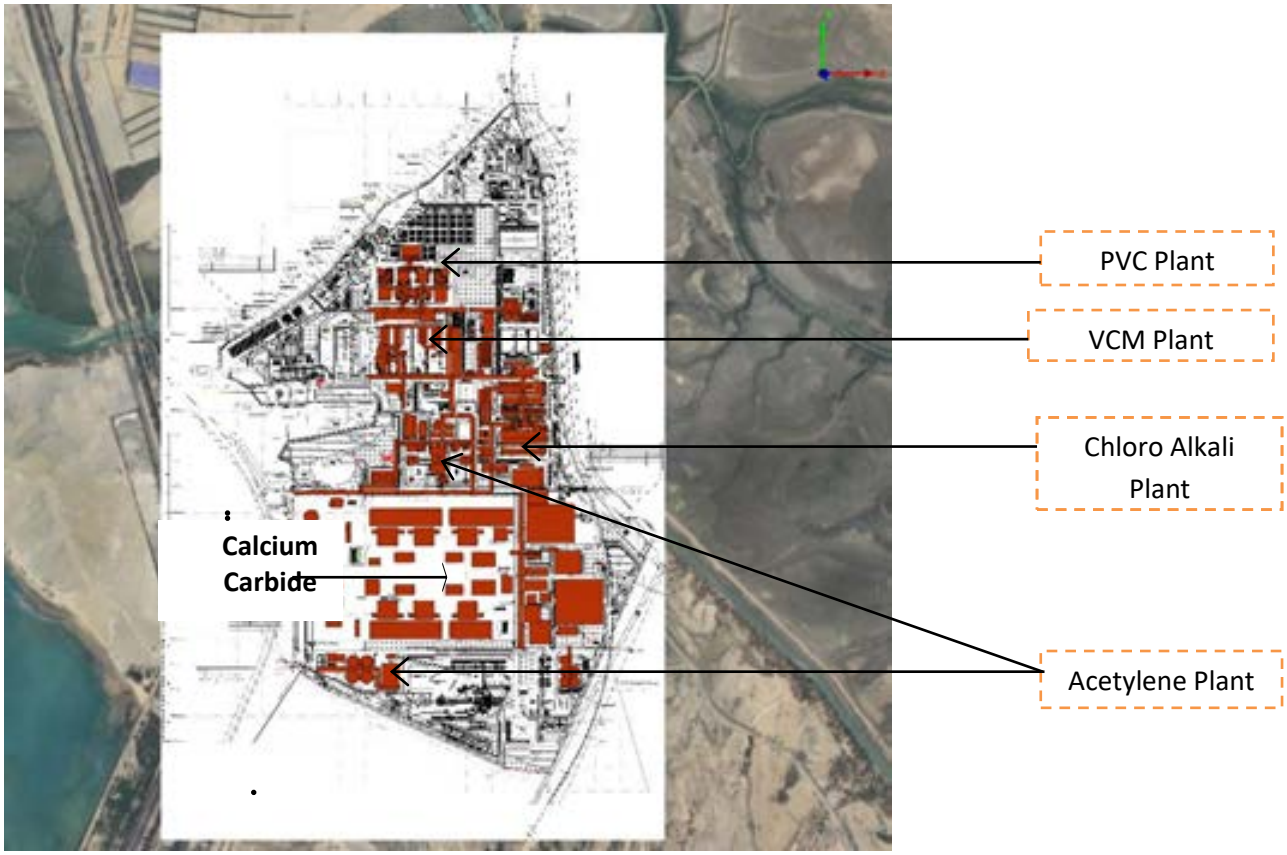


Figure 4: Zoomed Layout of Overall plant facilities with buildings

III.1.2 Weather Scenario:

Overall weather pattern over the study site at Mundra has been presented in terms of windrose as in *Figure 5*.

Weather frequency details were used during 2D QRA studies in evaluating scenario frequencies, whereas for 3D analysis their use is limited to subsequent stages of optimizing possible mitigation measures.

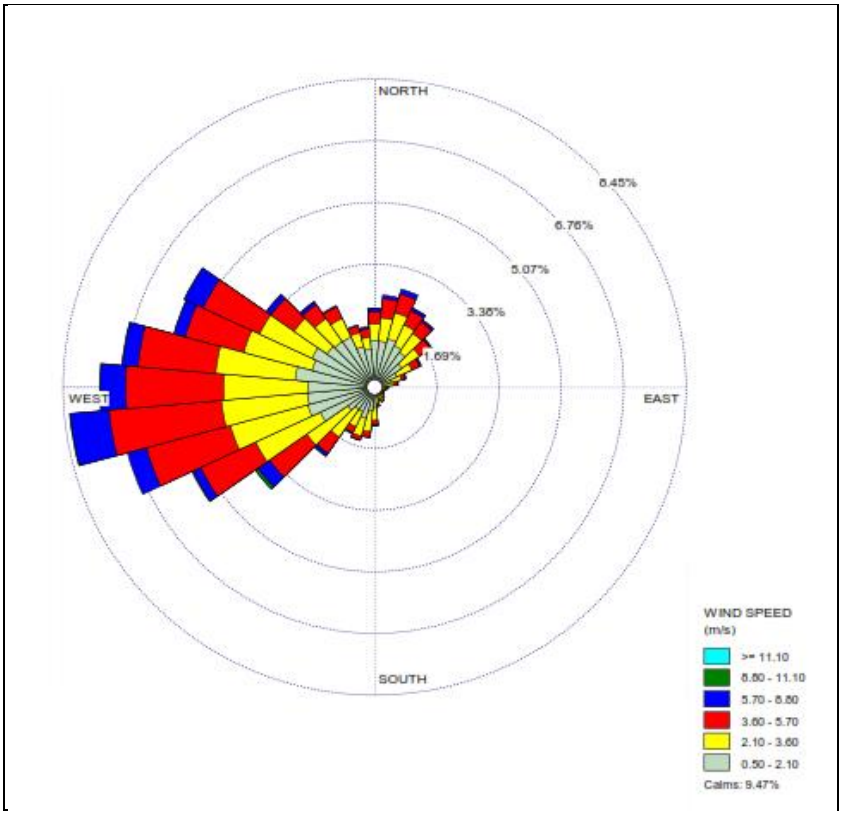


Figure 5: Windrose Pattern over the study region, Mundra, Gujarat

The critical wind directions chosen as to be blowing towards urban area were considered for flow field simulations.

The wind flow (speed and direction) influences the dispersion of vapours, two worst case weather conditions were considered in terms of wind speed and atmospheric stability, based on Standard Guidelines (IS 15656-2006). As a worst case condition, wind blowing towards Mundra Town, the nearest inhabitation, was selected which measures to a direction of 210° with reference to North. Summary of weather conditions considered for the simulations are as tabulated in Table 4.

Table 4: Weather Scenario considered for dispersion

Scenario	Wind Direction	Wind Speed, m/s	Stability Class	Ambient Temperature, ^{0}C
1	210°	2.0	F	31
2	210°	5.0	D	31
Vertical Wind and Temperature Profiles				FWG guidelines

III.1.3 Source Terms:

The source terms for the release scenario were evaluated using ASSESS_RISK - FLUIDYN's scenario and source term modelling tool based on UFIP (L'Union Française des Industries Pétrolières) methodology. All the scenario identified are associated with the materials being handled under respective operating conditions, thus resulting in liquid / vapour release, pool formation (for liquids) and vapour dispersion. Table 5 shows the source characteristics in terms of outflow from a rupture (pipe / vessel), pool evaporation derived for the LOC scenario considered.

For the liquid spillage and dispersion cases, the release is assumed to be long enough to achieve steady state. Gaseous releases are limited to the isolation time or till the outflow of entire inventory – whichever is smaller. The locations of Sources viz, Anhydrous HCl and Cl_2 in Chloro Alkali Plant Unit, VCM, Propane and Anhydrous HCL in VCM plant Unit, Cl_2 in Chloro Alkali Plant Unit, Methane and CO in Calcium Carbide Unit, Acetylene in Acetylene Unit, VCM in O&U Unit and PVC Unit are shown in the *Figure 6* to *Figure 10* respectively.

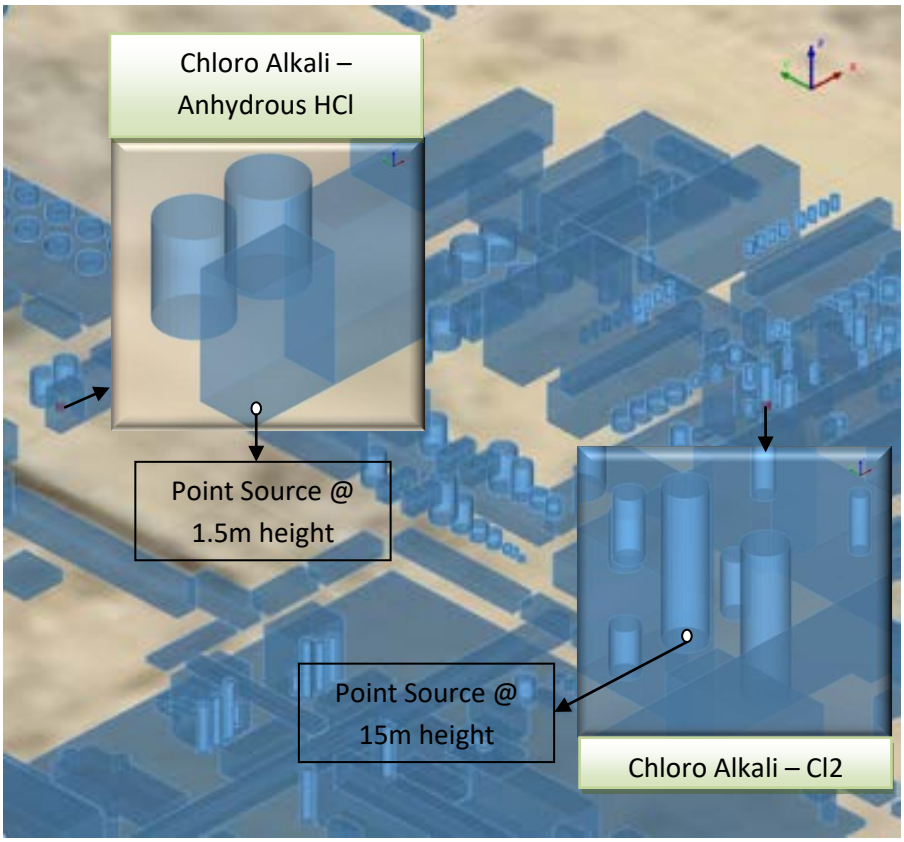


Figure 6: Location for Anhydrous HCl and Cl2 transport pipeline leakage in Chloro Alkali Unit

Table 5: Source parameters considered for identified MCA Scenario

No	Plant Site	Material	Outflow Kg/s	Temp °C	Type of Source	Release, Duration, s	Operating Pressure, barg	Piping Size, inch	Phase of Material Handled	Equipment/ Piping Covered	Pipeline Identification
1	Chloro Alkali - IS-12D	Anhydrous HCl (99.99%)	10.42	40	Point	Unsteady, 1800 s	Generation at desorption- 2 barg but at VCM- Pressure reduced to 1 barg	32	Vapour	Piping Scenario	Anhydrous HCl from HCl Synthesis unit, 401-U-5501 to OSBL.
2	Chloro Alkali - IS-1B	Cl_2-88.55% H_2-11.04% O_2-0.19% CO_2-0.22% (wt %)	13.366	83	Point	Unsteady, 1800 s	0.3	24	Vapour	Piping Scenario	Cl2 Transfer Piping from 401-SPWX-1506 to 401-XV-152602 via Headers and piping - Typical
3	VCM - IS-9A	VCM	26.042	51	Point	Unsteady, 1800 s	9	16	Vapour	Pipeline Scenario	Section Bounded by from FRACTIONATOR 601-C-0202 to FRACTIONATOR CONDENSER 601-E-0207
4	VCM- IS-17A	Propane	22.195	3	Point	Unsteady, 1800 s	4.9	9	Vapour	Pipeline Scenario	Primary Refrigerant Gas transfer from 601-E-0221 and 601-E-0220 to PRIMARY REFRIGERANT SYTEM 601-U-0301
5	Chloro Alkali - IS-08A	Liquid Cl_2	1.8519	-8	Point	Unsteady, 1800 s	16.71	2	Liquid	Pipeline Scenario	Liquid chlorine piping from 400 XV -260401 to inlet of Chlorine vapourizer
6	VCM- IS-02	Anhydrous HCl	17.6464	36	Point	Unsteady, 1800 s	1	20	Vapour	Pipeline Scenario	IS 02 - Section Bounded by the HCL is transfer from BL for Mixing
7	Calcium Carbide- IS-02	CO- 80% H2 - 12% Methane - 1.6% CO2 - 6.4% (Vol %)	34.3056	55	Point	Unsteady, 600 s	0.035	64	Vapour	Gasholder	CALCUIM CARBIDE FURNANCE OFF GAS section bounded by 301-MOV-510004 A to 301XV-520103 THROUGH WATER SEAL SYSTEM TO GAS HOLDER
8	Calcium Carbide- IS-05	Methane- 87.21% Ethane- 10.08 % Propane- 2.19%	1.44	Ambient	Point	Unsteady, 1800 s	5 to 7	12	Vapour	N2 and RLNG Vessel	RLNG LINE TO LIME KLIN

No	Plant Site	Material	Outflow Kg/s	Temp °C	Type of Source	Release, Duration, s	Operating Pressure, barg	Piping Size, inch	Phase of Material Handled	Equipment/ Piping Covered	Pipeline Identification
		Iso-butane- 0.11% n-butane- 0.12% (Mol %)									
9	PVC - IS-03	VCM	65.77	40	Point	Unsteady, 600 s	15	8	Liquid	VCM Charge pump	Section Bounded by VCM from 701-XV-000406 to 701-FV-001311 via VCM Charge pump 701-P-0601A/B
10	Acetylene-IS-06A	Acetylene -99.41 N2 -5.42E-01 CO2 -6.80E-03 O2 - 2.99E-02 Argon- 1.26E-03 H2O -6.45E-03 H2SO4 - 1.32E-09 Heavies -1.15E-09 (mol%)	8.78	13	Point	Unsteady, 600 s	0.89	36	Vapour	Acetylene Cooling tower	From 501-SPSV-0316 (inlet of Acetylene Cooling tower 510-C-303) upto Battery limit (500-XV-000201) and 501-XV-040304 on discharge of Acetylene Vacuum pump via Acetylene Cooling tower (510-C-0303), Acetylene Mist Filter (501-F-0301), 1st Purification Tower (501-C-0301),2nd Purification Tower (501-C-0302), Sulphuric Acid mist filter (501-F-0302)
11	O&U- IS-12	VCM	108.41	40	Point	Unsteady, 600 s	12.28	14	Liquid	VCM TRANSFER PUMP	Section bounded by A01XV-00702 and A01XV-802 to A01XV-00103 via VCM Transfer Pump (A01-P-0020A/B)-Train 1 - Typical to Train 2
12	O&U- IS-14	VCM	13.3	40	Point	Unsteady, 600 s	5	10	Liquid	VCM PRODUCT SPHERE	Section bounded by A01XV-00103 to A01XV-00102 via VCM Product Sphere (A01-S-001A/B) - Typical

NOTE: Gaseous releases from rupture of pipeline / vessel are considered as Point source (jet) release. Vapour releases from liquid pool evaporation are considered as Area source.

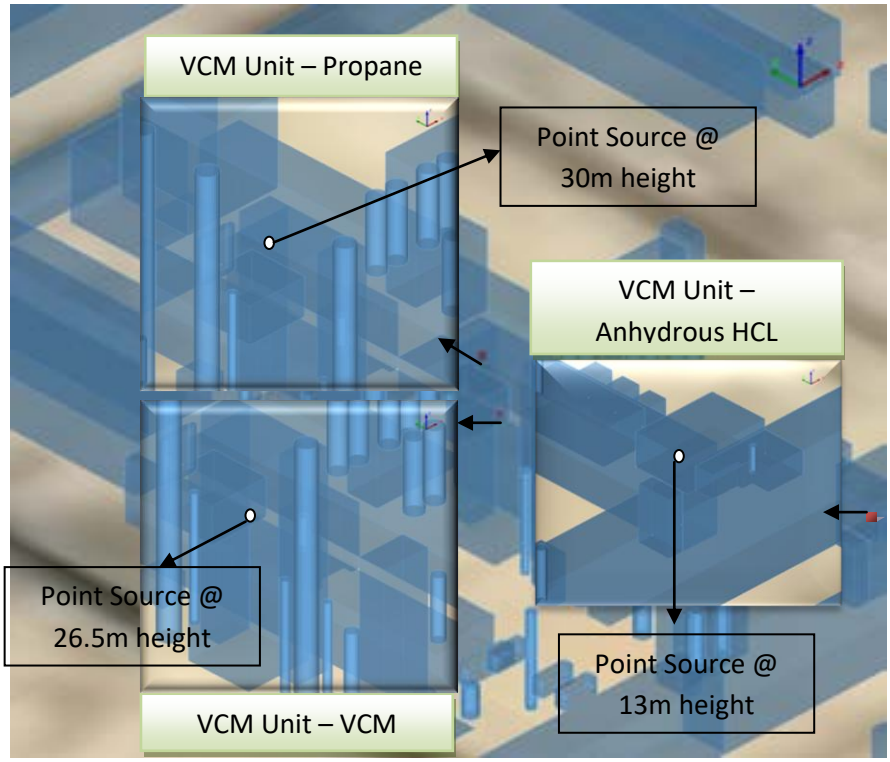


Figure 7: Location for VCM, Propane and Anhydrous HCL transport pipeline leakage in VCM Unit

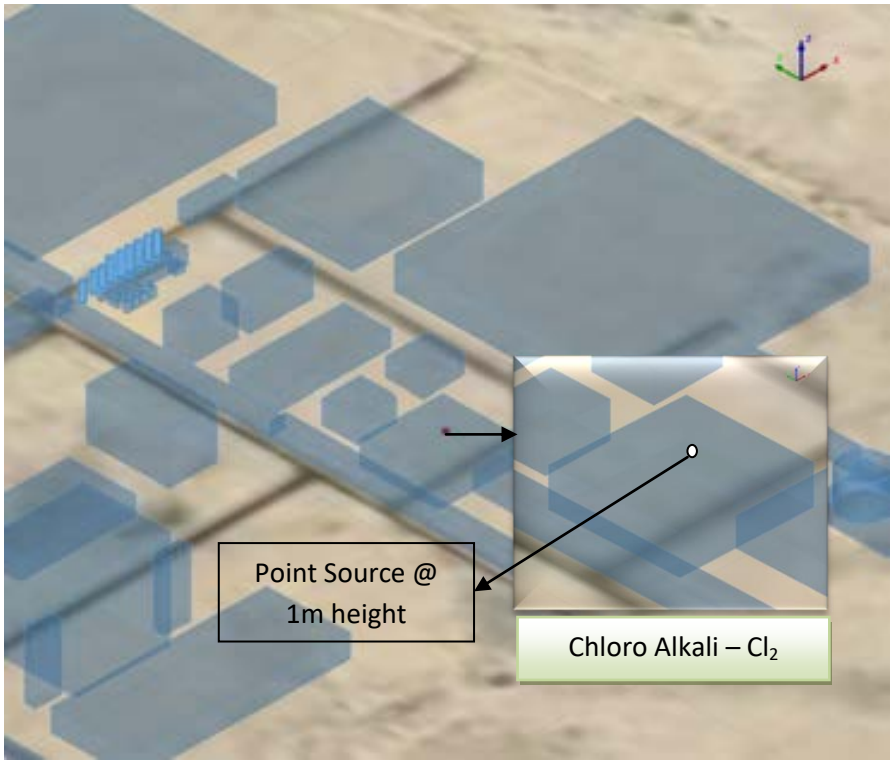


Figure 8: Location for Cl_2 transport pipeline leakage in Chloro Alkali Unit

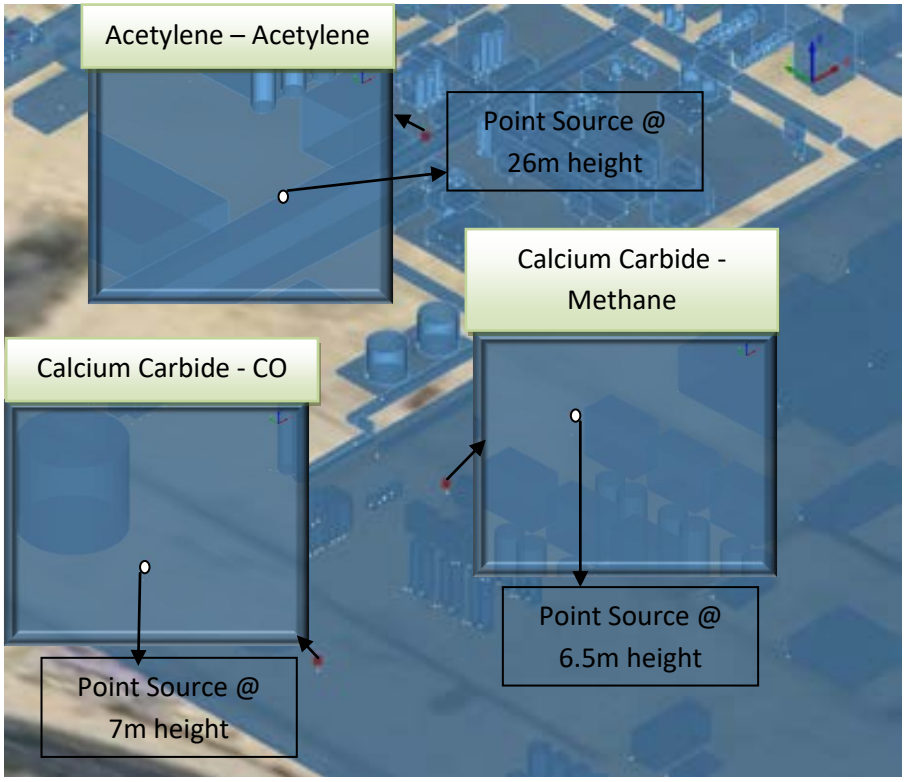


Figure 9: Location for Methane and CO transport from Vessel in Calcium Carbide Unit and Acetylene transport from Cooling Tower in Acetylene Unit

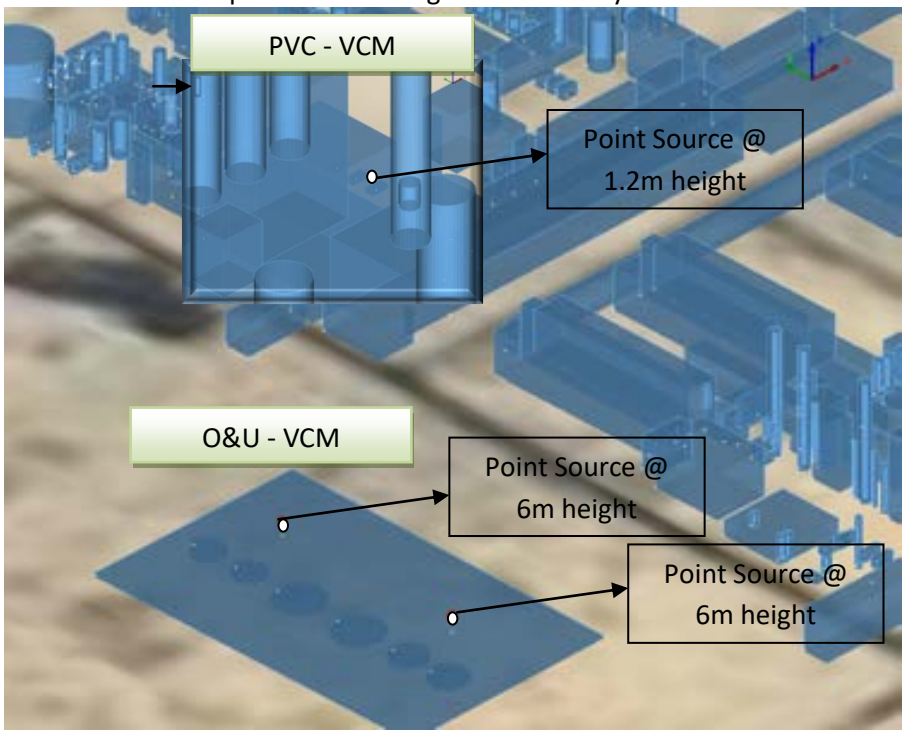


Figure 10: Location for VCM transfer Pump in O&U Unit and PVC Unit

According to the scenario, the point source height is generally determined from the Navisworks (NWD) file by using the ground level as the baseline or datum. The height value is taken from the object's Z coordinate, representing its vertical position above the ground level.

III.1.4 Computational Grid:

Simulations using 3D models involve discretization of the computational domain into finite volumes using 3D mesh. The mesh can be either Cartesian structured or unstructured. The advantages of unstructured mesh over the structured mesh is in its ability to capture the irregular shaped topographical elements (buildings / tanks / walls etc..) properly without having to assume partial porosity due to non aligning nodes. One more advantage of the unstructured mesh lies in its ability to congregate in the regions of specific interest without being expensive during calculations. Due to its inherent advantages in complex cases, unstructured mesh is chosen for this study.

Mesh considered for the simulations are as shown in *Figure 11*. The 3D mesh from ground and close up view has shown in *Figure 12*. Mesh generator in PANEPR comply with the meshing guidelines stipulated by French Regulator INERIS hence the enlisted criteria such as mesh fineness & aspect ratio based on the problem complexity were taken into account. Though overall mesh configuration was chosen to be similar across all scenario simulations, local refinements were incorporated for specific scenario for precision as needed. Fine mesh clusters were generated by the tool for the regions of specific interest as represented by CAD model. To achieve precision in simulations and also to optimise the runs three different mesh combinations for the identified scenario were prepared and used, the details of which are as furnished in Table 6.

Table 6: Mesh elements considered for Simulation

Plant Site	Material	Horizontal	Vertical	Total Elements
Chloro Alkali Unit	Anhydrous HCl	59785	24	1434840
Chloro Alkali and VCM Unit	Cl2, VCM, Propane	59991	27	1619757
Chloro Alkali, VCM, PVC, O&U Acetylene and Calcium Carbide Unit	Liquid Cl2, Anhydrous HCl, VCM, Acetylene, Carbon Monoxide and Methane	63905	28	1789340

Figure 11: 2D Mesh considered for dispersion simulations

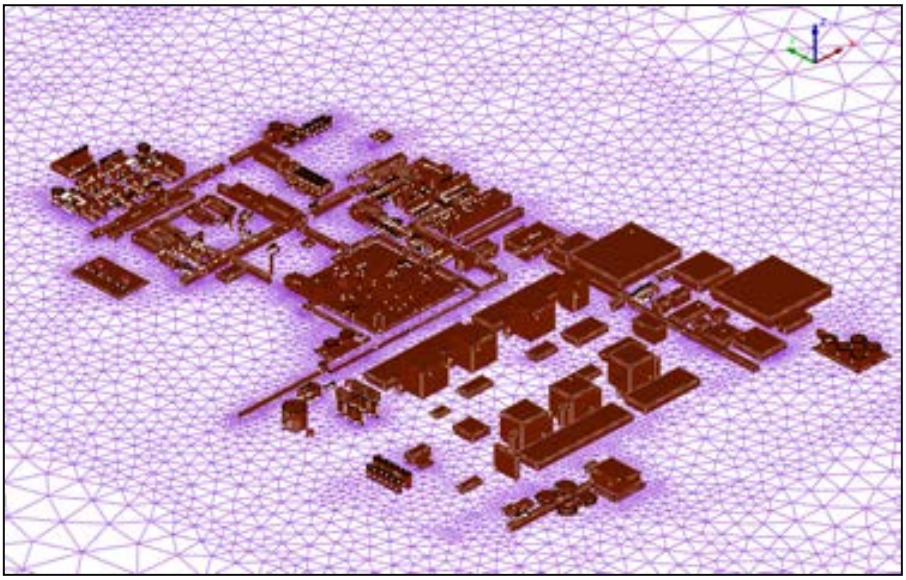


Figure 12: Close up View of 3D Mesh considered for dispersion simulations

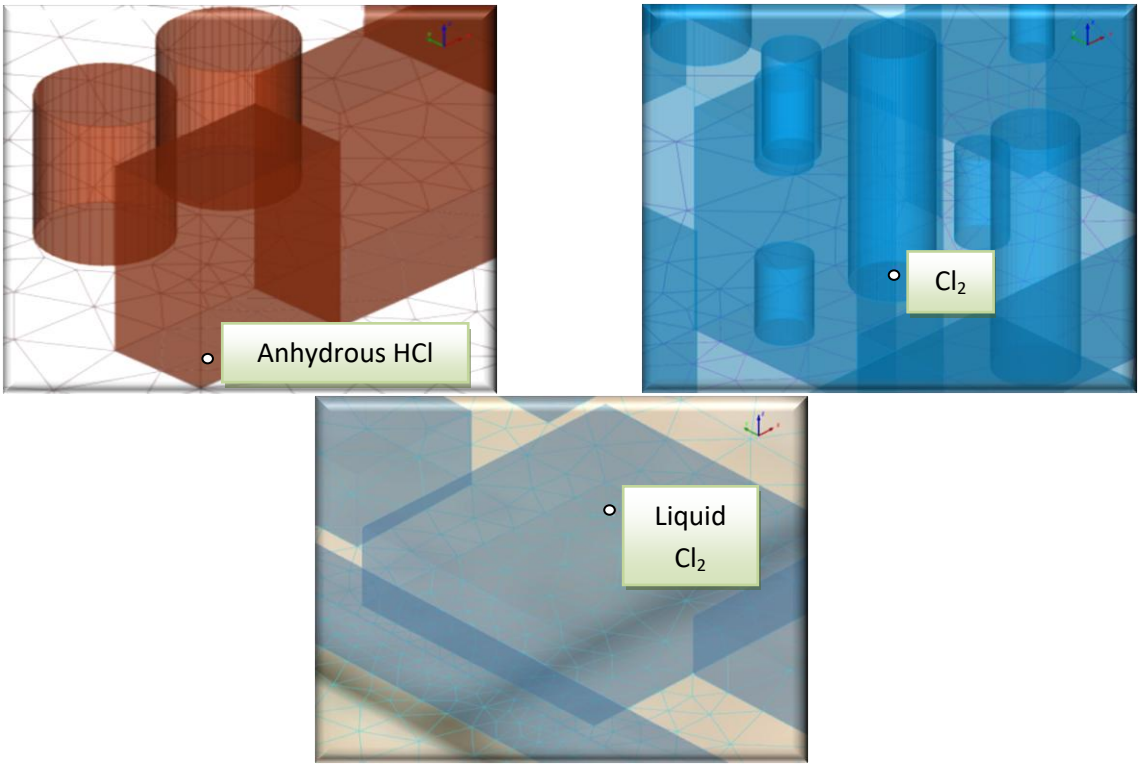


Figure 13: Close up View of 3D Mesh at Chloro Alkali Unit- Anhydrous HCl and Cl_2

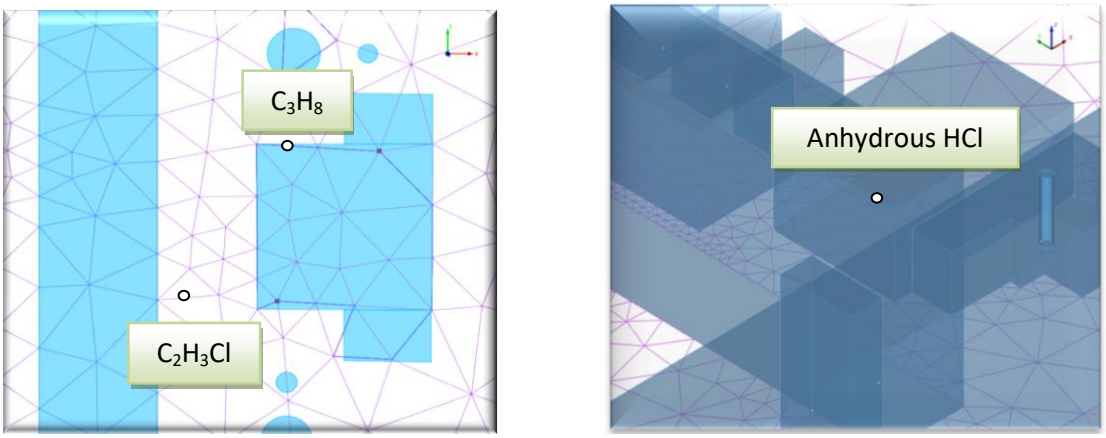


Figure 14: Close up View of 3D Mesh at VCM Unit-VCM, Propane and Anhydrous HCL

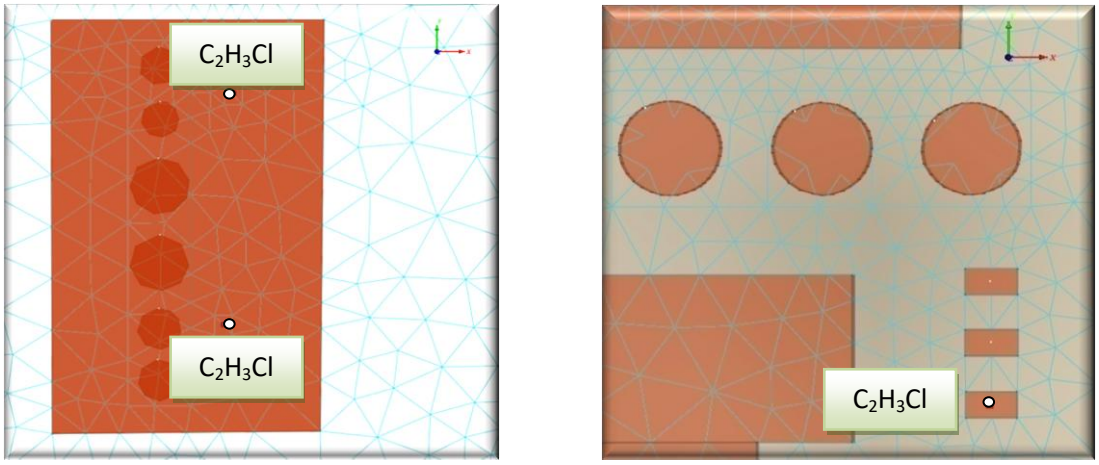


Figure 15: Close up View of 3D Mesh at O&U and PVC Unit-VCM

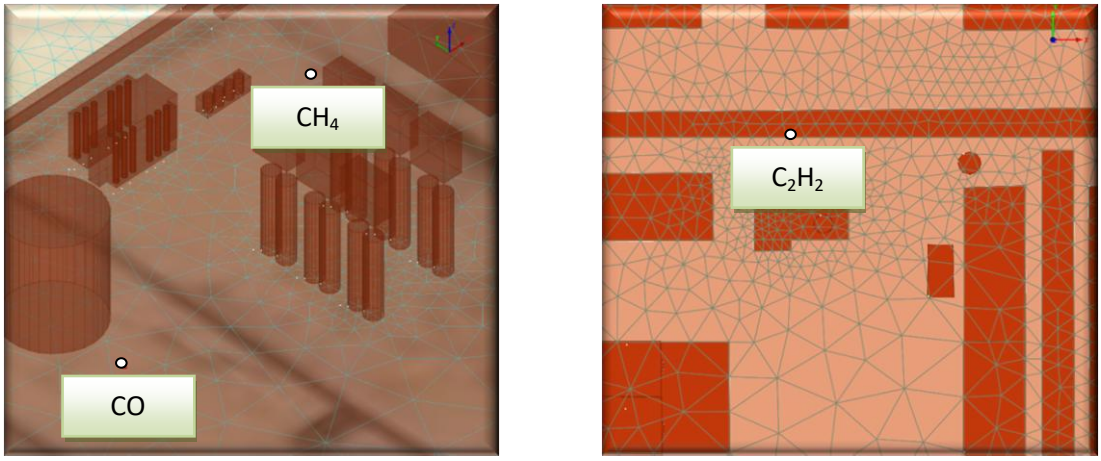


Figure 16: Close up View of 3D Mesh at Calcium Carbide and Acetylene Unit-Methane, CO and Acetylene

III.1.5 Wind Flow simulations:

The dispersion of hazardous gases/vapours is largely influenced by the wind flow pattern over the site comprising of complex topographical features. Hence the simulations to establish wind flow patterns in the site were carried out before initiating the dispersion.

The turbulence caused due to atmospheric boundary layer phenomena as well as the mechanical obstructions within the site was modelled using two equation standard k-ε model. The buoyancy effects of liquefied gas releases from the leaks were duly taken into consideration. Entire flow and dispersion simulations were carried out using Eulerian approach.

The illustrative images of the wind flow pattern for all the selected wind conditions are presented below.

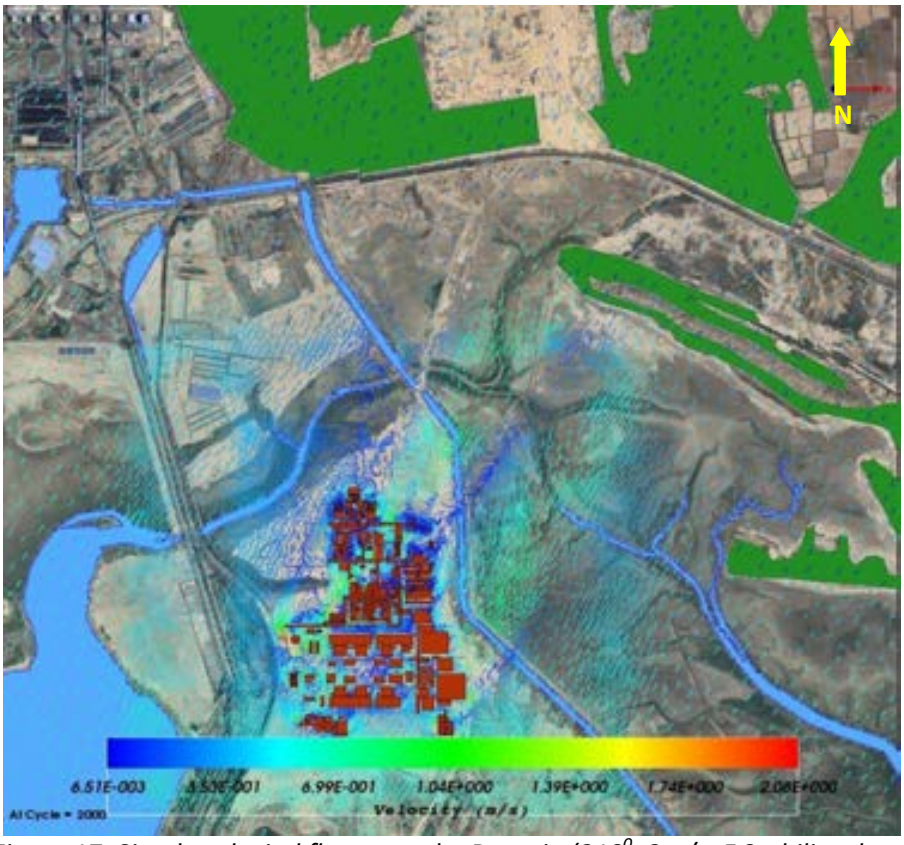


Figure 17: Simulated wind flow over the Domain (210^0, 2m/s, F Stability class)

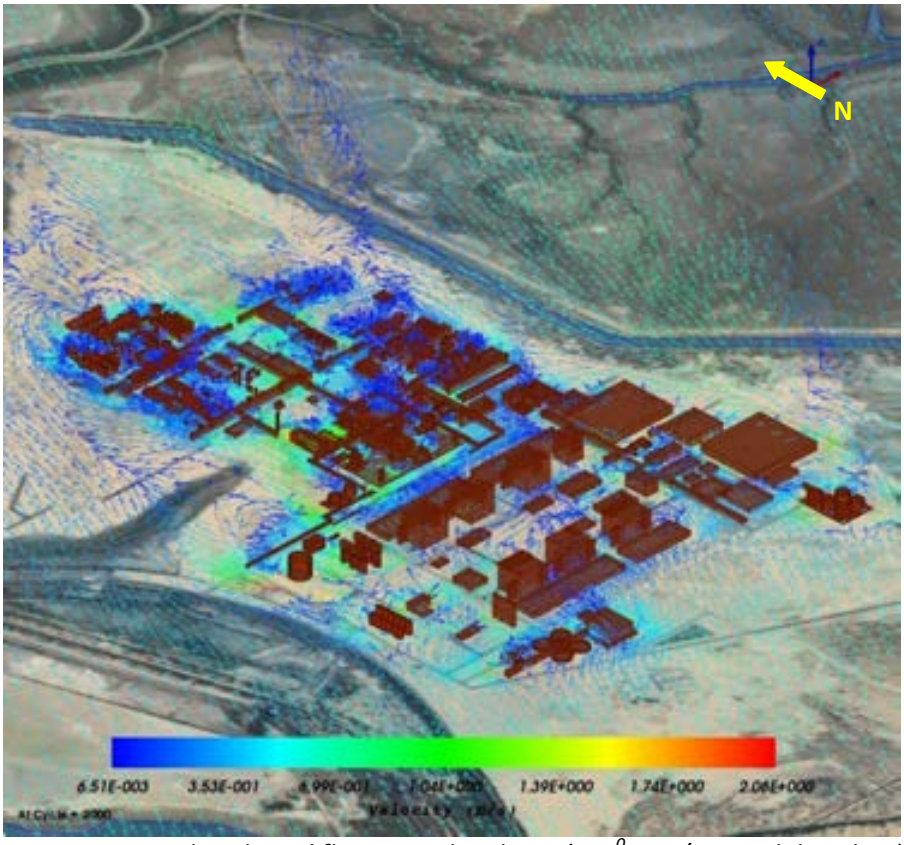


Figure 18: Simulated wind flow over the Plants (210^0, 2m/s, F Stability class)

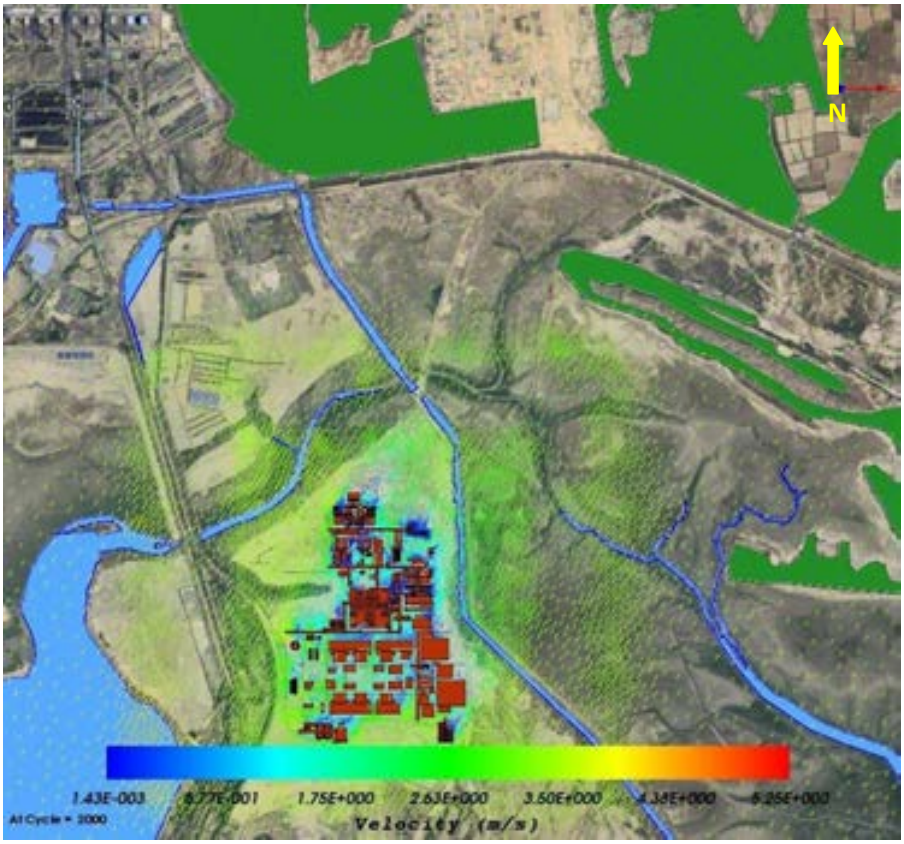


Figure 19: Simulated wind flow over the Domain ($210^{0,}$ 5m/s, D Stability class)

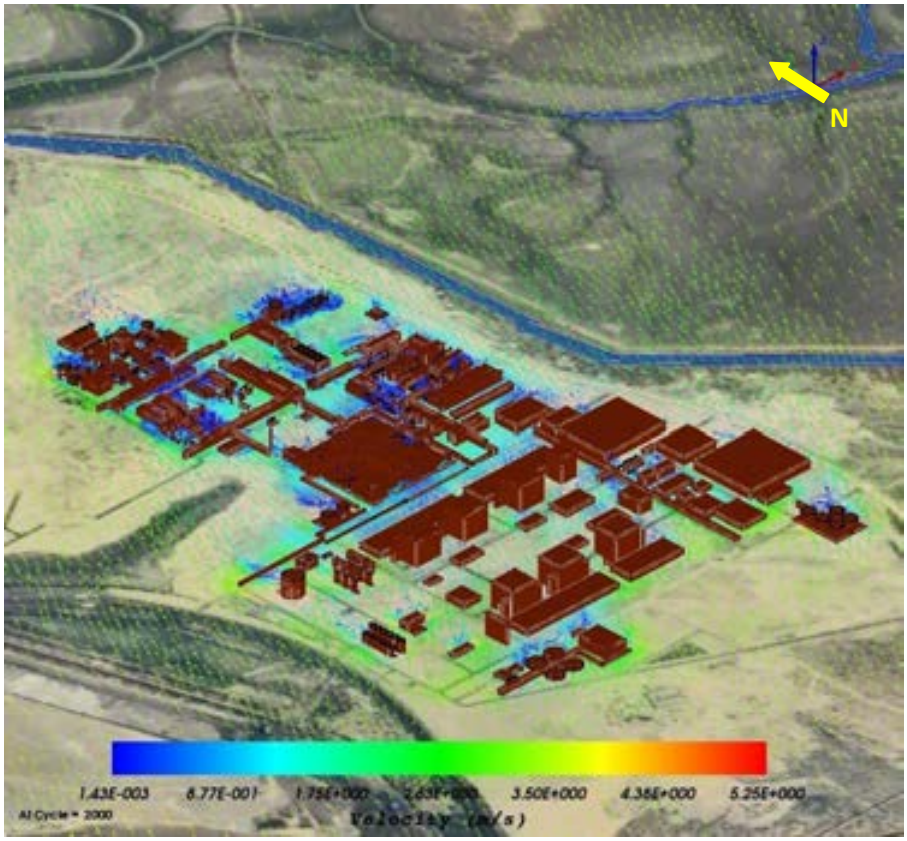


Figure 20: Simulated wind flow over the Plants (210^{0,} 5m/s, D Stability class)

Figure 17 to *Figure 20* show the wind flow pattern for the subsequent dispersion as simulated by PANEPR. The velocity vectors and the associated color bar, which ranges from blue to red, give a thorough depiction of the wind direction and wind speed in this study region. Blue indicates low wind speeds, while red indicates strong wind speeds. This color gradient illustrates the magnitude of wind velocities. By showing the predominant wind flow directions, the vectors' orientation makes it possible to identify areas of airflow variability and major dispersion channels. Regions with comparatively low wind speeds are indicated by areas tinted in blue and green. This could lead to a limited dispersion of airborne elements and possible buildup of contaminants. Red, orange, and yellow zones, on the other hand, are associated with increased wind speeds, suggesting a greater ability to disperse quickly and widely. As demonstrated by the warmer hues, porous buildings allow for greater airflow penetration, which raises local wind speeds and improves dispersion. In contrast, opaque structures often block airflow, resulting in standstill zones with reduced velocities and possible pollutant buildup. Disturbance & deflections in the wind flow due to the presence of obstacles in and around the site can be seen. This locally modified wind flow shall influence the transport and dispersion of released chemicals.

IV. CONSEQUENCE MODELING RESULTS

The results of consequence modelling in terms of dispersion of released hazardous compounds to form toxic / flammable cloud are discussed in this section.

NOTE-1:

In all the plots the iso-surface / contour region is the threshold coverage (IDLH, ERPG3 or LFL) for the specified scenario

Wherever threshold values were not reached, contours / 3D surface plots are presented for local maximum / lower values for representation purposes only.

NOTE-2:

The Lower Flammable Limit (LFL) is the lowest concentration of a gas or vapor in the atmosphere, stated as a percentage by volume, at which, under certain circumstances, a mixture with air can ignite and maintain a flame.

IDLH is the concentration level that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. IDLHs were based on effects that might occur as a consequence of a 30-min exposure.

IV.1 DISPERSION SIMULATIONS FOR TOXICITY AND FLAMMABILITY IMPACTS

IV.1.1 Chloro Alkali Unit Scenario – Anhydrous Hydrogen Chloride:

Release of Anhydrous HCl dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Chloro Alkali Unit - Anhydrous HCl

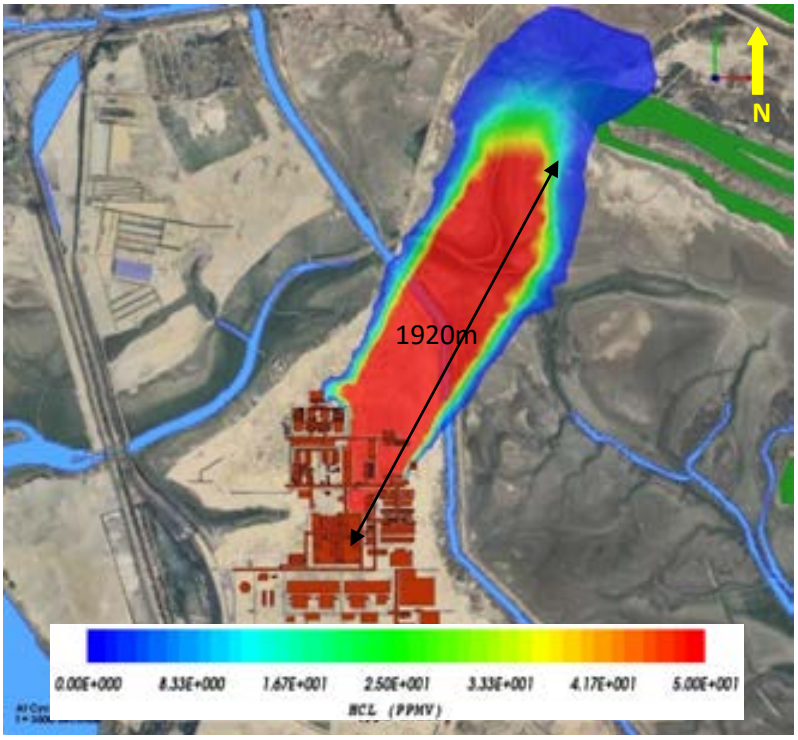


Figure 21: Concentration Contours at IDLH 50 ppm (Region in Red)

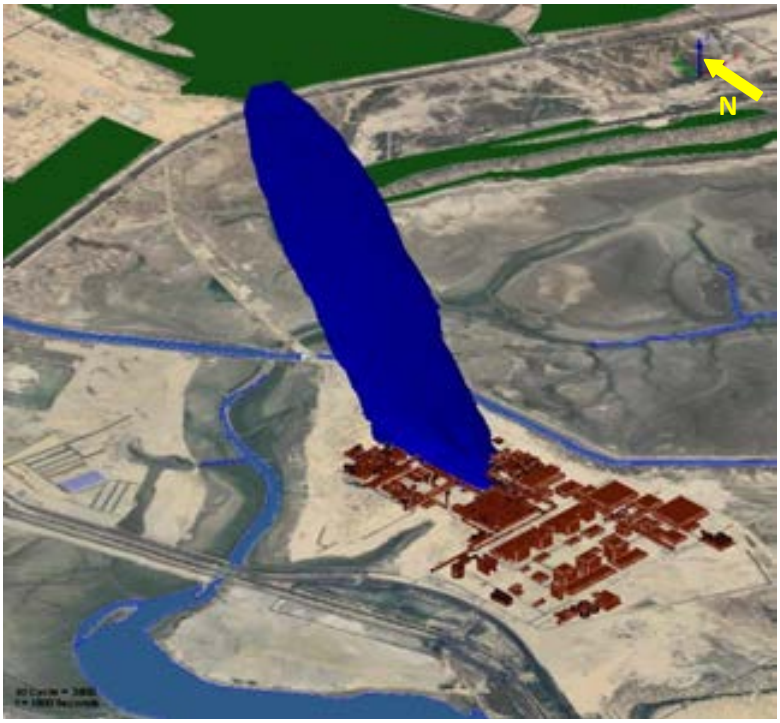


Figure 22: 3D plot view of IDLH @ 50 ppm

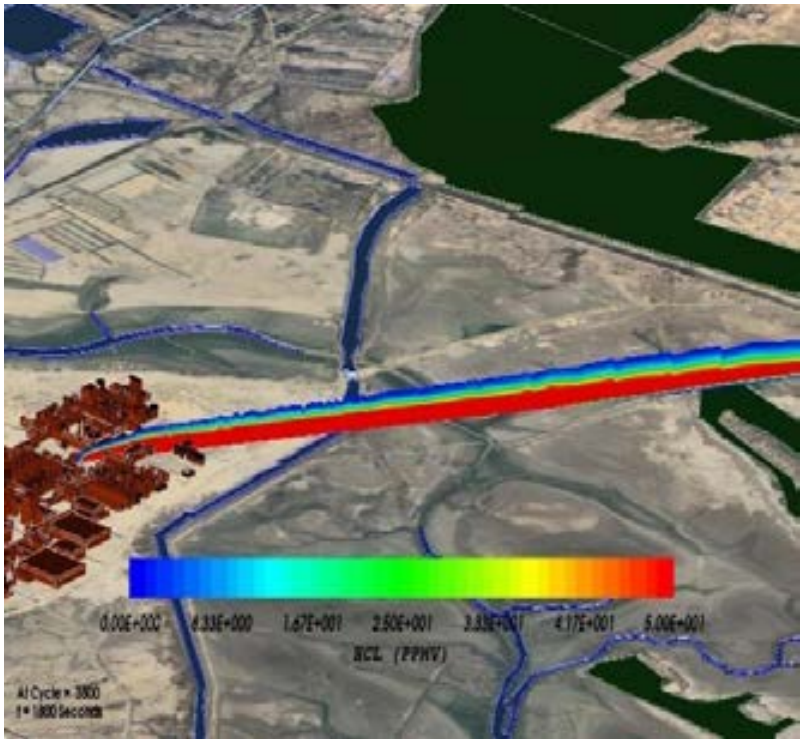


Figure 23: Anhydrous HCl IDLH Contours on a Vertical Section

5D - 210° Dispersion Simulation Results: Chloro Alkali Unit - Anhydrous HCl

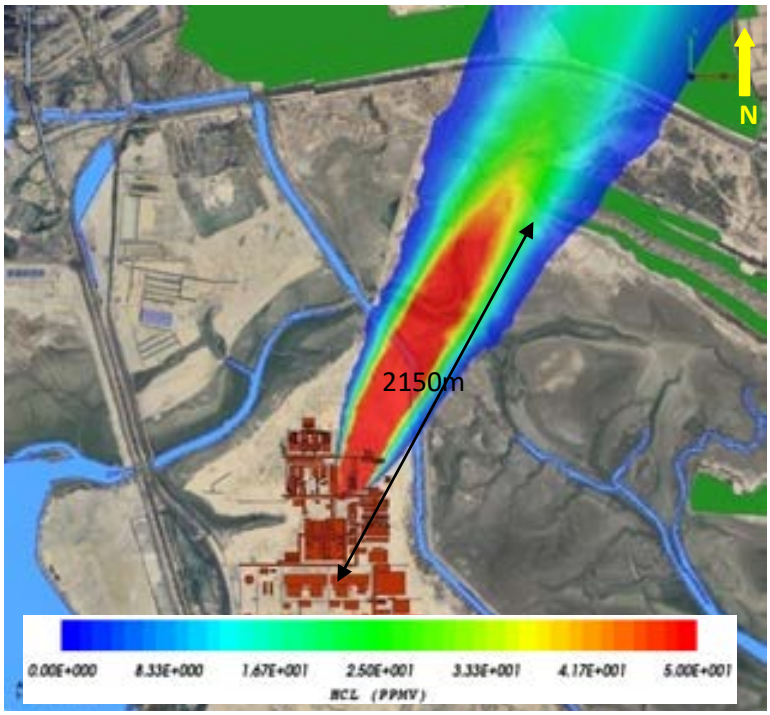


Figure 24: Concentration Contours at IDLH 50 ppm (Region in Red)

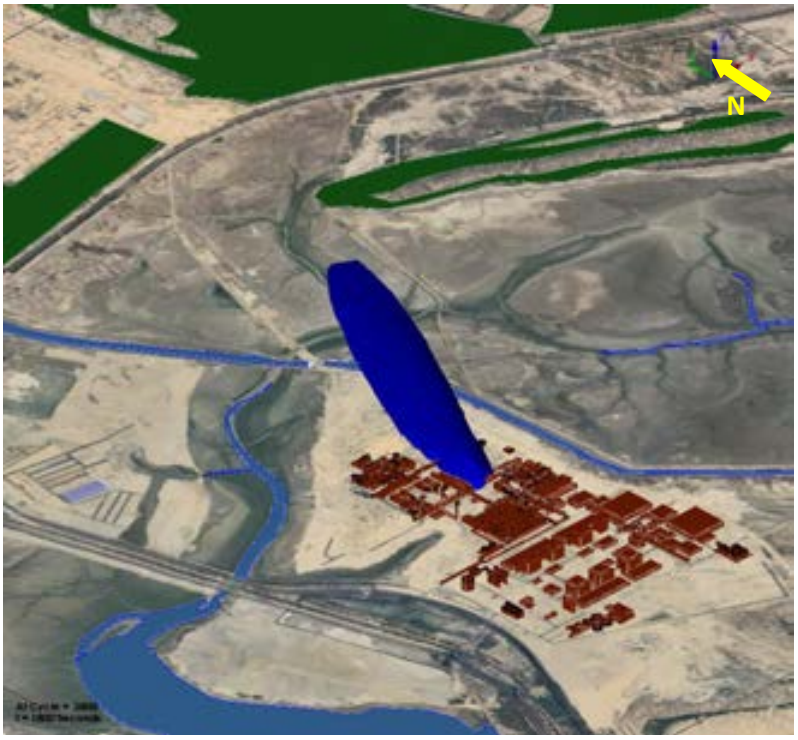


Figure 25: 3D plot view of IDLH @ 50 ppm

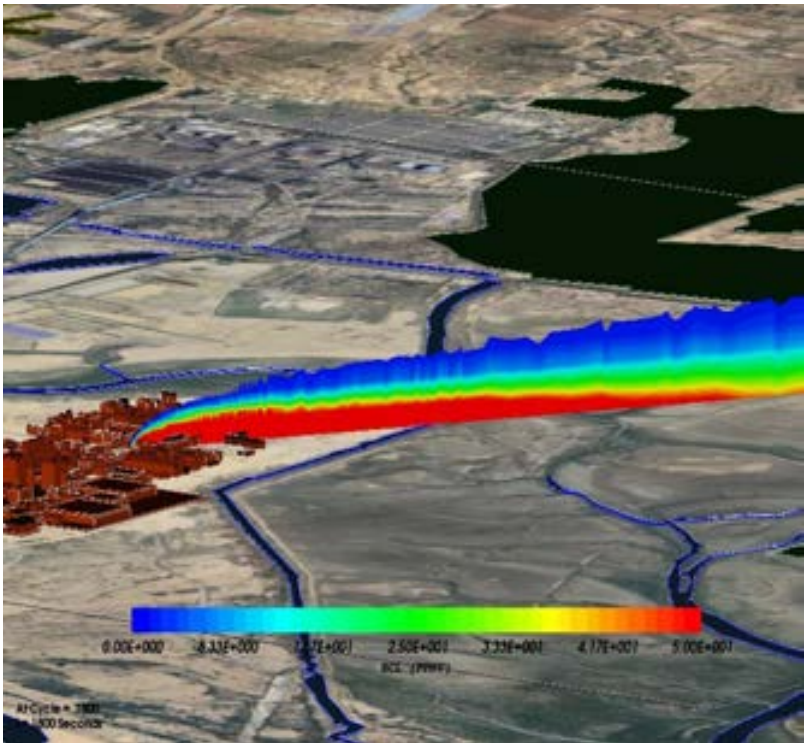


Figure 26: Anhydrous HCl IDLH Contours on a Vertical Section

3D dispersion analysis of Anhydrous HCl dispersion shows that the maximum impact distance of 2150m achieved after 1 hour of dispersion. It can be noted that the toxic plume shall continue to disperse and travel even after the stoppage of release, until it gets diffused to trace concentration levels.

IV.1.2 Chloro Alkali Unit Scenario – Chlorine:

Release of Cl2 dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Chloro Alkali Unit – Cl2

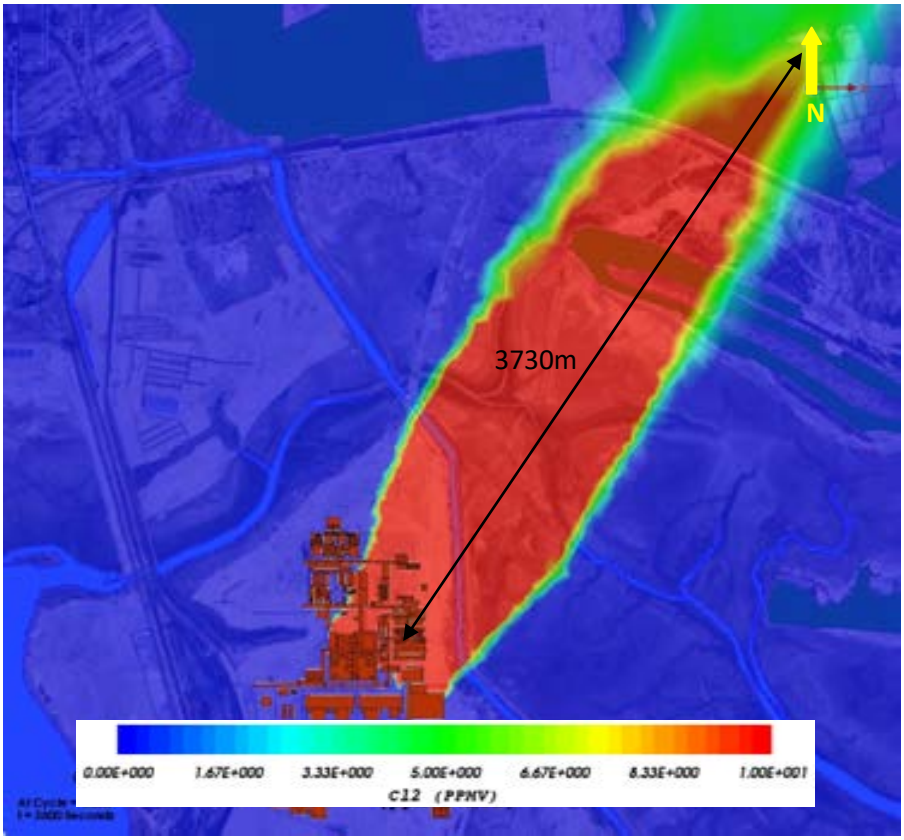


Figure 27: Concentration Contours at IDLH 10 ppm (Region in Red)

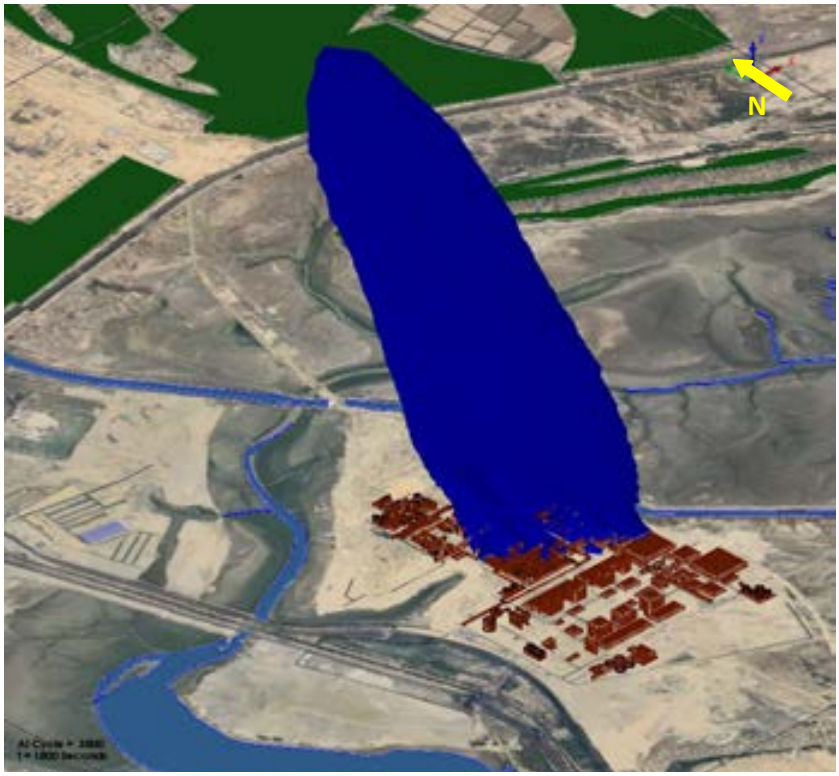


Figure 28: 3D plot view of IDLH @ 10 ppm

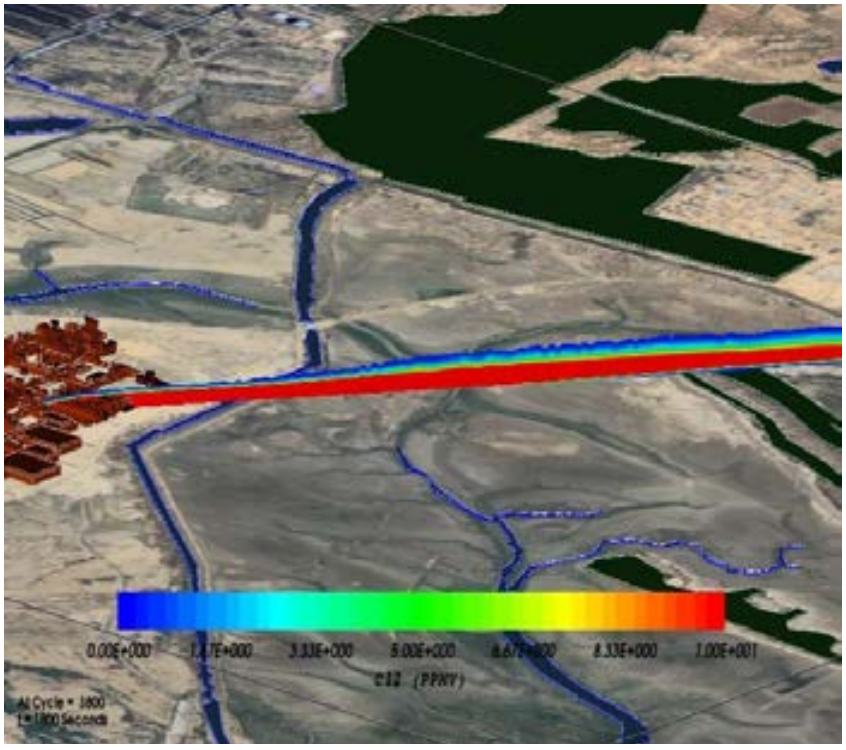


Figure 29: Cl2 IDLH Contours on a Vertical Section

5D - 210° Dispersion Simulation Results: Chloro Alkali Unit - Cl2

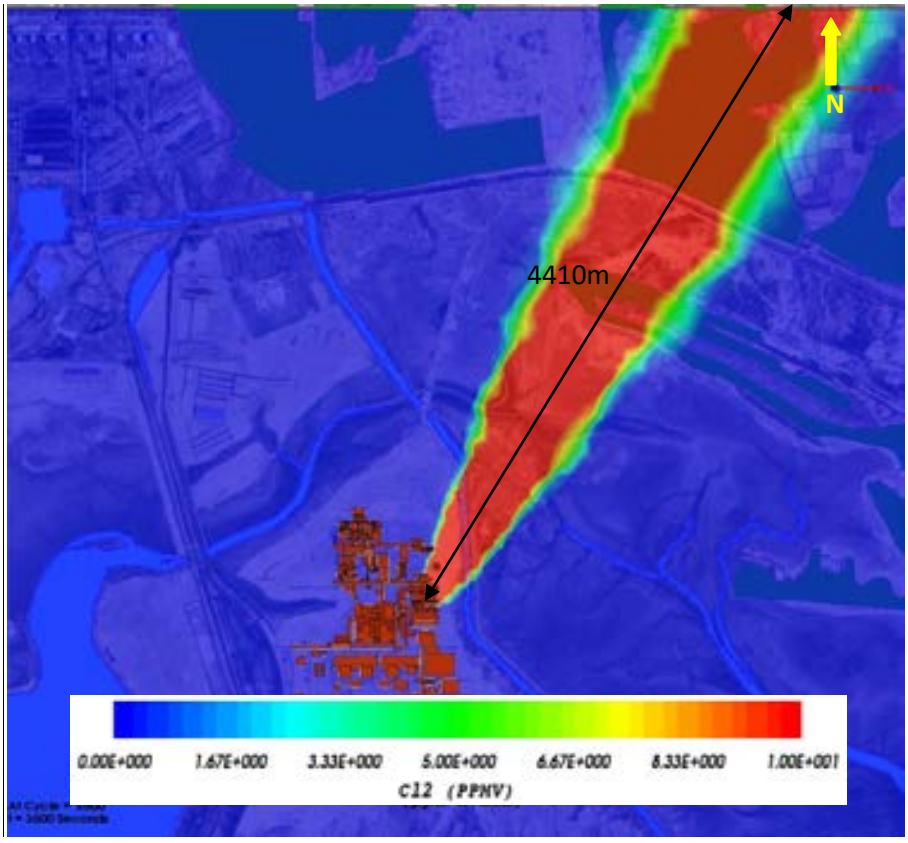


Figure 30: Concentration Contours at IDLH 10 ppm (Region in Red)

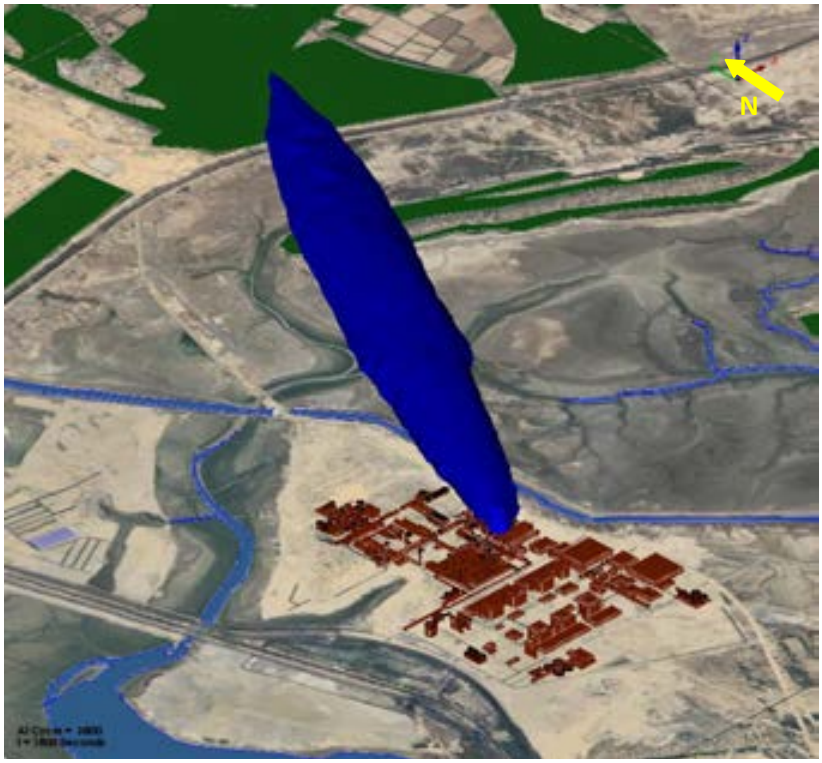


Figure 31: 3D plot view of IDLH @ 10 ppm

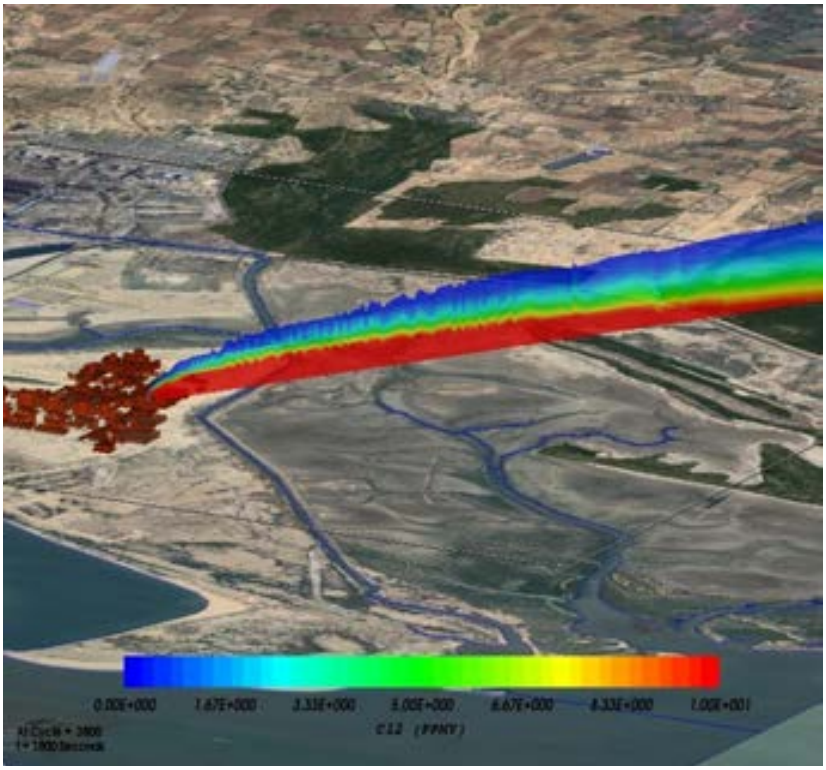


Figure 32: Cl2 IDLH Contours on a Vertical Section

3D dispersion analysis of Cl2 dispersion shows that the maximum impact distance of 4410m achieved after 1 hour of dispersion. It can be noted that the toxic plume shall continue to disperse and travel even after the stoppage of release, until it gets diffused to trace concentration levels.

IV.1.3 Chloro Alkali Unit Scenario – Liquid Chlorine:

Release of Liquid Cl_2 dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Chloro Alkali Unit - Liquid Cl2

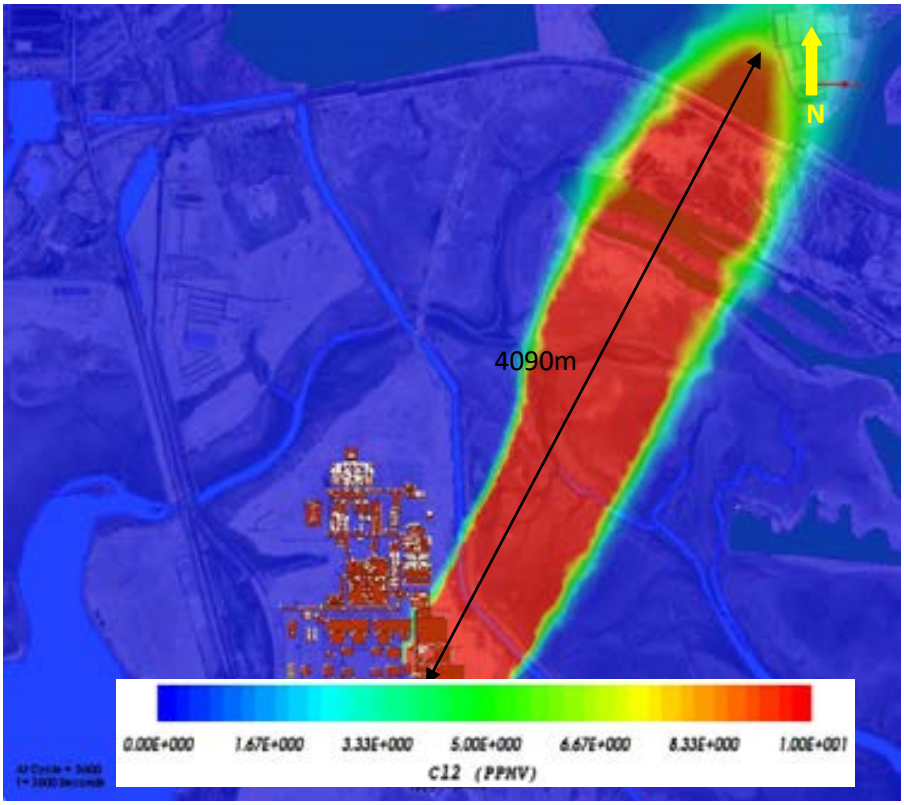


Figure 33: Concentration Contours at IDLH 10 ppm (Region in Red)

Figure 34: 3D plot view of IDLH @ 10 ppm

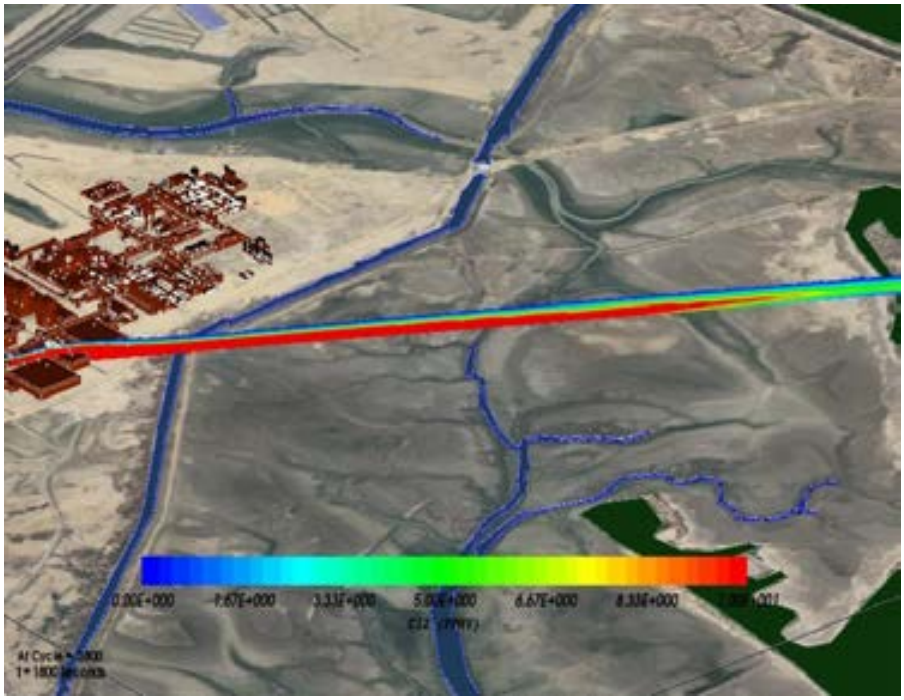


Figure 35: Cl_2 IDLH Contours on a Vertical Section

5D - 210° Dispersion Simulation Results: Chloro Alkali Unit - Liquid Cl2

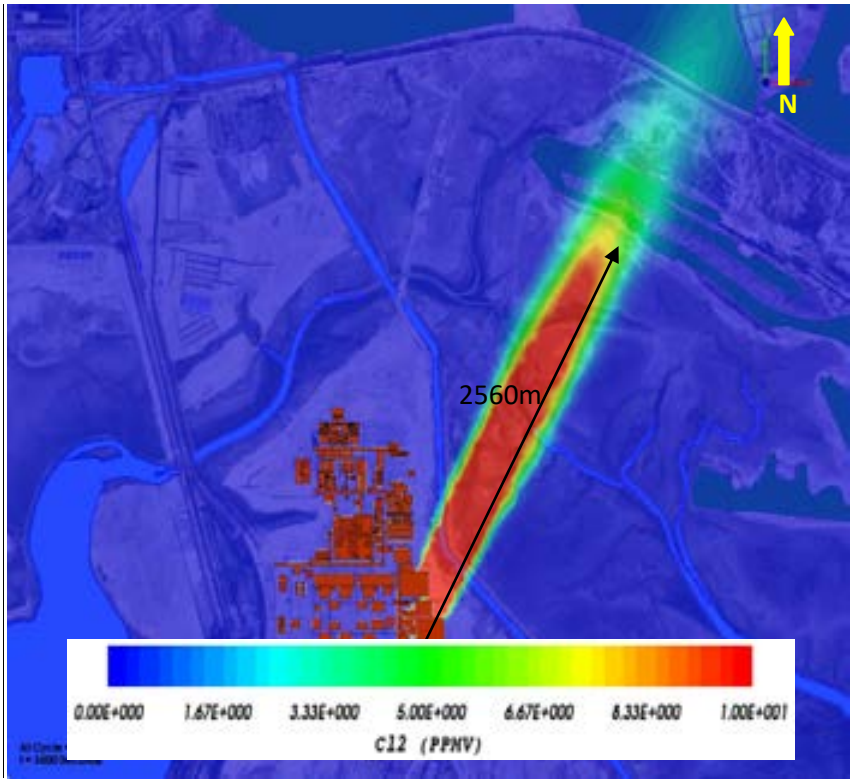


Figure 36: Concentration Contours at IDLH 10 ppm (Region in Red)

Figure 37: 3D plot view of IDLH @ 10 ppm

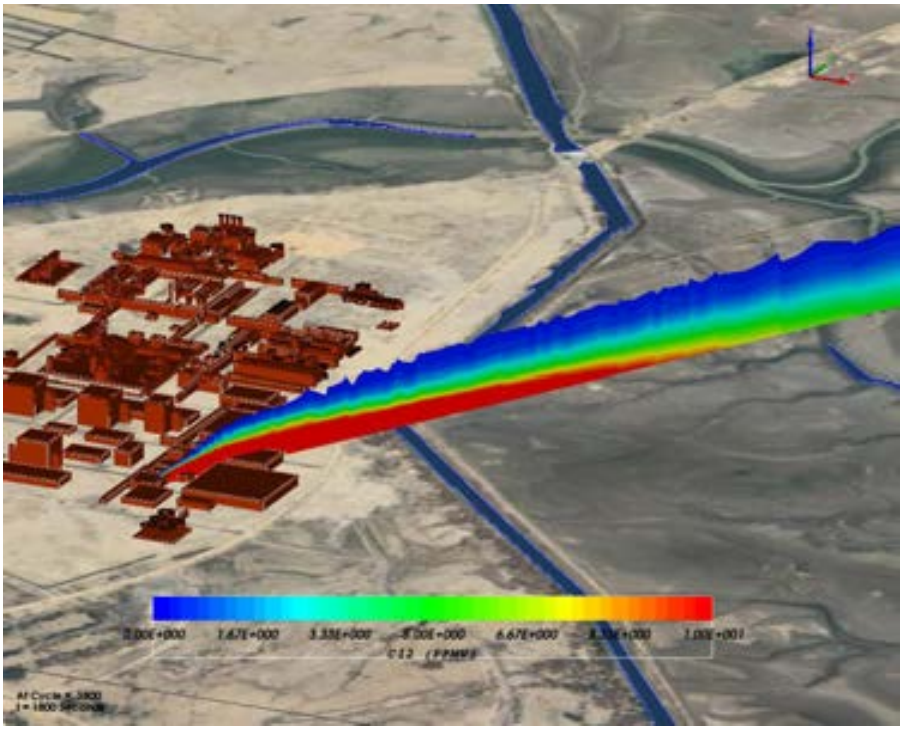


Figure 38: Cl_2 IDLH Contours on a Vertical Section

3D dispersion analysis of Liquid Cl_2 dispersion shows that the maximum impact distance of 4090m achieved after 1 hour of dispersion. . It can be noted that the toxic plume shall continue to disperse and travel even after the stoppage of release, until it gets diffused to trace concentration levels.

IV.1.4 VCM Unit Scenario - C_2H_3CL:

Release of C_2H_3Cl (VCM-Vinyl Chloride Monomer) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: VCM - C2H3Cl

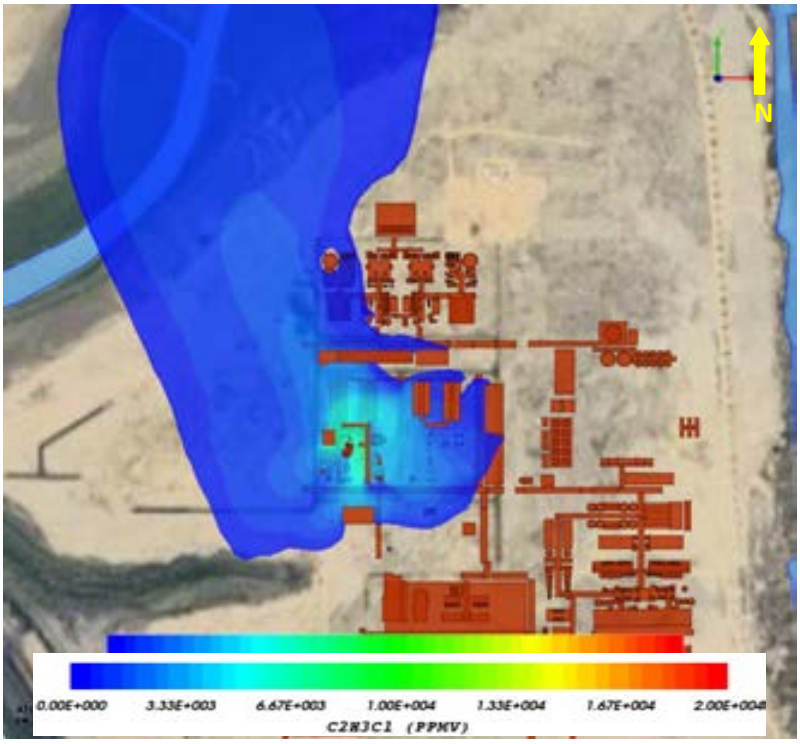


Figure 39: Concentration Contours at ERPG3 20000 ppm (not attained)

Figure 40: 3D view of ERPG3 @ 20000 ppm

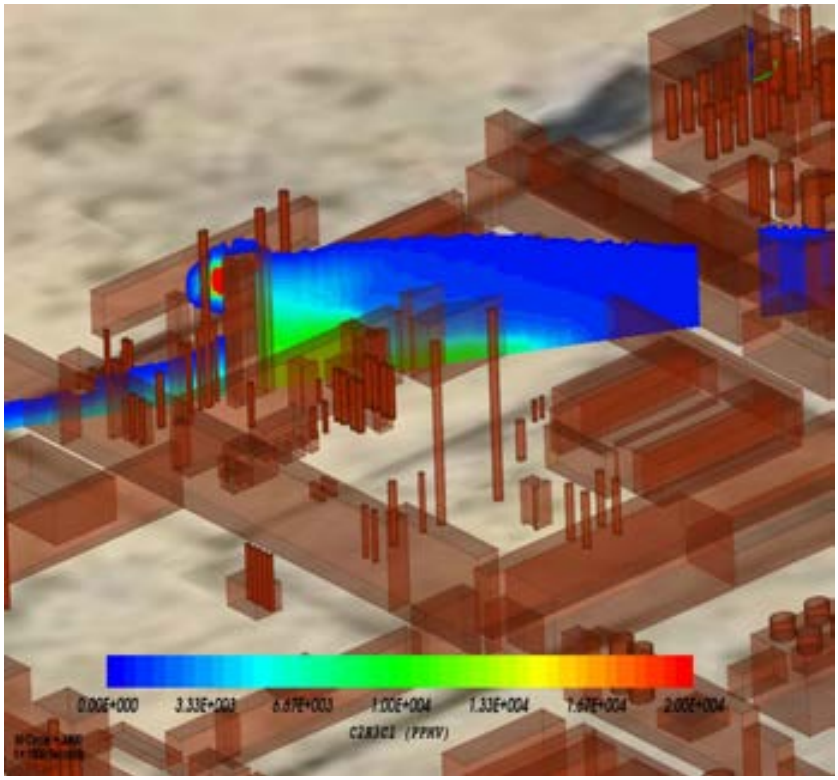


Figure 41: C_2H_3CL ERPG3 Plots on a Vertical Section

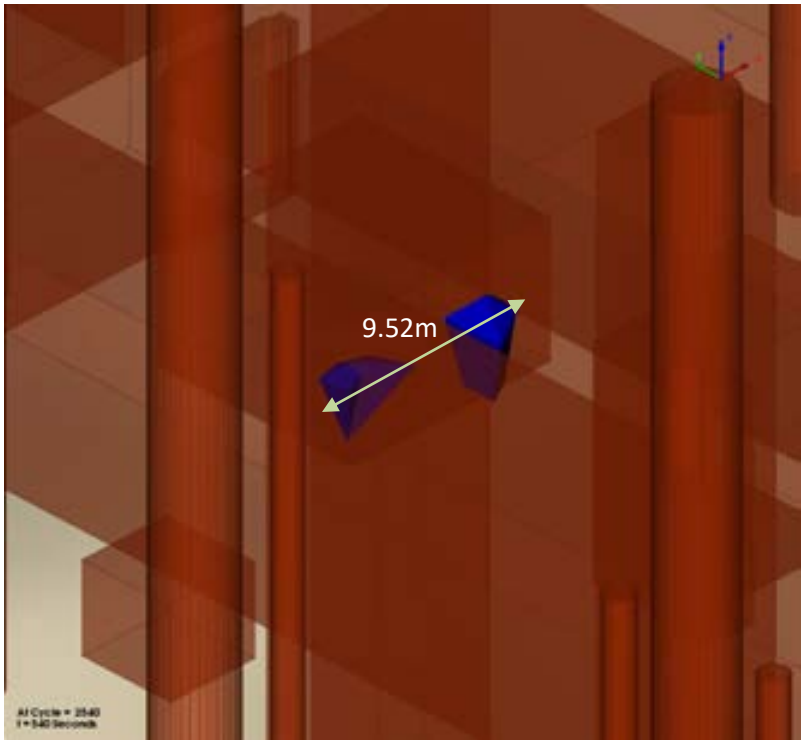


Figure 42: 100% LFL Cloud extent of VCM (FBR)

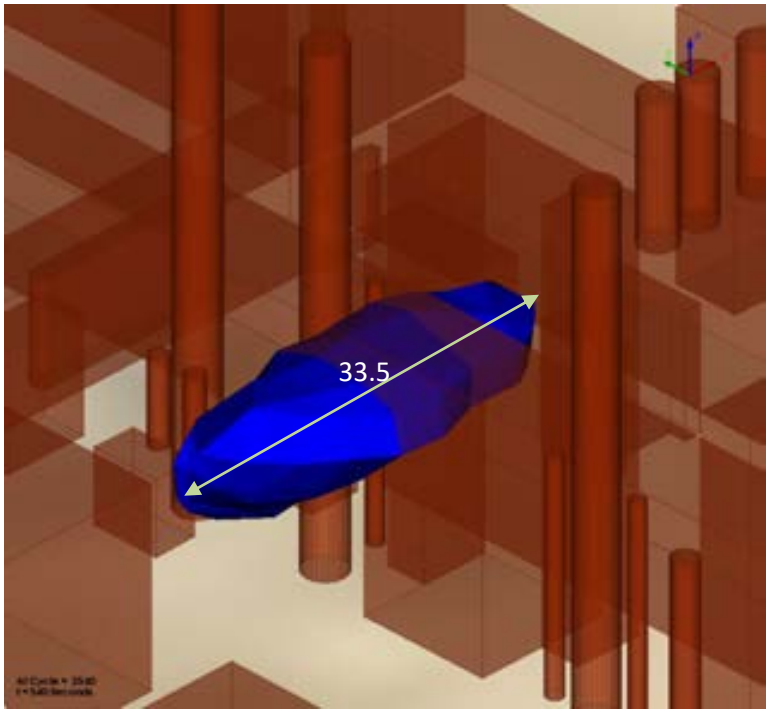


Figure 43: 50% LFL Cloud extent of VCM (FBR)

5D - 210° Dispersion Simulation Results: VCM – C2H3Cl

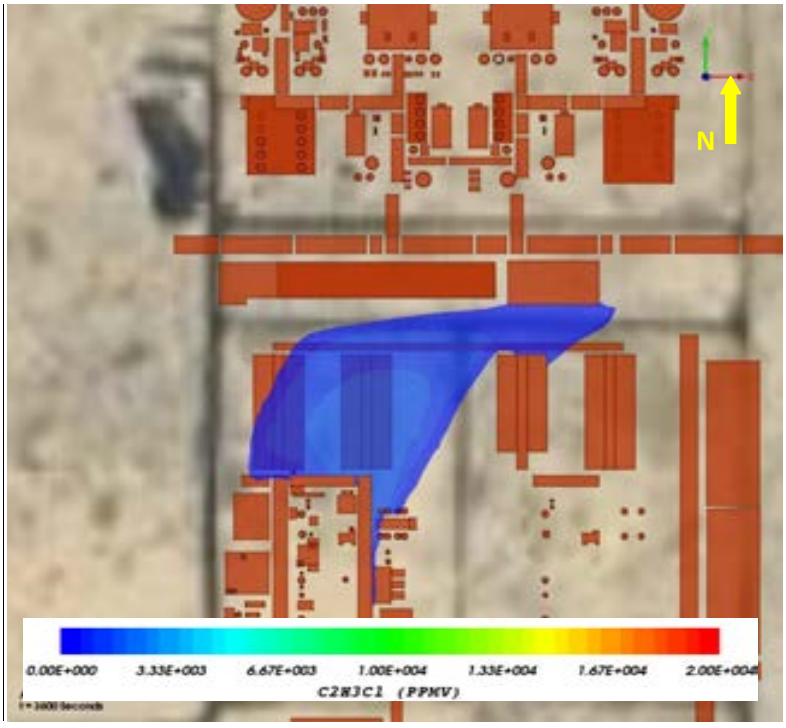


Figure 44: Concentration Contours at ERPG3 20000 ppm (not attained)

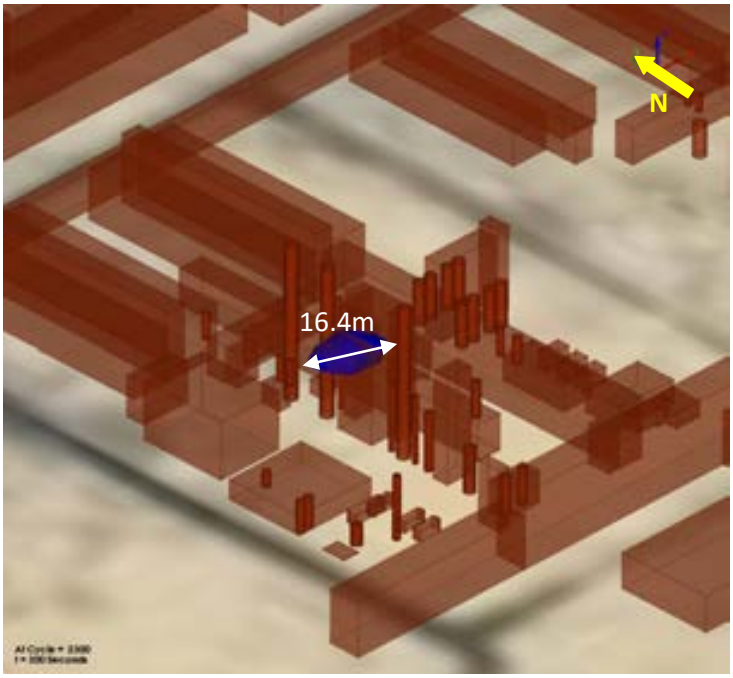


Figure 45: 3D plot view of ERPG3 @ 20000 ppm

It can be noted that the elevated release of VCM has shown no ERPG3 concentration on ground level plot (*Figure 44*), while the same was observed at an elevation as shown in *Figure 45*.

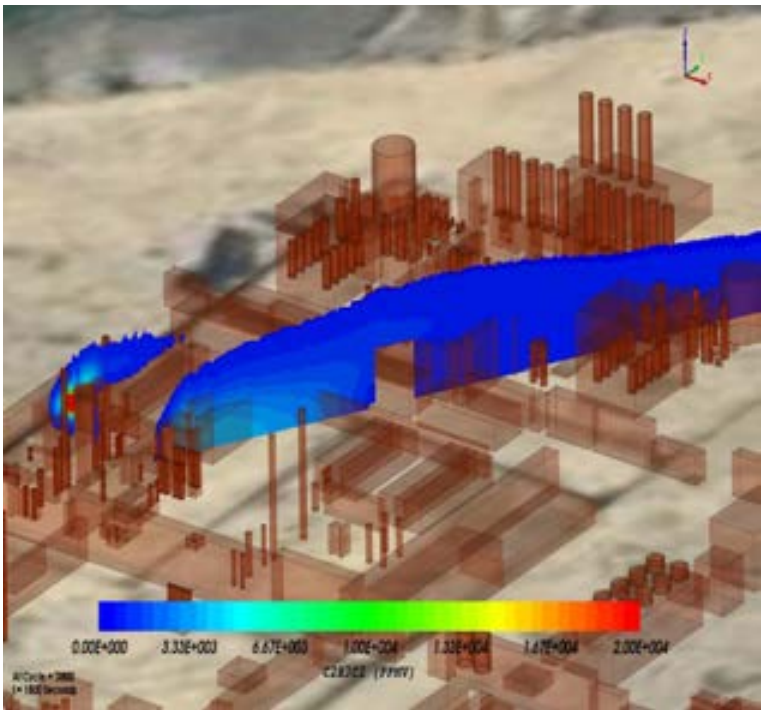


Figure 46: C_2H_3Cl ERPG3 Plots on a Vertical Section

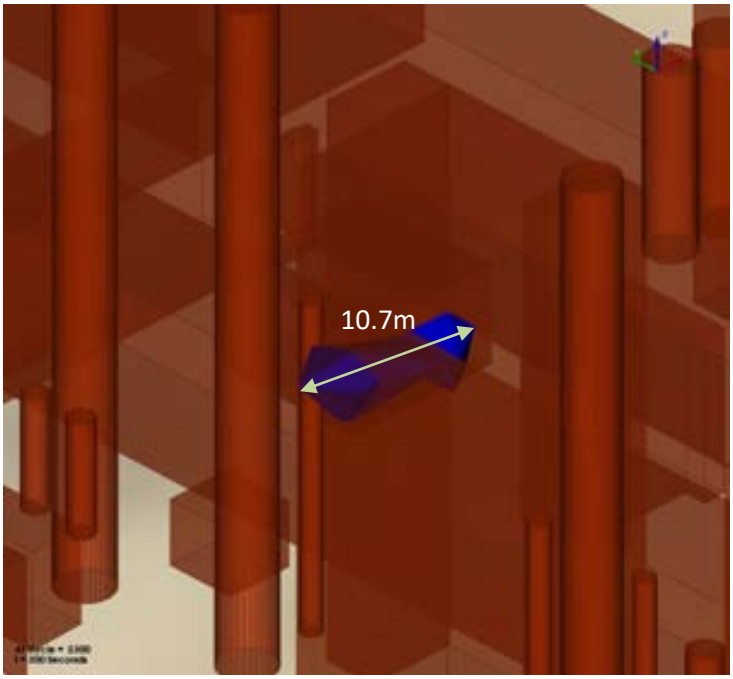


Figure 47: 100% LFL Cloud extent of VCM (FBR)

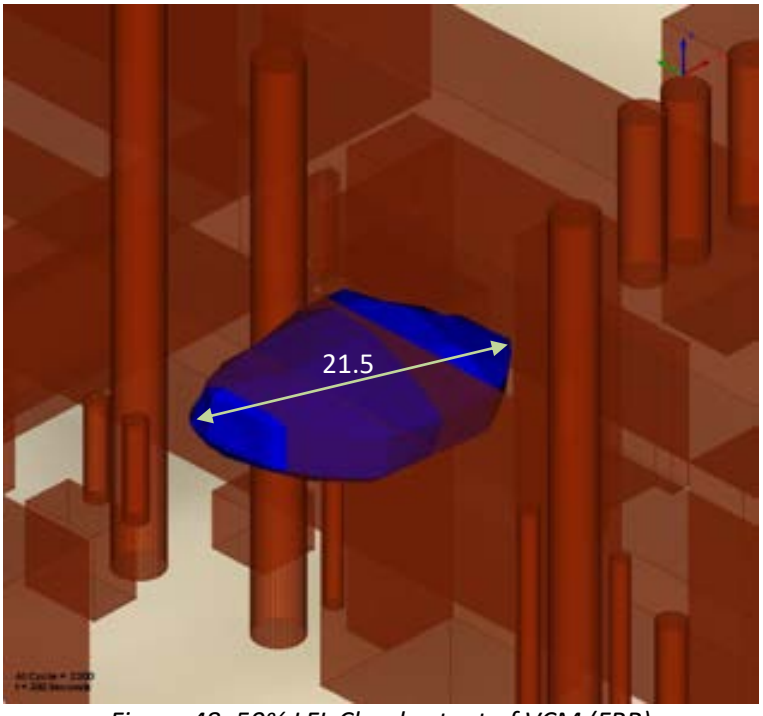


Figure 48: 50% LFL Cloud extent of VCM (FBR)

IV.1.5 VCM Unit Scenario - Propane:

Release of C3H8 dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: VCM - C3H8

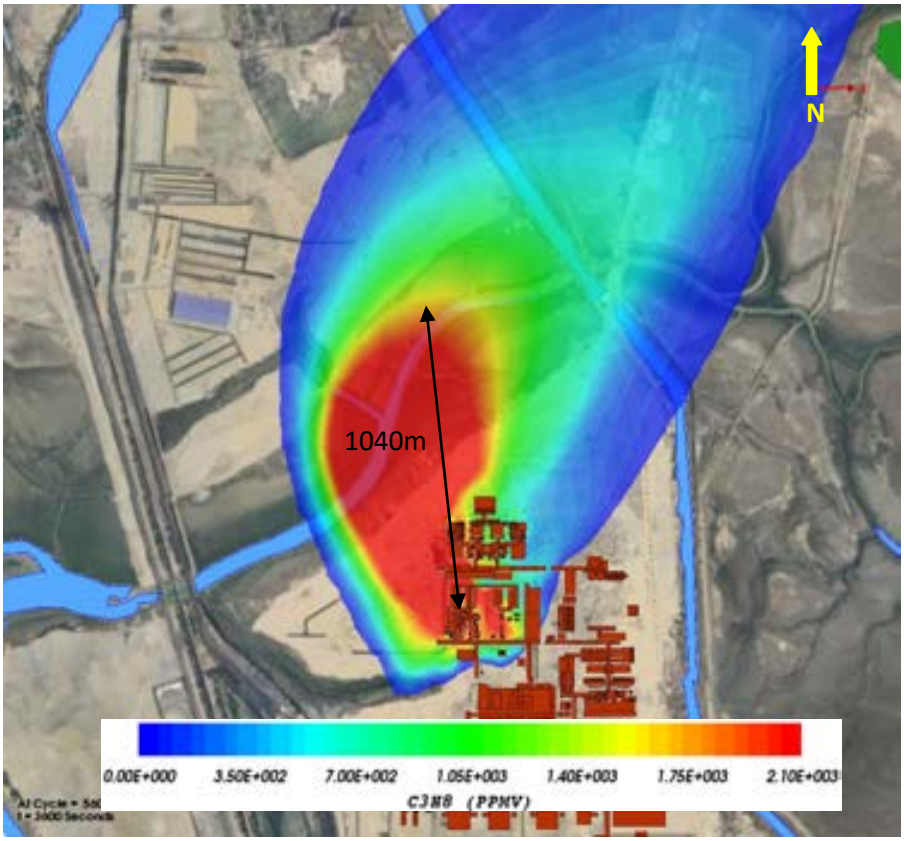


Figure 49: Concentration Contours at IDLH 2100 ppm (Region in Red)

Figure 50: 3D view of IDLH cloud @ 2100 ppm

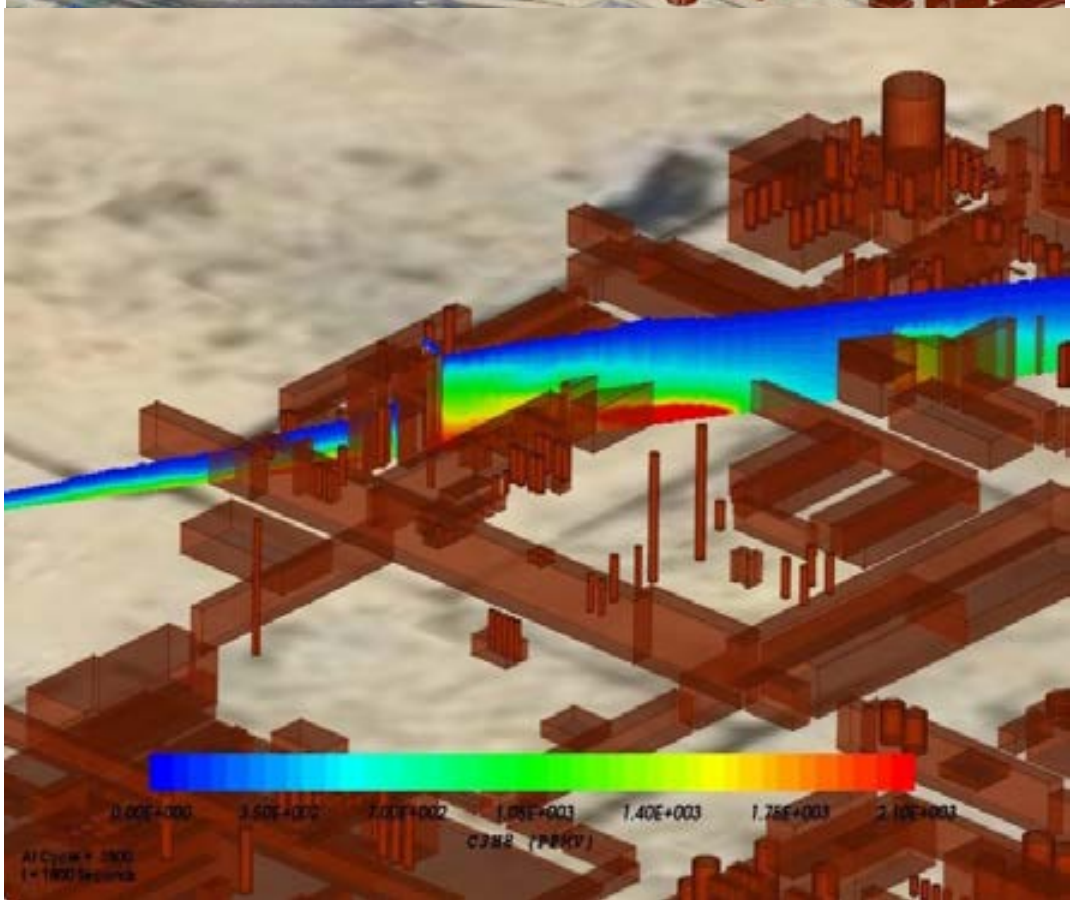


Figure 51: C_3H_8 IDLH Contours on a Vertical Section

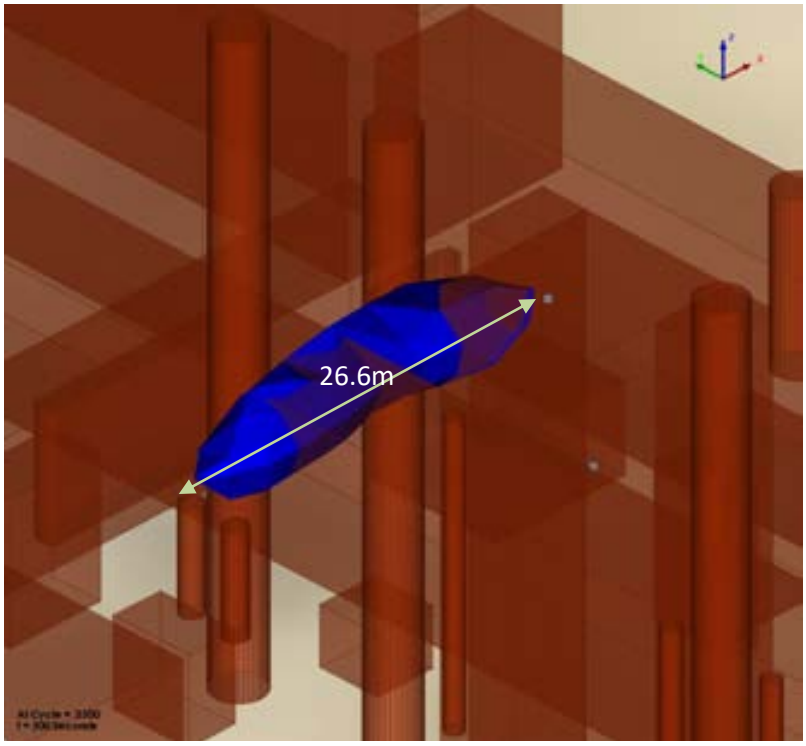


Figure 52: 100% LFL Cloud extent of Propane (FBR)

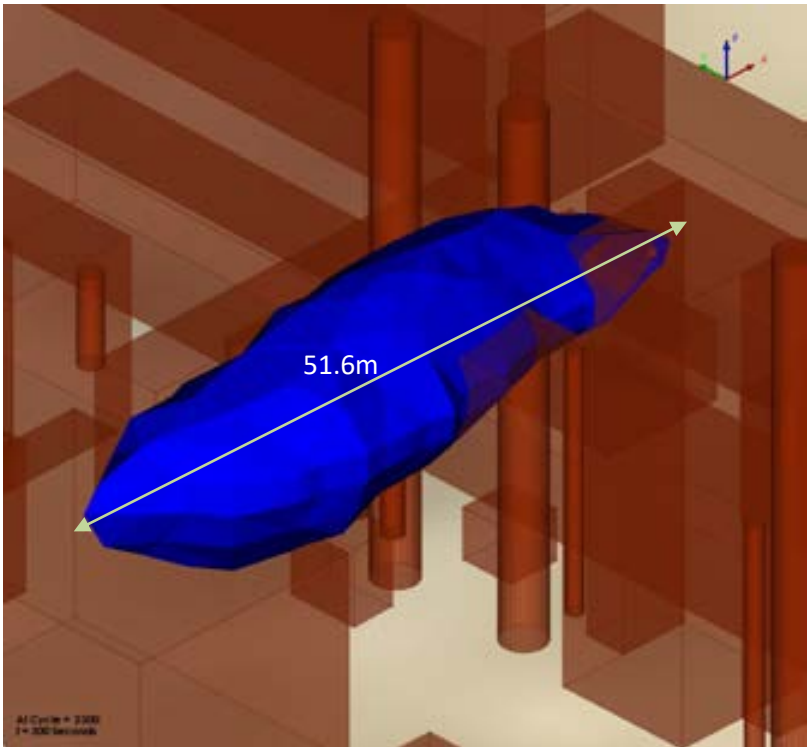


Figure 53: 50% LFL Cloud extent of Propane (FBR)

5D - 210° Dispersion Simulation Results: VCM – C3H8

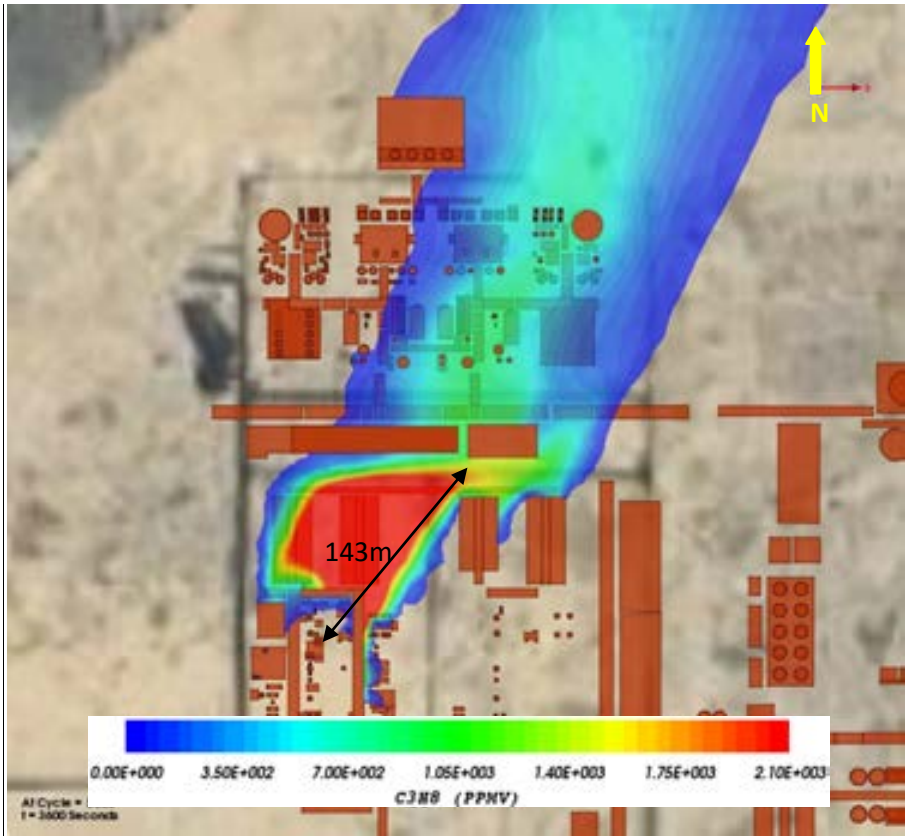


Figure 54: Concentration Contours at IDLH 2100 ppm (Region in Red)

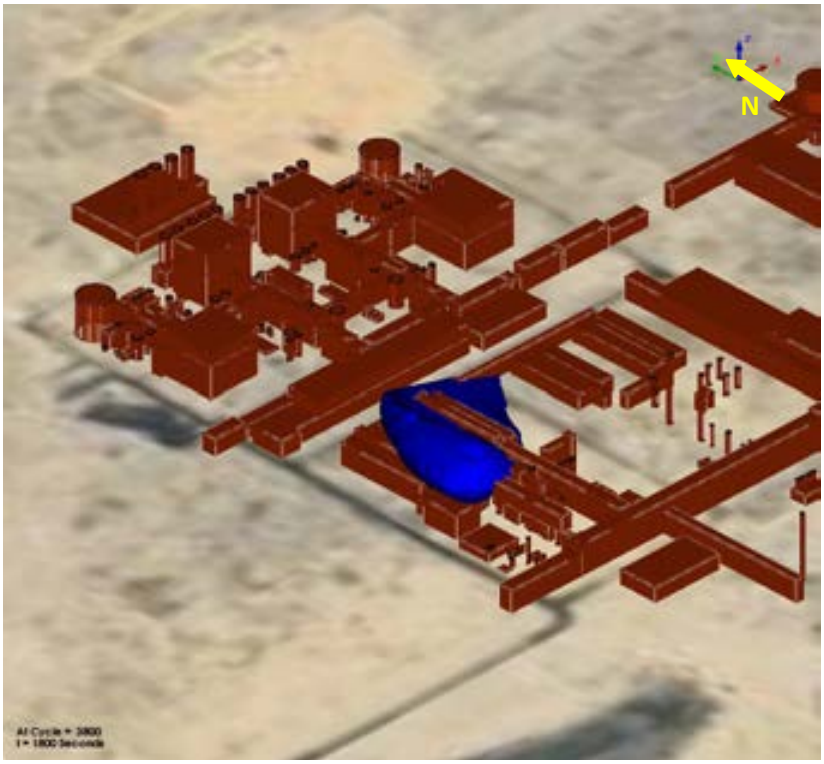


Figure 55: 3D plot view of IDLH @ 2100 ppm

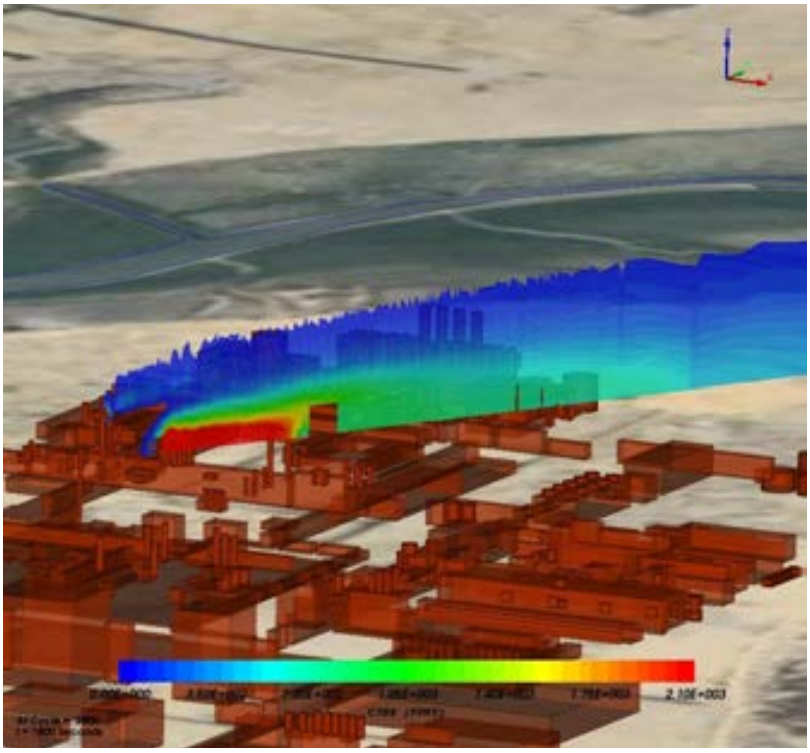


Figure 56: C_3H_8 IDLH Contours on a Vertical Section

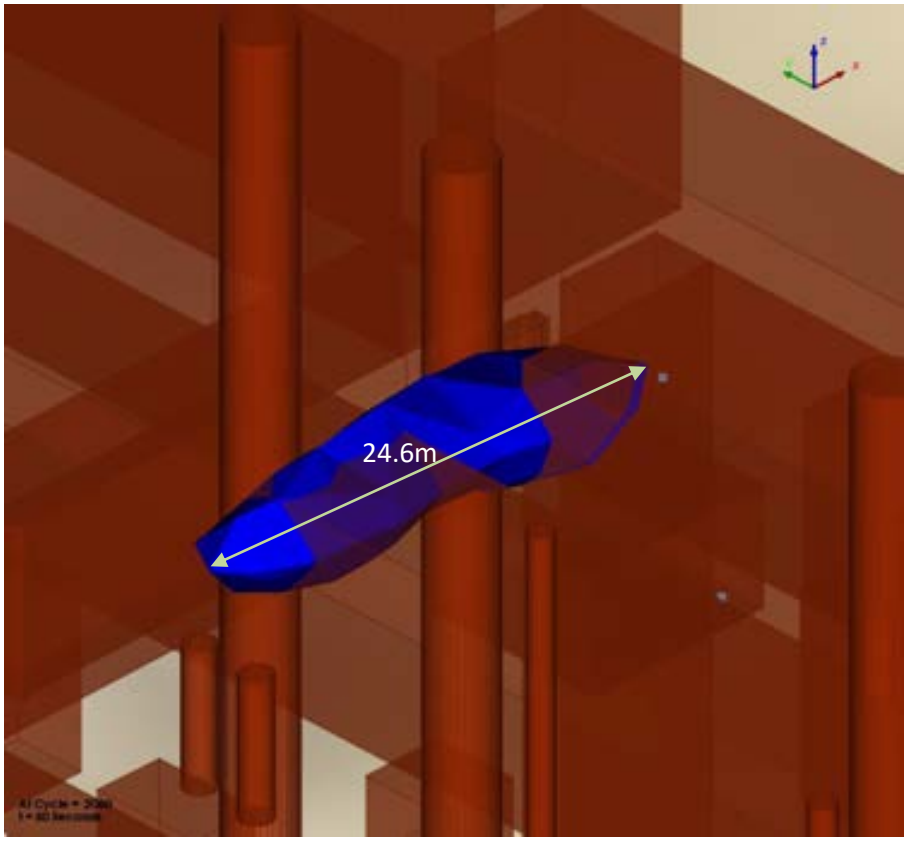


Figure 57: 100% LFL Cloud extent of Propane (FBR)

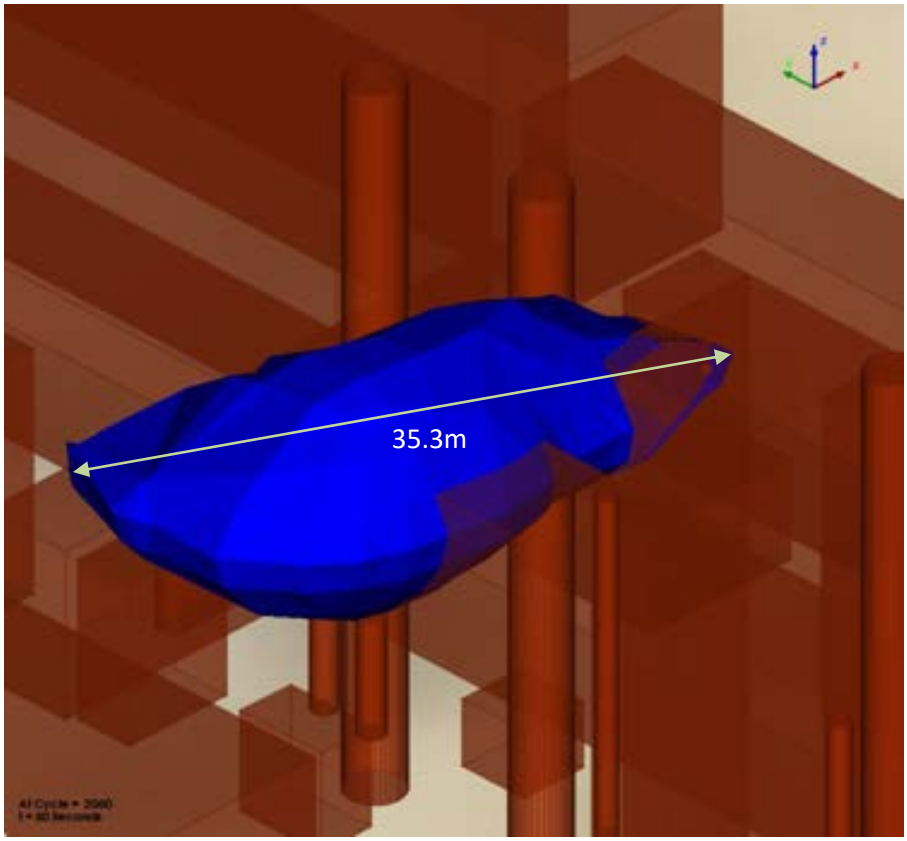


Figure 58: 100% LFL Cloud extent of Propane (FBR)

3D dispersion analysis of C_3H_8 dispersion shows that the maximum impact distance of 1040m achieved after 1 hour of dispersion.

It can be generally observed that for the elevated releases, threshold concentrations (IDLH / ERPG / LFL) were not significant on the ground but around the level of release.

IV.1.6 VCM Unit Scenario - Anhydrous Hydrogen Chloride:

Release of Anhydrous HCl dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: VCM - Anhydrous HCl

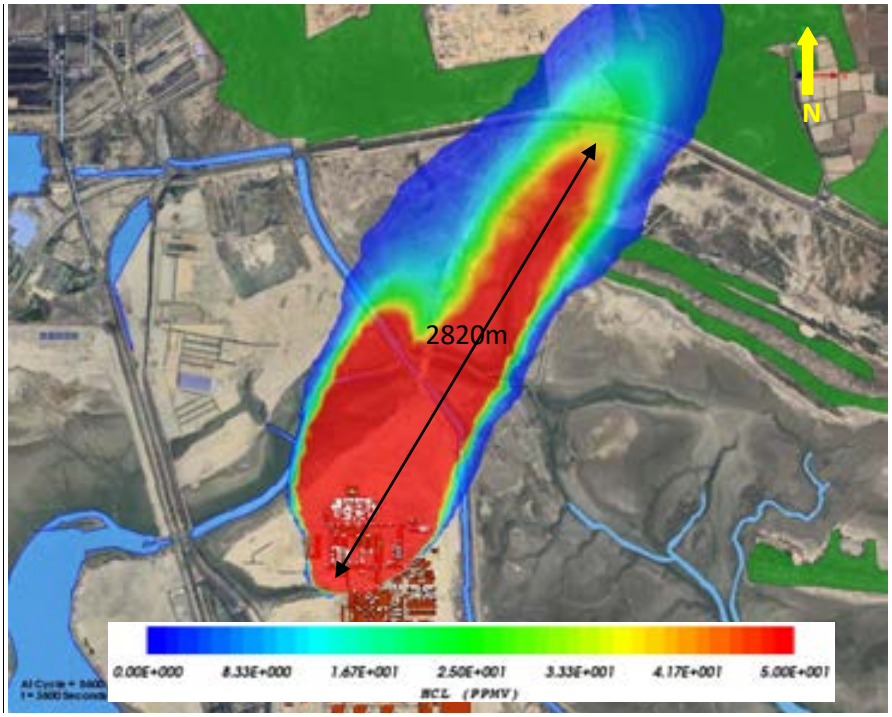


Figure 59: Concentration Contours at IDLH 50 ppm (Region in Red)

Figure 60: 3D plot view of IDLH @ 50 ppm

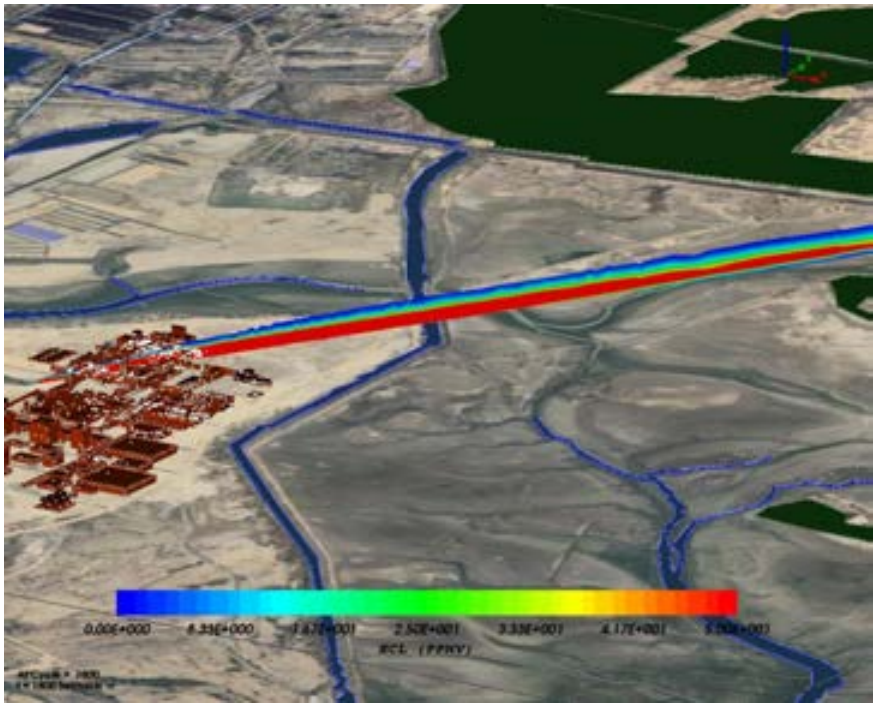


Figure 61: Anhydrous HCl IDLH Contours on a Vertical Section

5D - 210° Dispersion Simulation Results: VCM - Anhydrous HCl

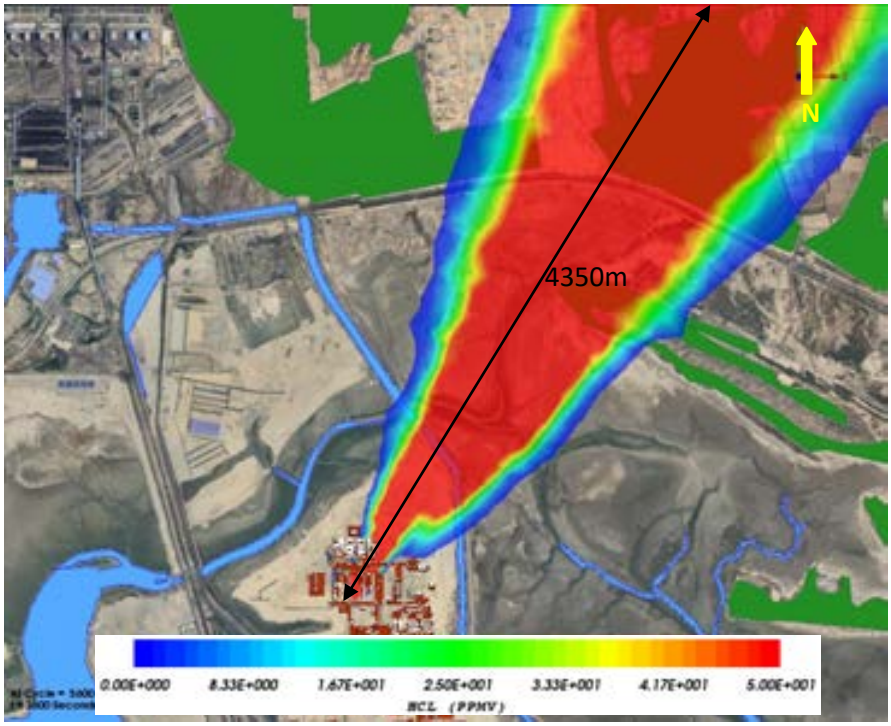


Figure 62: Concentration Contours at IDLH 50 ppm (Region in Red)

Figure 63: 3D plot view of IDLH @ 50 ppm

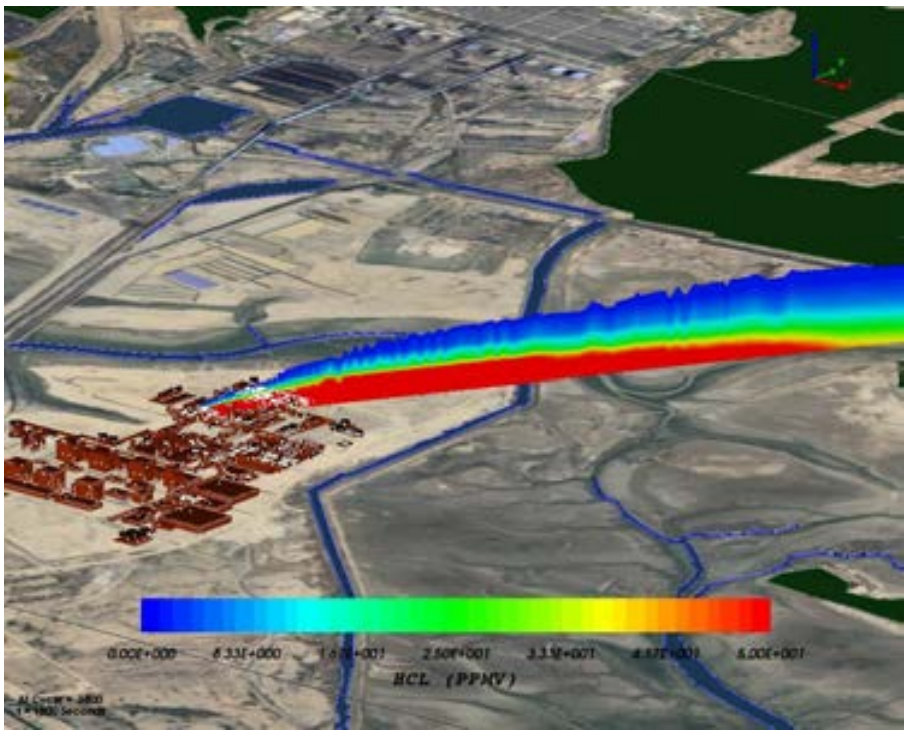


Figure 64: Anhydrous HCl IDLH Contours on a Vertical Section

3D dispersion analysis of Anhydrous HCl dispersion shows that the maximum impact distance of 4350 m achieved after 1 hour of dispersion. It can be noted that the toxic plume shall continue to disperse and travel even after the stoppage of release, until it gets diffused to trace concentration levels.

IV.1.7 PVC Unit Scenario - C_2H_3CL:

Release of C_2H_3Cl (VCM-Vinyl Chloride Monomer) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: PVC - C2H3Cl

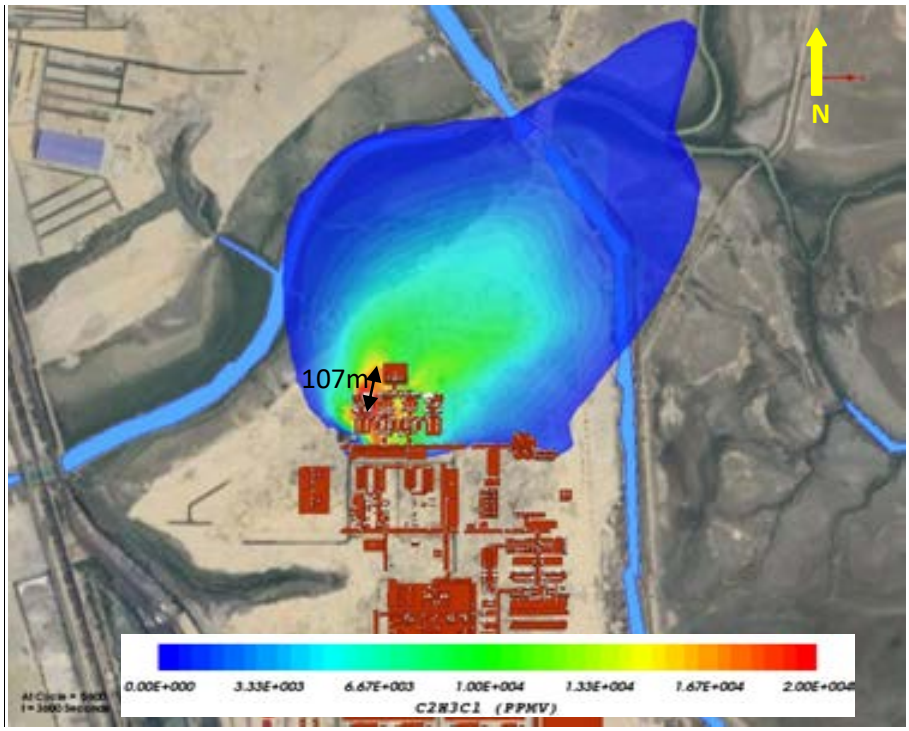


Figure 65: Concentration Contours at ERPG3 20000 ppm

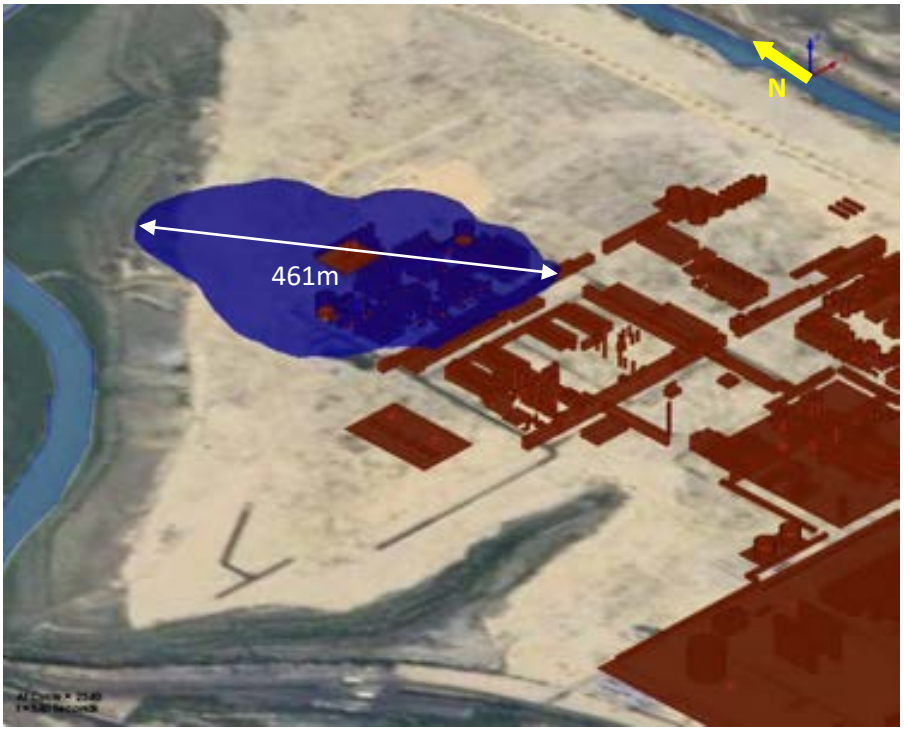


Figure 66: 3D view of ERPG3 @ 20000 ppm

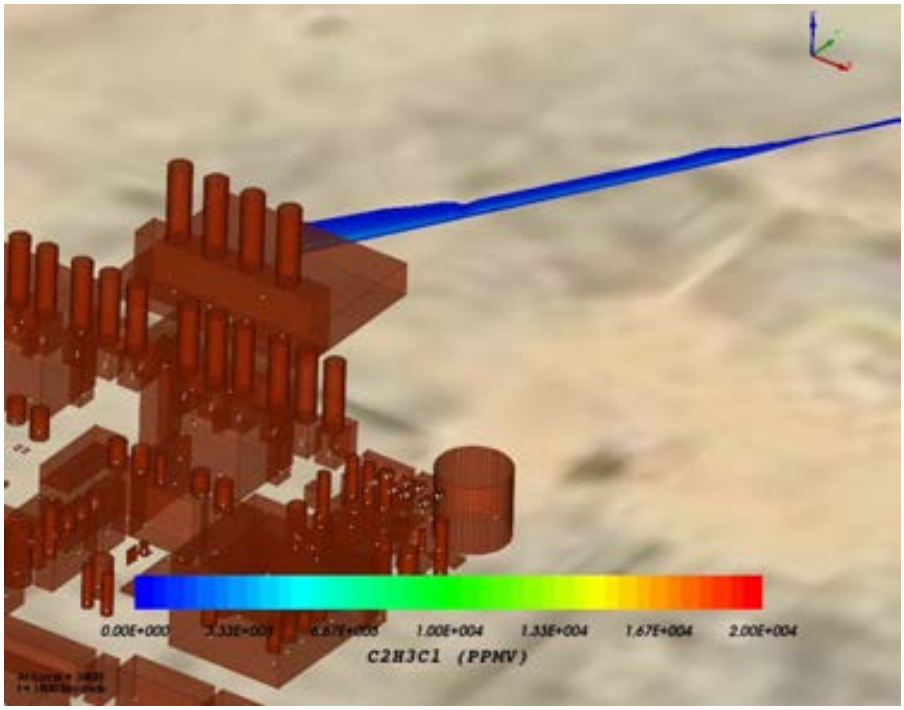


Figure 67: C_2H_3CL ERPG3 Plots on a Vertical Section

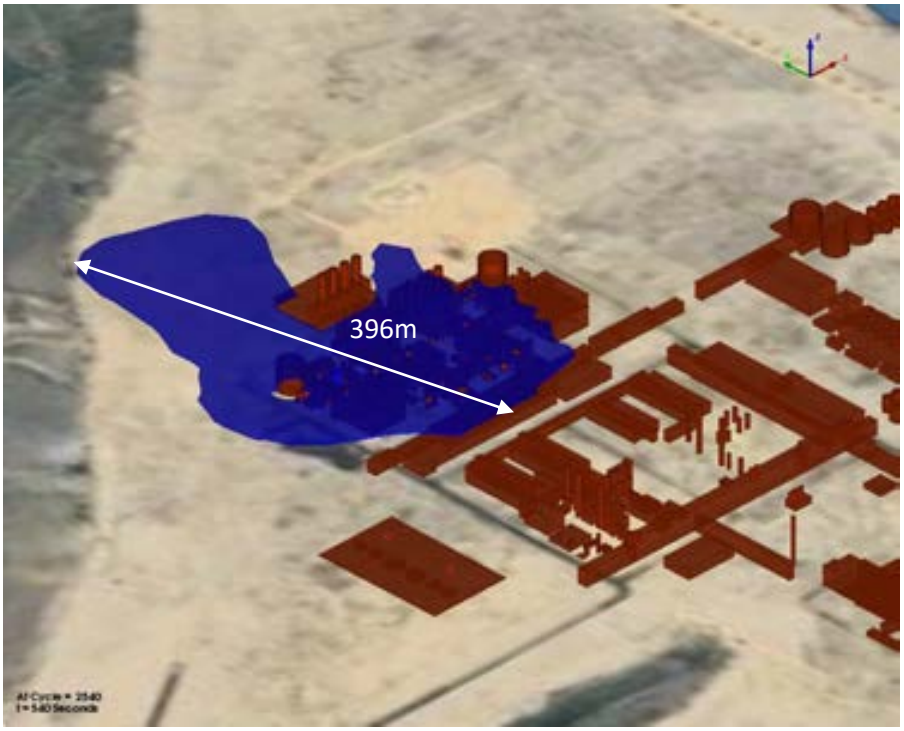


Figure 68: 100% LFL Cloud extent of VCM (FBR)

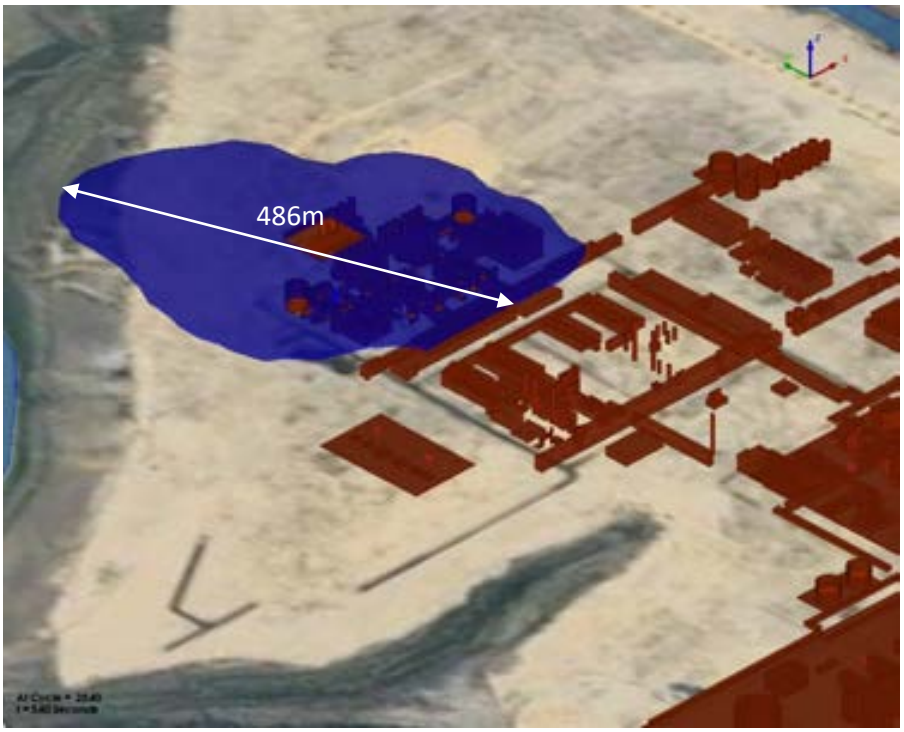


Figure 69: 50% LFL Cloud extent of VCM (FBR)

5D - 210° Dispersion Simulation Results: PVC – C2H3Cl

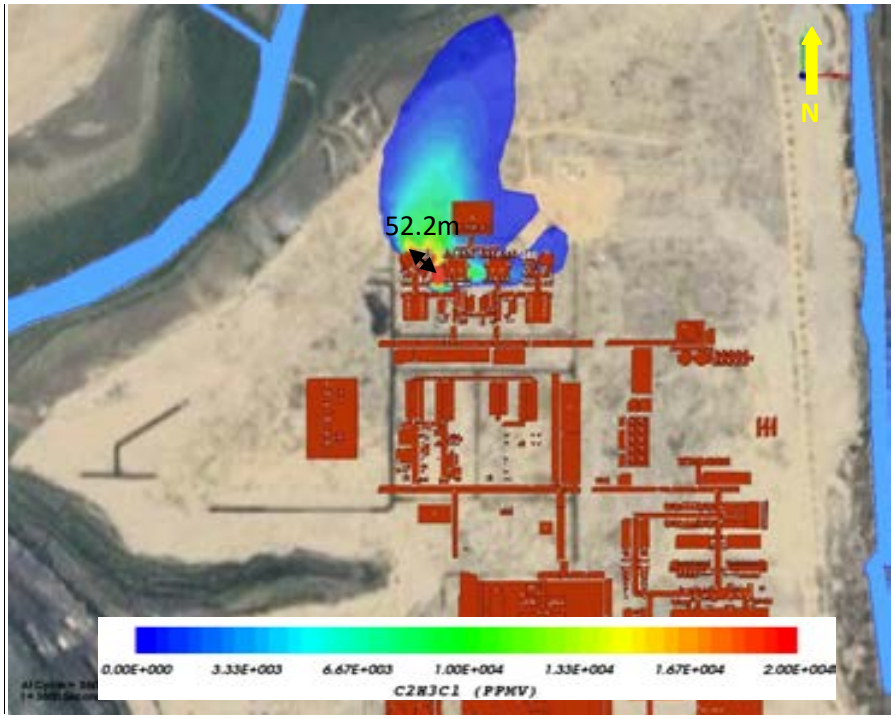


Figure 70: Concentration Contours at ERPG3 20000 ppm

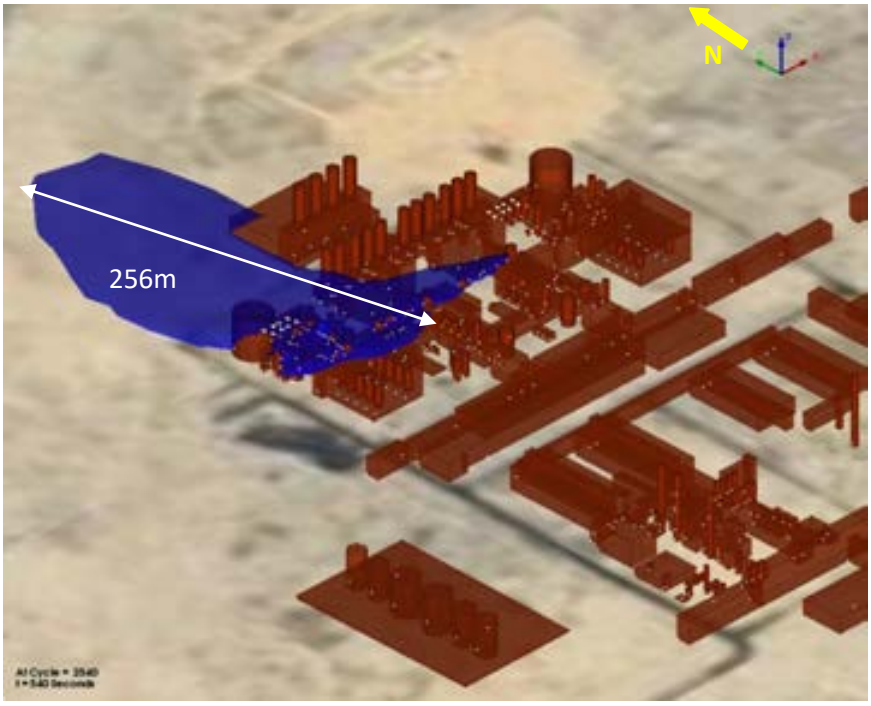


Figure 71: 3D plot view of ERPG3 @ 20000 ppm

It can be noted that the elevated release of VCM has resulted in lower threshold distances on ground, i.e. 107m for 2F; 52.2m for 5D, as can be seen in *Figure 65* & *Figure 70*.

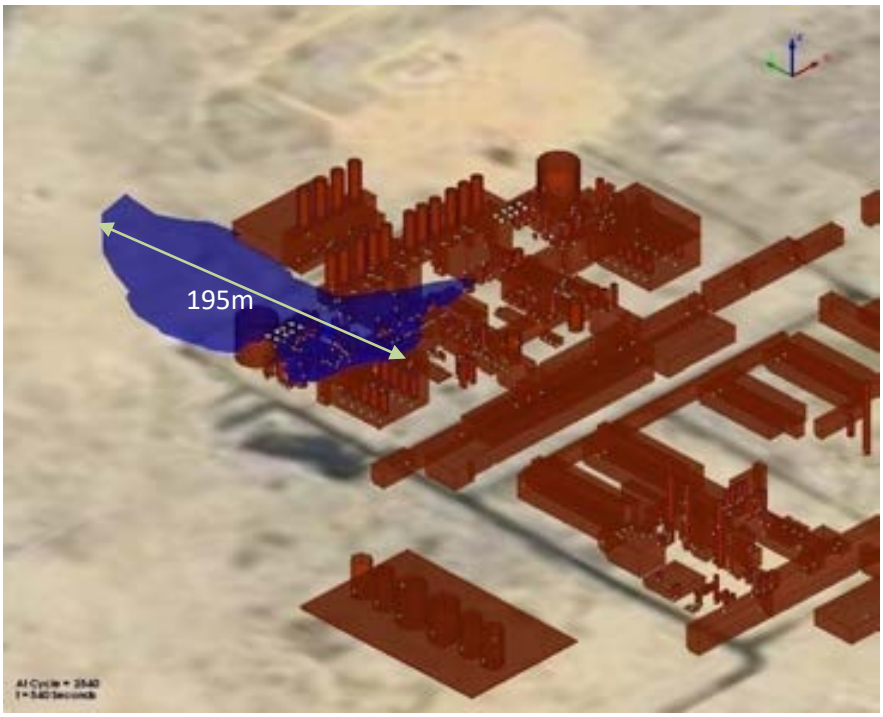


Figure 72: 100% LFL Cloud extent of VCM (FBR)

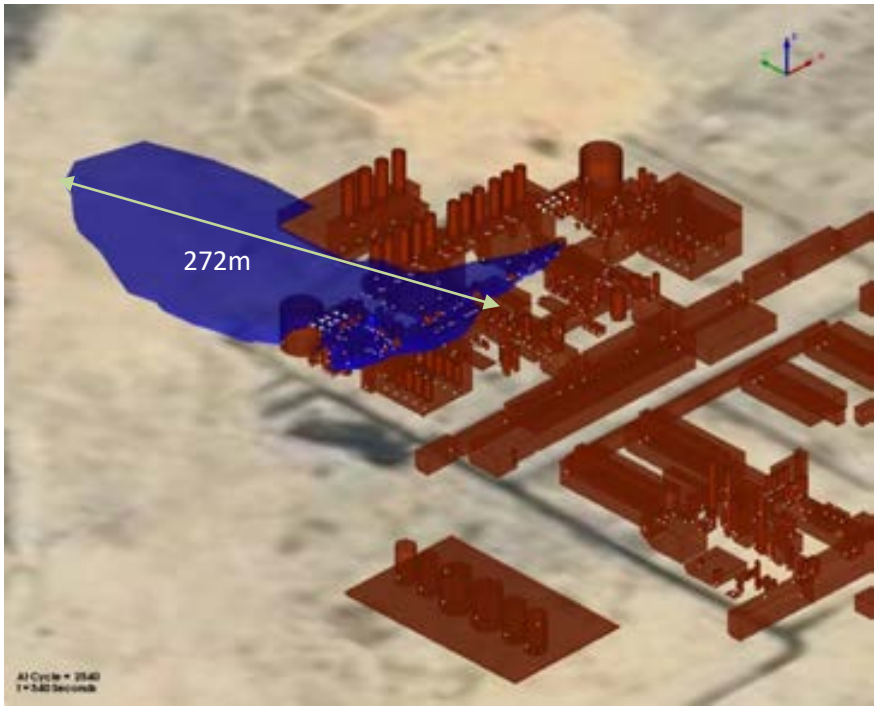


Figure 73: 50% LFL Cloud extent of VCM (FBR)

IV.1.8 O & U Unit Scenario - C2H3CL:

Release of C_2H_3Cl (VCM-Vinyl Chloride Monomer) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: O & U - C2H3Cl

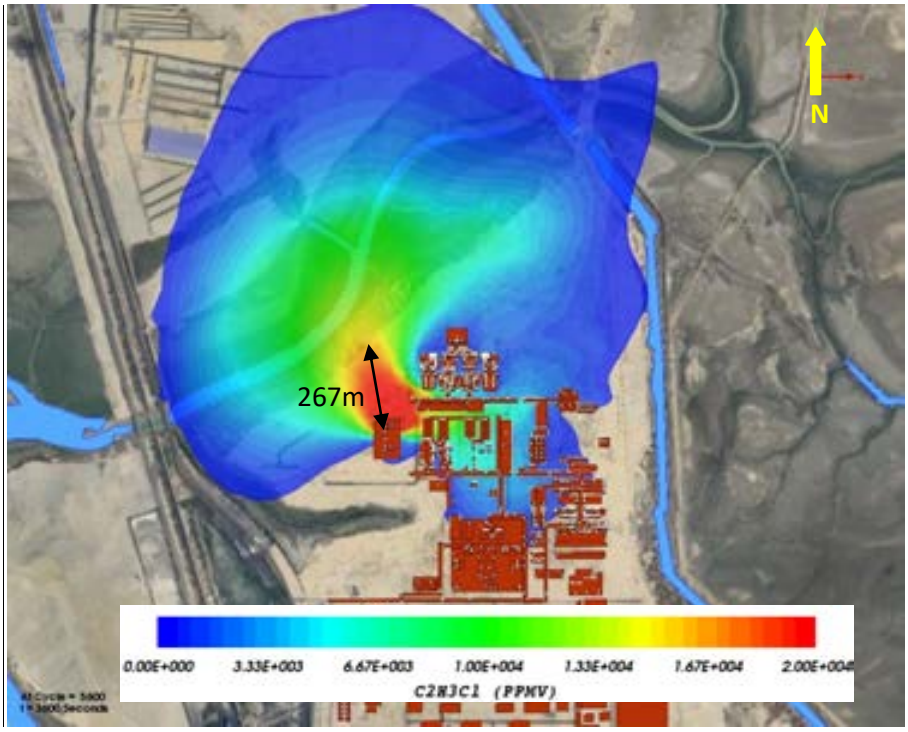


Figure 74: Concentration Contours at ERPG3 20000 ppm

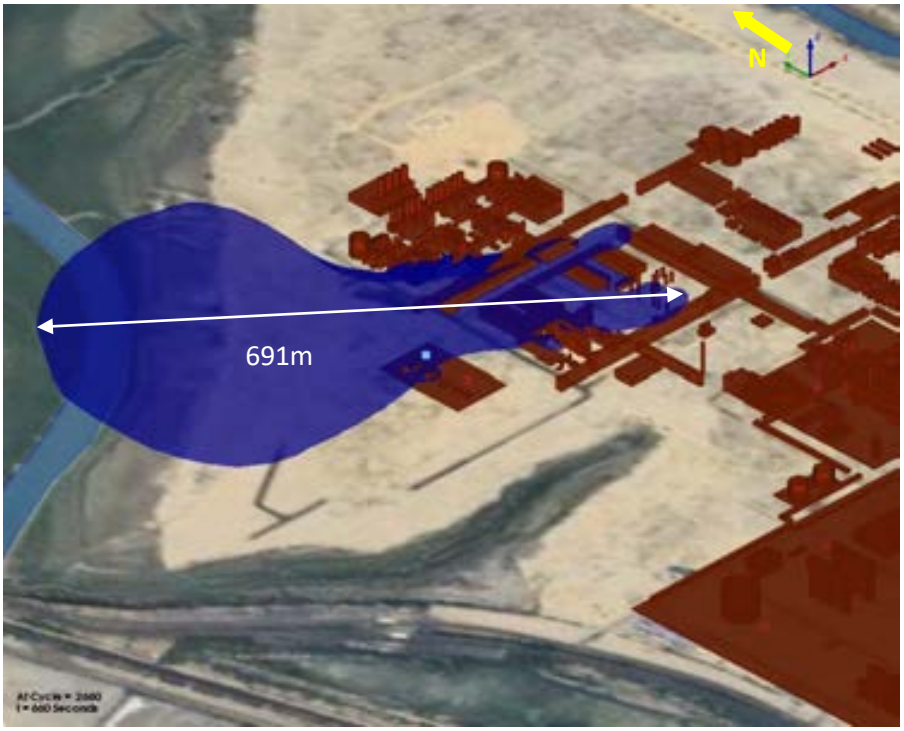


Figure 75: 3D view of ERPG3 @ 20000 ppm

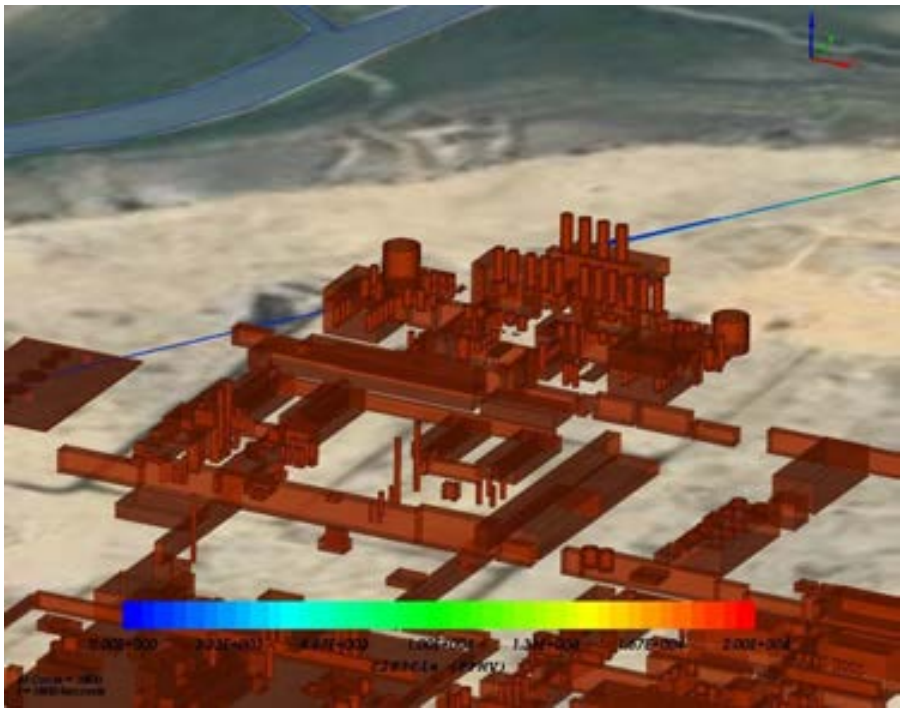


Figure 76: VCM ERPG3 Plots on a Vertical Section

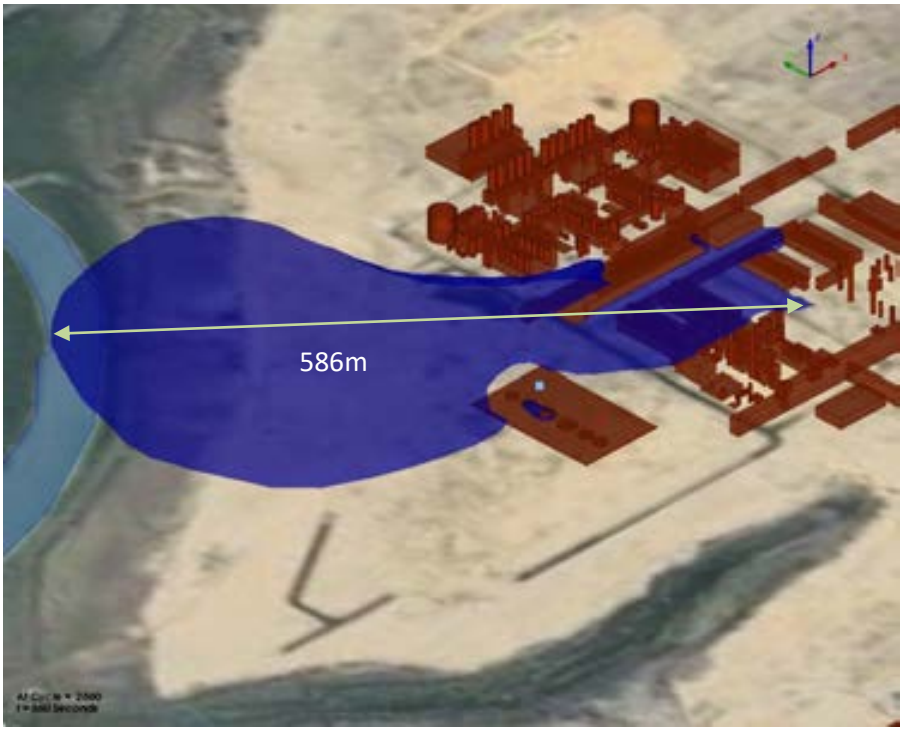


Figure 77: 100% LFL Cloud extent of VCM (FBR)

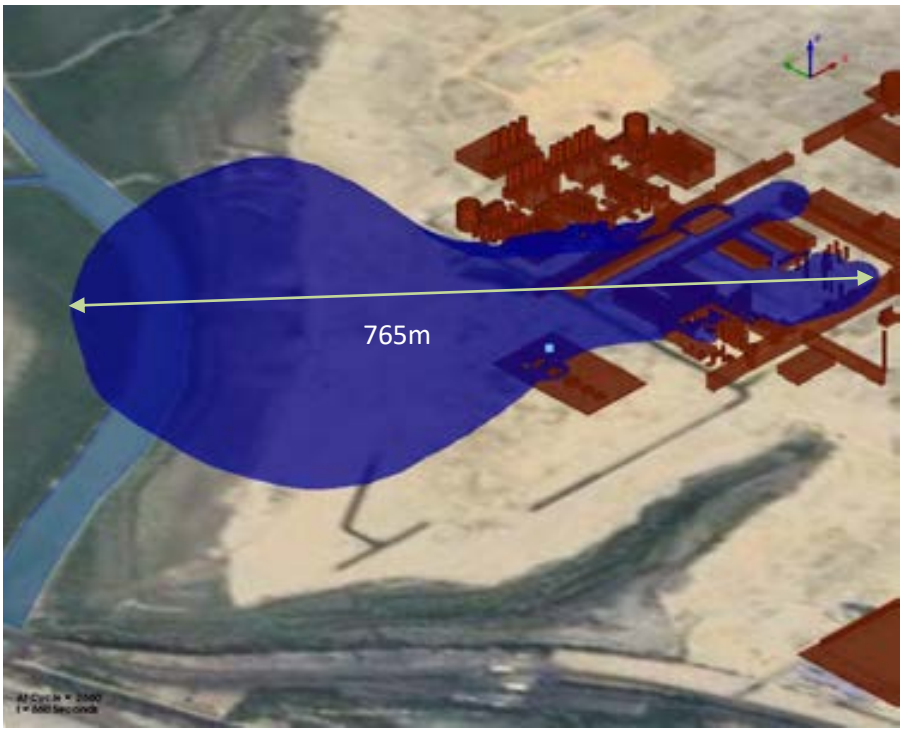


Figure 78: 50% LFL Cloud extent of VCM (FBR)

5D - 210° Dispersion Simulation Results: O & U – C2H3Cl

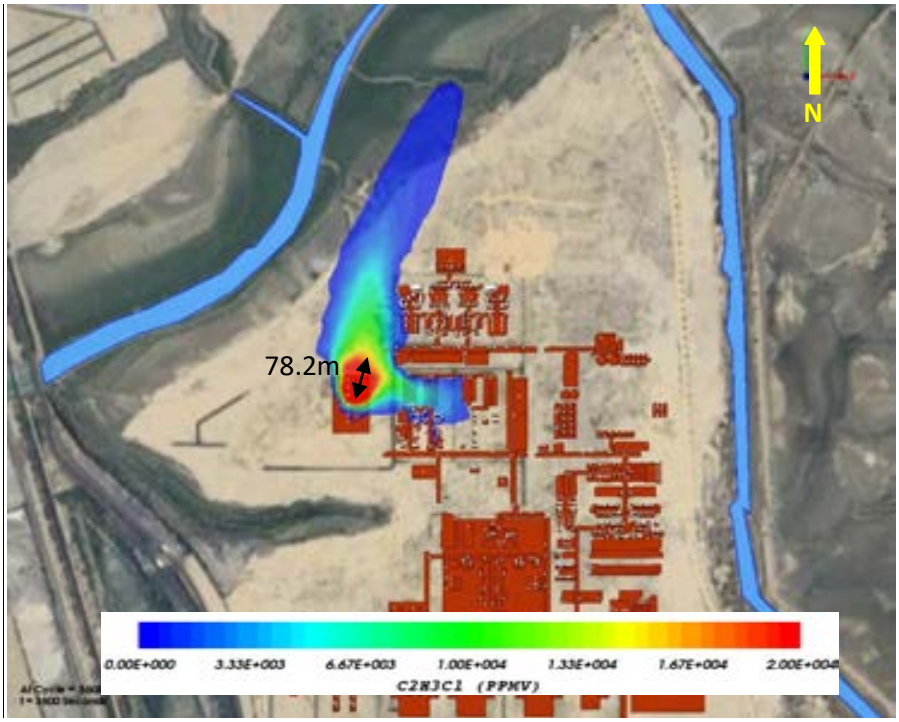


Figure 79: Concentration Contours at ERPG3 20000 ppm

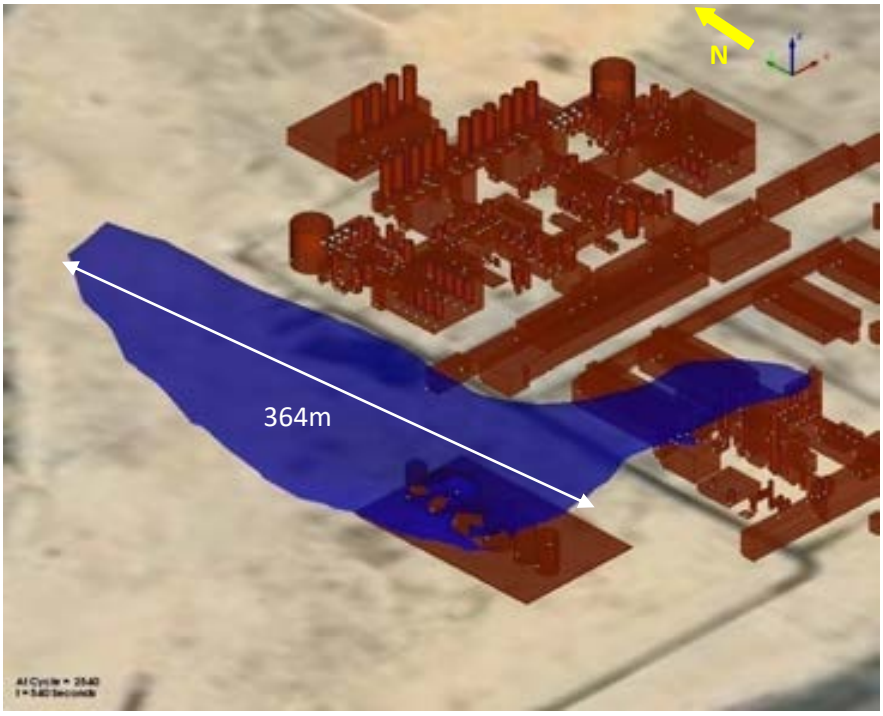


Figure 80: 3D plot view of ERPG3 @ 20000 ppm

It can be noted that the elevated release of VCM has shown 267m ERPG3 concentration on ground level plot (*Figure 74* & *Figure 79*).

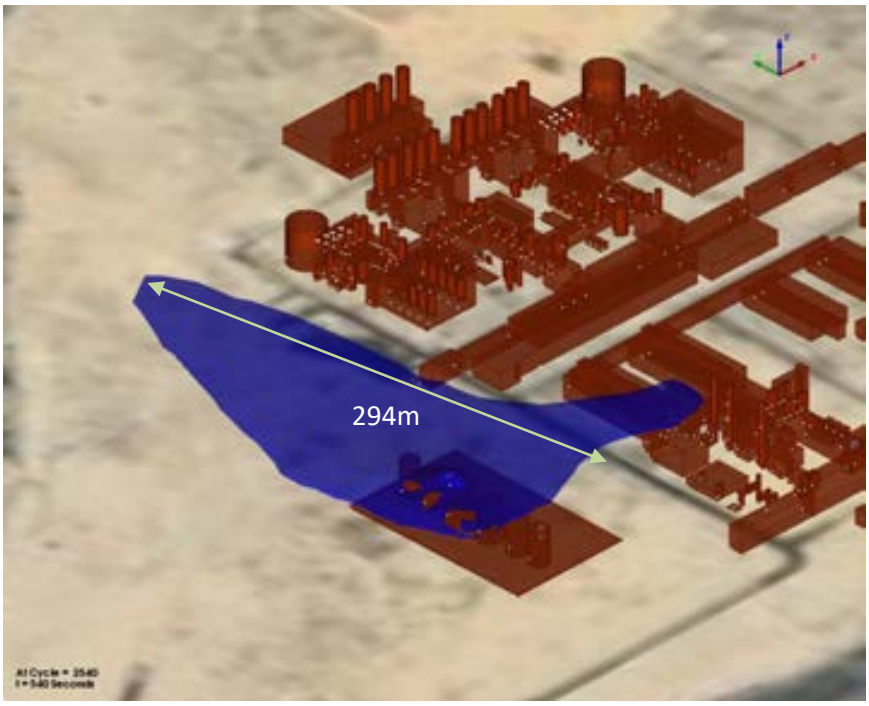


Figure 81: 100% LFL Cloud extent of VCM (FBR)

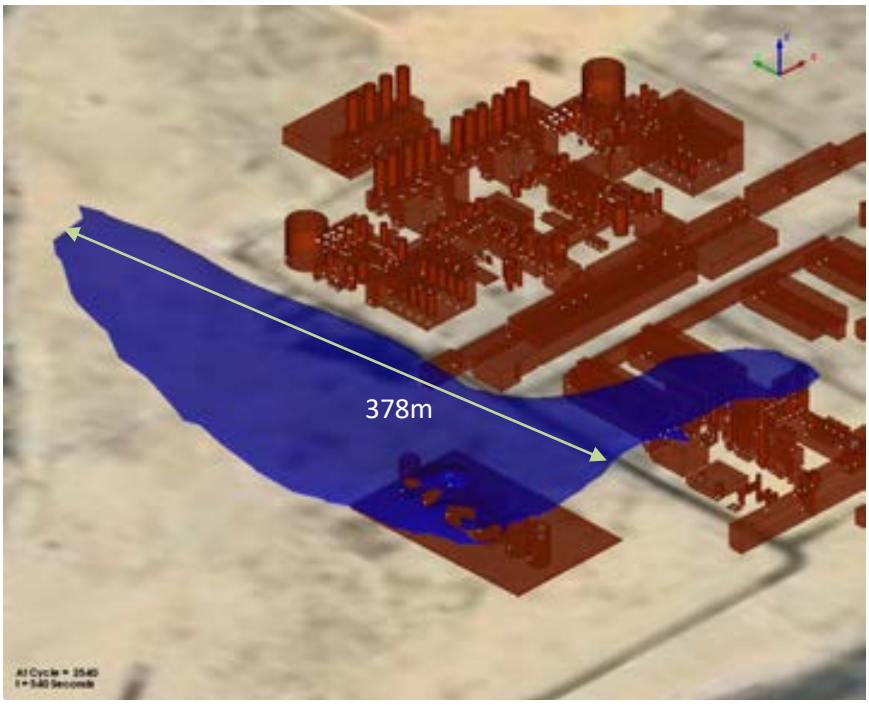


Figure 82: 50% LFL Cloud extent of VCM (FBR)

IV.1.9 O & U Unit Scenario - C_2H_3CL:

Release of C_2H_3Cl (VCM-Vinyl Chloride Monomer) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: O & U - C2H3Cl

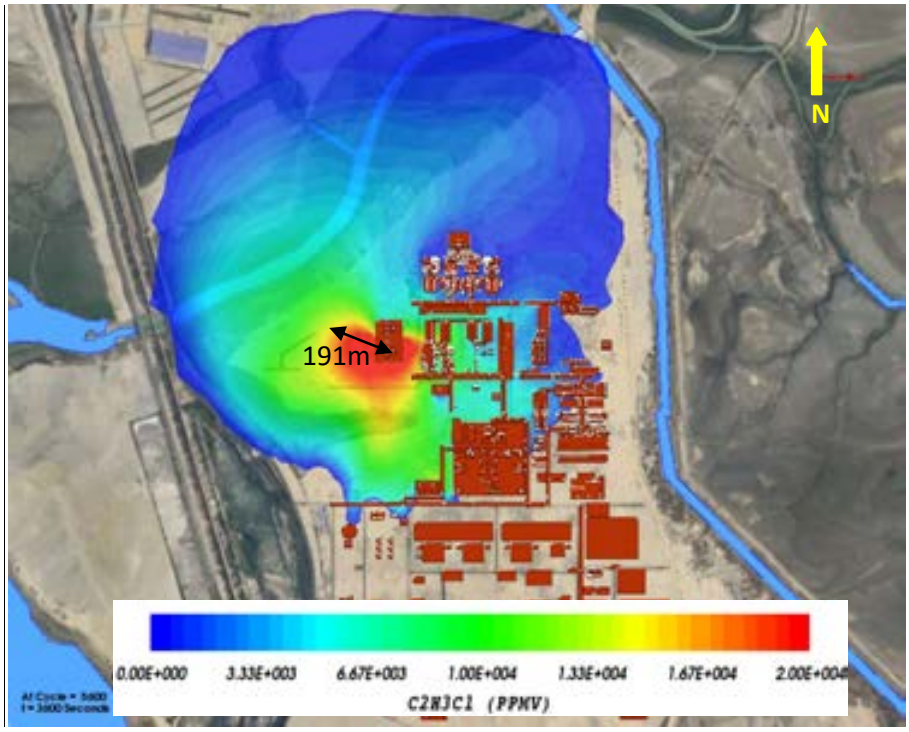


Figure 83: Concentration Contours at ERPG3 20000 ppm

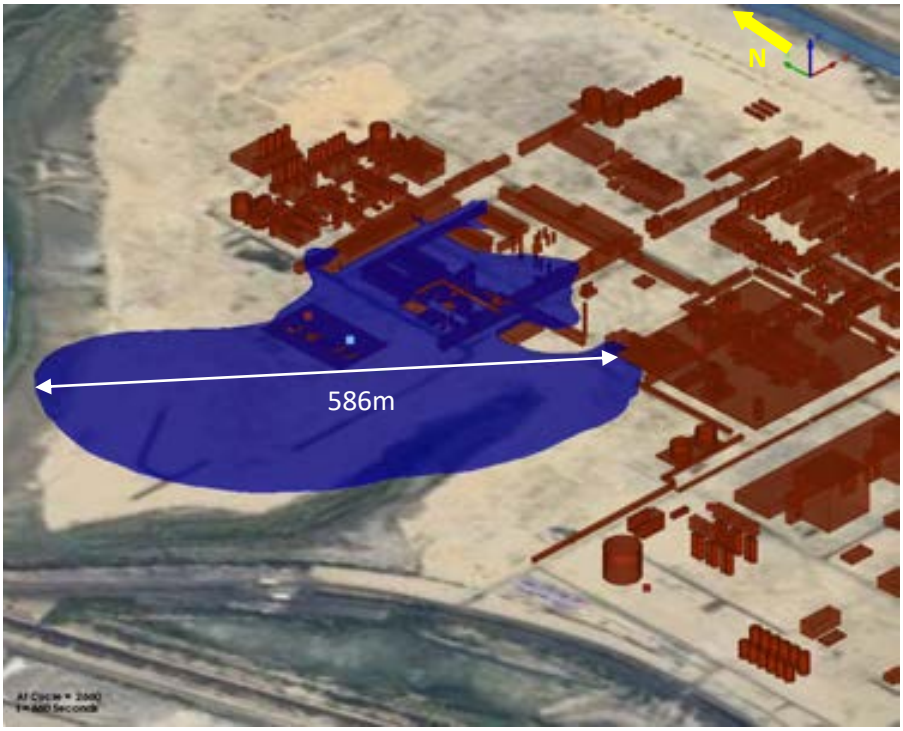


Figure 84: 3D view of ERPG3 @ 20000 ppm

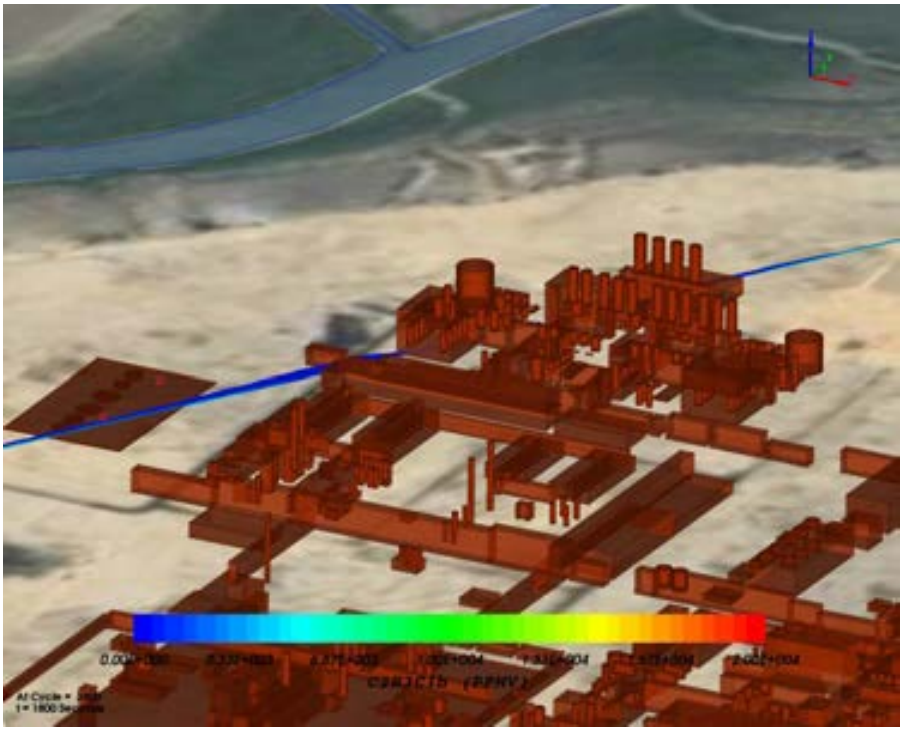


Figure 85: VCM ERPG3 Plots on a Vertical Section

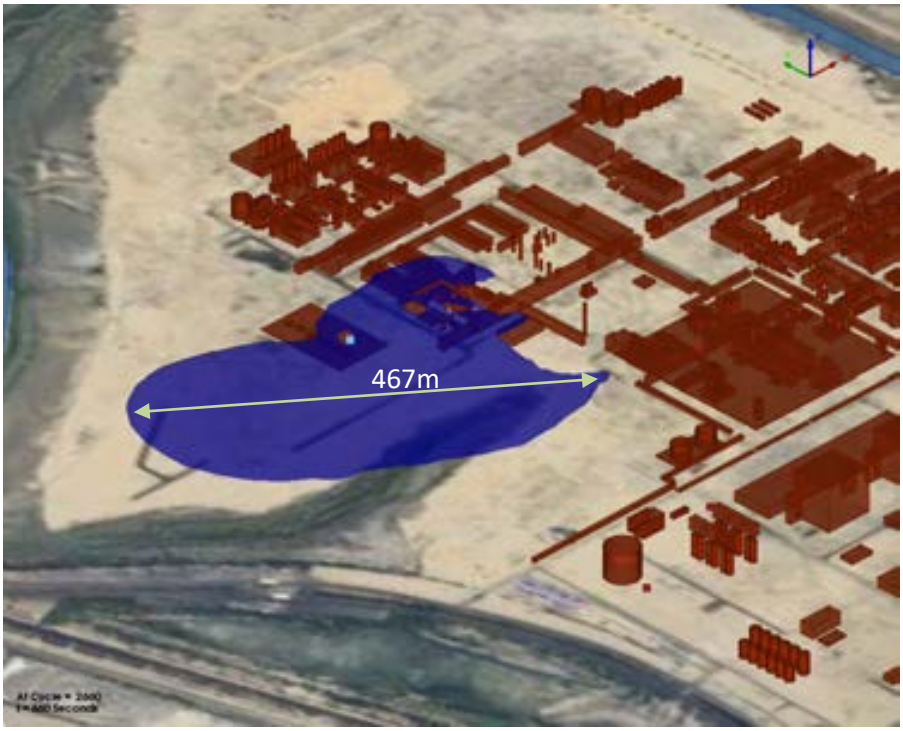


Figure 86: 100% LFL Cloud extent of VCM (100mm)

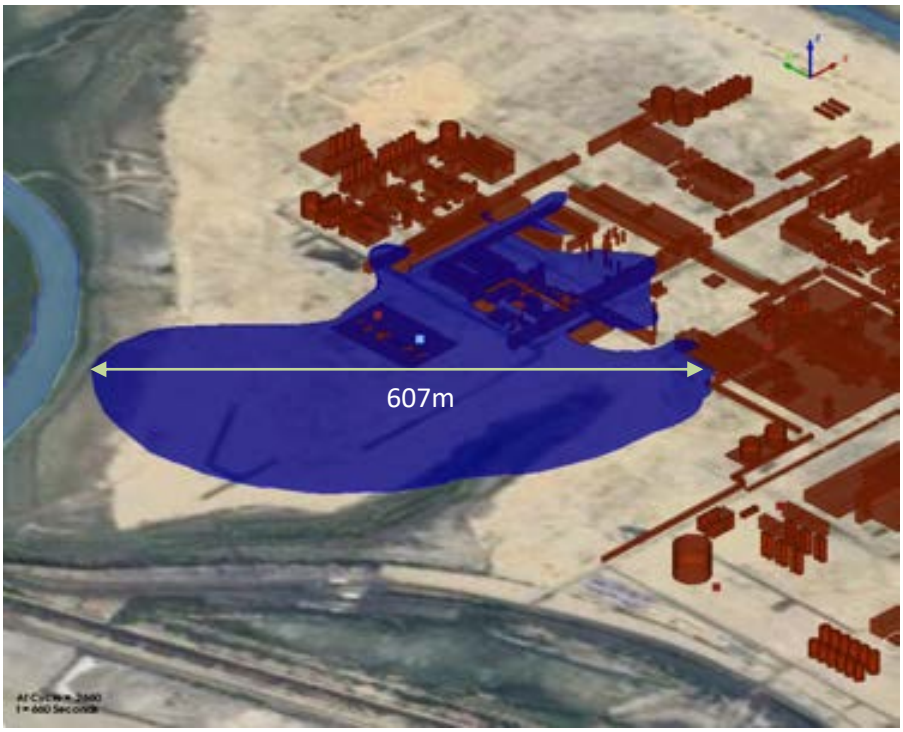


Figure 87: 50% LFL Cloud extent of VCM (100mm)

5D - 210° Dispersion Simulation Results: O & U – C2H3Cl

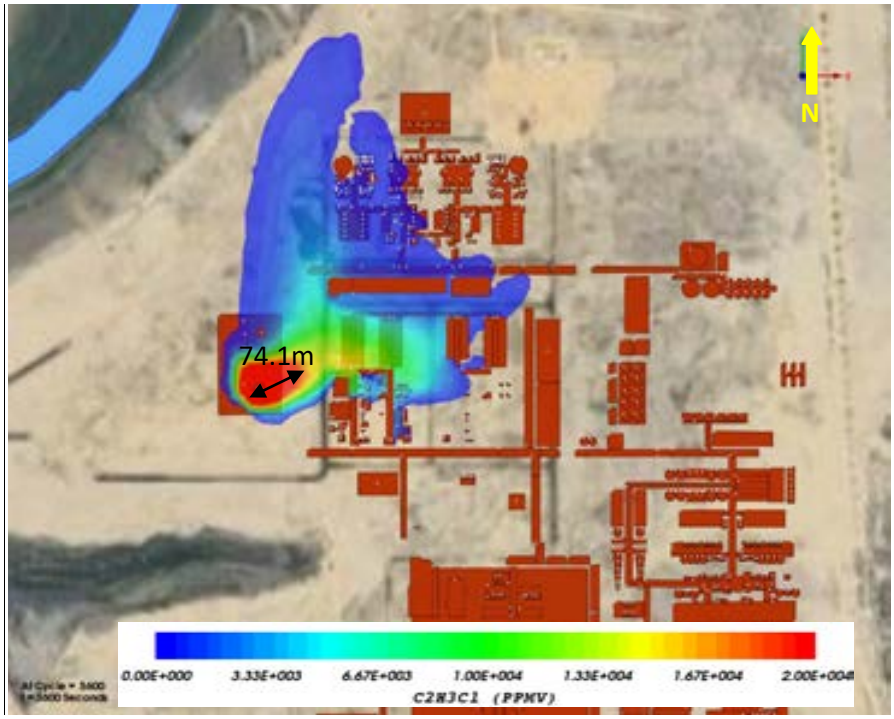


Figure 88: Concentration Contours at ERPG3 20000 ppm

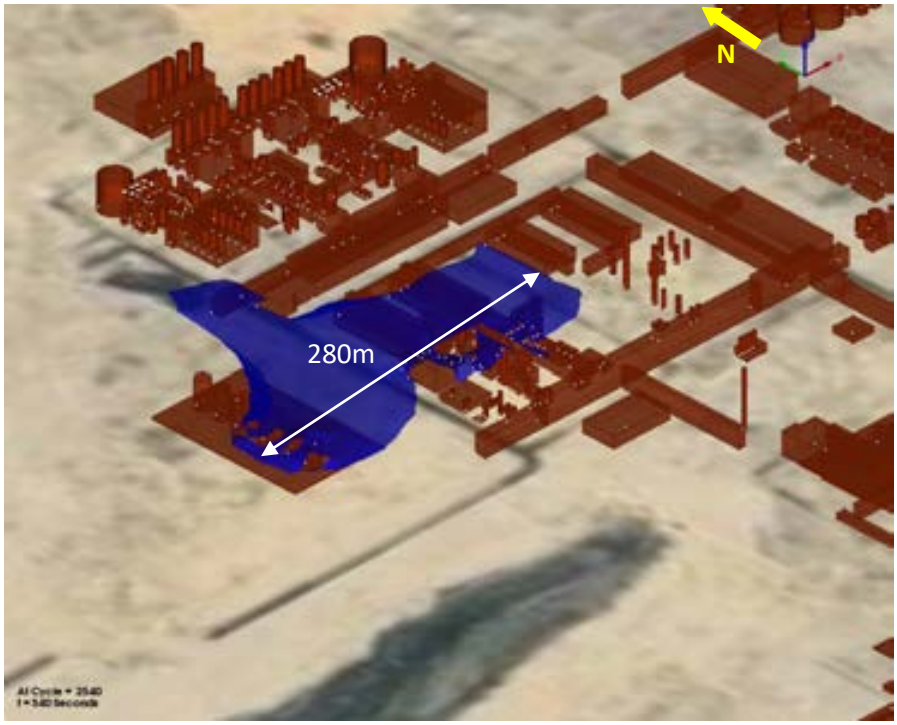


Figure 89: 3D plot view of ERPG3 @ 20000 ppm

It can be noted that the elevated release of VCM has shown less ERPG3 concentration around 191m on ground level plot (*Figure 83* & *Figure 88*).

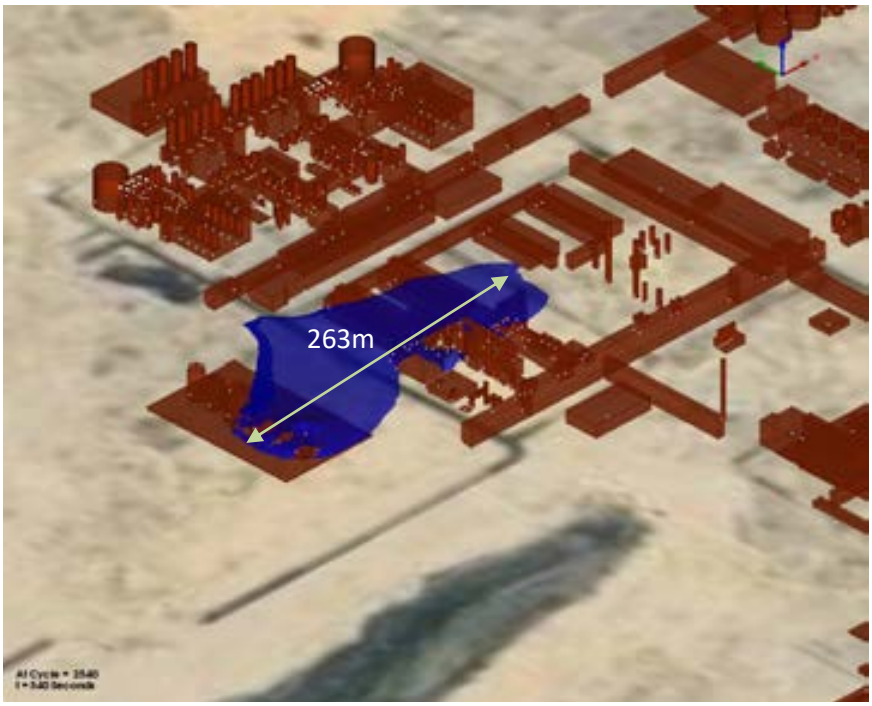


Figure 90: 100% LFL Cloud extent of VCM (100mm)

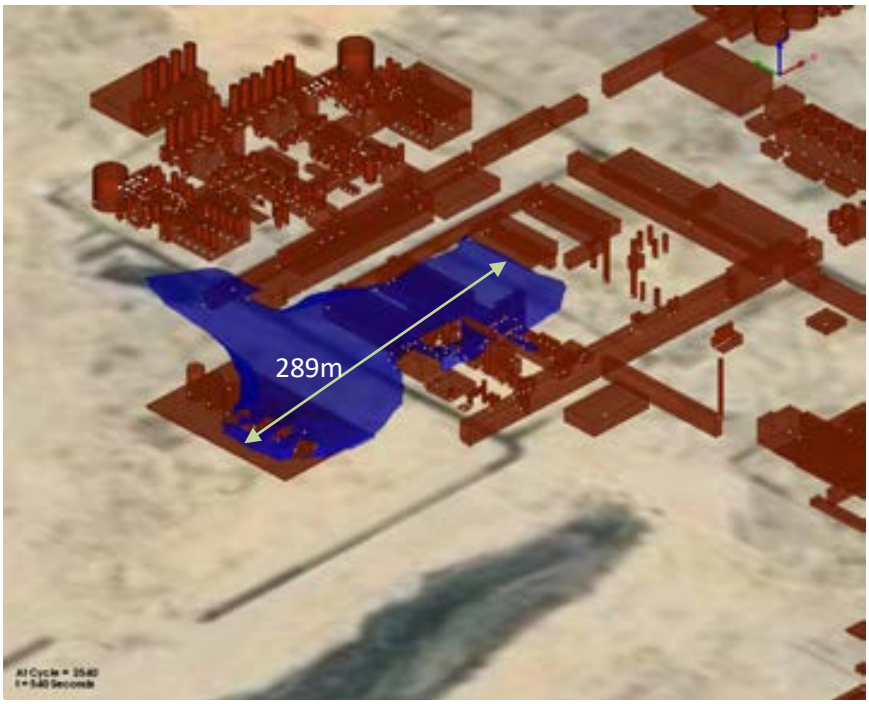


Figure 91: 50% LFL Cloud extent of VCM (100mm)

IV.1.10 Acetylene Unit Scenario - C2H2:

Release of C2H2 (Acetylene) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Acetylene - C2H2

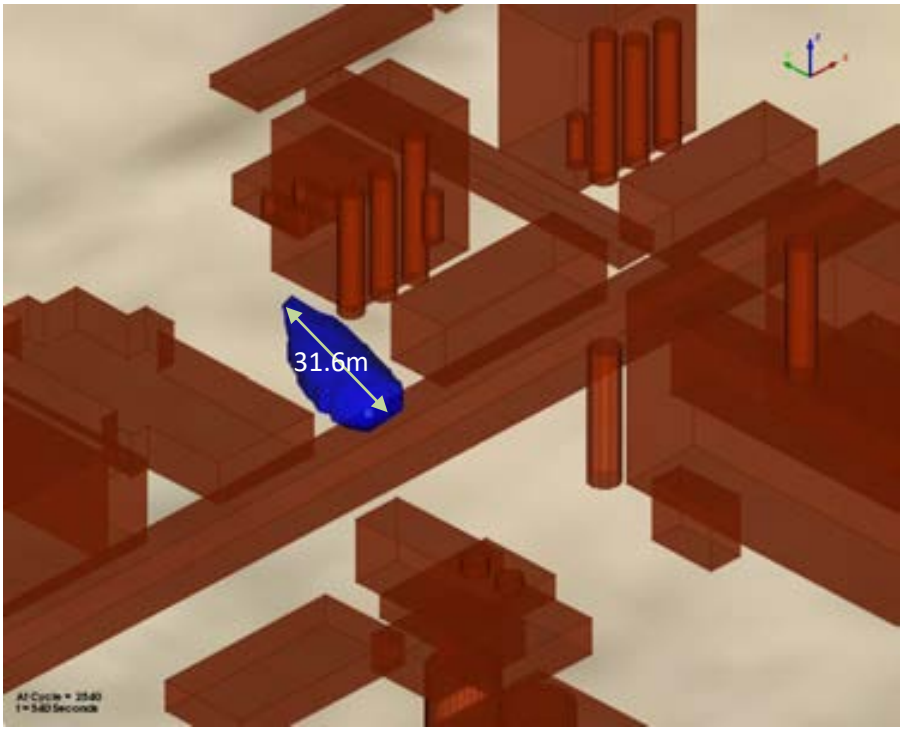


Figure 92: 100% LFL Cloud extent of Acetylene (FBR)

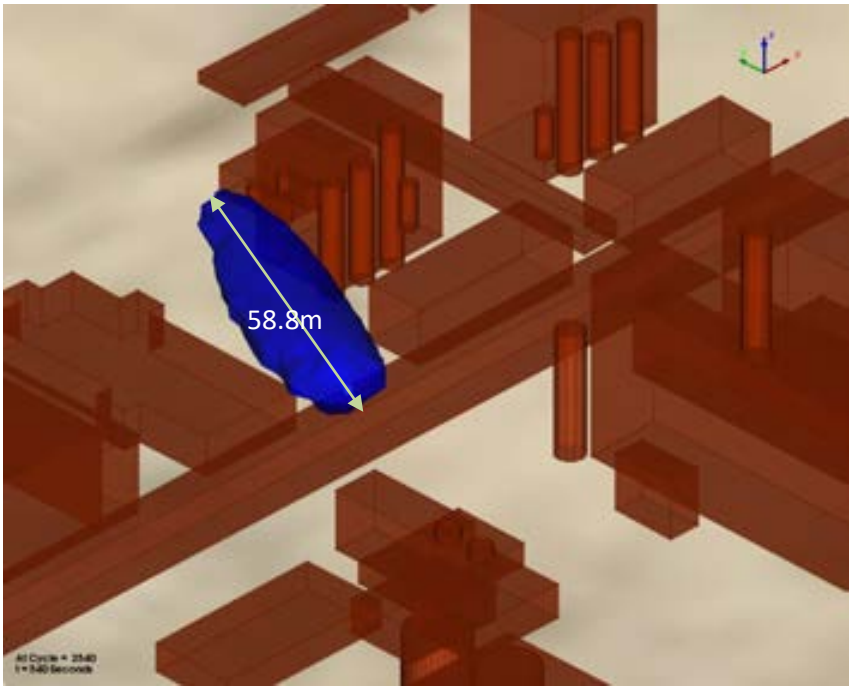


Figure 93: 50% LFL Cloud extent of Acetylene (FBR)

5D - 210° Dispersion Simulation Results: Acetylene - C2H2

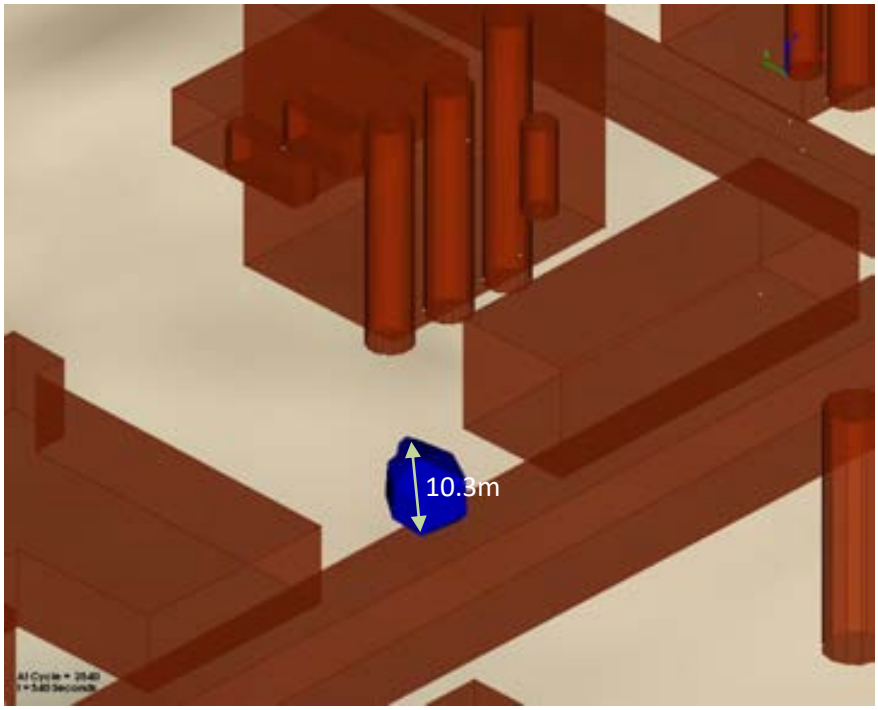


Figure 94: 100% LFL Cloud extent of Acetylene (FBR)

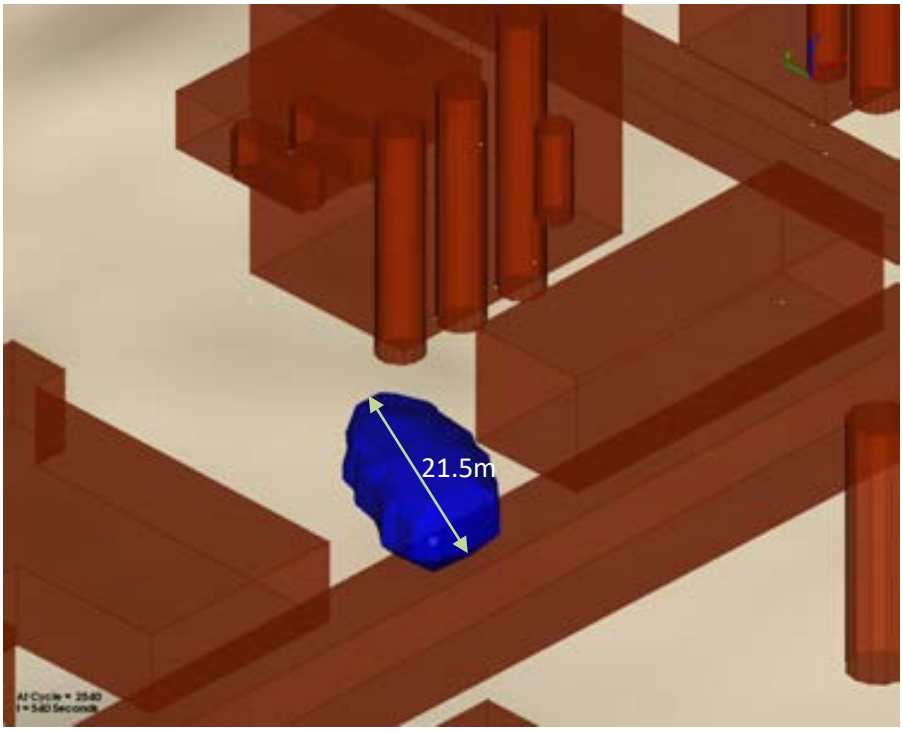


Figure 95: 50% LFL Cloud extent of Acetylene (FBR)

IV.1.11 Calcium Carbide Unit Scenario - CH4:

Release of CH4 (Methane) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Calcium Carbide – CH4

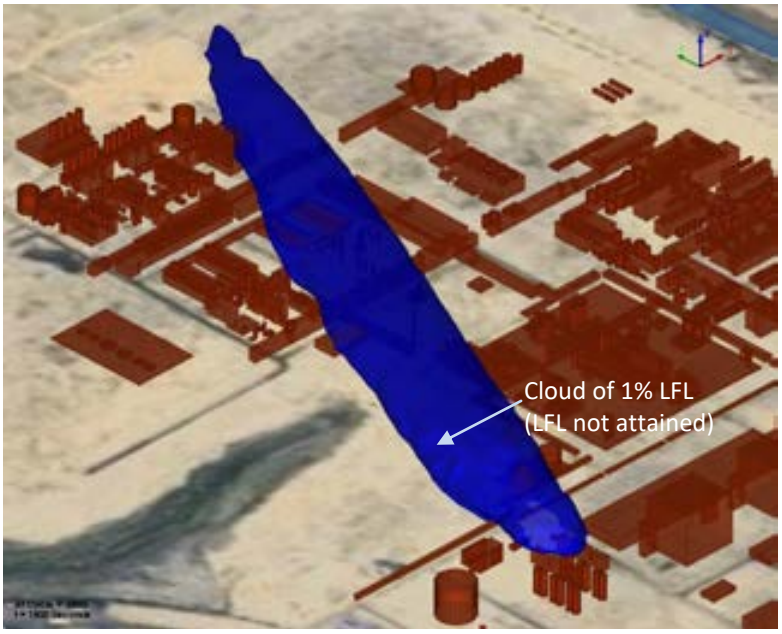


Figure 96: 1% LFL Cloud extent of Methane (100mm)

5D - 210° Dispersion Simulation Results: Calcium Carbide – CH4

Figure 97: 1% LFL Cloud extent of Methane (100mm)

IV.1.12 Calcium Carbide Unit Scenario - CO:

Release of CO (Carbon Monoxide) dispersion has been simulated and results are presented below.

2F - 210° Dispersion Simulation Results: Calcium Carbide – CO

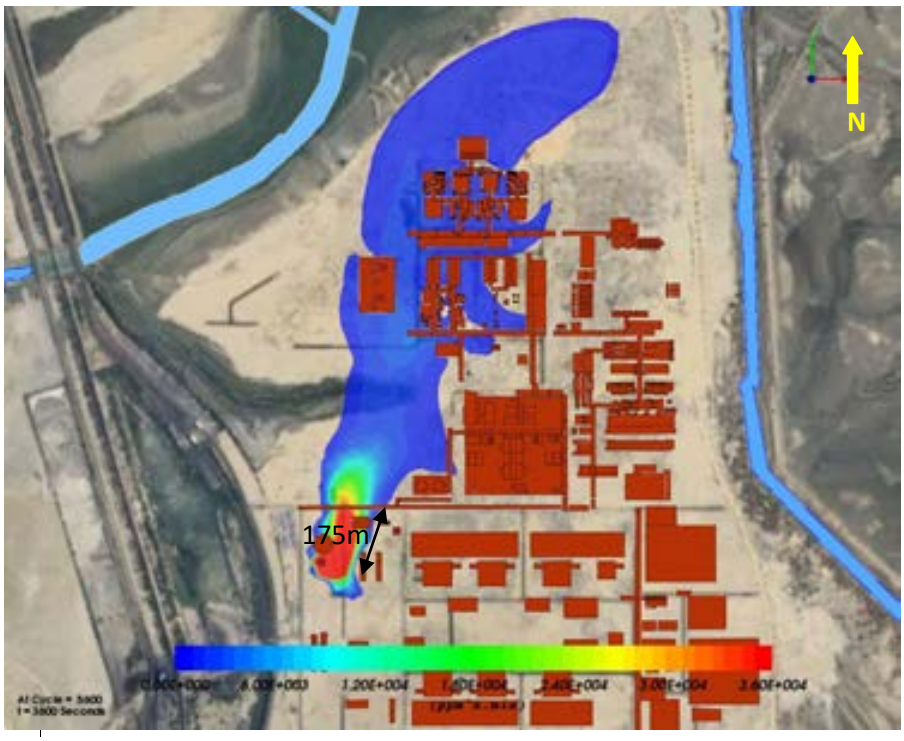


Figure 98: Concentration Contours at IDLH 1200 ppm (Region in Red)

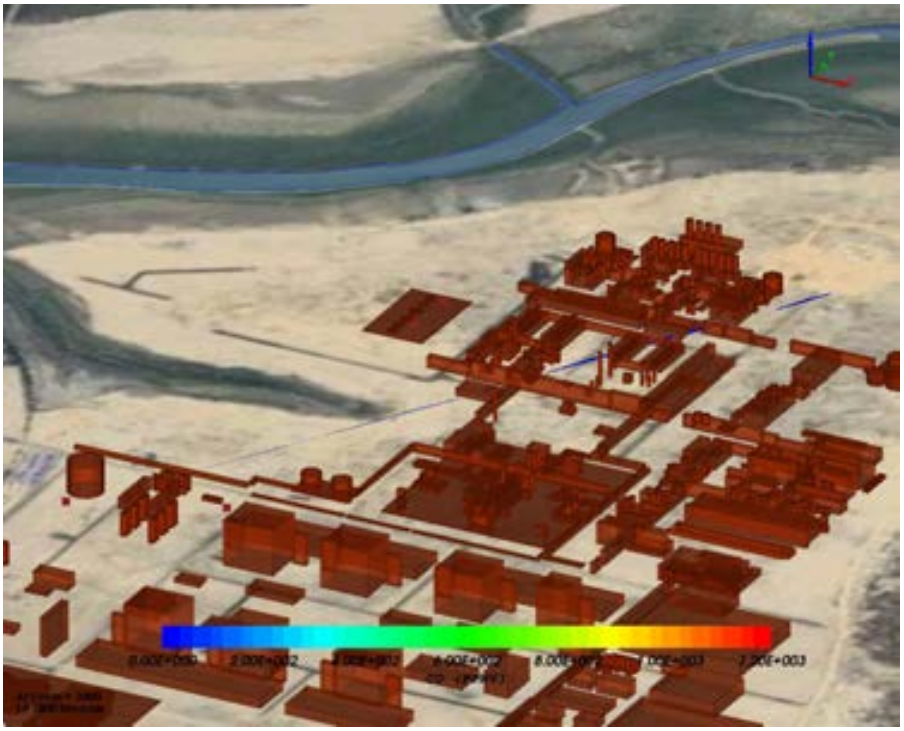


Figure 99: Carbon Monoxide IDLH Contours on a Vertical Section

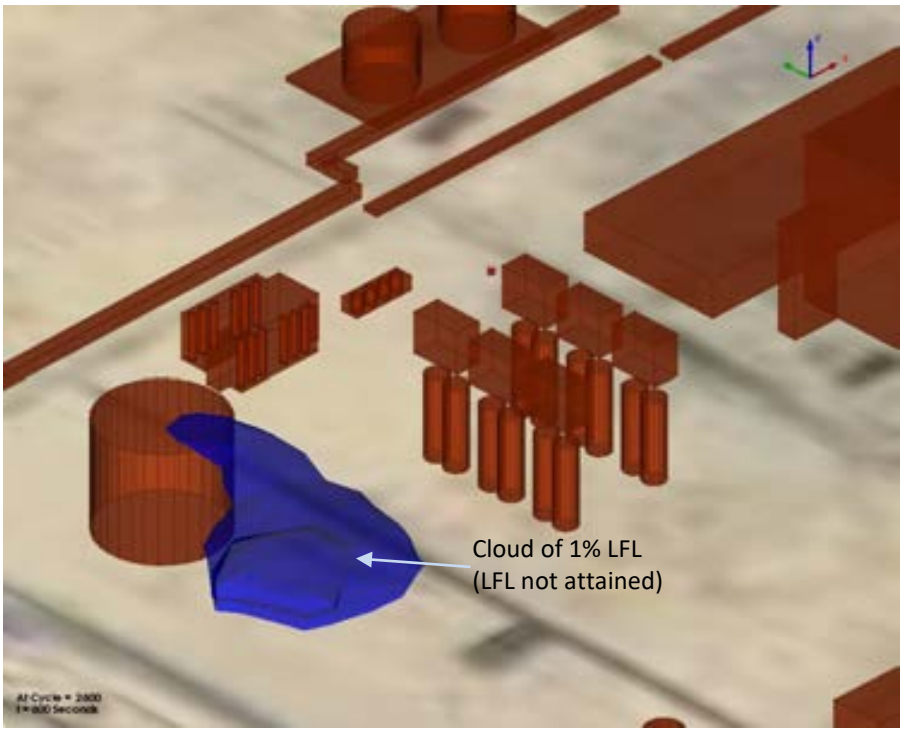


Figure 100: 1% LFL Cloud extent of Carbon Monoxide (100mm)

5D - 210° Dispersion Simulation Results: Calcium Carbide – CO

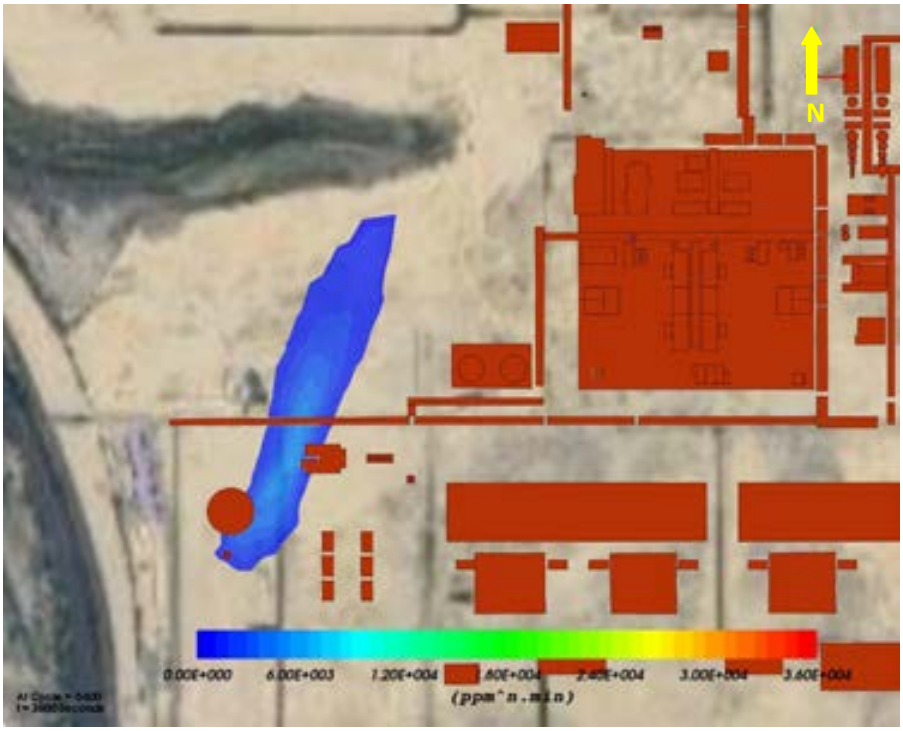


Figure 101: Concentration Contours at IDLH 1200 ppm – Not Attained (Region in Red)

3D dispersion analysis of Carbon Monoxide shows that the maximum impact distance of 175m achieved after 1 hour of dispersion. It can be noted that the toxic plume shall continue to disperse and travel even after the stoppage of release, until it gets diffused to trace concentration levels.

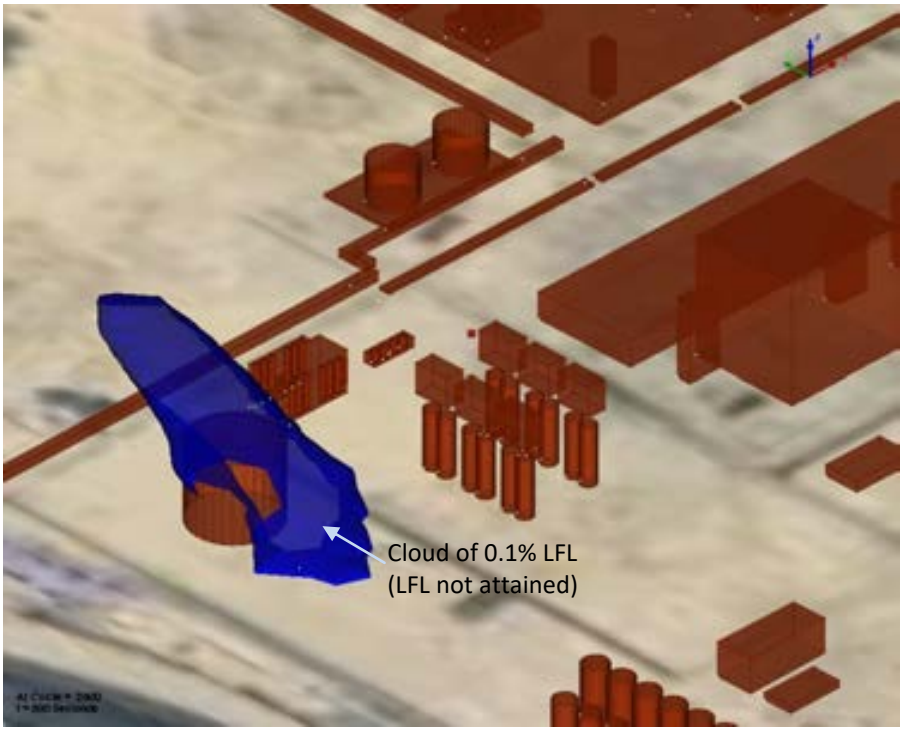


Figure 102: 0.1% LFL Cloud extent of Carbon Monoxide (100mm)

IV.2 FIRE RADIATION IMPACTS - POOL FIRE

Fire radiation consequences were modelled for the only identified Pool Fire scenario, i.e. immediate ignition of the pool formed around VCM Sphere due to line rupture in VCM transport pipeline. Consequences in terms of different thresholds are presented in this section.

Figure 103: Mesh considered for the Plant Site pool fire scenario

Figure 103 shows the mesh considered for the pool fire scenario. Smaller domain has been considered as the heat radiation impacts do not go beyond 1000m, since the radius is around 141m. Vertical domain extent of 300m was considered to take into account the flame height and the shadow effects of adjacent buildings.

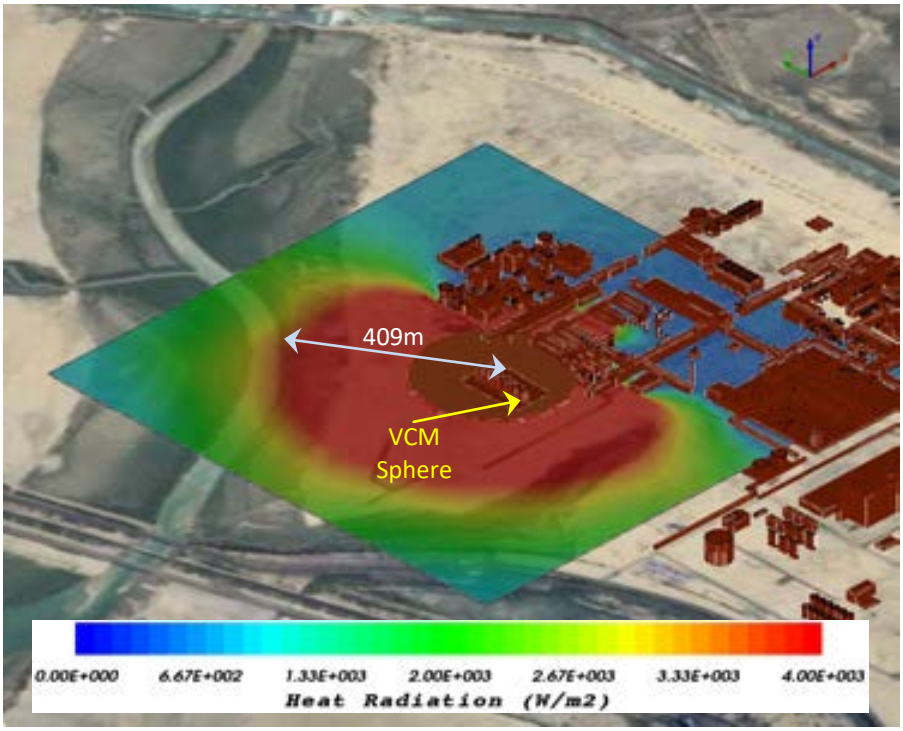


Figure 104: Fire Radiation extent (region in RED) for 4KW/m2

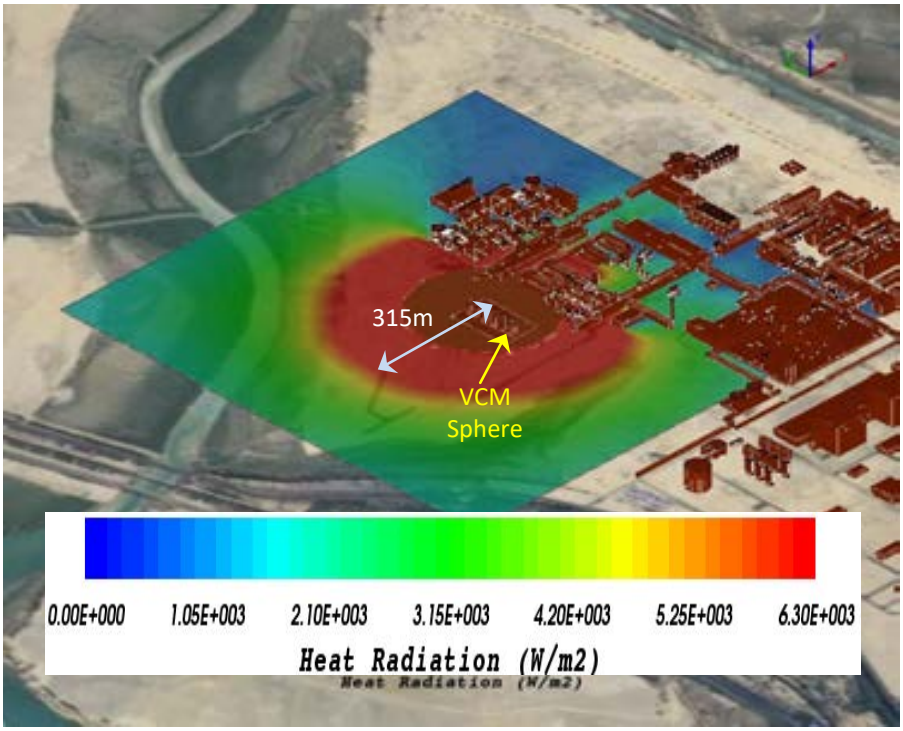


Figure 105: Fire Radiation extent (region in RED) for 6.3KW/m2

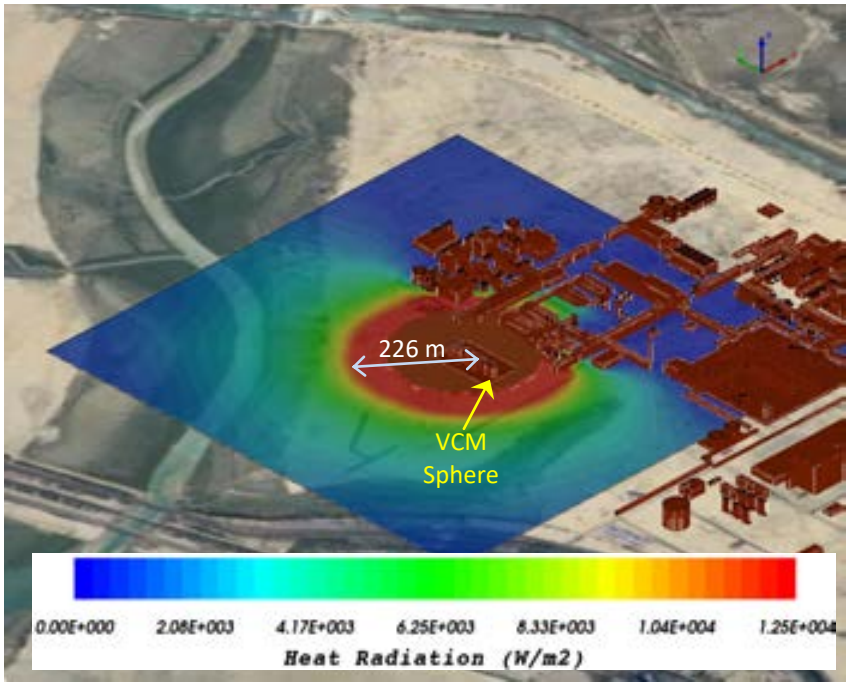


Figure 106: Fire Radiation extent (region in RED) for 12.5 KW/m2

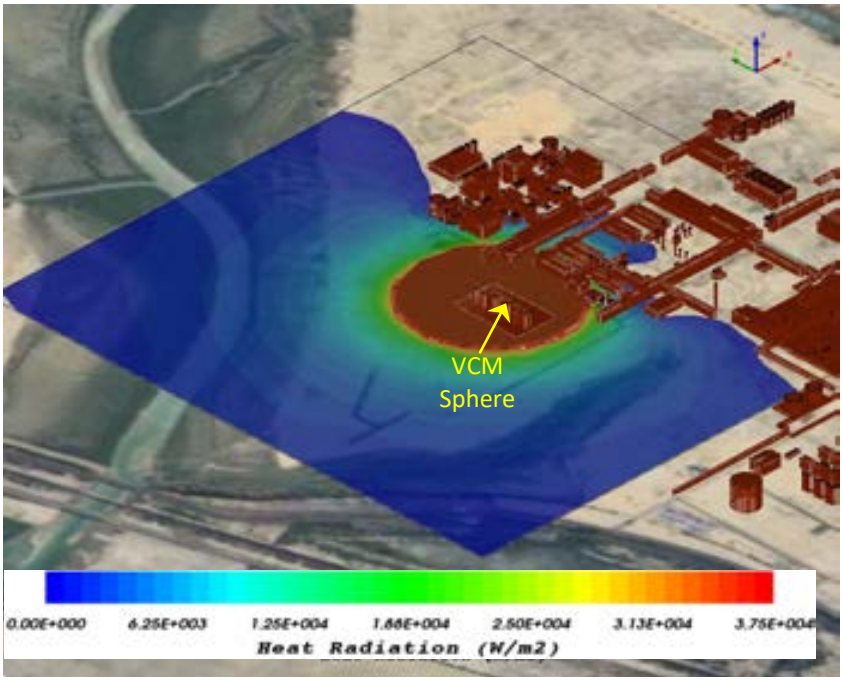


Figure 107: Fire Radiation extent (not attained outside flame area) for 37.5 KW/m2

Fire radiation of 4KW/m2 which is enough to cause first degree burns for an exposure period of has been found till a distance of 409 m.

IV.3 Overpressure Impacts – Vapour Cloud Explosion

Gas explosion from the three different leakage scenarios, from Acetylene Unit, PVC Unit and O&U Unit, to predict the overpressures on exploded regions and surroundings as well as in the vicinity of the reactors/equipment and to assess the ground and 3D overpressure zones were simulated using *fluidyn*-VENTEX.

IV.3.1 Scenario

Table 7 lists the scenario considered for explosion analysis.

Table 7: Maximum Credible Accident Scenario identified for CFD explosion scenario

No	Material	Release Scenario Description
Acetylene Unit		
Scenario 1	Acetylene	Leak from Pipeline - Acetylene Cooling tower - Flange of 36 inch size at a height of 26m from the ground
PVC Unit		
Scenario 2	VCM	Leak from Pipeline - VCM Charge pump - Flange of 8 inch size and at a height of 1.2m from the ground
O & U Unit		
Scenario 3	VCM	Leak from Pipeline - VCM Transfer pump - Flange of 14 inch size at a height of 5m from the ground

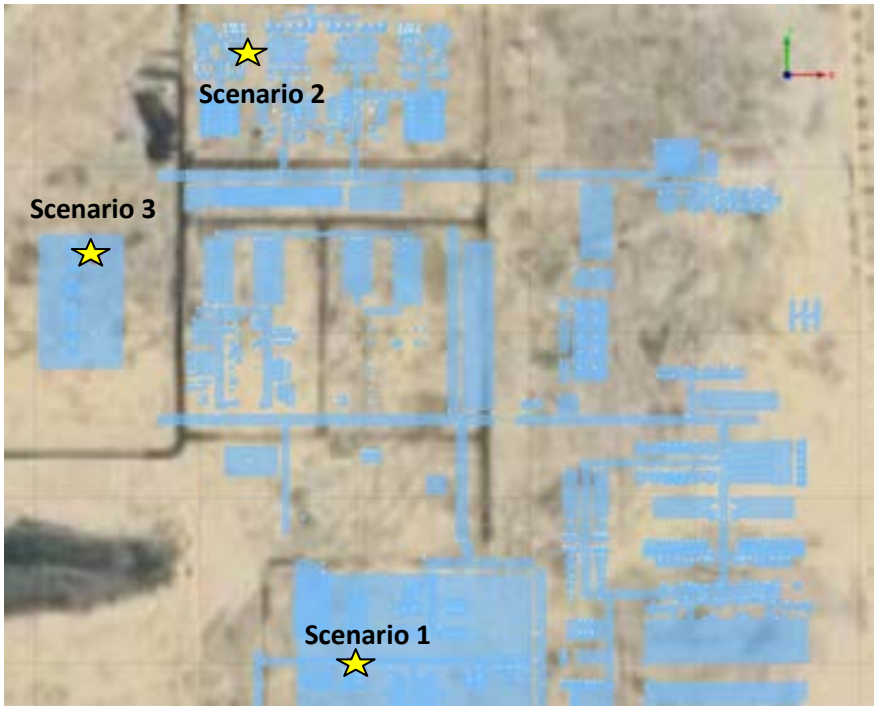


Figure 108: Scenario's Source locations for Acetylene Unit, PVC Unit and O&U Unit

IV.3.2 Methodology

Numerical Model: Geometry

Plant and building layout with details of all the facilities essential for 3D geometrical model & location of salient process units are considered inside explosion domain.

A simulation domain of 500 m x 500 m for Acetylene Plant and 1500 m x 1500 m for PVC Unit & O&U Unit was considered for the simulations with a height of 60 m above ground level as shown in the *Figure 109* to *Figure 111*.

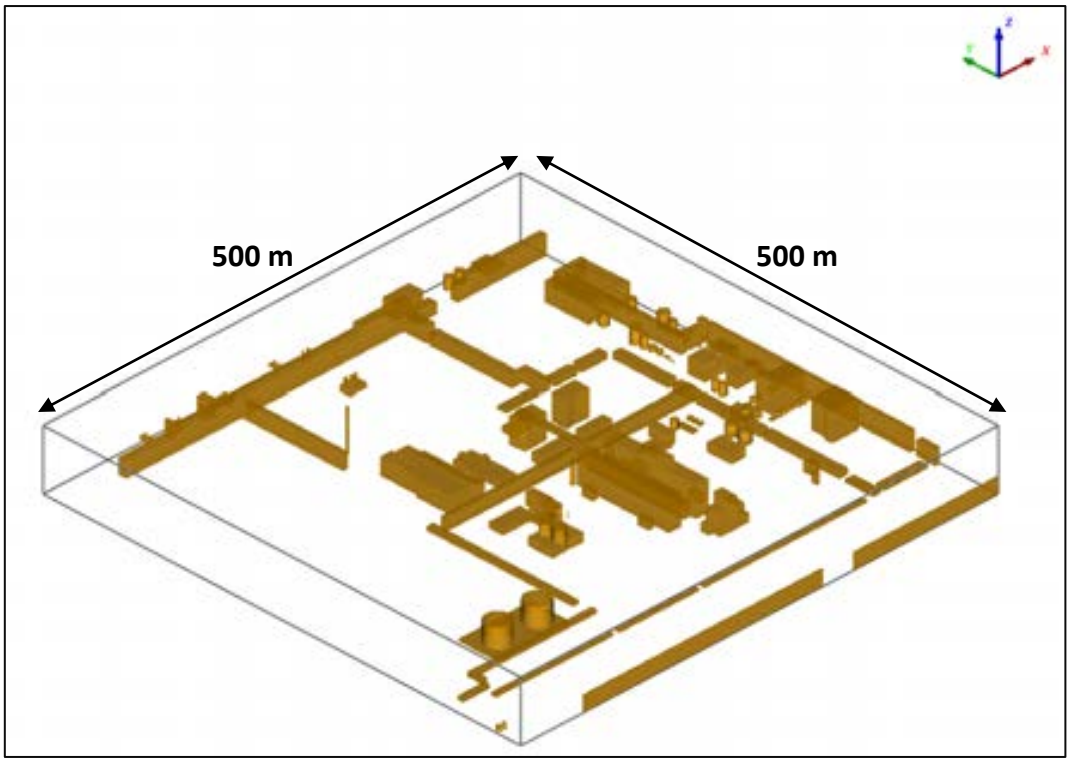


Figure 109: Geometry for Explosion Study for Scenario 1 - Acetylene Unit

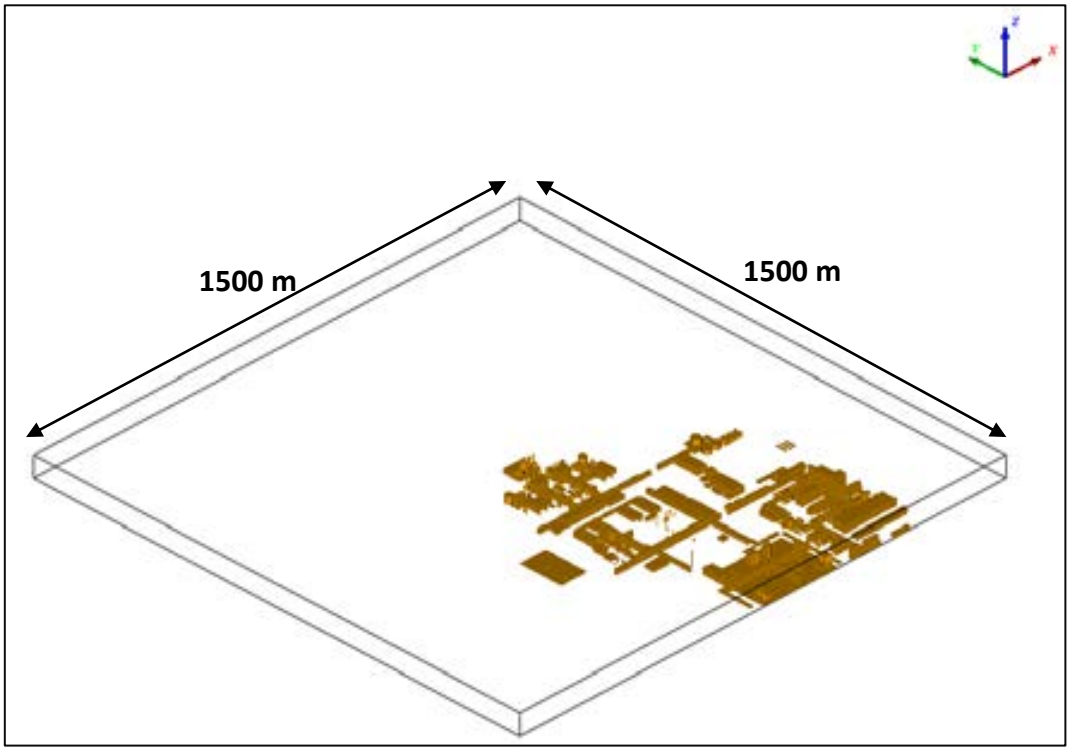


Figure 110: Geometry for Explosion Study for Scenario 2 - PVC Unit

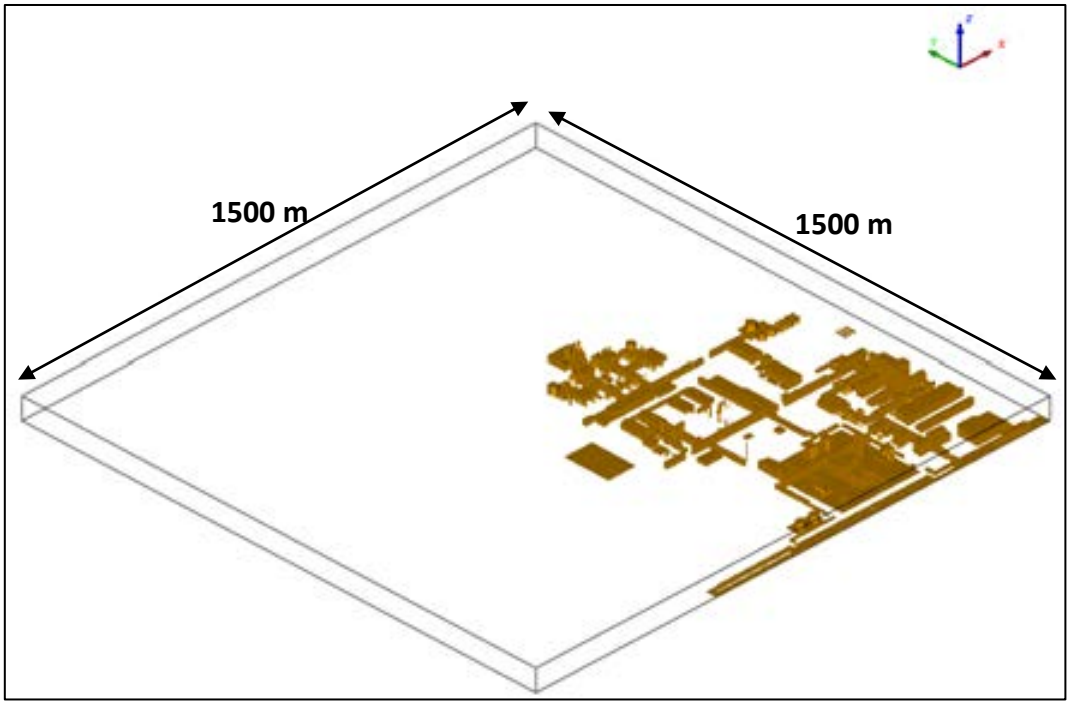


Figure 111: Geometry for Explosion Study for Scenario 3 – O & U Unit

Numerical Model: Mesh

For all 3 scenarios different explosion domain with separate mesh files are created to maintain the computational mesh as much as low. Fine mesh was maintained over flammable regions. *Figure 112* to *Figure 114* show unstructured mesh on ground for the entire three scenarios. Details of mesh are furnished in Table 8 .

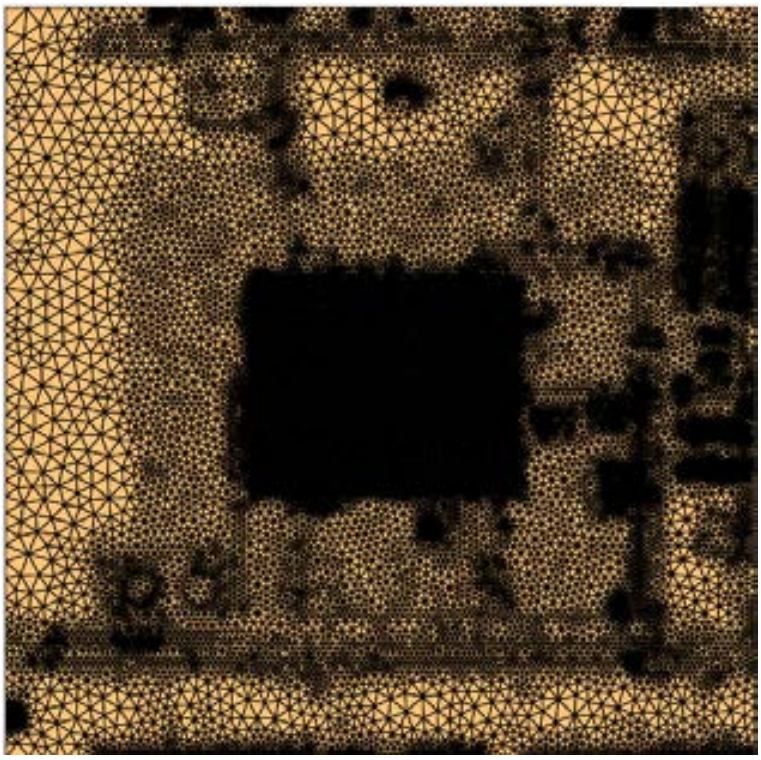


Figure 112: Scenario1 Unstructured Mesh on ground – Acetylene Unit

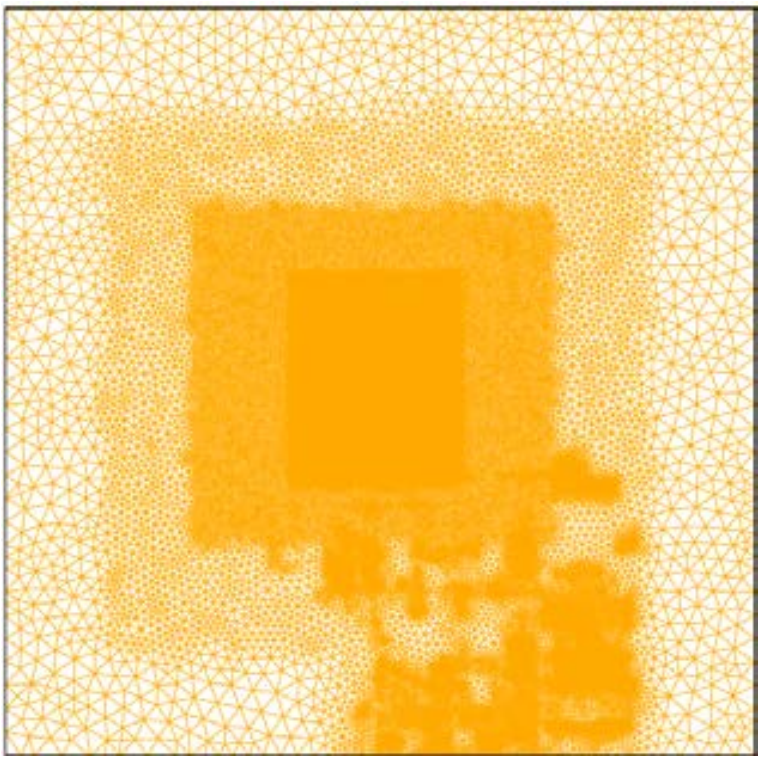


Figure 113: Scenario2 Unstructured Mesh on ground – PVC Unit

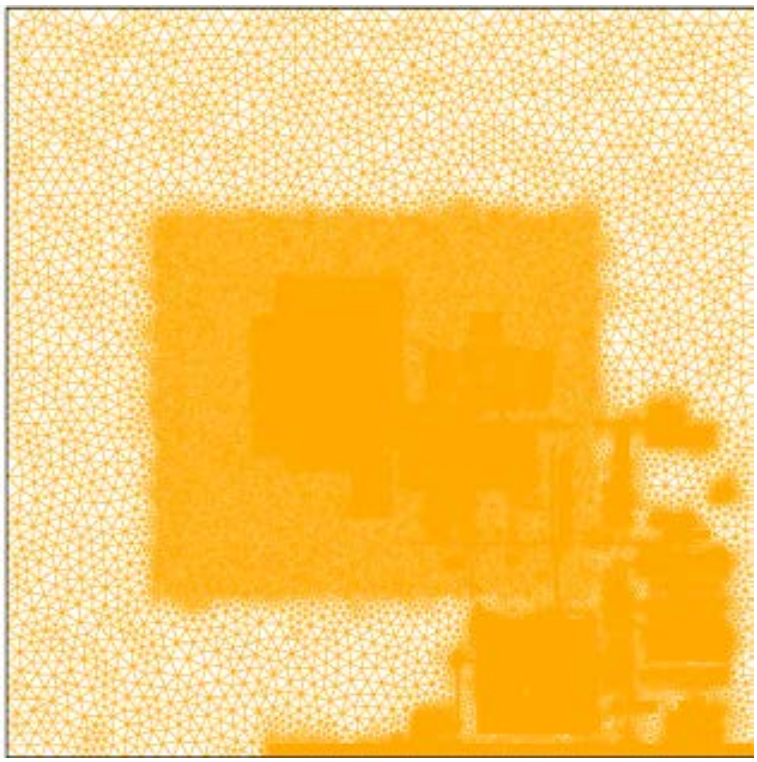


Figure 114: Scenario3 Unstructured Mesh on ground – O & U Unit

Table 8: Mesh details

Case Information	Scenario1	Scenario2	Scenario3
No.of Elements	1456180	4861920	5031334
Smallest size(m)	0.010028	0.023785	0.02378
Type	WEDGE	WEDGE	WEDGE

Explosive cloud

Flammable cloud extent for each of the scenario considered was mapped from dispersion results from *fluidyn*-PANEPR. Scenario description and flammable cloud details are furnished in Table 9.

Table 9: Summary for Explosion study Scenario

No	Material	Release Scenario	Weather Scenario	Source Height	Release Rate, Kg/s	Cloud Mass (in Kgs)
Acetylene Unit						
Scenario 1	Acetylene (IS-06A)	36 inch leak	2F_210Deg	26 m	8.13	1.7341e+03
PVC Unit						
Scenario 2	VCM (IS-03)	8 inch leak	2F_210Deg	1.2 m	65.84	9.8471e+04
O & U Unit						
Scenario 3	VCM (IS-12)	14 inch leak	2F_210Deg	5 m	108.86	2.0296e+05

Fully dispersed vapour cloud fuel-air mixture with turbulence field results were consider as initial condition for explosion simulations.

Atmospheric conditions are considered as the external initial conditions:

- P_{atm}=100000 Pa
- T=30°C
- Dispersed cloud and turbulence field

Flammable clouds for each scenario, being considered as initial conditions, are presented in *Figure 115* to *Figure 117*.

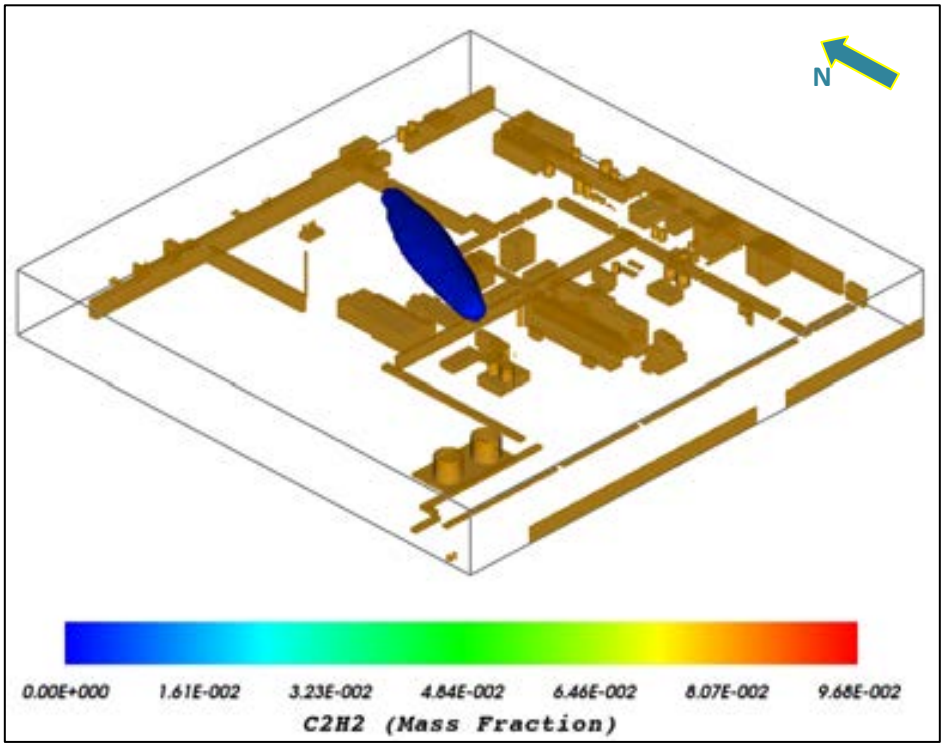


Figure 115: Scenario1 Gas Leakage – Acetylene Unit

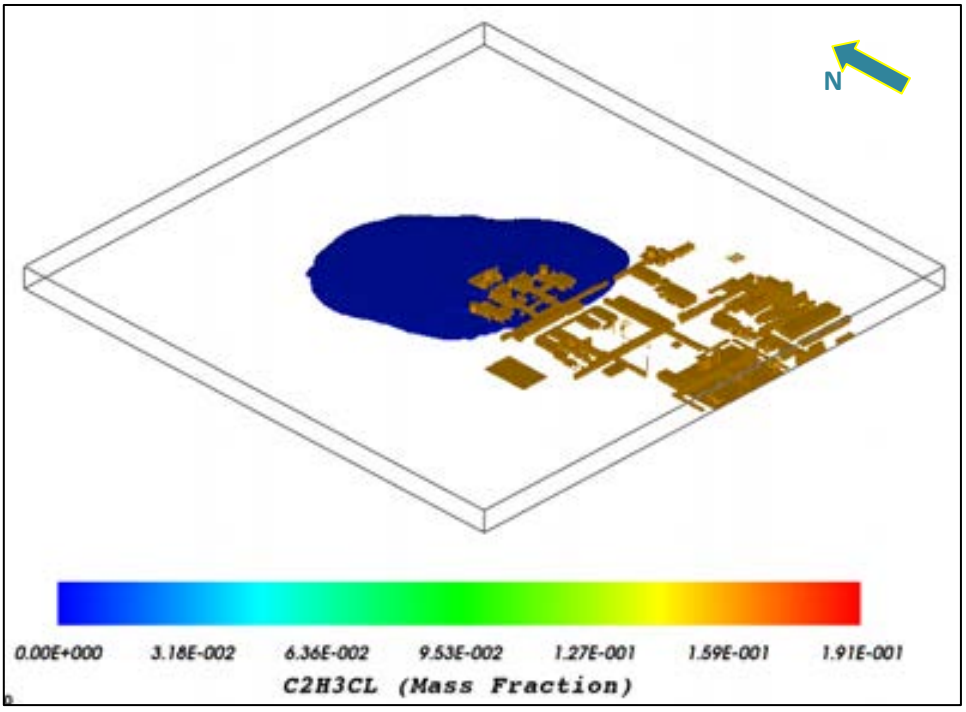


Figure 116: Scenario2 Gas Leakage – PVC Unit

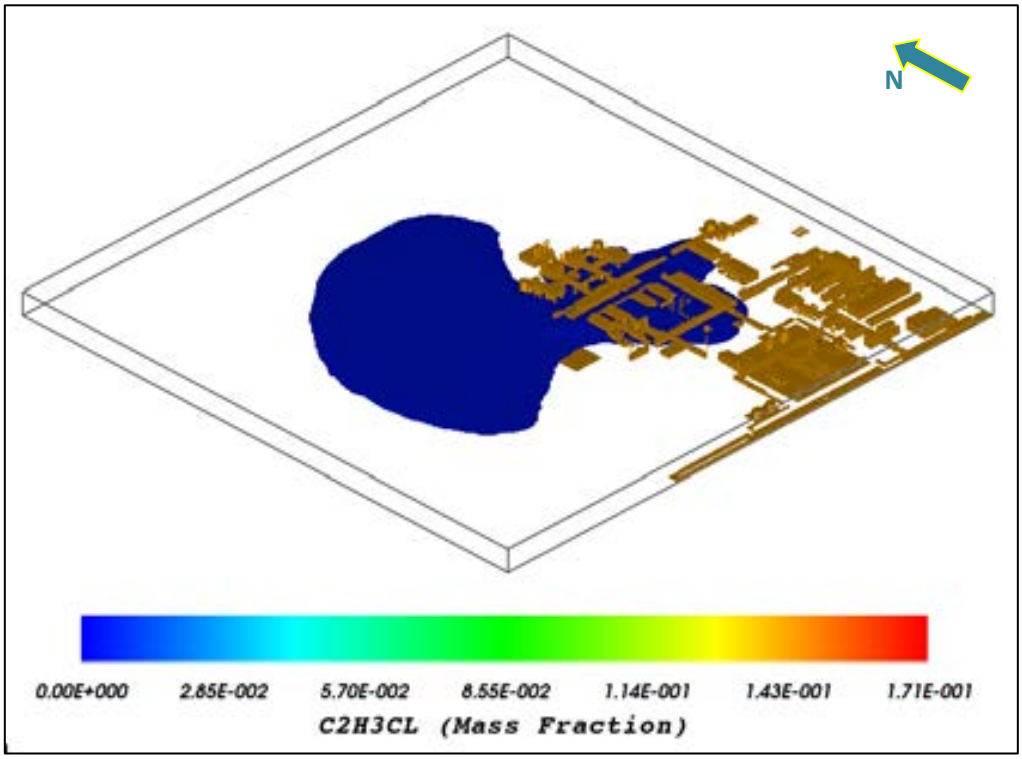


Figure 117: Scenario3 Gas Leakage – O & U Unit

Combustion reaction

Table 10: Combustion reaction details

	Scenario1	Scenario 2	Scenario 3
Chemical name	C_2H_2	C_2H_3CL	C_2H_3CL
Laminar flame speed (m/s)	1.38	0.44	0.44
Heat of formation (J/gmol)	228200	22000	22000
Chemical reaction	$C_2H_2 + 2.5O_2 = 2CO_2 + 1H_2O$	$C_2H_3CL + 2.75O_2 = 2CO_2 + 1.5H_2O + 0.5CL_2$	$C_2H_3CL + 2.75O_2 = 2CO_2 + 1.5H_2O + 0.5CL_2$
LFL (%v/v)	2.5	3	3
UFL (%v/v)	82	33	33

The combustion model used for deflagration is the Modified Bray-Moss-Libby model (MBML). The reaction rates and constants are detailed in Table 10.

Numerical models

The flow is viscous and unsteady. The thermodynamic properties of the fluid calculated based on mixture properties of species. The density of the fluid calculated based on the pressure, temperature and the overall molecular weight of the gas mixture. The variation of specific heat with temperature is considered. The variation of viscosity, thermal conductivity and mass diffusivity with respect to the temperature are considered. MBML turbulent Combustion model used for this study and considered single step reactions to represent fuel oxidation. Turbulence is modeled using standard k-epsilon turbulence model.

In summary, the following simulation parameters are:

- Unsteady Compressible flow
- Turbulence model : k-ε
- No gravity effect
- Model of combustion : MBML
- Pressure based fully implicit
- SIMPLEC (velocity-Pressure coupling) numerical scheme

IV.3.3 Results and analysis

Results of explosion simulations are presented in this section. The thresholds considered for overpressure plots are furnished in *Table 11.*

Table 11: Overpressure thresholds for consequences on structures

Impact Criteria	Overpressure Thresholds
Significant destructions of glass windows	20 mbar
Light damages	50 mbar
Heavy damages	140 mbar
Domino effects	200 mbar
Structural destruction (except concrete)	300 mbar

NOTE : For few scenario where the threshold overpressures (and distances) were not significantly observed, contour plots have been presented for lower overpressure values, only for interpretation purpose.

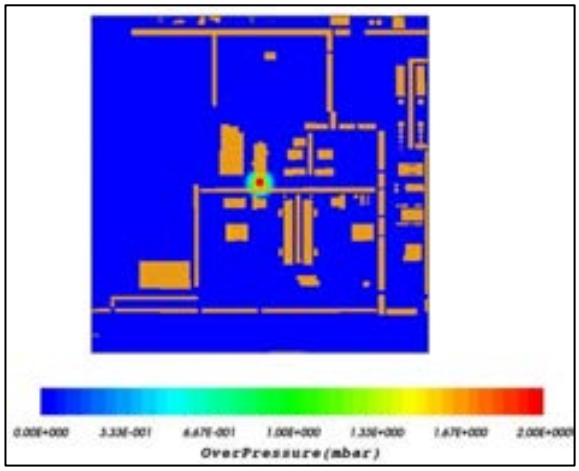
Explosion overpressure results are presented (at ground level) as:

- Contours of Overpressure propagation with time
- Contours of Maximum overpressure attained at any location over the study region

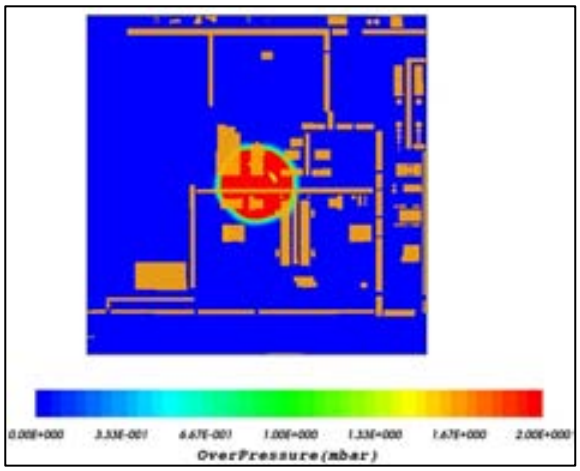
2F - 210° Weather Condition Scenario 1: Acetylene Unit

The scenario1 explosion observed very weak deflagration because of very small flammable cloud region due to very small leakage size. The maximum explosion overpressure generated during explosion is less than equal to 123mbar. Hence the plots are presented for lower overpressure values (not for thresholds) just for interpretation.

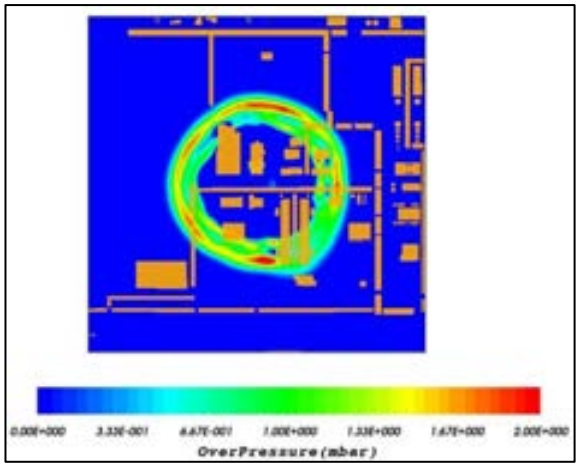
Figure 118 shows the scenario1 evolution of overpressure on ground with respect to different computational time.



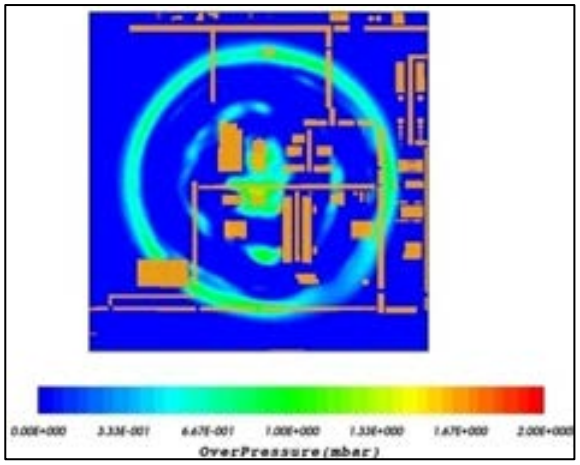
(a) 0.1s



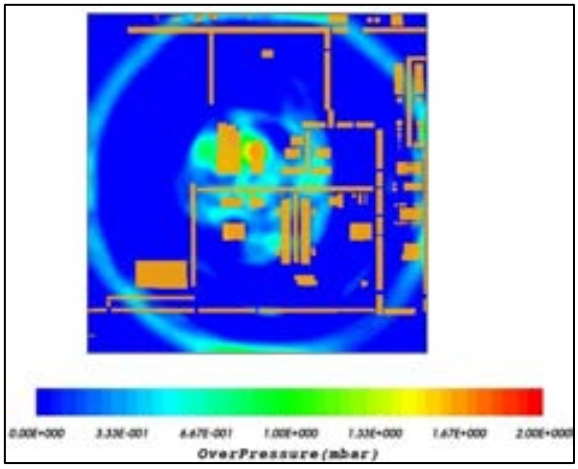
(b) 0.2s



(c) 0.4s



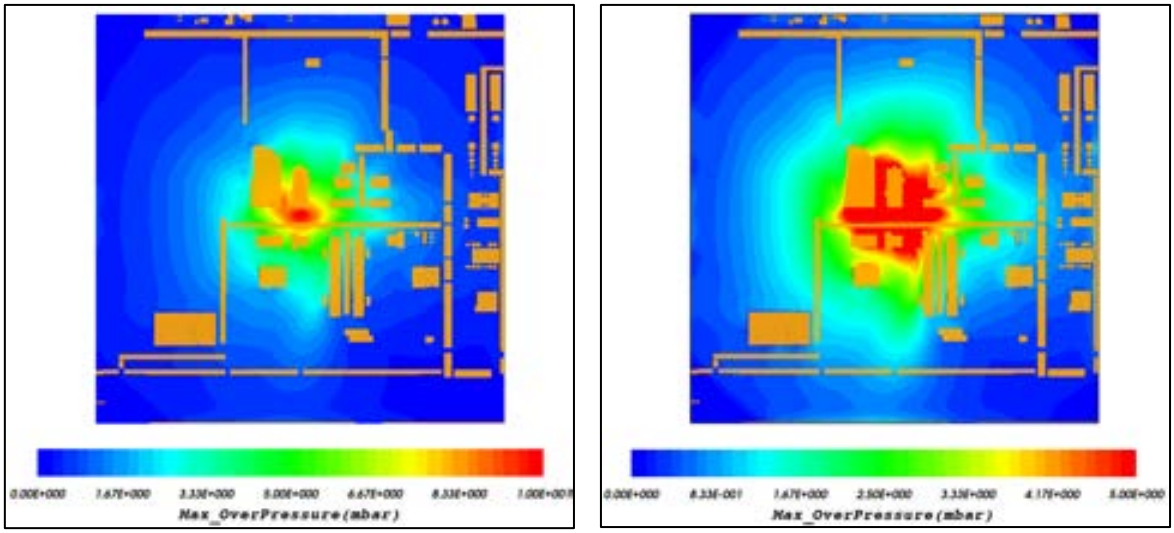
(d) 0.6s



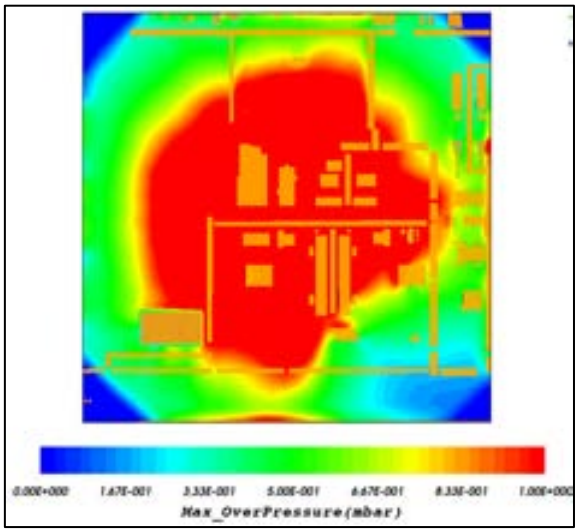
(e) 0.8s

Figure 118: Overpressure on ground (z=0) for range 0 to 2mbar

Figure 119 show the maximum overpressure on ground for ranges - 10mbar, 5mbar and 1mbar (thresholds not attained).



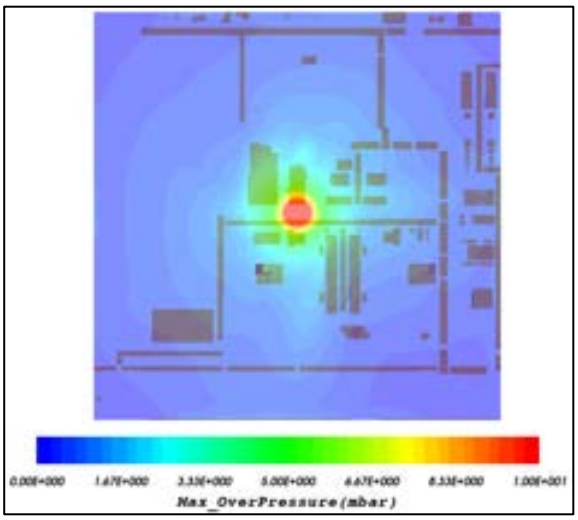
(a) 10mbar (b) 5mbar



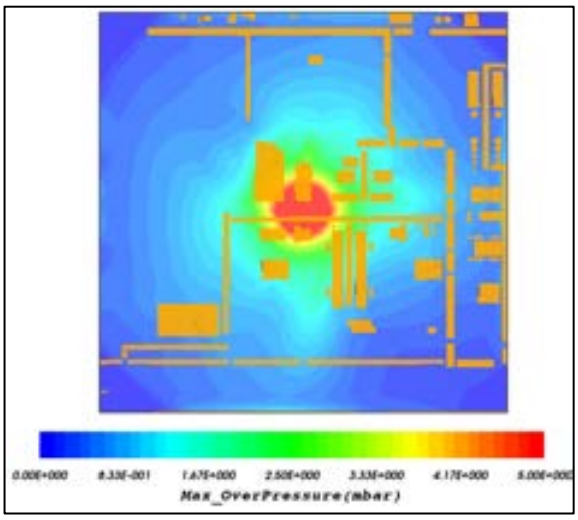
(c) 1mbar

Figure 119: Maximum Incident/reflected overpressure on ground (z=0)

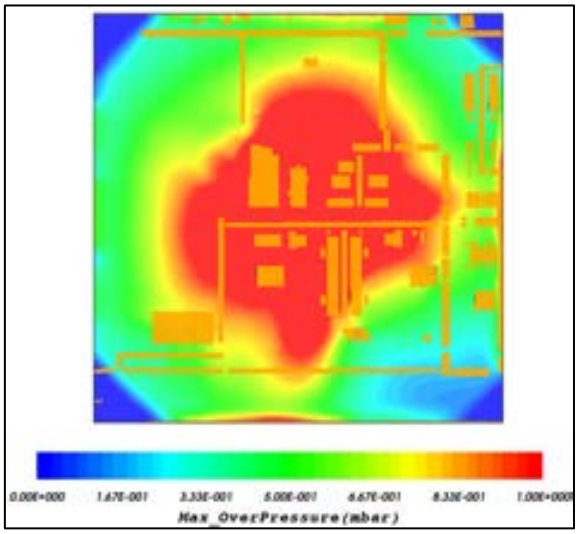
Similarly, *Figure 120* show the maximum overpressure at release plane (26m agl).



(a) 10mbar



(b) 5mbar



(c) 1mbar

Figure 120: Maximum overpressure at release plane (z=26m)

Table 12 shows the max incident overpressure threshold distances from the leakage location.

Table 12: Results Summary for Explosion study of Scenario 1

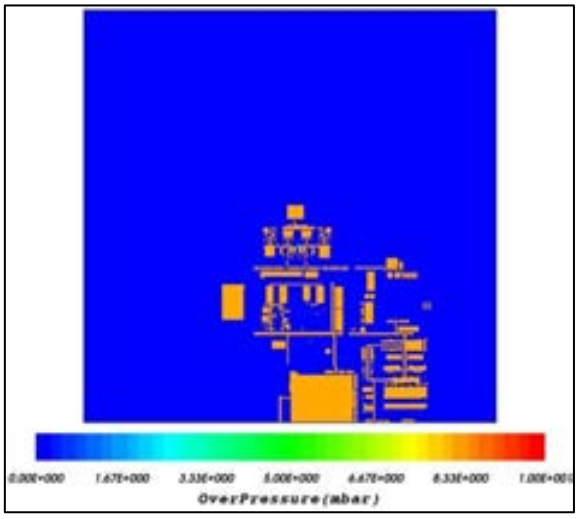
Acetylene Unit						
No	Material	Release Scenario	Weather Scenario	Distance to Max Incident Over Pressure, m		
				140 mbar	50 mbar	20 mbar
Scenario 1	Acetylene	36 inch leak	2F_210Deg	NA	NA	NA

*NA-Not Attained

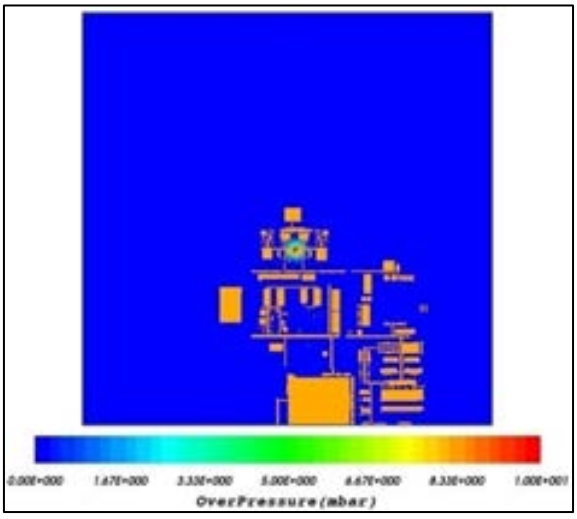
2F - 210° Weather Condition Scenario 2: PVC Unit

The scenario2 explosion is relatively stronger than Scenario1 but a weak deflagration because of very thin dispersed cloud region spread very close to ground level. The maximum explosion overpressure generated during explosion 128mbar.

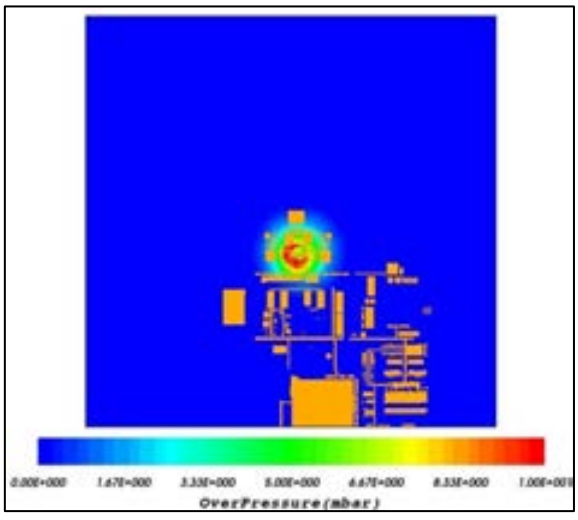
Figure 121 shows the scenario1 evolution of overpressure on ground with respect to different computational time in the user range of 0 to 10mbar.



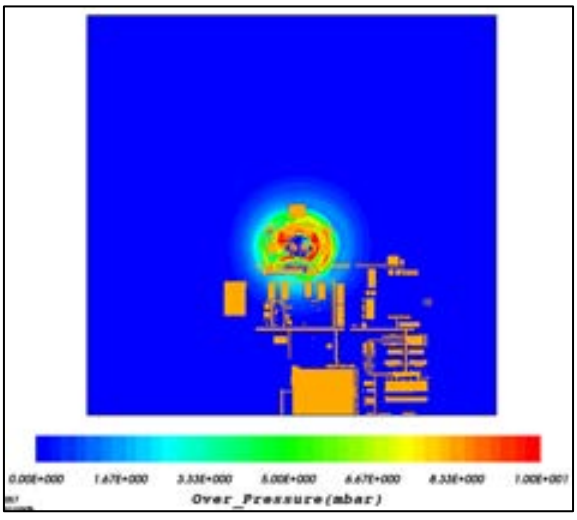
(a) 0.08s



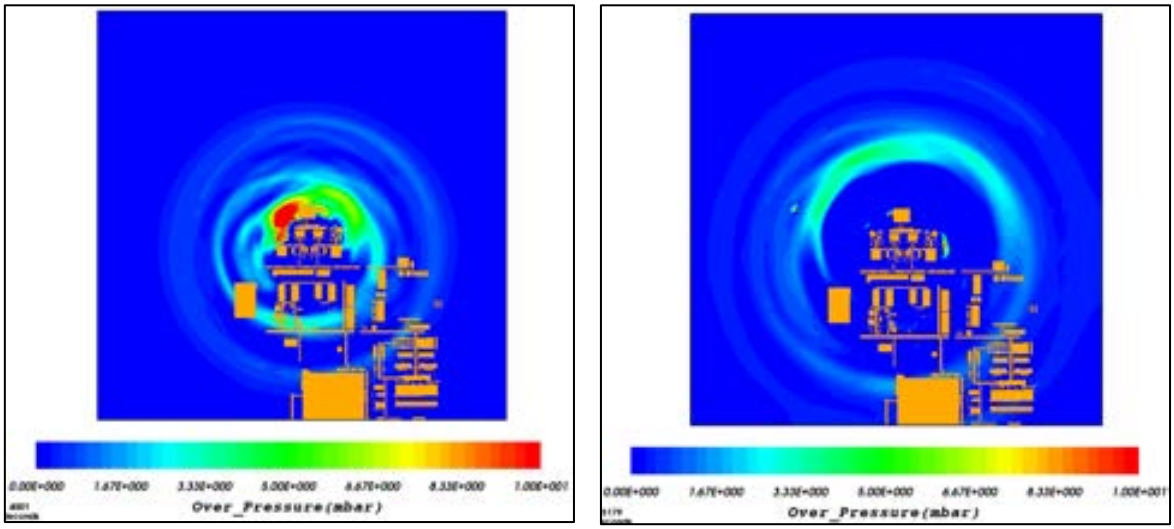
(b) 0.29s



(c) 0.71s



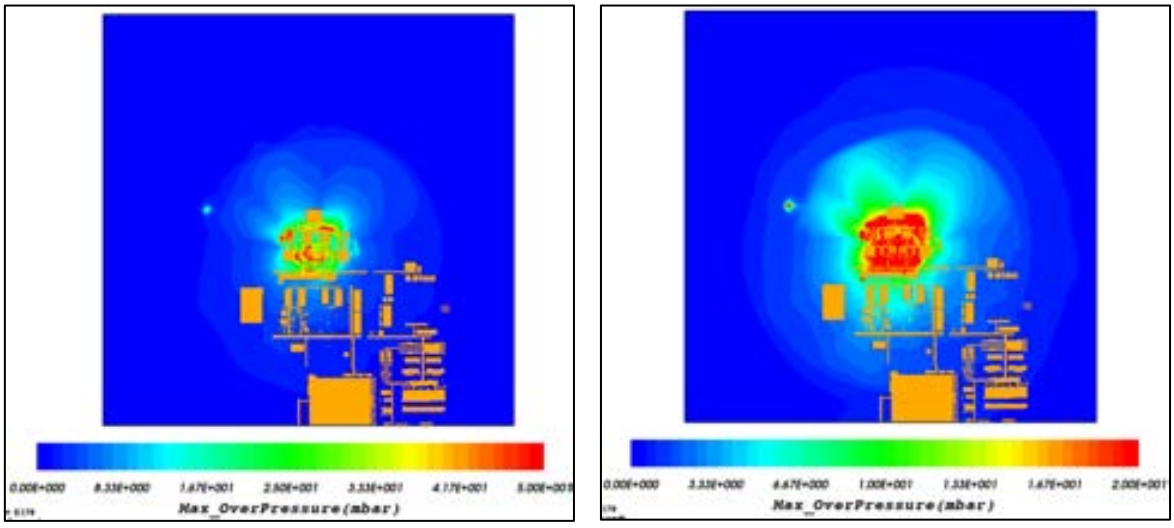
(d) 1.02s



(e) 2.04s (f) 2.62s

Figure 121: Overpressure on ground (z=0) for the range 0 to 10mbar

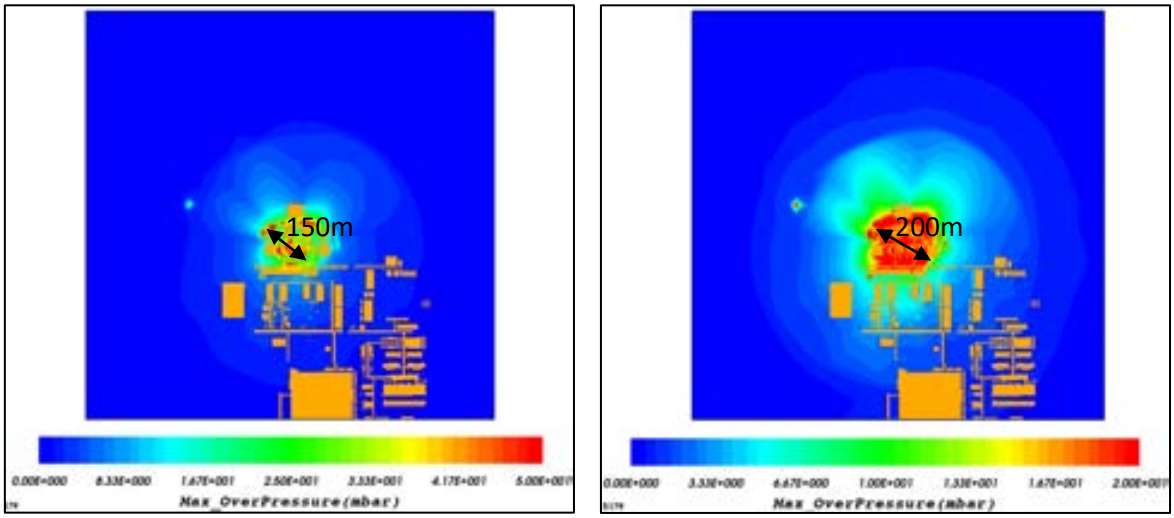
Figure 122 show the maximum overpressure on ground for ranges: 50mbar & 20mbar.



(a) 50mbar (b) 20mbar

Figure 122: Maximum overpressure on ground (z=0)

Similarly, *Figure 123* show the maximum overpressure at release height for ranges – 50mbar, 20mbar.



(a) 50mbar (b) 20mbar

Figure 123: Maximum overpressure at release plane (z=0.75m)

Table 13 shows Scenario2 max incident overpressure threshold distances from the leakage location.

Table 13: Results Summary for Explosion study of Scenario 2

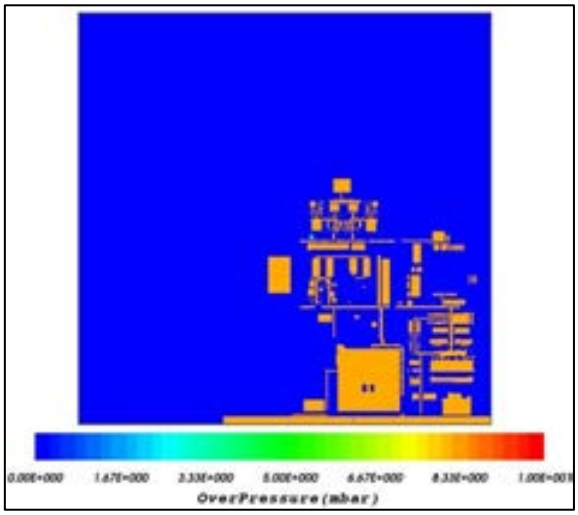
PVC Unit						
No	**Material**	**Release Scenario**	**Weather Scenario**	**Distance to Max Incident Over Pressure, m**		
				140 mbar	**50 mbar**	**20 mbar**
Scenario 2	VCM	8 inch leak	2F_210Deg	NA	150	200

*NA-Not Attained

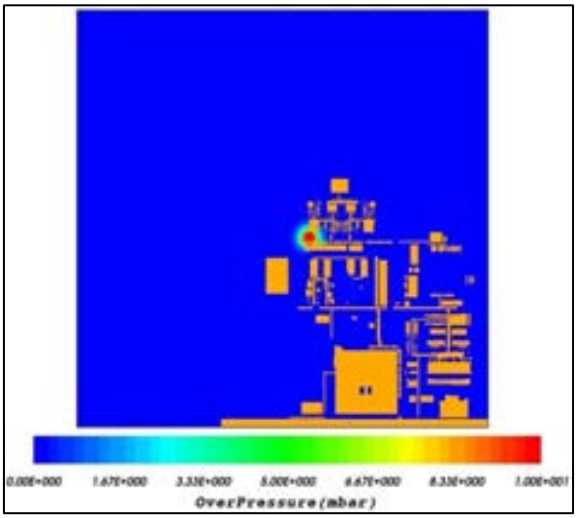
2F - 210° Weather Condition Scenario 3: O & U Unit

The scenario3 explosion is relatively stronger due to larger flammable cloud and confinements. Flame acceleration was not significant due to the thin dispersed cloud close to ground level. The maximum explosion overpressure generated during explosion is 177mbar.

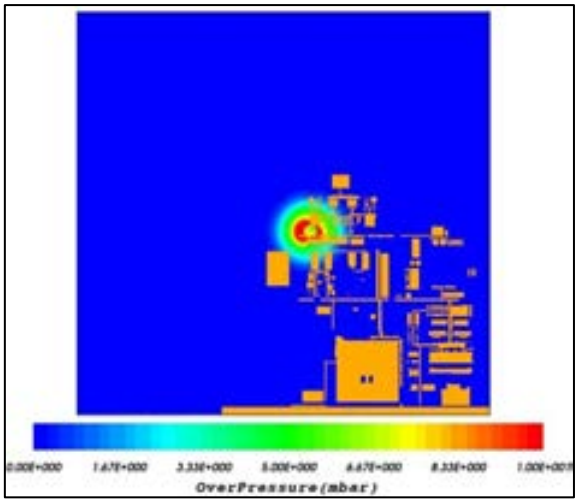
Figure 124 shows the Scenario3 overpressure propagation on ground with time with 0 to 10mbar range.



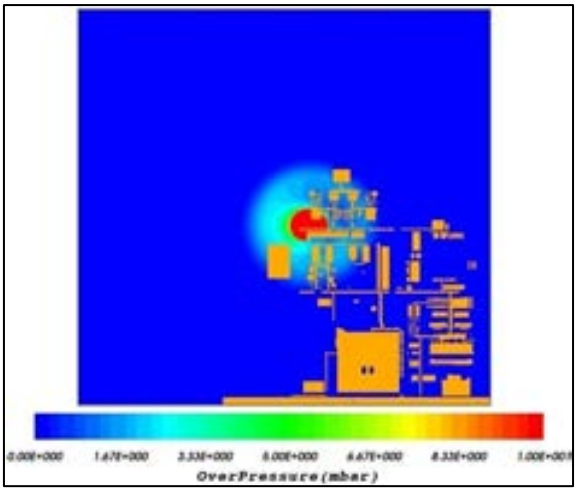
(a) 0.06s



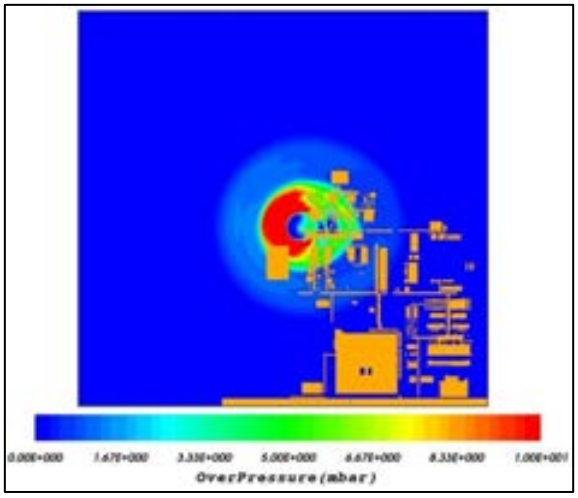
(b) 0.3s



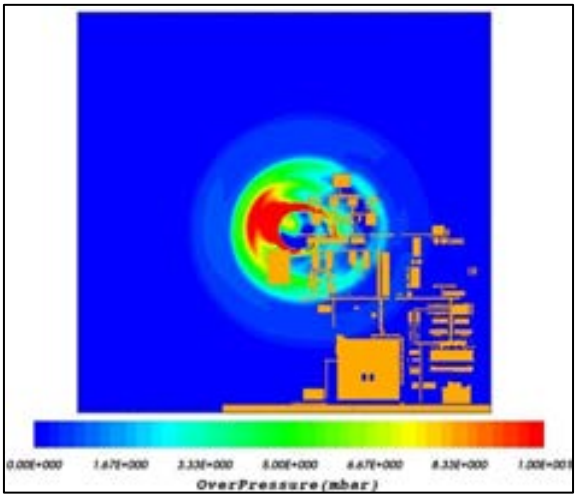
(c) 0.6s



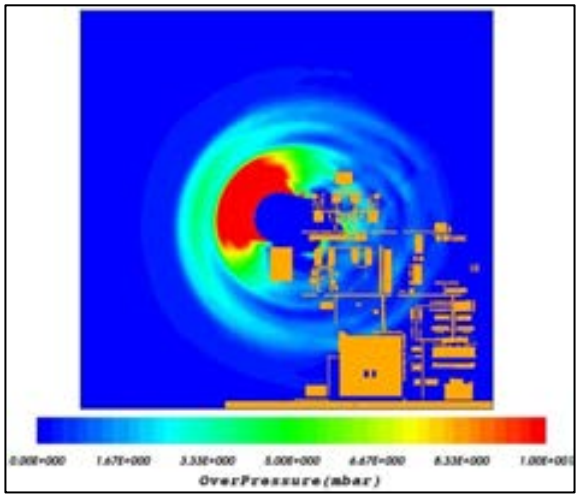
(d) 0.9s



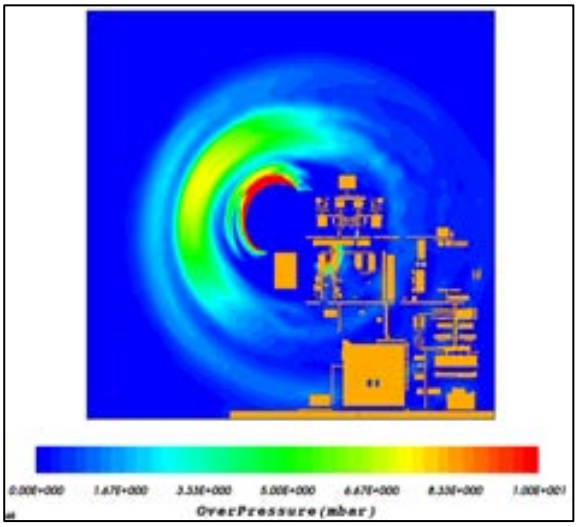
(e) 1.2s



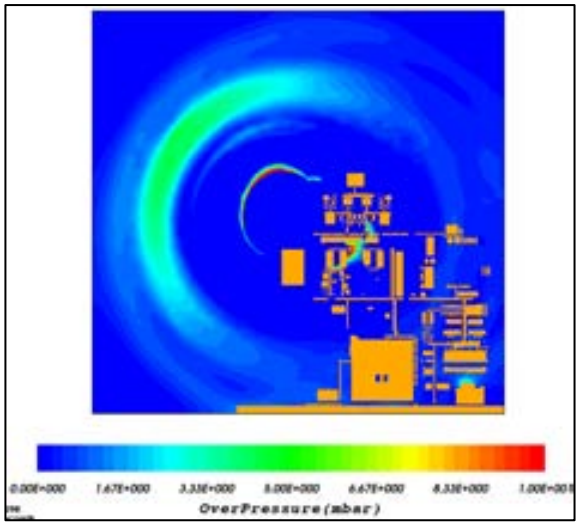
(f) 1.5s



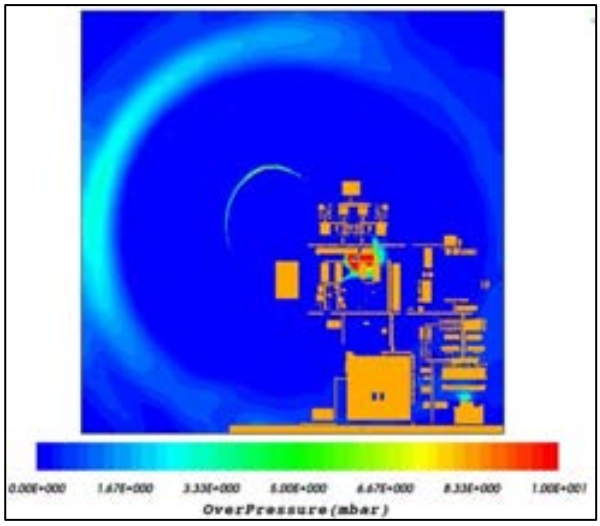
(g) 2.11s



(h) 2.56s



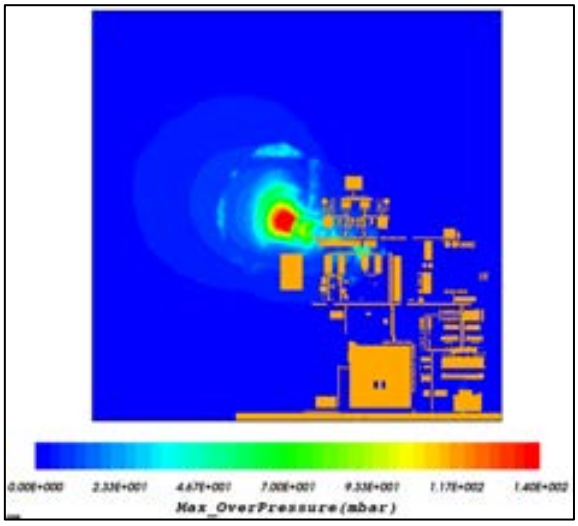
(i) 3.09s



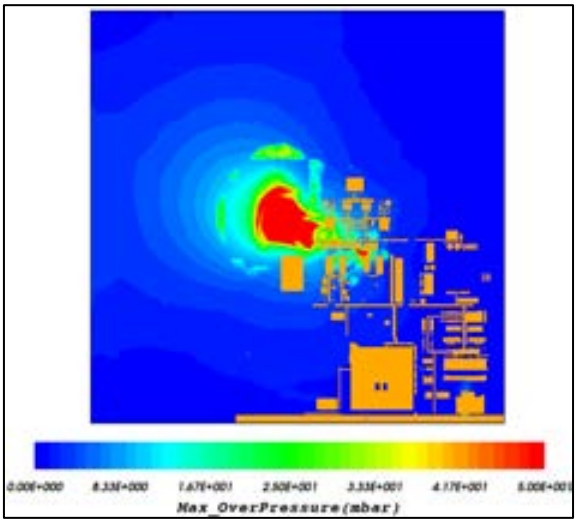
(j) 3.519s

Figure 124: Overpressure on ground (z=0) for user range (0 to 10mbar)

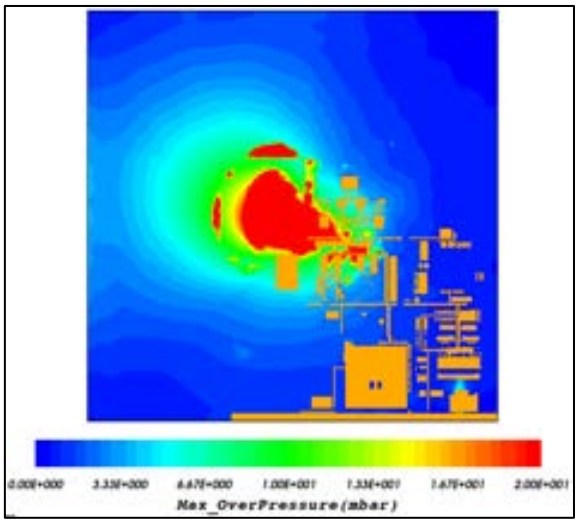
Figure 125 show the maximum overpressure on ground for ranges: 140mbar, 50mbar and 20mbar.



(a) 140mbar



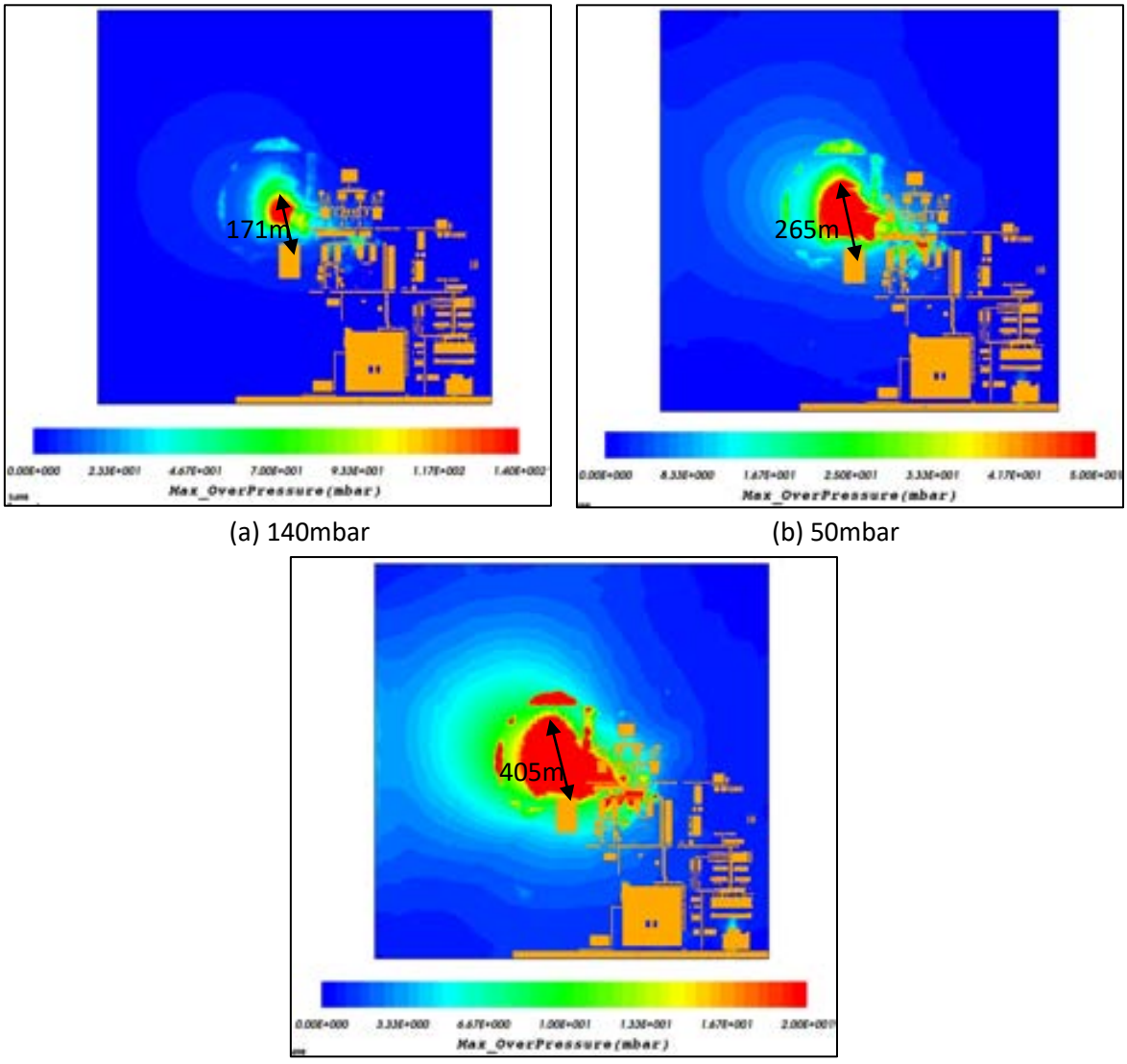
(b) 50mbar



(c) 20mbar

Figure 125: Maximum overpressure on ground (z=0)

Figure 126 show the maximum overpressure at release plane (level).



(a) 140mbar (b) 50mbar

(c) 20mbar

Figure 126: Maximum overpressure at release plane

Table 14 shows the summary of scenario3 different max incident overpressure threshold limits distance from the leakage location.

Table 14: Results Summary for Explosion study of Scenario 3

O & U Unit						
No	Material	Release Scenario	Weather Scenario	Distance to Max Incident Over Pressure, m		
				140 mbar	50 mbar	20 mbar
Scenario 3	VCM	14 inch leak	2F_210Deg	171	265	405

V. DISCUSSIONS ON THE RESULTS

Results of release and dispersion simulations for the identified scenario are discussed in this section. Toxicity impact distances for the toxic materials, observed from the simulation results are tabulated in Table 15.

Table 15: Results Summary for toxicity impact distances

Chloro Alkali Unit					
Plant Site	**Material**	**Release Height, m**	**Release Scenario**	**Weather Scenario**	**Max Impact Distance IDLH, m**
Chloro Alkali - IS-12D	Anhydrous HCl	1.5	FBR (32 inch)	2F_210Deg	1920
				5D_210Deg	2150
Chloro Alkali - IS-1B	Cl2	15	FBR (24 inch)	2F_210Deg	3730
				5D_210Deg	4410
Chloro Alkali - IS-08A	Cl2	1	FBR (2 inch)	2F_210Deg	4090
				5D_210Deg	2560
VCM Unit					
Plant Site	**Material**	**Release Height, m**	**Release Scenario**	**Weather Scenario**	**Max Impact Distance, m IDLH / ERPG3, m**
VCM - IS-9A	VCM	26.5	FBR (16 inch)	2F_210Deg	23.5
				5D_210Deg	16.4
VCM - IS-17A	Propane	30	FBR (9 inch)	2F_210Deg	1040
				5D_210Deg	143
VCM - IS-02	Anhydrous HCl	13	FBR (20 inch)	2F_210Deg	2820
				5D_210Deg	4350
PVC Unit					
Plant Site	**Material**	**Release Height, m**	**Release Scenario**	**Weather Scenario**	**Max Impact Distance IDLH / ERPG3, m**
PVC - IS-03	VCM	1.2	FBR (8 inch)	2F_210Deg	107
				5D_210Deg	52.2
O & U Unit					
Plant Site	**Material**	**Release Height, m**	**Release Scenario**	**Weather Scenario**	**Max Impact Distance, m IDLH / ERPG3, m**
O & U - IS-12	VCM	6	FBR (14 inch)	2F_210Deg	267
				5D_210Deg	78.2
O & U - IS-14	VCM	6	100mm (10 inch)	2F_210Deg	191
				5D_210Deg	74.1
Calcium Carbide Unit					
Plant Site	**Material**	**Release Height, m**	**Release Scenario**	**Weather Scenario**	**Max Impact Distance IDLH, m**
Calcium Carbide-IS-02	Carbon Monoxide	7	100mm (64 inch)	2F_210Deg	175
				5D_210Deg	NA

**NA-Not Attained*

Table 16 furnishes the scenario wise summary of consequence distances in terms of flammable cloud (LFL) for vapour dispersion impacts.

Table 16: Results Summary for Flammability Impact distances

Plant Site	Material	Flammability	Scen_210Deg	
			2F	5D
VCM – IS-9A	**VCM**	**100% LFL of C2H3Cl**	9.52 m	10.7 m
	VCM	**50% LFL of C2H3Cl**	33.5 m	21.5 m
VCM – IS-17A	**Propane**	**100% LFL of C3H8**	26.6 m	24.6 m
	Propane	**50% LFL of C3H8**	51.6 m	35.3 m
PVC - IS-03	**VCM**	**100% LFL of C2H3Cl**	396 m	195 m
	VCM	**50% LFL of C2H3Cl**	486 m	272 m
O & U – IS-12	**VCM**	**100% LFL of C2H3Cl**	586 m	294 m
	VCM	**50% LFL of C2H3Cl**	765 m	378 m
O & U – IS-14	**VCM**	**100% LFL of C2H3Cl**	467 m	263 m
	VCM	**50% LFL of C2H3Cl**	607 m	289 m
Acetylene –IS-06A	**Acetylene**	**100% LFL of C2H2**	31.6 m	10.3 m
	Acetylene	**50% LFL of v/v C2H2**	58.8 m	21.5 m
Calcium Carbide – IS-02	**Carbon Monoxide**	**100% LFL of v/v CO**	NA	NA
	Carbon Monoxide	**50% LFL of v/v CO**	NA	NA
Calcium Carbide – IS-05	**Methane**	**100% LFL of CH4**	NA	NA
	Methane	**50% LFL of CH4**	NA	NA

*NA-Not Attained

Table 17: Pool Fire Threshold distances

Plant Site	Material	Distances for Heat Radiation, m			
		4 KW/m^2	6.3 KW/m^2	12.5 KW/m^2	37.5 KW/m^2
O & U – IS-12	**VCM**	409.0	315.0	226.0	NA

*NA-Not Attained

3D Simulation outputs show that the IDLH plume for the highly toxic chemicals modelled, viz. Cl_2 and Anhydrous HCl have reached upto ~4.5 Km in the downwind direction under scenario ChloroAlkali IS-1B & VCM IS-02 respectively. This shows the extent of care to be taken into account while handling these materials within the plant. It may be noted that these impact distances were obtained without consideration of any inherent mitigation measures in the plant design, as to simulate worst case scenario. These mitigation systems are intended to reduce the impact distances thus ensuring the safety of inhabitants in the downwind town of Mundra.

However, for the VCM and Propane, which are less toxic, the toxic threshold distances were upto 1Km. For the VCM release scenario considered, it can be seen that the ERPG3 levels were not observed on the ground level, implying that the VCM got dispersed to below toxicity limits before it

reached ground. Whereas in case of PVC and O&U Unit, ERPG levels are too low, implying VCM has less toxicity at the ground level.

Similarly, LFL clouds for the flammable materials considered, VCM and Propane, have also not reached ground level. LFL is not attained for Carbon Monoxide and Methane, implies that the gas concentrations are too low to ignite or blow out. The cloud extents at the release elevation, as shown in the plots presented earlier, guide the plant engineers to avoid any ignition source within the cloud as to prevent explosion hazards, in case of an eventual release.

Among the critical scenario considered, only one is considered to be significant in terms of pool formation and subsequent fire event, i.e. O&U IS-12. The results, as tabulated in Table 17, showed that the maximum distance for the threshold of 4 KW/m^2 is 409m. Occupants within this region are to be evacuated before 2-3 minutes to safety, though some more time would be available for the pool to spread to its maximum.

Table 18: Results Summary for Explosion study

Acetylene Unit						
No	**Material**	**Release Scenario**	**Weather Scenario**	**Distance to Max Incident Over Pressure, m**		
				140 mbar	**50 mbar**	**20 mbar**
Scenario 1	Acetylene	36 inch leak	2F_210Deg	NA	NA	NA
PVC Unit						
Scenario 2	VCM	8 inch leak	2F_210Deg	NA	150	200
O & U Unit						
Scenario 3	VCM	14 inch leak	2F_210Deg	171	265	405

3D Numerical explosion study results have revealed that Scenario3 explosion is relatively stronger than Scenario2 and Scenario1. The scenario1 explosion observed very weak deflagration because of very small flammable cloud region due to very small leakage size and cloud position is far away from ground and totally free from confinement from machineries and buildings. Even though scenario2 and scenario3 having well dispersed cloud partially inside the confinement from machineries and buildings but it failed in flame acceleration due to very thin dispersed cloud region spread very close to ground level. In all three scenarios the maximum explosion overpressure generated during explosion is less than equal to 177mbar. From Table 18, 3D numerical results shows scenario1, scenario2 and scenario3 observed 50mbar overpressure range of radial distance from leakage location are 19m, 150m and 265m respectively.

VI. RECOMMENDATIONS FOR ONSITE EMERGENCY PLAN

It is suggested to follow below emergency response guidelines during eventual accidents:

1. Ensuring appropriate mitigation measures in the zones handing highly toxic materials, viz. Anhydrous HCl and Cl_2, which could include suction hoods, water sprinklers / curtains, sensors for early detection and alarm for faster isolation / containment etc..
2. Possible ignition sources are to be isolated / prevented in the flammable cloud region.
3. Common assembly area to be identified in one or more locations within the plant as to be accessible as quickly as possible.
4. Regular Mock drills and emergency preparedness training should be carried out
5. Wind sock shall be provided in one or more locations as to be visible from any point within the plant.
6. Escape routes / evacuation plans should be based on the prevailing (at the time of accident) wind direction (referred from the wind sock) – should be planned as to be laterally away from the cloud.
7. Fresh air intake systems (HVAC) into all the manned process and non-process buildings should be stopped in case of any release events.
8. Provide fire equipment protection and Passive Fire Protection (PFP) for VCM storage Sphere.
9. Provide perimeter flammable gas detectors wherever flammable inventories are handled in process areas.
10. It is recommended that effective gas detection system together with appropriate emergency response action like providing hooter in the shop floor area to raise the siren in case of confirmed gas release which can reduce the risk associated with gas release scenario.
11. Develop an Emergency Response Plan (ERP) which details out the actions and requirements. Also, ERP should include notification to the adjoining industrial facilities (if any) / offsite area to take appropriate action in order to minimize the impact on third party personnel in the event of a major accident.

ANNEXURE-I: *FLUIDYN*-STATE OF THE ART TOOLS ON RISK MODELING

FLUIDYN's 3D-CFD based tools for Risk Consequence modelling have been developed in-house and matured over a considerable period of time with technical inputs, evaluation and validations from various experts in research and academic fraternity. Among the vast range of engineering design & analysis tools, the ones that are significantly customised and tuned for Risk Assessment are:

fluidyn – **PANEPR** *for Accidental dispersions (3D fluid dynamics tool)*

- Heavy gases: gravity phenomena, stratification, heat exchange with ground;
- Multiple sources: stacks, point, road, surface and volume sources;
- Near field modelling of local phenomena (obstacles, buildings…) using embedded mesh;
- Droplets formation, transport, aerosol and pool evaporation;
- Dispersion of combustion products due to fire;
- Large and small scale dispersion;
- Effects of complex 3D topography;
- Effects of buildings and obstacles;
- Apt consideration of flow over porous regions such as pipe networks, semi-enclosed process units;
- Effects of different types of land cover;
- Weather conditions (including low winds);
- Atmospheric turbulence and mechanical turbulence around obstacles;
- Transient or chronic releases with any kind of pollutant (heavy gases, hot gases, light gases, particles…).

fluidyn – **ASSESS-RISK***Risk analysis*

Basic (2D analytical tools for LOC estimation)

- Database of 13 petrochemical equipments
- 45 possible accidental scenarios (including BLEVE, boilover, UVCE etc)
- Single step simulation
- Monitor points for sensitive zones (accurate values obtained)
- Accidental scenarios based on current regulations
- Analysis of domino effects

In its full version, *fluidyn –* **ASSESS-RISK** integrates modules listed below along with a 3D real-time dispersion modelling for the emergency response.

fluidyn – **PANFIRE***for Pool and Jet fires (3D analytical tool)*

- Thermal flux due to solid and liquid fire
- Radiation from a flame surface based on NFPA methodology

fluidyn – **VENTFIRE***for Pool and Jet fires (3D fluid dynamics tool)*

- Thermal flux due to solid and liquid fire
- Simulation of combustion in transient flow field

fluidyn – **VENTEX***for detonations and deflagrations (3D fluid dynamics tool)*

- Explosion simulations in confined & semi-confined regions
- Advanced combustion models and quenching effects due to local turbulence

fluidyn – **PANWAVE***for tank rupture consequences (3D fluid dynamics tool)*

- Simulation of teh consequences of any loss of containment on liquid storage tanks
- Overpressure on retention walls
- Overtopping and subsequent spreading on the petrochemical site

Besides the basic CFD modelling approaches, some of the specific areas where FLUIDYN tools have been fine tuned to take into account the scenario complexities and customization of physics to derive more reliable consequence quantification are as detailed in the below table.

Feature	*fluidyn*– PANACHE	Contemporary CFD Tools
Atmospheric Boundary Layer flow for heavy gas in urban / industrial congested topography	Uses French and now EU defined 3D modelling protocol **released in September 2015 as** **DRA-15-18997-06852A** **(Guide_Bonnes_Pratiques.pdf)**	Use general CFD simulation procedure. Results quality defer depending on the user knowledge, input parameters quality (e.g. meshing, Boundary conditions, chosen)
Effect of buildings and obstacles on air flow, especially in low wind conditions when the risk is higher	Uses unstructured mesh for exact representation of buildings and obstacles, capturing wake effect- low pressure recirculation zones- of buildings and obstacles	Use structured (Cartesian) mesh. Obstacles are represented by their general obstruction (porosity) mesh. Wake of buildings is not captured as porosity distribution is general over the whole domain. Air flow is in general wind direction without local obstacles flow recirculation effect.
Flow velocity and pollutants	Flow and pollutant concentration do not depend on X or Y direction. For the same mesh, they will give similar results whatever wind direction is chosen.	Flow velocity and pollutants extent in directions other than X or Y will be much smaller as numerical diffusivity (not real) will be higher. Often mesh is also built such that flow direction is along X or Y to keep mesh size smaller in the flow direction, though results are wrong.
Effect of ground temperature (solar heating), varying surface drag in low wind conditions	Varying effect of solar heating on water/ ground/ vegetation, etc. is considered automatically accounted for as soon as the time, latitude and vegetation are given in input data	Though major consequences are most likely in low wind conditions and ground temperature driven thermal convection is important factor, they are ignored.
Air flow boundary conditions for source size air flow precision	Uses multi embedded zones starting from large domains (>20 sq. km) to small domains (<100m). Each smaller domain has finer mesh and allow for capturing even a centimetre size leak	Mesh is Cartesian. Any local fine mesh usage penalises and gives non-uniform results everywhere else.

	for flow velocity accuracy	
Pollution plume structure	Pollution accumulation in the wake regions of obstacles is accurately simulated and breaks up in pockets behind obstacles	Pollution plume develops in general wind direction almost as a Gaussian plume (as porosity is same and obstacle contours are not clearly identified)
Pollution residence time and mitigation measures	While the pollutants may be washed from the open domain, they will still persist behind the obstacles in wake regions due to flow recirculation. Any muster points or evacuation strategy has to be derived based on these high concentration areas	As concentration of pollutants behind obstacles is not seen clearly, such that any emergency response mitigation can be derived.
Flammable cloud explosivity	As the accuracy of the flammable cloud size is an important factor, the time dependent concentration variation behind the obstacles is accurately modelled.	As the wake region gas cloud concentration is uncertain, there is no way of ascertaining the explosivity.
Sensor mapping	1. Optimised Sensor mapping 2. Real time leak source detection and 3. Dispersion forecast in real time available integrally 4. Rough empirical assessment of risk scenarios (with coupled Assess Risk).	As the pollutant concentration is approximate, so reliable sensor mapping is impossible.

IN-HOUSE VALIDATION OF FLUIDYN-PANACHE:

PANACHE was validated against the below dense gas field experiment results:

Desert Tortoise:

Dessert Tortoise was conducted at the Frenchmans Flat site in Nevada, and here the liquefied gas was emitted through an orifice plate. The pressure drop from the exit to the atmosphere caused part of the material to evaporate instantaneously, and the heat required for this phase transition was supplied as to compensate for the temperature drop of the released material.

Burro:

These LNG experiments were made at the US Naval Weapon Center (NWC) test site at China Lake, California, where liquefied natural gas was poured into a water basin. A steel plate was placed below the exit of the pipeline and the LNG was directed radially outwards on the water surface.

Case	Product	Windspeed	Source	Mass flow rate
Desert Tortoise	Ammonia	4.5 - 7.4 m/sec	Jet	81-133 $kg.sec^{-1}$
Burro	LNG	5.4 - 7.4 m/sec	Pool	11 to 18m^3/min
CO2PIPETRANS	CO_2	5.5 – 6.0 m/sec	Jet	4 – 40 $kg.sec^{-1}$
Porton Down	Freon	4 – 4.7 m/sec	Instantaneous release	40 m^3

CO2Pipetrans:

To investigate and fill the identified knowledge gaps and to validate computer dispersion models for liquid and supercritical CO2 releases, BP set up a research project in 2006. The experiments are characterized by both high-pressure cold release and high-pressure supercritical release. Experiments were carried out by BP and Shell around the Carbon Sequestration system.

Porton Down:

Forty two moderate scale (40 m3) Freon (CCl2F2) dispersion experiments “PortonDown Series” were conducted in 1976 at the Chemical Defence Establishment in Porton Down (Picknett Report, 1978).

FLUIDYN’s modelling tools have evolved by the rigorous usage and improvisation by the Chemical, Petrochemical and Nuclear Industrial experts. Some of the salient works carried out have already been published by FLUIDYN users.

PUBLICATIONS:

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1. *"Guide de Bonnes Pratiques pour la réalisation de modélisations 3D pour des scénarios de dispersion atmosphérique en situation accidentelle "* – a practical guide for the 3D modeling of accidental release scenario ; compiled based on deliberations by FWG (French Working Group) under the aegis of INERIS

2. *IS 15656- 2006 : Hazard Identification and Risk Analysis – Code of Practice ;* by BIS

3. *Guide methodologique UFIP pour la réalisation des études de dangers en raffineries, stockages et dépots de produits liquides et liquefies*; Methodology for the Hazard Studies; by UFIP

4. *fluidyn-PANACHE – Technical Manual; a document with model formulations and approaches; by* FLUIDYN

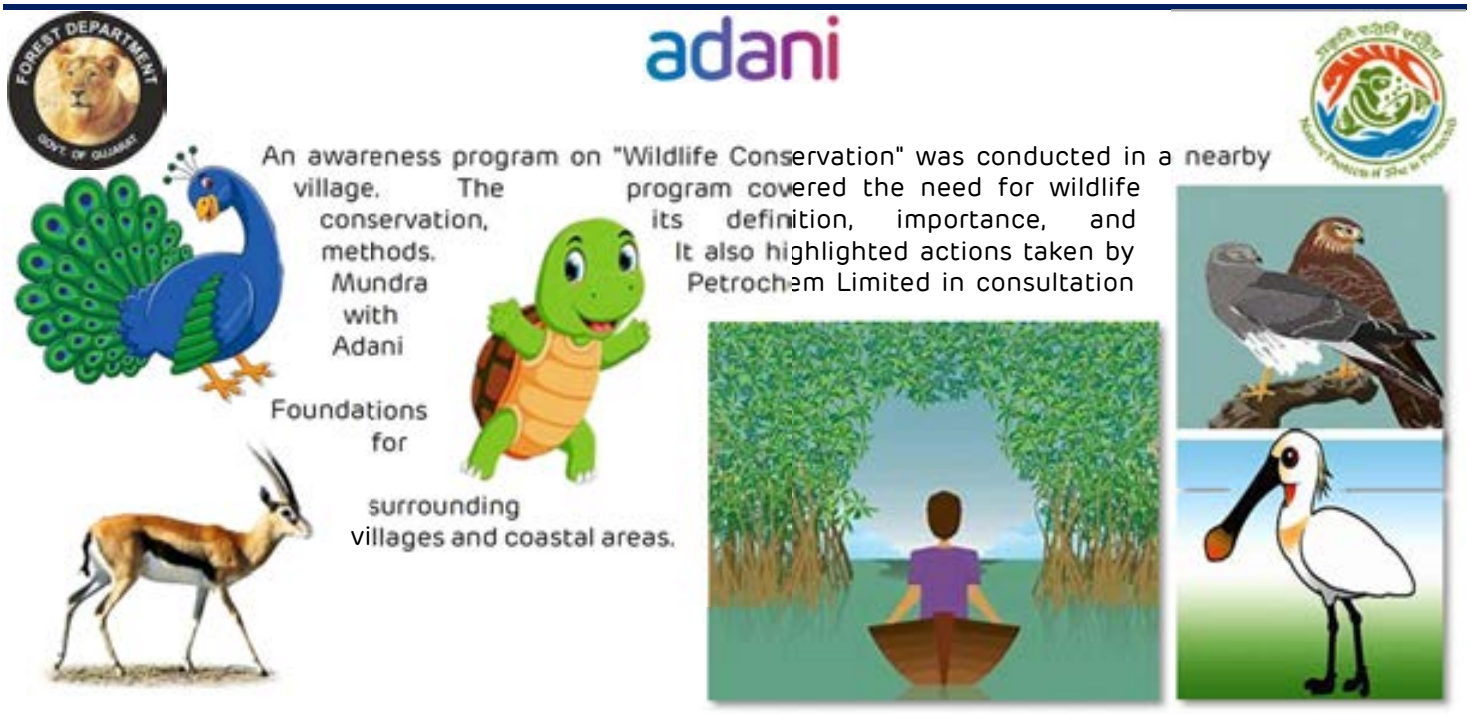
5. *Guidelines for Quantitative Risk Assessment – CPR-18E, the Purple Book;* by TNO

6. *Chemical Datasheet* by Cameo Chemicals

7. *The Properties of Gases and Liquids, 5th Edition* By Bruce E. Poling (University of Toledo), John M. Prausnitz (University of California at Berkeley), and John P. O'Connell (University of Virginia). McGraw-Hill: New York. 2001. 768 pp. $115.00. ISBN 0-07-011682-2

Annexure – III

Activities for Wildlife Conservation Plan



Status of Wild Life conservation plan.

Sr. No.	Activity	Villages / Area	Status	Remark
1	Plantation program for coservation of habitat	Nearby Villages	Fulfilled	88536+ trees have been planted at nearby villages.
2	Awareness programme for "Wild life" Conservation – Educational Program.	Tunda (1st Year)	Fulfilled*	Awareness programme have been conducted under Eco Club Programne.
		Vandh (2nd Year)	Fulfilled*	
		Navinal (3rd Year)	Fulfilled*	Awareness programme Have beenconducted under Eco Club Programne.
		Siracha (4th Year)	Fulfilled*	
		Kandagra (5th Year)	Fulfilled*	Awareness programme have been conducted under Eco Club Programne.
3	Artificial Concreate water pond of 1000 lit capacity to provide drinking water facility for wild animals.	2 villages in study area	Fulfilled	2 Nos. "Guzzler" – Drinking water facilities of more than 1000 liters capacity have been provided for wild life animals at the locations recommended by District Forest Department, Gov. of Gujarat.
4	Mangrove Plantation (1000 no. of plant per Ha.)	Near by project area.	Fulfilled	10000 numbers of mangrove plantation have been done in vicinity of plant premises.

* : 70 number of schools from neaby 16 villages and mundra & Mandavi towns have been covered under "ECO CLUB" which are formed for generating awareness on environmental best practices, wildlife conservation, Mangrove conservation, sustainability and Earth eco system.

Wildlife awareness programs have been conducted at schools of nearby villages under the Eco Club initiative. 70 schools from surrounding villages, including Mundra and Mandavi town areas, participated in these programs aimed at promoting environmental awareness on topics such as wildlife conservation, alternatives to single-use plastics, and mangrove conservation.

Over 6000 students participated in these programs, gaining an understanding of the importance of their local area and the dependence of life on barren land as well as coastal regions.

Students were also educated about the sanctuary and reserve forest areas located in the district and the measures taken to protect wildlife.

Mangroves are salt-tolerant trees and shrubs that thrive in coastal intertidal zones. These remarkable ecosystems are found in the coastal areas of Mundra and Mandavi talukas near the MPL premises. Mangrove forests are essential not only to the health of coastal environments but also to the communities that rely on them. This report highlights the significance of mangrove conservation.

Mangrove plantation in an area of 7+ Ha have been carried out at nearby PVC Project area – Kotadi Creek with planting 75000+ numbers of mangrove species. In addition to this, MPL is conserving mangroves through experts by constant supervision so that survival rate shall be more than 90%.

Furthermore, in accordance with the approved wildlife conservation plan, two "Guzzler" drinking water facilities for wild animals have been constructed in consultation with and under the supervision of the District Forest Department, Kutch, at the Reserve forest area, Navinal Dhuvo, near Bardimata Temple.

2 numbers of Guzzler have been constructed at Reserve forest area, Navinal Dhuvo, Near Baradi Mata Mandir, Navinal

Letter from Forest Department for Completion of "GUZZLER" – Drinking water facilities for animals.

M/S. MUNDRA PETROCHEM LIMITED (MPL)

Six Monthly Environmental Monitoring Report Mundra Petrochem Limited (MPL) Located at near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat

Month: April to Sept 2025

Submitted By

UniStar Environment & Research Labs Pvt. Ltd.
White House, Near GIDC Office, Char Rasta, Vapi, Gujarat, India – 396195

M/S. MUNDRA PETROCHEM LIMITED (MPL)

Six Monthly Environment Monitoring Report for Green PVC Project near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat

QUALITY CONTROL							
Name of Publication	Six Monthly Environmental Monitoring Report for Green PVC Project near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat						
SO No.	Service Order	**Issue No.**	1	**Revision No.**	01	**Released**	October 2025
Prepared & Managed By	MS. Pooja Gandhi		**Approved by**		Mr. Jaivik Tandel		
Released By	Unistar Environment and Research Labs Pvt. Ltd.						

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LIST OF ANNEXURES

ABBREVIATIONS AND ACRONYMS

MPL	:	Mundra Petrochem Limited
APL	:	Adani Power Limited.
APSEZL	:	Adani Ports & Special Economic Zone Limited
UERL	:	UniStar Environment and Research Labs Private Limited
CPCB	:	Central Pollution Control Board
EIA	:	Environment Impact Assessment
EMP	:	Environmental Management Plan
ETP	:	Effluent Treatment Plant
KLD	:	Kilo Liter Day
MOEFCC	:	Ministry of Environment, Forest & Climate Change
C_2H_2	:	Acetylene
CaC_2	:	Calcium Carbide
C_2H_3Cl	:	Vinyl chloride
GoI	:	Government of India
GPCB	:	Gujarat Pollution Control Board
PVC	:	Polyvinyl chloride
VCM	:	Vinyl Chloride Monomer

1 EXECUTIVE SUMMARY

1.1 Introduction

1.1.1 About ADANI Group

The Adani Group is a diversified organisation in India comprising 11 publicly traded companies. It has created a world class transport and utility infrastructure portfolio that has a pan-India presence. Adani Group has headquartered in Ahmedabad, in the state of Gujarat, India. Over the years, Adani Group has positioned itself to be the market leader in its transport logistics and energy utility portfolio businesses focusing on large scale infrastructure development in India with O&M practices benchmarked to global standards. With four IG rated businesses, it is the only Infrastructure Investment Grade issuer in India.

Over the years, Adani Group has positioned itself to be the market leader in its transport logistics and energy utility portfolio businesses focusing on large scale infrastructure development in India with O & M practices benchmarked to global standards, with key businesses across Resources -Coal mining & trading, Logistics – shipping, rail and airport terminals, Energy – Gas (LNG, City Gas), Thermal power generation, Renewables (Solar & Wind) and transmission energy infrastructure, Agro commodities, Ancillary industries and Real estate etc. Adani Group is the largest private power producer in India.

Adani owes its success and leadership position to its core philosophy of 'Nation Building' driven by 'Growth with Goodness' - a guiding principle for sustainable growth. Adani is committed to increasing its ESG footprint by realigning its businesses with emphasis on climate protection and increasing community outreach through its CSR programme based on the principles of sustainability, diversity and shared values.

Adani group is now executing green PVC project (Green PVC) at near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat

1.1.2 About UniStar Environment and Research Labs Private Limited (UERL)

UniStar Environment and Research Labs Private Limited is a company which provide efficient and economical services in the areas of environmental pollution control/monitoring and chemical analysis & research activities to various industries and institutions. UniStar provides technical consultancy backed by well-established sophisticated analytical laboratories, to comply with Statutory requirements and directives of the Pollution Control Board/ Committees under various Environment Pollution Control Acts. and Rules. We also carry out post Environmental Clearance monitoring and assist our valued customers in preparation of Half-yearly Environmental Clearance Compliance report.

- Ministry of Environment, Forest and Climate Change (MOEFCC), GOI recognized the Laboratory under the Environment Protection Act-1986 which is valid up to – 18/10/2027.
- ISO/IEC 17025 Accredited Laboratory by National Accreditation Board for Testing and Calibration Laboratories (NABL) which is valid up to – 22/09/2026.
- Recognized Environmental Auditor Laboratory by Gujarat Pollution Control Board, Gandhinagar, Gujarat, India which is valid up to 31/12/2025.

  Copy of relevant certificates are attached as Annexure I.

1.2 Brief Description of Project

The proposed Green PVC Project is having various major units such as, Semi-coke Plant, Calcium Carbide Plant, Acetylene Plant, VCM Plant, PVC Plant, Caustic Soda Plant, Ethylene Glycol Plant & Cement Plant. The associated infrastructure facilities such as boiler, final/intermediate product storages etc, utilities, pipelines, ancillary facilities for interconnecting /transferring of materials between pockets, loading/unloading, roads, drainages, pipe racks, trenches, cable trays, non-plant buildings, laboratories, fabrication yards, batching Plant, dispatch section, general stores/ warehouse, fire & safety department, maintenance workshop, occupational health centre etc. will also be established.

2 ENVIRONMENTAL MONITORING

2.1 General Philosophy & Scope of Work

The environmental monitoring encompassed various disciplines and environmental attributes, including air quality, water quality, noise levels, and soil conditions. As per the given scope of work for environmental monitoring by MPL, we have prepared Environmental Monitoring Plan as per below.

Sr. No	Discipline	Location	Parameter	Frequency
1.	Ambient Air Quality Monitoring	Seven Locations	As per NAAQMS, 2009	Monthly
2.	Ambient Noise Monitoring	Seven Locations	Day Time & Nighttime - Noise Levels in Leq dB(A)	Monthly
3.	Treated Sewage water	One Location	pH, Bio-Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Faecal Coliform (FC) (Most Probable Number per 100 millilitre, MPN/100ml, Nitrogen-Total, Phosphorus-Total	Monthly
4.	Ground water	Eight Location	pH, Temperature, Turbidity, conductivity, Total Dissolved Solids, Bio-Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Salinity, Ammonical Nitrogen, Total Alkalinity, Total Hardness, Calcium, Magnesium, Chloride, Sulphate, Nitrate, Fluoride, Phenolic Compound, Sodium, Potassium, Calcium Hardness, Magnesium Hardness, Lead, Iron, Cadmium, Manganese, Copper, Arsenic, Chromium, Mercury, Nickel, Zinc, Total Nitrogen, Cyanide, Total Phosphorous, Sodium Absorption Ratio (SAR)	Pre & Post Monsoon
5.	Surface Water	Four Location	pH, Colour, Conductivity, Total Dissolved Solids, Bio-Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen, Total Hardness, Calcium Hardness, Magnesium Hardness, Chloride, Sulphate, Nitrate, Fluoride, Phenolic Compound, Ammonical Nitrogen, Lead, Iron, Cadmium, Manganese, Copper, Arsenic, Chromium, Boron, Mercury, Zinc, Cyanide, Sodium Absorption Ratio (SAR)	Pre & Post Monsoon
6.	Surface Water (Marine)	Three Location	pH, Colour, Odour, turbidity, Total Suspended Solids, Total Dissolved Solids, Bio-Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen, Oil & Grease, Lead, Iron, Cadmium, Manganese,	Pre & Post Monsoon

2.2 Sampling & Analysis

The selection of methods for sampling, preservation, and analysis holds significant importance in environmental monitoring. To ensure the highest quality in environmental sampling and analysis, the Central Pollution Control Board (CPCB) has established guidelines for these processes. Adhering to these guidelines, specific methods for sampling and analysis of environmental samples have been chosen and implemented. Instrument used in sampling are calibrated from NABL accredited Laboratory. Details are as follows:

Sr. No	Name of Instrument Used	ID No./Sr. No	Make/Model	Calibration Date	Cal. Valid up to
1.	Respirable Dust Sampler PM 10	UERL/AIR/RDS/24/ 2345-DTB-2012	Envirotech/ APM 460-BL	19/12/2024	18/12/2025
2.	Fine Particulate Sampler PM 2.5	UERL/AIR/FPS/30/ 132-DTL-2012	Envirotech/ APM 550-MINI	18/12/2024	17/12/2025
3.	Respirable Dust Sampler PM 10	UERL/AIR/RDS/25/ 1744-DTA-2013	Envirotech/ APM 460-BL	18/12/2024	17/12/2025
4.	Fine Particulate Sampler PM 2.5	UERL/AIR/FPS/41/ 137-DTD-2013	Envirotech/ APM 550-MINI	19/12/2024	18/12/2025
5.	Respirable Dust Sampler PM 10	UERL/AIR/RDS/26/ 1745-DTA-2013	Envirotech/ APM 460-BL	19/12/2024	18/12/2025
6.	Fine Particulate Sampler PM 2.5	UERL/AIR/FPS/42/ 125-DTD-2013	Envirotech/ APM 550-MINI	20/12/2024	19/12/2025
7.	Sound Level Meter	UERL/AIR/SLM/09A	Envirotech - SLM 100 /24 DTE 2008	16/12/2024	15/12/2025
8.	Sound Level Meter	UERL/AIR/SLM/09B	Envirotech - SLM 100 /310 DTK 2015	16/12/2024	15/12/2025
9.	Sound Level Meter	UERL/AIR/SLM/09C	Extech / SDL 600	16/12/2024	15/12/2025

***Calibration certificates are attached in Annexure II**

2.2.1 Ambient Air Quality Sampling and Analytical Techniques

The techniques used for ambient air quality monitoring and its permissible limit are given in following table.

Sr. No.	Parameter	Technique	Technical protocol	Permissible Limit (As per NAAQS)
1.	Particulate Matter as PM10	Respirable Dust Sampler (Gravimetric method)	IS - 5182, Part - 23	100
2.	Particulate Matter as PM2.5	fine particular Sampler (Gravimetric method)	IS - 5182, Part - 24	60
3.	Sulphur Dioxide as SO2	Modified West and Gaeke	IS - 5182, Part - 2	80
4.	Nitrogen Dioxide as NO2	Jacob &Hochheiser	IS - 5182, Part - 6	80
5.	Carbon Monoxide as CO	Gas Analyser (CO)	IS - 5182, Part - 10	4.0
6.	Ozone as O3	UV Spectrophotometer	IS - 5182, Part - 9	180
7.	Ammonia as NH3	Titrimetric Method	IS - 5182, Part - 25	400
8.	Lead as Pb	AAS Method	IS - 5182, Part - 22	1.0
9.	Nickel as Ni	AAS Method	IS - 5182, Part - 26	20
10.	Arsenic as As	AAS Method	IS - 5182, Part - 22	6.0
11.	Benzene as C6H6	GC Method	IS - 5182, Part - 11	5.0

Sr. No.	Parameter	Technique	Technical protocol	Permissible Limit (As per NAAQS)
12.	Benzo (a) Pyrene (BaP)	GC Method	IS - 5182, Part - 12	1.0

2.2.2 Ambient Noise Level Sampling Techniques

The techniques used for ambient air quality monitoring and its permissible limit are given in following table.

Sr. No.	Parameter	Technique	Technical protocol	Permissible Limit (As per CPCB)
1.	Ambient Noise Level Monitoring at Industrial Area	Noise Meter (Leq)	IS : 9989 : 1981	Day Time – 75 dB Night Time – 70 dB
2	Ambient Noise Level Monitoring at Residential Area	Noise Meter (Leq)	IS : 9989 : 1981	Day Time – 55 dB Night Time – 45 dB

2.2.3 Ground Water Sampling & Analysis Techniques

Sr. No.	Parameter	Technical protocol	IS 10500 Standard Limits for drinking water	
			Desirable limit	Per. Limit in the Abs. of Alt. Source
1	pH	IS 3025(Part 11):2022	6.5-8.5	NR
2	Temp	IS 3025(Part 9):1984	NS	NS
3	Turbidity	IS 3025(Part 10):1984	1	5
4	TDS	IS 3025(Part 14):1984	500	2000
5	Electrical Conductivity	IS 3025(Part 16):2024	NS	NS
6	COD	IS 3025(Part 58): 2006	NS	NS
7	BOD	IS 3025(Part 44): 1993	NS	NS
8	Phenol	IS 3025(Part 43): 2020	0.001	0.002
9	Chlorides	IS 3025(Part 32): 1988	250	1000
10	Sulphate	IS 3025(Part 24): 2022	200	400
11	Total Hardness	IS 3025(Part 21): 2009	200	600
12	Ca++ Hardness	APHA 23rd Ed,2017,3500 Ca. B	NS	NS
13	Mg++ Hardness	APHA 23rd Ed,2017,3500 Mg. B	NS	NS
14	Total Alkalinity	IS 3025(Part 23): 1986	200	600
15	Nitrate	APHA 23rd Ed,2017,4500 NO3-B	45	NR
16	Fluoride	IS 3025(Part 60): 2008	1	1.5
17	Sodium	APHA 23rd Ed,2017,3500 Na. B	NS	NS
18	Potassium	APHA 23rd Ed,2017,3500 Mg. B	NS	NS
19	Calcium	APHA 23rd Ed,2017,3500 Ca. B	75	200
20	Magnesium	APHA 23rd Ed,2017,3500 Mg. B	30	100
21	Salinity	APHA 23rd Ed,2017,2520-B, 2-60	NS	NS
22	Total Nitrogen	APHA 23rd Ed,2017,4500 NH3 - B	0.5	NR
23	Total Phosphorous	APHA 23rd Ed,2017,4500-P, D	NS	NS
24	Dissolved Oxygen	APHA 23rd Ed,2017,4500-O, B	NS	NS
25	Ammonical Nitrogen	IS 3025(Part 34) (ISE Method):1988	NS	NS
26	SAR	By Calculation	NS	NS
	Heavy Metals			
27	Arsenic (as As)	APHA 23rd Ed,2017,3114-C	0.01	0.05
28	Cadmium (as Cd)	IS 3025(Part 41): 1992	0.003	NR
29	Chromium (as Cr)	APHA 23rd Ed,2017,3111-B	0.05	NR

Sr. No.	Parameter	Technical protocol	IS 10500 Standard Limits for drinking water	
			Desirable limit	Per. Limit in the Abs. of Alt. Source
30	Copper (as Cu)	APHA 23rd Ed,2017,3111-B	0.05	1.5
31	Cyanide (as CN)	IS 3025(Part 27): 1986	0.05	NR
32	Iron (as Fe)	IS 3025(Part 53): 2003	0.3	NR
33	Lead (as Pb)	IS 3025(Part 47): 1994	0.01	NR
34	Mercury (as Hg)	APHA 23rd Ed,2017,3112-B	0.001	NR
35	Manganese (as Mn)	APHA 23rd Ed,2017,3500 Mn. B	0.1	0.3
36	Nickel (as Ni)	IS 3025(Part 54): 1994	0.02	NR
37	Zinc (as Zn)	IS 3025(Part 49): 1994	5	15
38	Total Coliform	IS 1622:1981	Shall not be detectable	
39	Faecal Coliforms	IS 1622:1981	Shall not be detectable	

2.2.4 Surface Water Sampling & Analysis Techniques

Sr. No.	Parameter	Technical protocol	Classification for Inland Surface Water (CPCB)
			Class E
1	pH	IS 3025(Part 11):2022	6.5 to 8.5
2	Dissolved Oxygen	APHA 23rd Ed,2017,4500-O, B	NA
3	TDS	IS 3025(Part 14):1984	2100
4	Electrical Conductivity	IS 3025(Part 16):2024	2250
5	BOD	IS 3025(Part 44): 1993	NA
6	Colour	IS 3025(Part 4):2021	-
7	Total Hardness	IS 3025(Part 21): 2009	NA
8	Ca++ Hardness	APHA 23rd Ed,2017,3500 Ca. B	NA
9	Mg++ Hardness	APHA 23rd Ed,2017,3500 Mg. B	NA
10	Chlorides	IS 3025(Part 32): 1988	600
11	Sulphate	IS 3025(Part 24): 2022	1000
12	Nitrate	APHA 23rd Ed,2017,4500 NO3-B	NA
13	Fluoride	IS 3025(Part 60): 2008	-
14	Phenol	IS 3025(Part 43): 2020	NA
15	Ammonical Nitrogen	IS 3025(Part 34) (ISE Method):1988	NA
16	SAR	By Calculation	26
17	Copper (as Cu)	APHA 23rd Ed,2017,3111-B	NA
18	Iron (as Fe)	IS 3025(Part 53): 2003	NA
19	Manganese (as Mn)	APHA 23rd Ed,2017,3500 Mn. B	NA
20	Mercury	APHA 23rd Ed,2017,3112-B	NA
21	Cadmium (as Cd)	IS 3025(Part 41): 1992	NA
22	Arsenic (as As)	APHA 23rd Ed,2017,3114-C	NA
23	Cyanide	IS 3025(Part 27): 1986	NA
24	Lead (as Pb)	IS 3025(Part 47): 1994	NA
25	Zinc	IS 3025(Part 49): 1994	NA
26	Chromium (as Cr)	APHA 23rd Ed,2017,3111-B	NA
27	Boron	IS 3025(Part 49): 1994	2
28	Total Coliform	IS 1622:1981	-
29	COD	IS 3025(Part 57): RA 2021	-

2.2.5 Surface Water (Marine) Sampling & Analysis Techniques

Sr. No.	Parameter	Technical protocol	Classification for Coastal marine water (CPCB)
			SW-I
1	pH	IS 3025(Part 11):2022	6.5 to 8.5
2	Dissolved Oxygen	APHA 23rd Ed,2017,4500-O, B	5
3	Colour & Odour	IS 3025(Part 4):2021 & IS 3025(Part 5):1983	No Colour No Odour
4	Floating Matters	-	None
5	Total Suspended Solid	APHA 23rd Ed,2017,2540-D	None from Sewage or Industrial waste Origin
6	Turbidity	IS 3025(Part 10):1984	-
7	BOD	IS 3025(Part 44): 1993	-
8	Oil & Grease	IS 3025(Part 39): 1991	0.1
9	Mercury as Hg	APHA 23rd Ed,2017,3112-B	0.01
10	Lead (as Pb)	IS 3025(Part 47): 1994	0.01
11	Cadmium (as Cd)	IS 3025(Part 41): 1992	0.01
12	Iron (as Fe)	IS 3025(Part 53): 2003	-
13	Manganese (as Mn)	APHA 23rd Ed,2017,3500 Mn. B	-
14	Total Coliform	IS 1622:1981	-
15	Sludge Deposits, Solid refuse floating Solids, Oil Grease and Scum	-	-
16	COD	IS 3025(Part 57): RA 2021	-

2.2.6 Treated Water Sampling & Analysis Techniques

The techniques used for waste water Sampling and analysis its permissible limit is given in following table.

Sr. No.	Parameter	Technical protocol	Permissible Limit (As per MOEFCC notification no. GSR 1265(E) dt. 13 Oct. 2017)
1.	Treated Effluent from STP		
	pH	IS 3025(Part 11):2022	6.5 to 9.0
	BOD	APHA 23rd Ed,2017,5210-B	<30
	COD	IS 3025(Part 58): 2006	-
	TSS	APHA 23rd Ed.,2017, 2540 – D	<50
	Nitrogen Total	APHA 23rd Ed,2017,4500-B, C	--
	Phosphorous Total	APHA 23rd Ed,2017,4500-P, D	--
	Faecal Coliform	IS 1622:1981	<1000

2.3 Location (map showing general location, Monitoring location and project boundary) with coordinates & Monitoring details.

The general location of the project is shown in ***Map 2-1*** shows the study area of 10 Km radius around the project site on Google Earth downloaded image.

The sampling location used for monitoring purpose is taken after due consideration with baseline monitoring location, availability of power & weather condition etc. Also In order to evaluate the quality of sewage water, samples were acquired from the sewage water treatment plant for comprehensive analysis. These analyses encompassed physico-chemical, general-chemical, and microbiological parameters.

Sr. No.	Sampling Type	Sampling Location	Type of Area	Coordinates
1.	Ambient Air & Noise	Project Site (Pocket – 1)	Industrial Area	22.785943° N, 69.566645° E
2.	Ambient Air & Noise	Project Site (Pocket – 2)	Industrial Area	22.78221° N, 69.559541° E
3.	Ambient Air & Noise	Project Site (Pocket – 3)	Industrial Area	22.802171° N, 69.552084° E
4.	Ambient Air & Noise	Near Fabrication & Batching Plant	Industrial Area	22.807563° N, 69.704170° E
5	Ambient Air & Noise	Village - Navinal	Rural Area	22.829246° N, 69.598332° E
6.	Ambient Air & Noise	Village - Zarpara	Rural Area	22.837942° N, 69.646225° E
7.	Ambient Air & Noise	Village - Vandh	Rural Area	22.809106° N, 69.53562° E
8.	Trade Effluent – STP Outlet	Project Site (Pocket – 1)	Industrial Area	22.784881° N, 69.566798°E

Photograph 2-1: Proposed Project Site (Current Status of Land)

Pocket – 1

Pocket – 2

Pocket 3

Photograph 2-2: Photographs of monitoring

	
Project Site (Pocket – 1)	**Project Site (Pocket – 2)**
	
Project Site (Pocket – 3)	**Near Fabrication & Batching Plant**
	
Village Navinal	**Village Vandh**

	
Village-Zarpara	**Project Site (Pocket – 1) - STP**
	
Near Fabrication & Batching Plant	**Village-Zarpara**
	
Marine Water – APL Intake	**Marine Water – Kotadi Creek**

	
Surface Water- Village	**Surface Water - Siracha Village**
	
Surface Water – Nagmati River	**Ground Water – Nana Bhadiya**
	
Ground Water – Siracha	**Ground Water – Deshalpur**

Map 2-1: Images Project General Location Map

Project General Location Map.

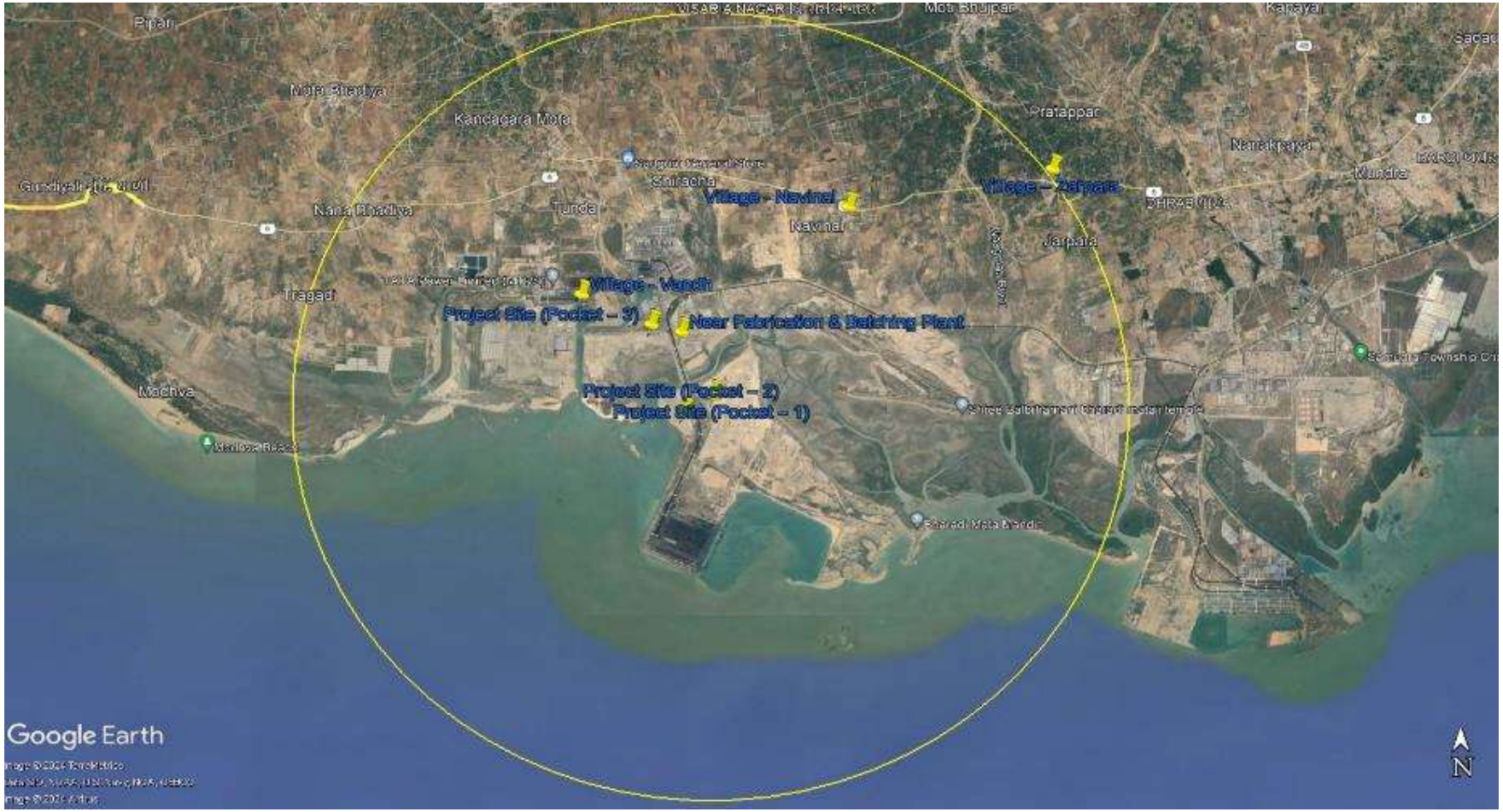
Source: Google Earth

Client: M/s. Mundra Petrochem Limited

Prepared by:

M/s. Unistar Environment and Research labs Pvt. Ltd., Vapi.

Map 2-1: Project site and Study Area of 10 Km radius on Google Earth Downloaded



3 CLIMATIC CONDITON

3.1 Climatic data from secondary sources

For the Green PVC project secondary data for weather conditions in the region is available for the period of October 2024 to March 2025. This table gives useful information about a region's weather condition. Meteorological data was analysed/reviewed for important parameters like Temperature, Humidity, BP, Wind speed, Wind direction, Solar radiation and Rainfall.

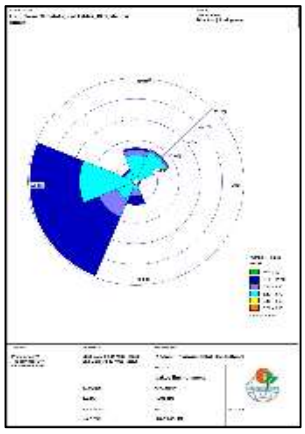
Average meteorological condition recorded at metrological station is as given in below table.

Table 3-1: Average meteorological condition

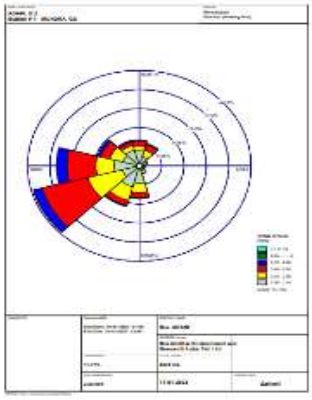
Weather Monitoring Data							
Month	**Scale**	**Temp. (°C)**	**RH (%)**	**BP (mmHg)**	**Wind Direction**	**Wind speed (Km/ Hr.)**	**Total Rainfall (mm)**
April 2025 to September 2025	Max.	44.5	98.1	765.9	360.0	42.3	682
	Min.	23.0	8.0	744.0	0.0	0.0	
	Average/ Total	30.9	73.9	751.6	272.9	10.4	

Based on wind patterns data, monthly wind-rose diagrams are presented in below Figure along with historical windrose of area.

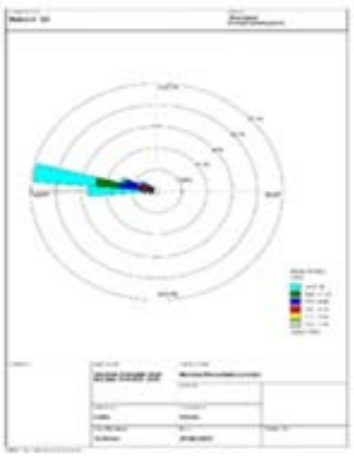
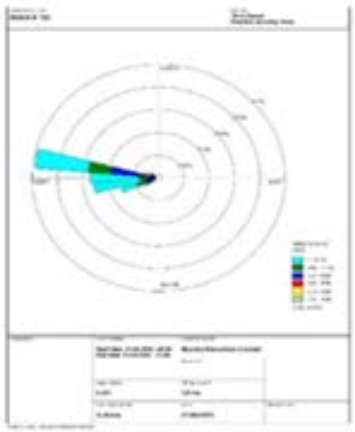
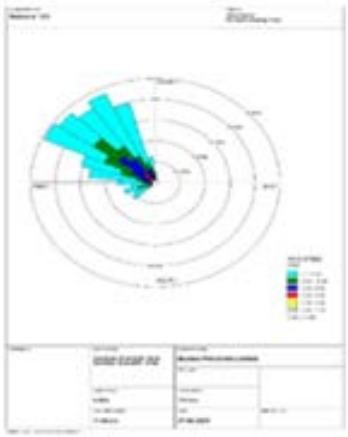
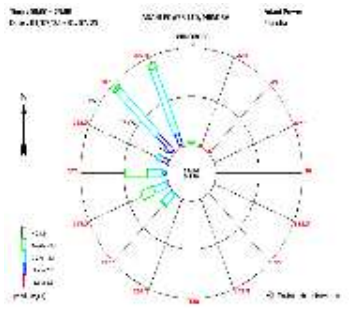
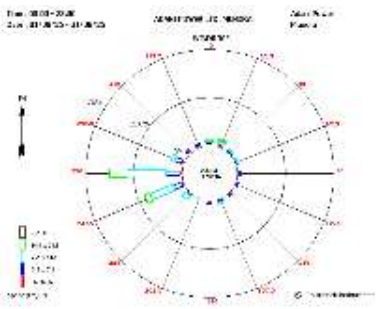
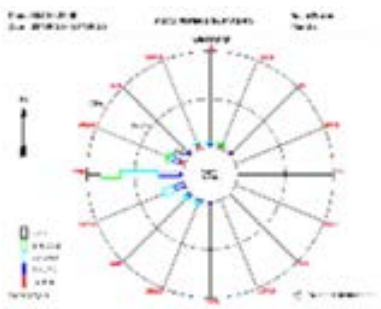
Figure 3-1: Season wise wind-rose diagrams.



Annual



Wind Rose 2024 APL Mundra

		
Wind Rose Apr-25	Wind Rose May-25	Wind Rose Jun-25
		
Wind Rose Jul-25	Wind Rose Aug-25	Wind Rose Sep-25

4 ANALYSIS & INTERPRETATION

4.1 Ambient Air

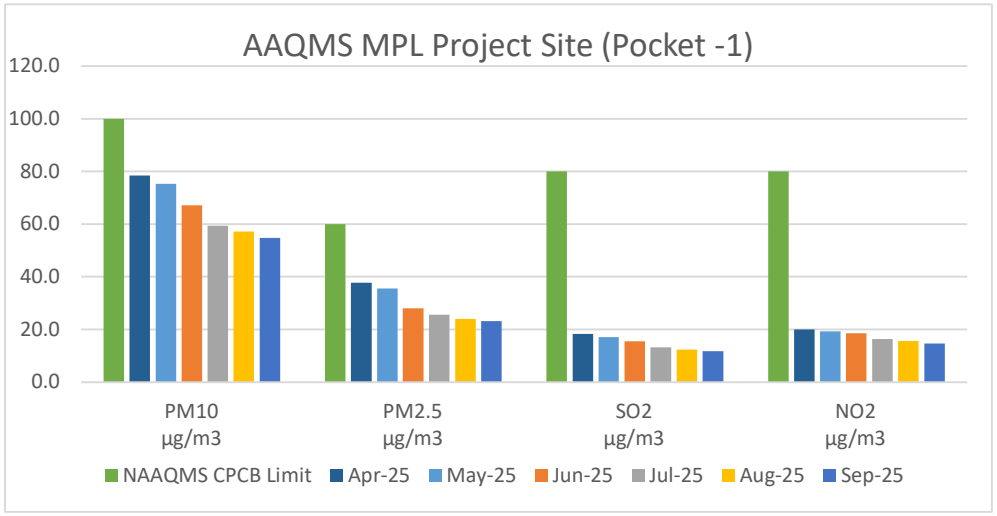
Sr. No.	Month	Parameter with Results											
		PM10	PM2.5	SO2	NO2	CO	O3	NH3	Pb	Ni	As	Benzene	Benzo (a) Pyrene
		µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	ng/m3	ng/m3	µg/m3	ng/m3
		Permissible Limit As per NAAQS – 2009 Notification.											
		100	60	80	80	2	400	100	1	6	20	5	1
Location : Project Site (Near to Pocket -1)													
1	Apr-25	78.5	37.8	18.3	20.1	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	75.3	35.6	17.1	19.4	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	67.2	28.1	15.5	18.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	59.3	25.7	13.2	16.4	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	57.2	24.1	12.4	15.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	54.8	23.1	11.7	14.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No. - URA/25/04/A-065 dt. 05/05/2025, URA/25/05/A-066 dt. 06/06/2025, URA/25/06/A-058 dt. 03/07/2025, URA/25/07/A-094 dt. 04/08/2025, URA/25/08/A-079 dt. 03/09/2025, URA/25/09/A-066 dt. 04/10/2025													
Location: Project Site (Near to Pocket -2)													
1	Apr-25	61.2	28.7	21.4	22.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	59.8	27.6	20.6	23.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	52.3	23.4	17.2	21.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	49.9	21.1	15.5	18.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	52.3	23.1	16.2	19.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	51.1	20.9	15.4	18.4	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No. - URA/25/04/A-066 dt. 05/05/2025, URA/25/05/A-080 dt. 06/06/2025, URA/25/06/A-059 dt. 03/07/2025, URA/25/07/A-104 dt. 04/08/2025, URA/25/08/A-096 dt. 03/09/2025, URA/25/09/A-071 dt. 04/10/2025													
Location: Project Site (Near to Pocket -3)													
1	Apr-25	74.5	31.2	21.7	22.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	72.6	30.2	19.8	21.5	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	64.3	25.6	16.5	19.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	59.8	21.3	14.5	17.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	58.2	20.9	15.4	18.3	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	57.5	19.8	14.2	17.5	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No. - URA/25/04/A-075 dt. 05/05/2025, URA/25/05/A-068 dt. 06/06/2025, URA/25/06/A-061 dt. 03/07/2025, URA/25/07/A-103 dt. 04/08/2025, URA/25/08/A-089 dt. 03/09/2025, URA/25/09/A-067 dt. 04/10/2025													

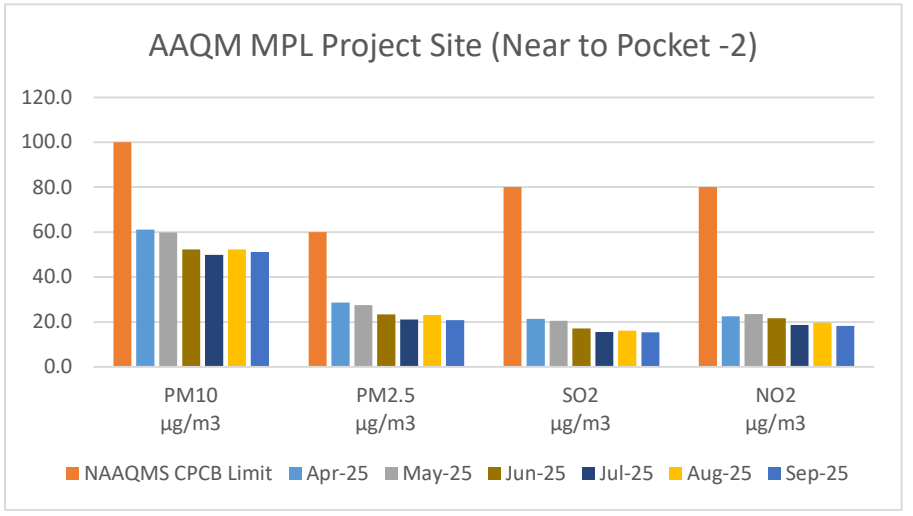
Location: Near Fabrication and Batching Plant													
1	Apr-25	68.1	26.5	18.3	20.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	66.3	25.8	16.5	19.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	61.2	20.5	14.4	17.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	57.3	17.5	12.4	16.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	56.8	16.2	14.4	18.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	55.2	15.8	13.1	17.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No.- URA/25/04/A-076 dt. 05/05/2025, URA/25/05/A-069 dt. 06/06/2025, URA/25/06/A-077 dt. 03/07/2025, URA/25/07/A-102 dt. 04/08/2025, URA/25/08/A-090 dt. 03/09/2025, URA/25/09/A-057 dt. 04/10/2025													
Location : Village Navinal													
1	Apr-25	65.4	29.9	18.9	20.3	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	64.1	27.4	17.3	20.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	59.3	23.1	15.6	18.4	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	52.4	21.1	12.5	15.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	54.6	23.7	13.4	17.3	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	53.6	22.9	11.2	15.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No. - URA/25/04/A-081 dt. 05/05/2025, URA/25/05/A-065 dt. 06/06/2025, URA/25/06/A-076 dt. 03/07/2025, URA/25/07/A-100 dt. 04/08/2025, URA/25/08/A-083 dt. 03/09/2025, URA/25/09/A-054 dt. 04/10/2025													
Location : Village Zarpara													
1	Apr-25	62.3	24.3	18.2	19.4	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	60.4	22.5	17.6	20.7	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	55.4	18.1	14.2	18.5	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	50.4	15.3	13.2	16.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	48.3	17.4	11.5	15.1	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	47.3	16.2	10.9	14.2	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No. - URA/25/04/A-070 dt. 05/05/2025, URA/25/05/A-047 dt. 06/06/2025, URA/25/06/A-010 dt. 03/07/2025, URA/25/07/A-101 dt. 04/08/2025, URA/25/08/A-084 dt. 03/09/2025, URA/25/09/A-055 dt. 04/10/2025													
Location : Village Vandh													
1	Apr-25	67.2	25.6	18.8	19.6	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
2	May-25	65.4	24.3	15.4	18.3	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
3	Jun-25	57.5	21.2	13.1	16.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
4	Jul-25	54.2	19.5	12.3	17.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
5	Aug-25	50.6	17.5	13.2	16.9	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
6	Sep-25	49.7	17.6	12.6	15.8	<0.01	<5.0	<5.0	<0.5	<1.0	<1.0	<1.0	<0.1
Report Ref. No.- URA/25/04/A-082 dt. 05/05/2025, URA/25/05/A-079 dt. 06/06/2025, URA/25/06/A-063 dt. 03/07/2025, URA/25/07/A-108 dt. 04/08/2025, URA/25/08/A-080 dt. 03/09/2025, URA/25/09/A-058 dt. 04/10/2025													

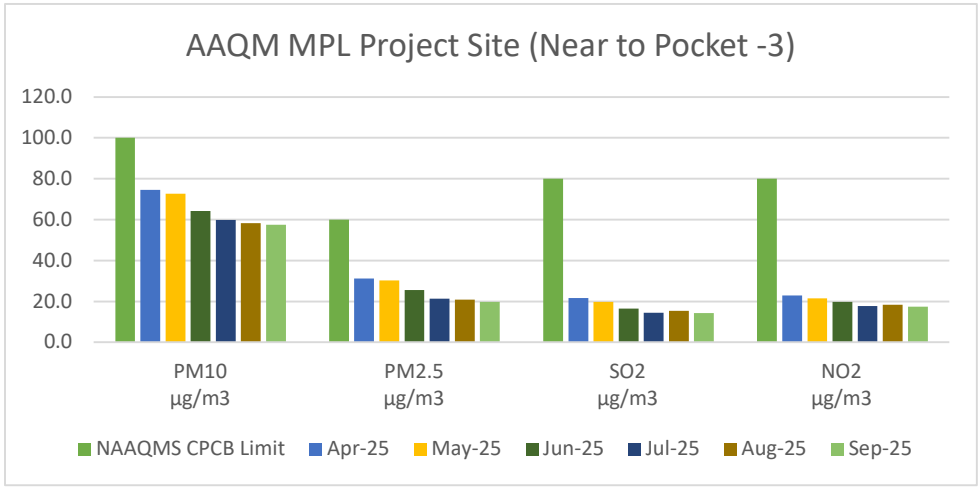
Observations

- The concentration of PM10 ranged from 78.5 µg/m3 at the Project Site - Pocket 1 to 47.3 µg/m3 in the Village of Zarpara, with an average concentration of 59.3 µg/m3.
- The concentration of PM2.5 ranged from 37.8 µg/m3 at the Project Site - Pocket -1 to 15.3 µg/m3 in the Village of Zarpara, with an average concentration of 23.3 µg/m3.
- The concentration of SO2 ranged from 21.7 µg/m3 at the Project Site - Pocket 3 to 10.9 µg/m3 in the Village of Zarpara, with an average concentration of 15.4 µg/m3.
- The concentration of NO2 ranged from 23.6 µg/m3 at the Project Site - Pocket 2 to 14.2 µg/m3 in the Village of Zarpara, with an average concentration of 18.5 µg/m3.
- The concentrations of CO were below <0.01 mg/m3, & NH3 were below <5.0 µg/m3, O3 were below <5.0 µg/m3 at all the locations.
- The concentrations of Lead (Pb) were below <0.5 µg/m3, Arsenic (As) were below <1.0 ng/m3 & Nickel (Ni) were all below <1.0 ng/m3 at all the locations.
- The concentrations of Benzene were below <1.0 µg/m3 & BaP were all below <0.1 ng/m3 at all the locations.

The concentrations of all monitored air quality parameters were found to be within the permissible limits as defined by the National Ambient Air Quality (NAAQ) Standards set by the Ministry of Environment, Forest and Climate Change (MoEF&CC).


AAQMS MPL Project Site (Pocket -1)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25


AAQM MPL Project Site (Near to Pocket -2)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25


AAQM MPL Project Site (Near to Pocket -3)
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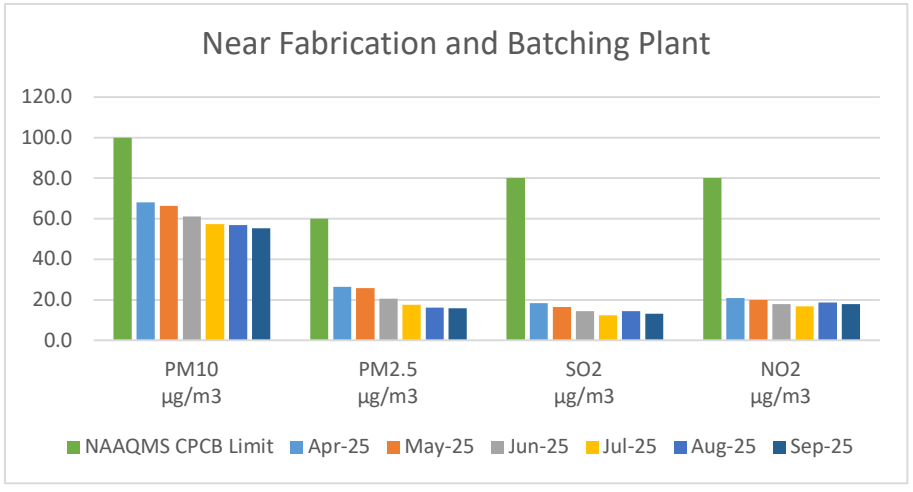
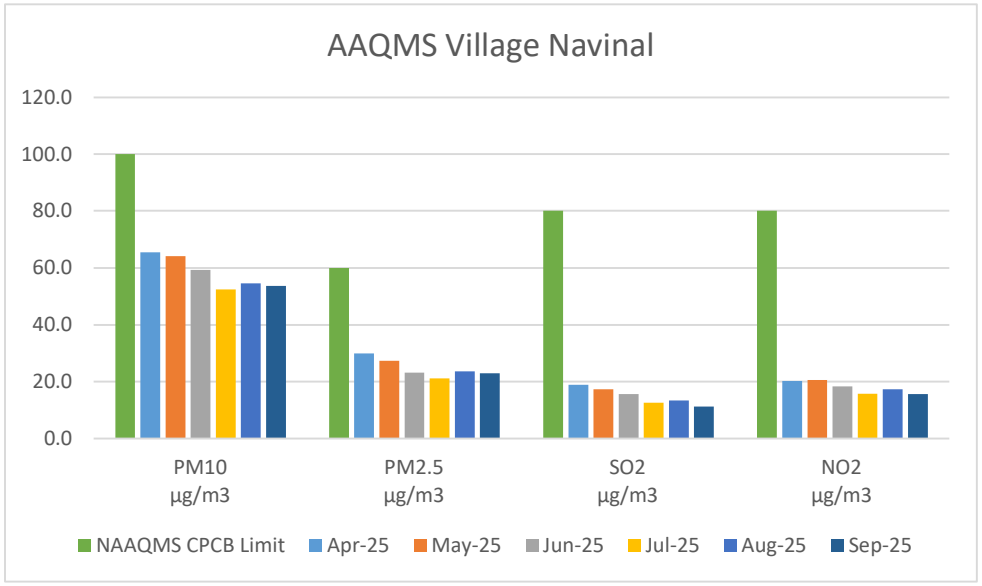
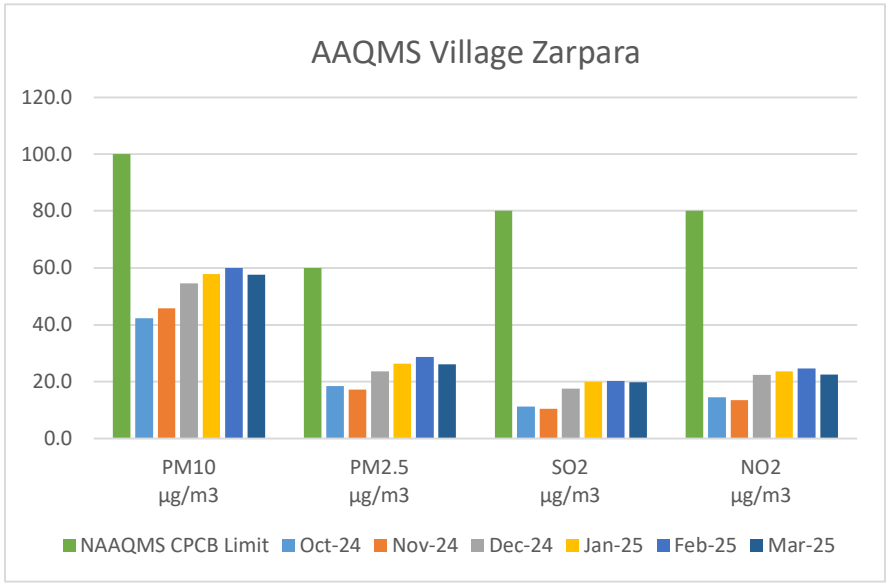
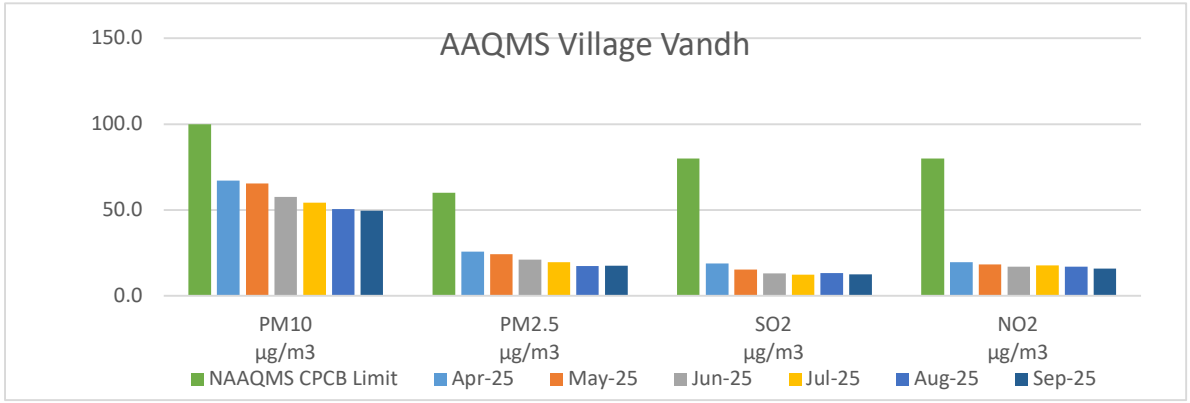
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25


Near Fabrication and Batching Plant
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25


AAQMS Village Navinal
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25


AAQMS Village Zarpara
120.0
100.0
80.0
60.0
40.0
20.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Oct-24
Nov-24
Dec-24
Jan-25
Feb-25
Mar-25


AAQMS Village Vandh
150.0
100.0
50.0
0.0
PM10 µg/m3
PM2.5 µg/m3
SO2 µg/m3
NO2 µg/m3
NAAQMS CPCB Limit
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25

4.2 Ambient Noise

The ambient noise levels measured and analysed for equivalent noise levels viz. Leq (24hrly), Leq day, Leq night at all the noise monitoring locations.

Ambient Noise Level in Leq														
Sr. No	Location	Day Time Noise Level in Leq							Night Time Noise Level in Leq					
		CPCB Limits	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	CPCB Limits	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25
1	PS (Pkt – 1)	75	58.2	57.2	56.5	57.8	59	60.4	70	46.8	45.8	46	46.8	46.3	48
2	PS (Pkt – 2)	75	57.5	56.4	54.6	56.1	56.8	56.9	70	45.7	44.8	43.4	45.2	48.1	49.9
3	PS (Pkt – 3)	75	57	54.9	53.4	54.4	54	55.3	70	47.3	46.5	45.4	47.4	46.2	47.6
4	Nr. Fab. & Batch. Plant	75	58.3	56.3	55.5	57.1	60	60	70	46.0	43.5	41.9	43.8	44.6	47.8
5	Vill - Navinal	55	43.9	42.7	42	44.1	49.6	54.8	45	37.7	35.7	36.9	38.2	39.2	44.4
6	Vill - Zarpara	55	52	49.7	48.5	48.9	51	53.8	45	41.0	31.2	38.5	38.1	40.9	41.7
7	Vill - Vandh	55	49	47.2	46.3	48.6	52.2	57	45	39.1	38.2	37.5	37.9	39.8	44.9

Report Ref. No.-

URA/25/04/AN-034 dt.05/05/25, URA/25/04/AN-035 dt.05/05/25, URA/25/04/AN-044 dt.05/05/25, URA/25/04/AN-045 dt.05/05/25, URA/25/04/AN-048 dt.05/05/25, URA/25/04/AN-041 dt.05/05/25, URA/25/04/AN-049 dt.05/05/25,

URA/25/05/AN-039 dt.06/06/25, URA/25/05/AN-047 dt.06/06/25, URA/25/05/AN-040 dt.06/06/25, URA/25/05/AN-041 dt.06/06/25, URA/25/05/AN-038 dt.06/06/25, URA/25/05/AN-037 dt.06/06/25, URA/25/05/AN-046 dt.06/06/25,

URA/25/06/AN-028 dt. 03/07/25, URA/25/06/AN-029 dt. 03/07/25, URA/25/06/AN-034 dt. 03/07/25, URA/25/06/AN-037 dt. 03/07/25, URA/25/06/AN-036 dt. 03/07/25, URA/25/06/AN-007 dt. 03/07/25, URA/25/06/AN-035 dt. 03/07/25

URA/25/07/AN-040 dt.04/08/25, URA/25/07/AN-046 dt.04/08/25, URA/25/07/AN-045 dt.04/08/25, URA/25/07/AN-044 dt.04/08/25, URA/25/07/AN-042 dt.04/08/25, URA/25/07/AN-043 dt.04/08/25, URA/25/07/AN-047 dt.04/08/25

URA/25/08/AN-029 dt.03/09/25, URA/25/08/AN-041 dt.03/09/25, URA/25/08/AN-035 dt.03/09/25, URA/25/08/AN-036 dt.03/09/25, URA/25/08/AN-033 dt.03/09/25, URA/25/08/AN-034 dt.03/09/25, URA/25/08/AN-030 dt.03/09/25

URA/25/09/AN-027 dt.04/10/25, URA/25/09/AN-032 dt.04/10/25, URA/25/09/AN-028 dt.04/10/25 , URA/25/09/AN-024 dt.04/10/25, URA/25/09/AN-019 dt.04/10/25. URA/25/09/AN-055 dt.04/10/25, URA/25/09/AN-025 dt.04/10/25

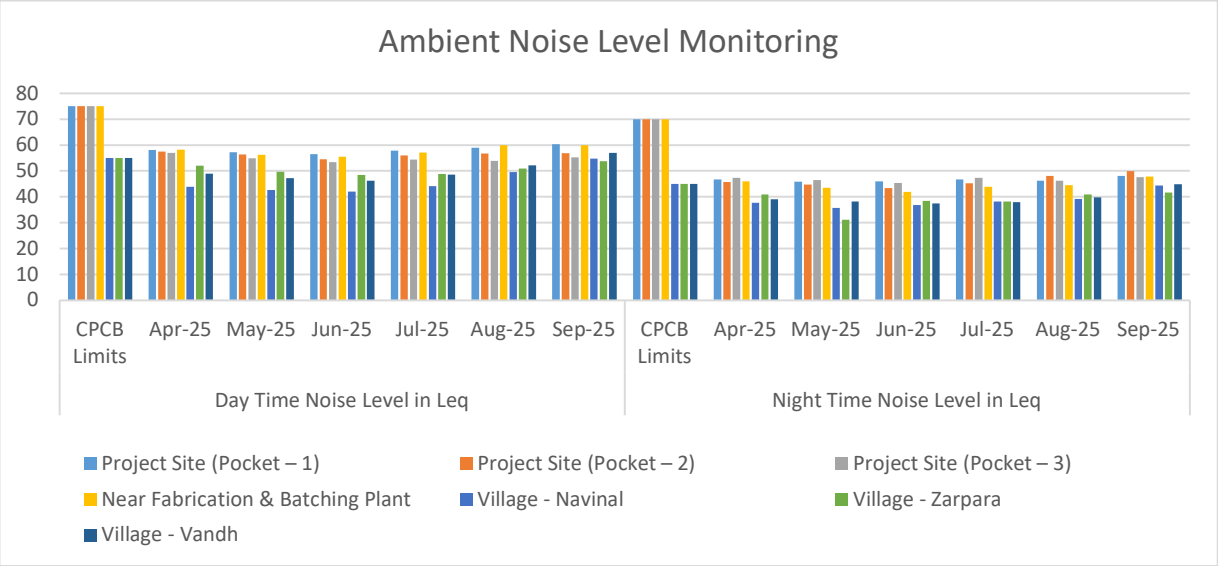
Observations

Industrial Zone

The Average Leq (equivalent continuous sound level) during the day for the industrial zone ranged from 60.4 dB(A) at Project Site (Pocket – 1) to 53.4 dB(A) at Project Site (Pocket – 3). Similarly, the Leq during the night ranged from 49.9 dB(A) at Project Site (Pocket – 2) to 41.9 dB(A) at Near Fabrication & Batching Plant. Importantly, all these values remained within the CPCB (Central Pollution Control Board) limits specified for the industrial zone, both during daytime and night time.

Residential Zone

The Average Leq (equivalent continuous sound level) during the day in the residential zone varied from 57.0 dB(A) in Village Vandh to 42.0 dB(A) in the village Navinal. Meanwhile, the Leq during the night ranged from 44.9 dB(A) in Village Vandh to 31.2 dB(A) in Village Zarpara. It's worth noting that the ambient noise levels in these villages are affected by the local environment, and all the Leq values are compliant with permissible limits across all the villages.


Ambient Noise Level Monitoring
80
70
60
50
40
30
20
10
0
CPCB Limits
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25
CPCB Limits
Apr-25
May-25
Jun-25
Jul-25
Aug-25
Sep-25
Day Time Noise Level in Leq
Night Time Noise Level in Leq
Project Site (Pocket – 1)
Project Site (Pocket – 2)
Project Site (Pocket – 3)
Near Fabrication & Batching Plant
Village - Navinal
Village - Zarpara
Village - Vandh

4.3 Water Quality

4.3.1 Ground Water Quality

Ground water was collected as grab samples from seven location sent to laboratory for analysis for various parameters.

The water quality findings from the ground water samples are outlined in the following table:

Sr. No.	Parameter	Unit	IS 10500 Standard Limits for drinking water		GW 01 Nani Khakhar	GW 02 Moti Khakhar	GW 03 Mota Kandagra	GW 04 Siracha	GW 05 Navinal	GW 06 Tunda	GW 07- Nana Bhadiya	GW 08 Deshalpar
			Desirable limit	Permissible Limit in the Absence of Alternate Source								
1	pH	pH scale	6.5-8.5	NR	8.38	8.47	8.36	8.37	8.41	7.48	8.42	8.38
2	Temp	o C	NS	NS	30	30	30	30	30	30	30	30
3	Turbidity	NTU	1	5	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)
4	TDS	mg/l	500	2000	968	1940	2050	1990	2220	3230	1680	2560
5	Electrical Conductivity	µmhos/ cm	NS	NS	1460	2930	3100	3010	3360	4909	2540	3870
6	COD	mg/l	NS	NS	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)
7	BOD	mg/l	NS	NS	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)	BDL (MDL1.0)
8	Phenol	mg/l	0.001	0.002	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)
9	Chlorides	mg/l	250	1000	249.9	604.8	649.8	650	764	1484.8	467.4	986
10	Sulphate	mg/l	200	400	45.5	139.4	113.1	128.4	97.7	42.2	74	198.6
11	Total Hardness	mg/l	200	600	145.5	261.9	261.9	630.5	572.3	256.1	128	562.6
12	Ca++ Hardness	mg/l	NS	NS	67.9	106.7	67.9	261.9	203.7	151.3	66	223.1
13	Mg++ Hardness	mg/l	NS	NS	77.6	155.2	194	368.6	368.6	104.8	62.1	339.5

Sr. No.	Parameter	Unit	IS 10500 Standard Limits for drinking water		GW 01 Nani Khakhar	GW 02 Moti Khakhar	GW 03 Mota Kandagra	GW 04 Siracha	GW 05 Navinal	GW 06 Tunda	GW 07- Nana Bhadiya	GW 08 Deshalpar
			Desirable limit	Permissible Limit in the Absence of Alternate Source								
14	Total Alkalinity	mg/l	200	600	339.5	518.9	582	504.4	373.45	514.1	509.25	426.8
15	Nitrate	mg/l	45	NR	5.4	4.8	3	5.6	1.3	6.8	2.1	10
16	Fluoride	mg/l	1	1.5	2.74	0.68	1.72	2	1.8	2.1	4.6	1.8
17	Sodium	mg/l	NS	NS	231.7	500.2	537.4	410	542	520	450.2	680
18	Potassium	mg/l	NS	NS	3	13	8.3	3.9	7.8	9.2	8.9	6.2
19	Calcium	mg/l	75	200	27.2	42.8	27.2	105	81.6	60.6	26.4	89.4
20	Magnesium	mg/l	30	100	18.8	37.7	47.1	89.6	89.6	25.5	15.1	82.5
21	Salinity	mg/l	NS	NS	0.4	1.1	1.2	1.2	1.7	2.6	0.8	1.8
22	Total Nitrogen	mg/l	0.5	NR	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)	BDL (MDL:2.0)
23	Total Phosphorous	mg/l	NS	NS	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
24	Dissolved Oxygen	mg/l	NS	NS	6.5	6.5	6.4	6.5	6.4	6.4	6.5	6.4
25	Ammonical Nitrogen	mg/l	NS	NS	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)	BDL (MDL:0.2)
26	SAR	-	NS	NS	2.9	13.4	14.4	7.1	9.9	14.1	18.4	12.5
Heavy Metals												
27	Arsenic (as As)	mg/l	0.01	0.05	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)
28	Cadmium (as Cd)	mg/l	0.003	NR	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)	BDL (MDL:0.003)
29	Chromium (as Cr)	mg/l	0.05	NR	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)

Sr. No.	Parameter	Unit	IS 10500 Standard Limits for drinking water		GW 01 Nani Khakhar	GW 02 Moti Khakhar	GW 03 Mota Kandagra	GW 04 Siracha	GW 05 Navinal	GW 06 Tunda	GW 07- Nana Bhadiya	GW 08 Deshalpar
			Desirable limit	Permissible Limit in the Absence of Alternate Source								
30	Copper (as Cu)	mg/l	0.05	1.5	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)
31	Cyanide (as CN)	mg/l	0.05	NR	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)
32	Iron (as Fe)	mg/l	0.3	NR	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)
33	Lead (as Pb)	mg/l	0.01	NR	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)	BDL (MDL:0.01)
34	Mercury (as Hg)	mg/l	0.001	NR	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)	BDL (MDL:0.001)
35	Manganese (as Mn)	mg/l	0.1	0.3	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)	BDL (MDL:0.1)
36	Nickel (as Ni)	mg/l	0.02	NR	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)	BDL (MDL:0.02)
37	Zinc (as Zn)	mg/l	5	15	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)	BDL (MDL:0.05)
38	Total Coliform	MPN	Shall not be detectable		Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
39	Faecal Coliforms	MPN	Shall not be detectable		Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Report Ref. No. URC/25/XX/XXX & URB/25/XX/XXX					05/0615 05/0616	05/0617 05/0618	05/0605 05/0606	05/0607 05/0608	05/0609 05/0610	05/0611 05/0612	05/0694 05/0695	05/0613 05/0614

Observations :

These analysed results were subsequently compared against the IS:10500 Standard Limits for drinking water.

4.3.2 Surface Water Quality

Surface water sample were collected as grab samples from four location. Same has been sent to laboratory for analysis for various parameters.

The water quality findings from the surface water samples are outlined in the following table:

Sr. No.	Parameter	Unit	Classification for Inland Surface Water (CPCB)	SW 4 Nagavanti Nadi	SW 5 Zarpara village pond	SW 6 Navinal village pond	SW 07- Siracha village pond
			Class E	May-25	May-25	May-25	May-25
1	pH	pH Scale	6.5 to 8.5	8.11	8.12	7.85	7.81
2	Dissolved Oxygen	mg/l	NA	6.1	6.5	6.7	6.1
3	TDS	mg/l	2100	2567	736	340	618
4	Electrical Conductivity	µmohs/cm	2250	4230	1127	520	945
5	BOD	mg/l	NA	7.0	6.1	6.2	6.2
6	Colour	Pt.co	-	BDL(MDL:5.0)	BDL(MDL:5.0)	BDL(MDL:5.0)	BDL(MDL:5.0)
7	Total Hardness	mg/l	NA	702	99.8	89.2	94.2
8	Ca++ Hardness	mg/l	NA	229	72.5	52.4	62.3
9	Mg++ Hardness	mg/l	NA	473	27.3	36.9	31.9
10	Chlorides	mg/l	600	873	234	102.5	200.5
11	Sulphate	mg/l	1000	632	168.6	14.4	124.5
12	Nitrate	mg/l	NA	1.2	1.05	0.7	0.3
13	Fluoride	mg/l	-	1.44	0.49	0.72	0.44
14	Phenol	mg/l	NA	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)
15	Ammonical Nitrogen	mg/l	NA	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)
16	SAR		26	8.3	4.1	1.7	2
17	Copper (as Cu)	mg/l	NA	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
18	Iron (as Fe)	mg/l	NA	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
19	Manganese (as Mn)	mg/l	NA	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)
20	Mercury	mg/l	NA	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)
21	Cadmium (as Cd)	mg/l	NA	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)
22	Arsenic (as As)	mg/l	NA	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)

Sr. No.	Parameter	Unit	Classification for Inland Surface Water (CPCB)	SW 4 Nagavanti Nadi	SW 5 Zarpara village pond	SW 6 Navinal village pond	SW 07- Siracha village pond
			Class E	May-25	May-25	May-25	May-25
23	Cyanide	mg/l	NA	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
24	Lead (as Pb)	mg/l	NA	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
25	Zinc	mg/l	NA	BDL (MDL: 0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
26	Chromium (as Cr)	mg/l	NA	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)
27	Boron	mg/l	2	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)
28	Total Coliform	MPN/100ml	-	Absent	Absent	Absent	Absent
29	COD	mg/l	-	17.2	42.2	24.6	18.4
			Report Ref. No.	URC/25/05/0733 URB/25/05/0730	URC/25/05/0731 URB/25/05/0732	URC/25/05/0729 URB/25/05/0730	URC/25/05/0735 URB/25/05/0736

Observations :

These analysed results were subsequently compared against the **Classification for Inland Surface Water (CPCB)** Class E.

4.3.3 Surface Water (Marine) Quality

Surface water (Marine) was collected as grab samples from three location. Same has been sent to laboratory for analysis for various parameters.

The water quality findings from the surface water (marine) samples are outlined in the following table:

Sr. No.	Parameter	Unit	Classification for Coastal marine water (CPCB)	SW 1- Intake channel of APL	SW 2- Kotadi Creek water	SW 3- Baradi mata creek
			SW I	May-25	May-25	May-25
1	pH	pH scale	6.5 to 8.5	8.15	8.27	8.32
2	Dissolved Oxygen	mg/l	5	6.1	6.1	6.1
3	Colour & Odour	-	No Colour No Odour	10 & Agreeable	10 & Agreeable	10 & Agreeable
4	Floating Matters	-	None	--	--	--

Sr. No.	Parameter	Unit	Classification for Coastal marine water (CPCB)	SW 1- Intake channel of APL	SW 2- Kotadi Creek water	SW 3- Baradi mata creek
			SW I	May-25	May-25	May-25
5	Total Suspended Solid	mg/l	None from Sewage or Industrial waste Origin	68	44	32
6	Turbidity	mg/l	-	5	1	1
7	BOD	NTU	-	2.9	3.5	3.2
8	Oil & Grease	mg/l	0.1	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)
9	Mercury as Hg	mg/l	0.01	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)
10	Lead (as Pb)	mg/l	0.01	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)
11	Cadmium (as Cd)	mg/l	0.01	BDL	0.090	BDL (MDL : 0.003)
12	Iron (as Fe)	mg/l	-	0.26	0.182	0.288
13	Manganese (as Mn)	mg/l	-	0.188/BDL	0.286	0.122
14	Total Coliform	ml (MPN)	-	Absent	Absent	Absent
15	Sludge Deposits, Solid refuse floating Solids, Oil Grease and Scum	-	-	--	--	None
16	COD	mg/l	-	22.6	28.2	30.9
			Report Ref. No.	URC/25/05/0723 URB/25/05/0724	URC/25/05/0725 URB/25/05/0726	URC/25/05/0727 URB/25/05/0728

Observations :

These analysed results were subsequently compared against the Classification for Coastal marine water (CPCB)Class SW I & are found well within Limits

4.3.4 Sewage Water Quality

Sewage water samples was collected as grab samples from STP outlet and sent to laboratory for analysis for various parameters.

The water quality findings from the sewage water sampling locations are outlined in the following table:

Sr. No.	Location	MOEFCC Limits	STP Outlet					
			Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25
1	pH @25°C	6.5 – 9.0	7.18	7.1	7.28	7.23	7.1	6.67
2	Total Suspended Solid	<50	26	28	24	28	18	20
3	Chemical Oxygen Demand (COD)	-	40.2	41.6	45.5	42.2	21.8	27
4	Biochemical Oxygen Demand (BOD) (5 days at 20 0C)	<30	18	21	19	25	9	9
5	Total Nitrogen	-	3.6	3.9	2.9	3.2	4.5	9.5
6	Total Phosphorus	-	2.4	2.3	2.3	2.4	0.6	0.5
7	Faecal Coliform	<1000	29	27	26	28	26	27
Report Ref. No. : URC/25/04/0614 dt. 07/05/2025, URC/25/05/0591 dt. 03/06/2025, URC/25/06/0595 dt. 04/07/2025, URC/25/07/0411 dt. 01/08/2025, URC/25/08/0300 dt. 01/09/2025, URC/25/09/0326 dt. 06/10/2025								

Observations :

The analysed results were reviewed against the standards prescribed by the Ministry of Environment, Forest and Climate Change (MoEF&CC) under notification GSR 1265(E) dated 13 October 2017 and were confirmed to be well within the stipulated limits.

4.4 Soil Quality

Soil was collected as grab samples from four location & sent to laboratory for analysis for various parameters.

The soil quality findings from the soil samples are outlined in the following table:

Sr. No.	Parameter	Unit	ST1a Pocket 1	ST1c Pocket 2	Pocket 3
1	Porosity	%	47.8	41.2	32.9
2	Water Holding Capacity	ml/100 gm	32	30.2	31.5
3	Permeability	Cm/Sec	0.148	0.164	0.156
4	Particle Size Distribution				
a	Sand	%	68.6	62	72.4
b	Clay	%	12.5	15.6	13.4
c	Silt	NTU	18.9	22.4	14.2
5	Texture	%	Sandy Loam	Sandy Loam	Sandy Loam
6	Cation Exchange Capacity	--	30.4	27.5	27.4
7	SAR	meq/100g	3.12	4.1	1.6

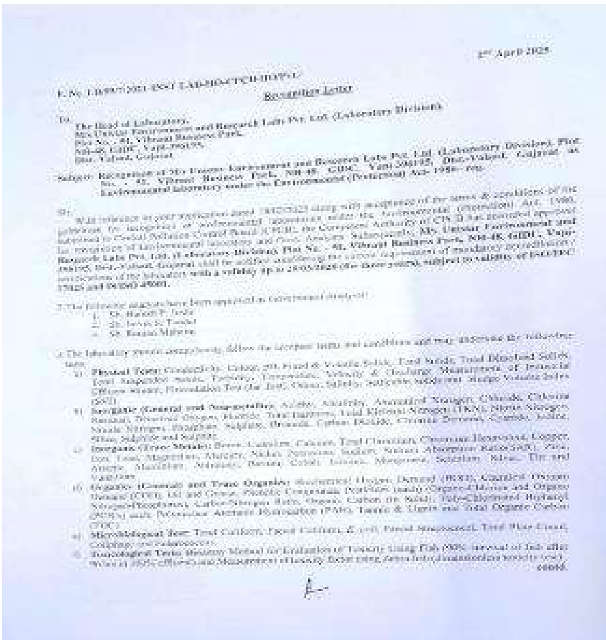
Sr. No.	Parameter	Unit	ST1a Pocket 1	ST1c Pocket 2	Pocket 3
8	Electrical Conductivity	--	170	234	324
9	Exchangeable Sodium	µs/cm	7.52	12.4	9.32
10	pH	%	8.89	9.12	8.12
11	Calcium	--	458.4	510.4	2842.2
12	Magnesium	meq/100gm	139	156.2	86.9
13	Sodium	meq/100gm	384	534	444.2
14	Potassium	mg/kg	70	60.6	56.2
15	Total Organic Carbon	mg/kg	0.084	0.089	0.089
16	Available phosphorus	mg/kg	8.03	8.52	8.44
17	Available potassium	mg/kg	176.5	144	144.1
Report Ref. No.			**URC/25/05/MPL - 0941**	**URC/25/05/MPL - 0942**	**URC/25/05/MPL - 0943**

Observations :

These analysed results were subsequently compared against the standards set by the Central Pollution Control Board (CPCB) are found well within Limits. Soil testing has been conducted to assess the present characteristics of the soil. The analytical results obtained from the testing are presented above.

ANNEXURE

Annexure 1: Laboratory Recognition by MOEFCC, NABL, GPCB Sch.II Auditor & NABET Certification



Recognition Letter

Laboratory Recognition by MOEFCC

National Accreditation Board for Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

UNISTAR ENVIRONMENT AND RESEARCH LABS PVT. LTD. (LABORATORY DIVISION)

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

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

for its facilities at

PLOT NO. 51, VIBRANT BUSINESS PARK, NH-48, GIDC, VAPI, VALSAD, GUJARAT, INDIA

in the field of

TESTING

Signed for and on behalf of NABL

Laboratory Recognition by NABL

GUJARAT POLLUTION CONTROL BOARD
Paryavaran Bhavan
Sector - 10 A, Gandhinagar - 382 010.

Clean Gujarat Green Gujarat

Laboratory Recognition by GPCB

National Accreditation Board for Education and Training

Certificate of Accreditation

NABET

NABET Certification

Annexure 2: Calibration Certificates

Calibration Certificate

Instrument Name	:	Respirable Dust Sampler
Instrument ID No.	:	UEBL/AIR/RDS/05
Instrument Sr. No. Supplier	:	1144-01A-2013, 1127-07J-2012
Calibration Certificate No.	:	UEBL/CC/RDS-05/1218/24-25
Date of Calibration	:	18/12/2024
Next Calibration due Date	:	17/12/2025

Sr. No.	Name of Unit Calibrated	Calibrator Traceable to	Calibration Certificate No. Date of Calibration
1.	Flow Meter ID. No. (UEBL/AIR/RDS/FM/05)	Top Loading Orifice Envirotech Calibration Laboratory Id No.: (UEBL/MASTER/AIR/AA/MAA/01) Pressure Indicator Mahlo Test & civil LLP	EC/LAB/PL/0024-25/PC/240/0024 Date of Cal.: 03.08.2024 ML/MCH/2504/01/0024-25 Date of Cal.: 17.12.2024
2.	Time Totalizer ID. No. (UEBL/AIR/RDS/TT/05)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/TT/AA/01)	ML/EE/2504/01/0024-25 Date of Cal.: 17.12.2024
3.	Rotameter ID. No. (UEBL/AIR/RDS/RM/05)	Rotameter Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/RM/02)	ML/FT/2504/02/0024-25 Date of Cal.: 17.12.2024

- UNCERTAINTY MEASUREMENT: Flow Meter : ± 0.047 m3/min.
- UNCERTAINTY MEASUREMENT: Time Totalizer : ± 0.001 hour
- UNCERTAINTY MEASUREMENT: Rotameter : ± 0.140 LPM

The reported uncertainty is the expanded uncertainty in measurement at 95 % Confidence level with coverage fact or k = 2 which corresponds to coverage probability of approximately 95 % of normal distribution.

Prepared By: Senior chemist

Approved By: Technical manager

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UEBL/AIR/F-75/00

Calibration Certificate for RDS

Calibration Certificate

Instrument Name	:	Fine Particulate Sampler
Instrument ID No.	:	UEBL/AIR/FPS/41
Instrument Sr. No. Supplier	:	APM – 550/137-DID-2013
Calibration Certificate No.	:	UEBL/CC/FPS-41/1219/24-25
Date of Calibration	:	19/12/2024
Next Calibration due Date	:	18/12/2025

Sr. No.	Name of Unit Calibrated	Calibrator Traceable to	Calibration Certificate No. Date of Calibration
1.	Rotameter ID. No. (UEBL/AIR/FPS/RM/41)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/RM/01)	ML/FR/2504/01/0024-25 Date of Cal.: 17.12.2024
2.	Time Totalizer ID. No. (UEBL/AIR/FPS/TT/41)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/TT/AA/01)	ML/TT/2504/01/0024-25 Date of Cal.: 17.12.2024

- UNCERTAINTY MEASUREMENT: Rotameter : ± 0.470 LPM
- UNCERTAINTY MEASUREMENT: Time Totalizer : ± 0.001 hour

The reported uncertainty is the expanded uncertainty in measurement at 95 % Confidence level with coverage fact or k = 2 which corresponds to coverage probability of approximately 95 % of normal distribution.

Prepared By: Senior chemist

Approved By: Technical manager

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UEBL/AIR/F-75/00

Calibration Certificate for FPS

Calibration Certificate

Instrument Name	:	Respirable Dust Sampler
Instrument ID No.	:	UEBL/AIR/RDS/04
Instrument Sr. No. Supplier	:	2340-07B-2013, 1127-07C-2012
Calibration Certificate No.	:	UEBL/CC/RDS-04/1219/24-25
Date of Calibration	:	19/12/2024
Next Calibration due Date	:	18/12/2025

Sr. No.	Name of Unit Calibrated	Calibrator Traceable to	Calibration Certificate No. Date of Calibration
1.	Flow Meter ID. No. (UEBL/AIR/RDS/FM/04)	Top Loading Orifice Envirotech Calibration Laboratory Id No.: (UEBL/MASTER/AIR/AA/MAA/01) Pressure Indicator Mahlo Test & civil LLP	EC/LAB/PL/0024-25/PC/240/0024 Date of Cal.: 03.08.2024 ML/MCH/2504/01/0024-25 Date of Cal.: 17.12.2024
2.	Time Totalizer ID. No. (UEBL/AIR/RDS/TT/04)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/TT/AA/01)	ML/EE/2504/01/0024-25 Date of Cal.: 17.12.2024
3.	Rotameter ID. No. (UEBL/AIR/RDS/RM/04)	Rotameter Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/RM/02)	ML/FT/2504/02/0024-25 Date of Cal.: 17.12.2024

- UNCERTAINTY MEASUREMENT: Flow Meter : ± 0.047 m3/min.
- UNCERTAINTY MEASUREMENT: Time Totalizer : ± 0.001 hour
- UNCERTAINTY MEASUREMENT: Rotameter : ± 0.140 LPM

The reported uncertainty is the expanded uncertainty in measurement at 95 % Confidence level with coverage fact or k = 2 which corresponds to coverage probability of approximately 95 % of normal distribution.

Prepared By: Senior chemist

Approved By: Technical manager

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UEBL/AIR/F-75/00

Calibration Certificate for RDS

Calibration Certificate

Instrument Name	:	Fine Particulate Sampler
Instrument ID No.	:	UEBL/AIR/FPS/30
Instrument Sr. No. Supplier	:	APM – 550/133-DID-2013
Calibration Certificate No.	:	UEBL/CC/FPS-30/1218/24-25
Date of Calibration	:	19/12/2024
Next Calibration due Date	:	18/12/2025

Sr. No.	Name of Unit Calibrated	Calibrator Traceable to	Calibration Certificate No. Date of Calibration
1.	Rotameter ID. No. (UEBL/AIR/FPS/RM/30)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/RM/01)	ML/FR/2504/01/0024-25 Date of Cal.: 17.12.2024
2.	Time Totalizer ID. No. (UEBL/AIR/FPS/TT/30)	Mahlo Test & civil LLP ID. No. (UEBL/MASTER/AIR/TT/AA/01)	ML/TT/2504/01/0024-25 Date of Cal.: 17.12.2024

- UNCERTAINTY MEASUREMENT: Rotameter : ± 0.470 LPM
- UNCERTAINTY MEASUREMENT: Time Totalizer : ± 0.001 hour

The reported uncertainty is the expanded uncertainty in measurement at 95 % Confidence level with coverage fact or k = 2 which corresponds to coverage probability of approximately 95 % of normal distribution.

Prepared By: Senior chemist

Approved By: Technical manager

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UEBL/AIR/F-75/00

Calibration Certificate for FPS

Calibration Certificate for RDS

Calibration Certificate for FPS

Calibration Certificate for Sound Level Meter

UniStar Environment & Research Labs Pvt. Ltd.

White House, Near GIDC Office, Char Rasta, Vapi,

Gujarat, India – 396195

Annexure - V

MUNDRA PETROCHEM LIMITED

Corporate Environmental Responsibility

April to September, 2025

-: GROWTH WITH GOODNESS :-

Table of Contents

1. EXECUTIVE SUMMERY

This report highlights the significant accomplishments of Mundra Petrochem Limited (MPL)'s Corporate Environmental Responsibility (CER) initiatives for the period April to September, 2025. MPL remains dedicated to effecting positive change within the communities adjacent to its project activities, with an emphasis on environmental sustainability, community empowerment, and promoting a healthier society.

Educational Initiatives.

Addressing the Sustainable Development Goal of providing quality education, MPL's education initiative focuses on developing infrastructure, providing necessary resources to students, and promoting girl child education through awareness campaigns. There are several gaps in the educational system in the region that need to be addressed, and through systematic planning and execution, MPL's team is enhancing the quality of education in the area.

As part of this initiative, over 1057 numbers of syllabus books and more than 1200 numbers of stationery items have been handed over to students come from fisherfolk community from surrounding villages. More than 86 students were provided with transportation for pick-up and drop-off to attend school. Additionally, over 75 students received educational kits. Educational awareness programs have been conducted by field experts, emphasizing the importance of environmental sustainability in daily life. Career development / awareness programs have been conducted for the students studying in standard 9th to 12th. Approximate 465 students have been participated from 8 schools of nearby villages.

In context of above, mora than 421 number of Books for users of library at Moti Bhujpur have been provided for preparation of competitive exams. School infrastructure improvements include a Saline Water Reverse Osmosis (SWRO) unit to provide safe drinking water. Efforts also include strengthening sanitation and hygiene within school premises.

In addition to this, Agricultural fair has been organized for farmers. More than 2,00,000 numbers of farmers participated and enhanced their ideas, knowledge, and best farming practices.

Community Health Initiatives.

MPL's primary assessment identified the local fishing community as one of the most vulnerable. The goal of this initiative is to support the fishing community, including by providing essential medical assistance and health education. The project aims to reach over 60,000 people in 16 villages through disease prevention awareness drives, family planning workshops, menstrual hygiene and nutrition workshops, and general health sessions.

Under this initiative, an Ambulance has been provided to "KARVAN – E – MUSTAFA" medical & Educational Trust to serve the service at nearby area i.e fisherman community residence at coastal villages like Dhrab, Zarpara, Navinal, etc.

Additionally, a menstrual health awareness session was organized for girls and women. Clean and safe drinking water was made available to students through the installation of SWRO units at the primary school villages Moti Khakhar.

Sustainable Livelihood and women Empowerment.

MPL has organized programs to empower women, foster sustainable livelihoods, and cultivate environmental awareness within the community.

In coastal communities, women play a vital role in the fishing industry. They have been educated on hygiene and best practices for the fishing business. Additionally, menstrual health awareness initiatives have engaged

over girls and women. Financial empowerment programs have supported over 55 marginalized women from village Moti Bhujpur, Nani Bhujpur and Zarpara. More than 40 earning equipment like sewing machine, kitchen utensils, freezers, Milk storage cans etc. have been provided to the women.

Sustainable infrastructure projects included check dam restoration, percolation well cleaning, river and stream cleaning, culvert construction. Renovation of the check dam benefitted over 170 farmers by storing more than 2,45,000 cubic meters of water. Additionally, river/stream cleaning and pond deepening efforts have been carried out. Culvert construction has supported irrigation system and preventing the fam soil erosions.

Community tree plantations covered an area of 16.5 acres, resulting in the planting of over 12,500+ trees in reporting time period i.e April – September, 2025. Additionally, more than 2,00,000 farmers have been aware for new technology and best available farming practices through Agri Fair, 2025. An Eco Club was established for the community, involving 70 schools and over 6,000 students in environmental and sustainability awareness initiatives. A mangrove conservation, alternatives to single-use plastic (SUP) and wild life conservation sessions were engaged for students.

Community Rural Infrastructure Development.

The Community Rural Infrastructure Development program by MPL encompasses a wide range of initiatives aimed at enhancing the living standards in rural areas. It focuses on water conservation through measures such as check dam restoration, de-siltation, and bore well recharge structures.

Pond deepening work at village Zarpara with increasing water storage capacity about 22,000 Cu.M and Check Dam strengthening work at Moti Bhujpur with increasing water storage capacity about 2,45,000 Cu. M have been carried out.

Road repair work was carried out in nearby villages and fisherfolk community areas. Paver blocks pathway has been constructed for fisher folk community.

Further, about 100 acres of "*Gauchar*" area have been clean, fertilizes and planted with native grass at village Zarpara. In addition to this, extending support through providing Sheds for "*Gaushala*" at village Deshalpar and Zarpara which benefited more than 2350 cows.

Total 5 SWRO units, with capacities of 3,000 liters per hour, 50 liters per hour, and 150 liters per hour, were provided for clean water in Tunda, Zarpara and Moti Khakhar villages, benefiting villagers and students. School furniture and other infrastructure were also constructed in nearby villages.

An overview of CER Expenditure by MPL for the period April – September, 2025:-

Sr. No.	**Sector**	**CER Expenditure (INR)**
1	Educational Initiatives.	3129484.07
2	Community Health Initiatives.	4842033.86
3	Sustainable Livelihood and women Empowerment.	8464417.3
4	Community Rural Infrastructure Development.	6114949.14
5	Monitoring & Reporting	720415
	Total	**23271299.37**

i.e. Approximate INR 232.713 Lakhs

Total CER expenditure incurred in various community welfare & eco – development activities was approximate INR 1533.713 Lakhs cumulative till September, 2025 including expenditure occurred INR 232.713 Lakhs for the period April – September, 2025.

2. ABOUT MUNDRA PETROCHEM LTD

Mundra Petrochem Limited (MPL), a step-down subsidiary of Adani Enterprises Limited, is an emerging company with a substantial vision. MPL aims to become a significant player in India's petrochemical sector. The company's primary focus is on developing a greenfield PVC complex strategically located within SEZ notified land of Adani Ports and Special Economic Zone (APSEZ) at Mundra, Gujarat.

MPL's mission extends beyond production; it is dedicated to pioneering sustainable practices within the industrial sector, in alignment with the Adani Group's commitment to national development. The state-of-the-art facility is currently under engineering design, incorporating advanced technologies to minimize environmental impact. This commitment is further demonstrated through MPL's focus on community development via various Corporate Environmental Responsibility (CER) initiatives.

With pre and full operations of proposed project anticipated to commence in Jun-2026 and Oct-27, respectively, MPL is expected to create significant economic opportunities for the region. By promoting sustainable practices and empowering local communities, MPL aspires to set a benchmark for responsible industrial development in India.

MPL's Corporate Environmental Responsibility (CER) program surpasses mere carbon reduction efforts. It embodies a holistic approach grounded in rigorous scientific methodologies. This comprehensive initiative addresses environmental concerns while enhancing ecological resilience and empowering local communities. The subsequent sections of this report will explore the impactful outcomes achieved through MPL's extensive CER program.

3. SECTOR IDENTIFICATION BASED ON THE "CER" MANDATE

Mundra Petrochem Limited (MPL)'s CER action plan has been approved by the MoEF&CC as part of Environmental Clearance (EC) for the PVC project activities. As per the action plan, the activities were divided into four major impact sectors: -

- **Educational Support.**
- **Community Health Initiatives.**
- **Sustainable Livelihood & Women Empowerment.**
- **Community Rural Infrastructure Support.**

This report outlines the interventions implemented by MPL as part of the CER initiative. It provides a concise overview of the project details, including input, output, outcome, and impact (where applicable). The programs or activities carried out by MPL were in strict adherence with the provisions of action plan approved by the MoEF&CC, addressing the concerns raised during the public hearing process of the project activity.

4. CER INITIATIVES & INTERLINKAGE WITH SDGs.

Mundra Petrochem Limited has established a benchmark in business practices that extend beyond regulatory requirements, with the goal of creating a better world. Consequently, we have invested in initiatives designed to generate the maximum positive impact in the shortest time frame with long-lasting effects. Mundra Petrochem Limited's operations are aligned with Sustainable Development Goals—social, economic, and environmental—underpinned by a robust governance framework.

- End hunger and ensure access to safe, nutritious and sufficiant food.
- End all form of malnutrition.
- Ensure sustainable food production system and implement resilient agricultural practice.
- Investment in rural infrastructure.

- Promoting natural farming for a healthy lifestyle and conducting health camps to address the health issues.

- Ensure that all girls and boys complete free equitable and quality primary and secondary education.
- Bulding and upgrading education facilities.
- Providing transportation and school stuffs to students to attend the hasslefree education system.

- End all form of discrimination agaist all women and girls.
- Ensure women's full and effective participation
- Creating an inclusive environment for women in the community through participation in the decision-making process and other activities.

- Restoring water bodies and encouraging water harvesting through participatory actions
- Protect and restore waterrelated ecosystems
- Support and strengthen the participation of local communities in improving water and sanitation management.

- Promoting use of biogas for clean and affordable energy solution

• Full and productive employment and decent work for all women and men Creating livelihood opportunities for women and youth through skilling programs

• Empower and promote the social, economic and Ensure equal opportunity & reduce inequalities of outcome.

•Adopted policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality.

• Providing holistic solutions through water management, sustainable agriculture, green energy, and resilience building through health and disaster management.

• Promoting green areas through plantation, preserving, and restoring mangrove ecosystems, and commencing IEC based awareness activities for building environmental stewardship.

• Dedicated efforts are made to restore the mangrove ecosystem which supports many marine life forms.

•Sustainably manage and protect marine and coastal ecosystem.

•Increased afforestation and reforestation.

•Reduce the degradation of natural habitats, halt the loss of biodiversity.

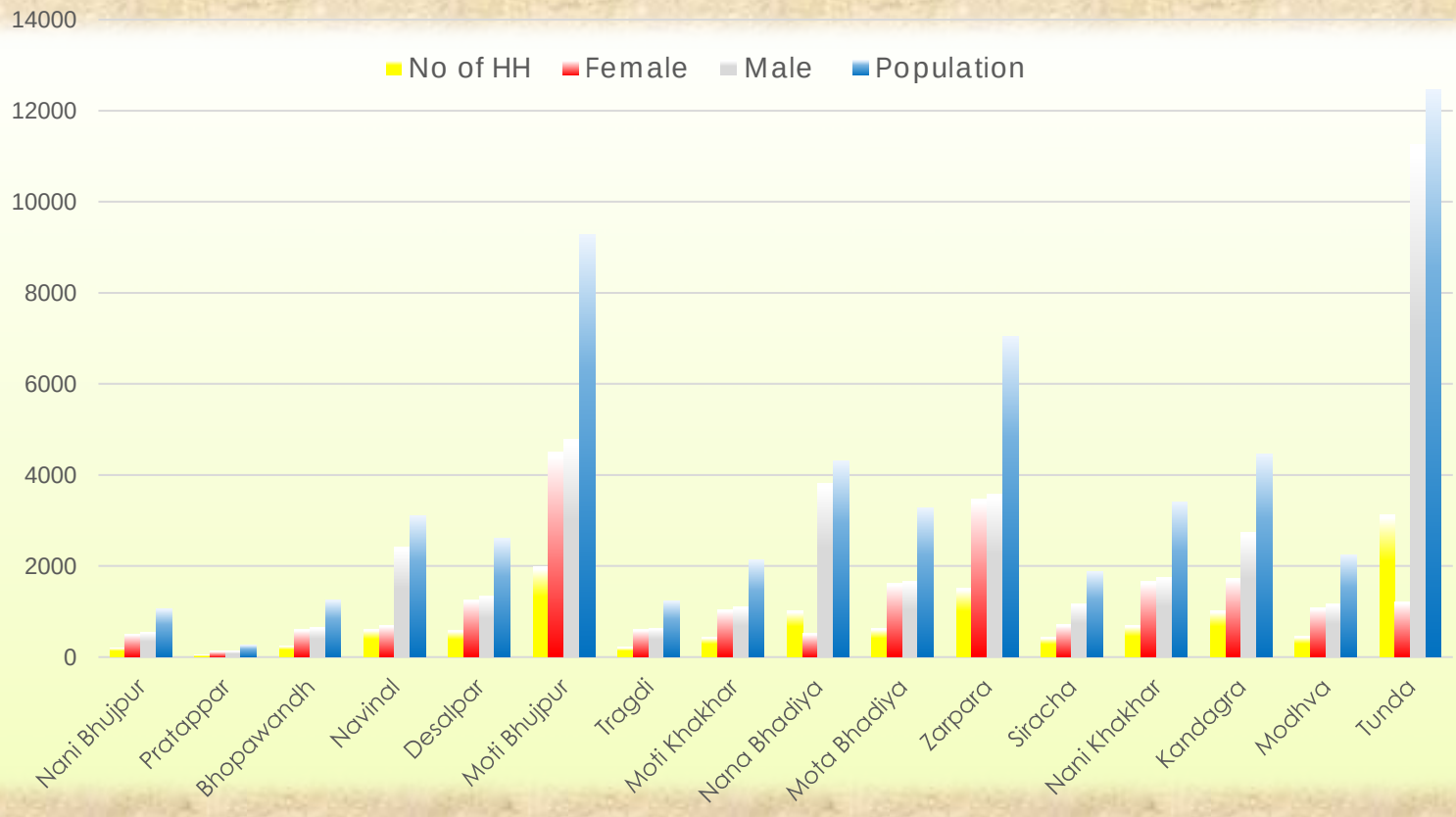
•Integrate ecosystem and biodiversity values.

•Conservation of the local ecosystem through restoration action and mobilizing communities to minimize plastic consumption.

5. ABOUT REGION

Mundra, historic port town in Gujarat's Kutch district, boasts a hot, arid climate with rich biodiversity despite limited rainfall. Located on the Gulf of Kutch at around 46 feet elevation, this census town reflects the cultural diversity of the district. The ecology is surprisingly vibrant with mangroves and birdlife, but water scarcity necessitates conservation efforts. Mundra's industrial growth ingredients by sustainable development practices.

Demographic details of the 16 study villages in Mundra and Mandavi region are as under[1]:

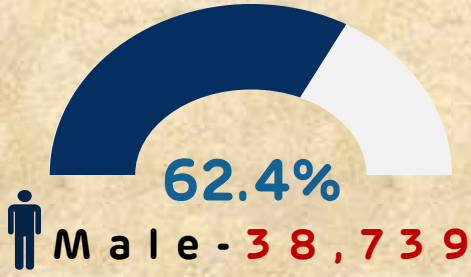


Sr. No.	Village Name	Population	Male	Female	No of HH
1	Nani Bhujpur	1056	551	505	210
2	Pratappar	268	136	132	48
3	Bhopawandh	1250	650	600	250
4	Navinal	3100	2406	694	602
5	Desalpar	2611	1350	1261	581
6	Moti Bhujpur	9278	4777	4501	1979
7	Tragdi	1238	636	602	216
8	Moti Khakhar	2139	1101	1038	436

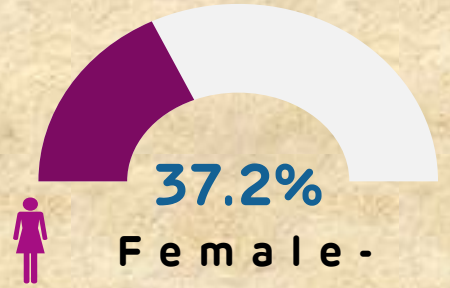
Sr. No.	Village Name	Population	Male	Female	No of HH
9	Nana Bhadiya	4318	3805	513	1011
10	Mota Bhadiya	3284	1669	1615	624
11	Zarpara	7052	3572	3480	1506
12	Siracha	1879	1171	708	429
13	Nani Khakhar	3412	1758	1654	691
14	Kandagra	4461	2729	1732	1015
15	Modhva	2250	1167	1083	450
16	Tunda	12471	11261	1210	3134

[1] The data is source from the Census, 2011

Total- 60,067



Male- 38,739



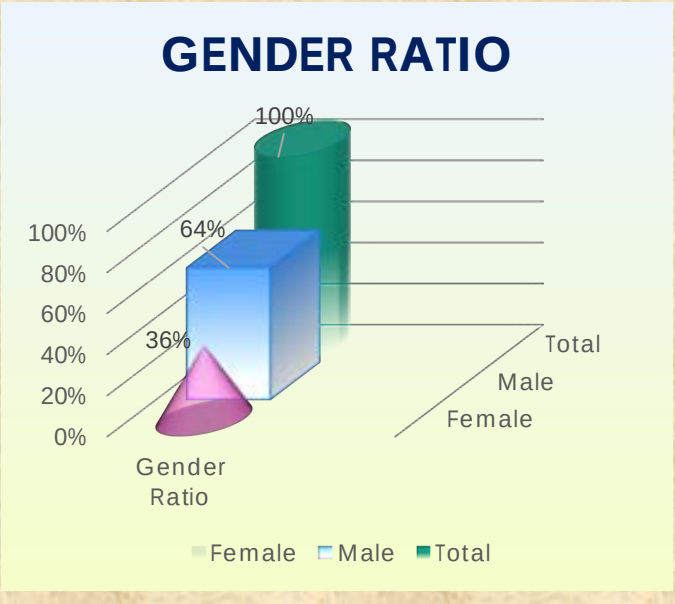
Female- 21,328

Household- 13,182

The chart presents the population data across different villages. Tunda, Moti Bhujpar has the highest population at 12,471 and 9278 respectively, significantly larger than most other villages. Zarpara and Kandagra also have relatively high populations. Several villages like Nani Khakhar and Desalpar have populations of around 3,000 to 4,000.

The chart highlights the variation in population size across rural areas, with some villages being quite populous while others have very small populations like Pratappar with just 268 residents. This data provides insights into the demographic distribution and density patterns in the region.

5.1 GENDER RATIO



In the collective populace of 16 villages, males significantly surpass females at a ratio of 9 to 1. Tunda village exhibits the most pronounced gender disparity, with males constituting 90% of its inhabitants. Across these villages, there are a total of 13,182 households, with Tunda boasting the highest count and Pratappar the lowest.

This disparity highlights a notable trend in gender distribution within rural communities, underscoring the need for further examination of socio – cultural dynamics and their implications on population demographics and societal structure.

6. EDUCATION PROMOTIONAL INITIATIVE.

Educational promotive initiatives are organized efforts designed to foster, enhance and support educational opportunities and outcomes for learners of all ages. In this era of shaping future, the role of corporate responsibility in fostering sustainable development and empowering communities cannot be overstated. One such commendable endeavor is the "**Project Utthan**", Education Initiative undertaken by Adani Foundation (Under CSR), which stands as a testament to the organization's commitment towards creating a positive impact in society. The Utthan Initiative encompasses a multifaceted approach to enhance educational infrastructure, empower local institutions and foster community development. Through strategic interventions spanning infrastructure support, capacity building and community engagement, Adani Foundation (under CSR) has endeavored to address the educational needs of underserved communities and contribute to their holistic development. Mundra Petrochem Limited has supported various education promotion initiatives undertaken by Adani Foundation (under CSR / CER).

6.1 KEY INTERVENTIONS

Infrastructure Support to Local Institutions

MPL's commitment to improving educational infrastructure is exemplified by various initiatives, including the provision of essential resources such as office stationery, clean and Hygiene water availability, Additionally, constructing a sanitary facilities and renovating the primary school in underscore MPL's dedication to creating conducive learning environments for students.

Training & Capacity Building

Recognizing the pivotal role of educators in shaping young minds, MPL has invested in capacity building measures by hiring Utthan Sahayak and Shikshan Sahayak for government primary schools. Moreover, the distribution of education kits further empowers teachers and students with the necessary tools for effective learning and skill development.

Community Support

MPL's Education Initiative extends beyond the confines of school premises, reaching out to the broader community. By arranging transportation for underprivileged students, MPL ensures access to education for all, irrespective of socio-economic barriers. Furthermore, initiatives such as women awareness programs contribute towards fostering a more inclusive and empowered society.

6.2 RESULT AND OUTCOMES OF THE "UTTHAN" INITIATIVE.

This chapter details the significant achievements of the Education support initiative, highlighting improved educational access, enhanced learning outcomes and empowering students within the community.

Addressing the SDG of providing quality education, MPL's education institution in the form of developing infrastructure, providing necessary resources to students and encouraging girl child education through awareness. There are several gaps in the educational system in the region which need to be addressed and through systematic planning and execution, MPL's team is enhancing the quality of education in the region.

SOCIAL IMPACT

6.2.1 EXTENDED SUPPORT THROUGH EDUCATIONAL KIT – BOOKS & STATIONERY

Education and Books have always played a pivotal role in shaping the lives of individuals, societies and nations. As Books are indispensable tools for students that unlock potential, develop critical thinking and empower to succeed in ever – evolving world and It equips students with the knowledge and skills to navigate life's challenges and opportunities. MPL has supported through 1057 numbers of syllabus books and more than 1200 numbers of stationery items to students belongs to fisherman communities. Based on these pillars, they shall have careers opportunities, expanding horizons, enhancing literacy & communication skills, Instilling Discipline and Focuses toward the society.

75 numbers of students from Fisherman community have been beneficiated

1057+ numbers of Books & 1200+ numbers of stationery items for students

6.2.2 EXTENDED SUPPORT THROUGH BOOKS FOR LIBRARY AT MOTI BHUJPUR




Preparing for competitive exams can be both an exhilarating and daunting journey. The right books serve not only as sources of knowledge but also as trusted companions, guiding candidates through the intricate maze of syllabus, concepts and questions. Books are invaluable assets to laying the groundwork for success in every aspect of life. By investing in education and making books accessible to all, we can ensure that every user can realize their full potential and contribute to a brighter future. It fosters intellectual curiosity, social awareness and moral values, preparing them to contribute meaningfully to their communities and global stage. Considering this, MPL has extended support through providing more than 421 number of books at Library, village Moti Bhujpur for competitive exams.

421+ numbers of Books for Students / Users

6.2.3 HIGHER EDUCATIONAL OPPORTUNITIES FOR MARGINALIZED COMMUNITIES.



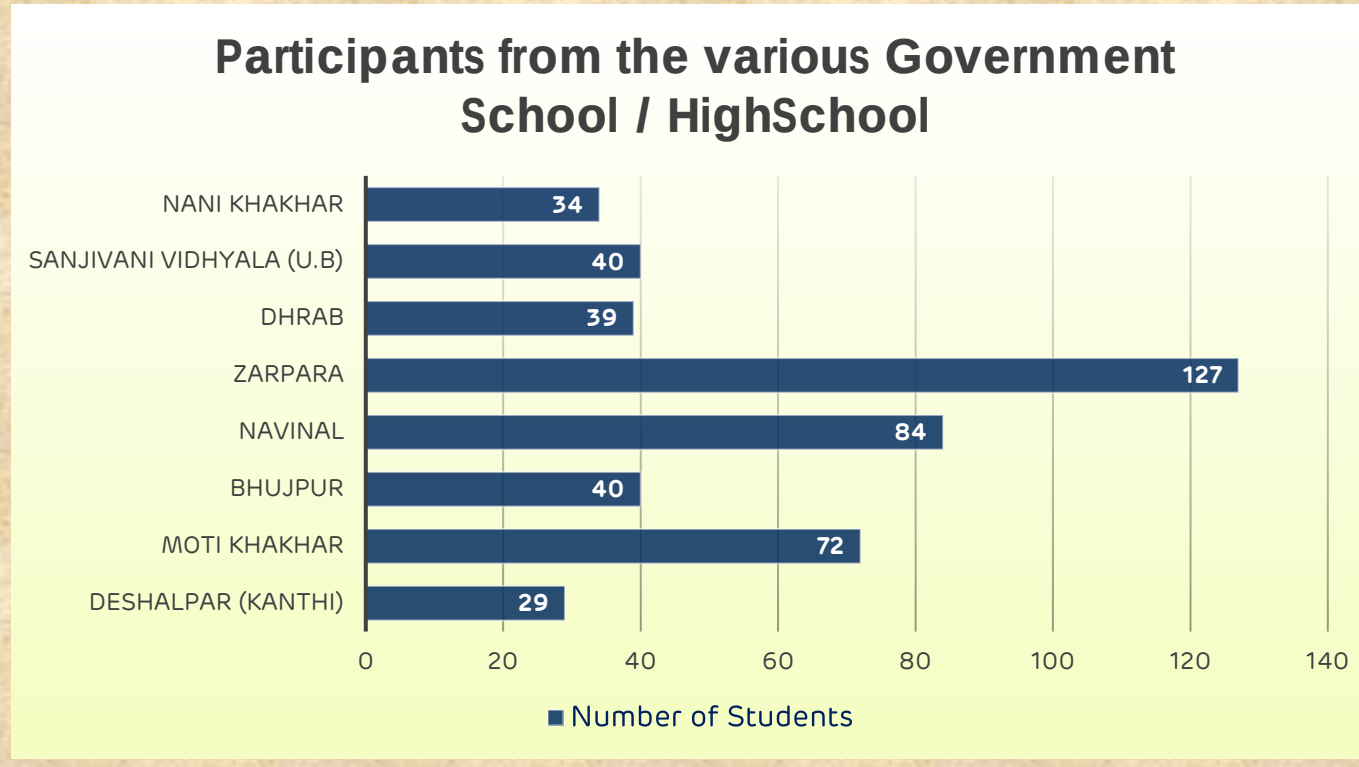
Reason for providing facilities:	Impact of Providing facilities:
• High Schools are very limited in fisherfolk villages, making it hard for families to afford transportation costs. • The foundation of students is very poor due to negligence in primary education. • Not enough economical ground to support the expenses of high school. • Parents are uneducated and busy with daily labor, leaving no time to support their children education.	• To provide safe and reliable transportation for the children of the fisherfolk community. • Vehicle transportation (two way) facilities are provided to more than 86 students - pick up & drop to attend the school. • This initiative has significantly reduced transportation challenges and improved school attendance which contributes better educational outcomes. Drop out ratio have been reduced. • Students from villages like Modhava, Tragadi Bandar & Zarpara Bandar are facilited.

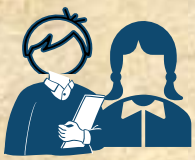
6.2.4 CAREER DEVELOPMENT AND AWARENESS PROGRAMM

Career development and awareness program for students from 9th to 12th standard have been carried out in 8 schools from nearby villages.

These sessions covered with,

- Career Awareness Sessions.
- Psychometric Testing and Career Counseling.
- Stream and Course Selection Guidance.
- Skill development workshop.
- Parents involvement Seminars.





465+ Total Numbers of Students have been facilitated.

6.2.5 SCHOOL INFRASTRUCTURE

MPL is deeply intended to create structure that has meaningful OR positive outcome for the long lasting period. Further, this can improve the beauty of the educational institutions, so that students have positive impress to love the school environment.

250 + students have access to clean water

In alignment with Sustainable Development Goal (SDG) initiatives focused on clean water and sanitation for all, MPL has installed a Saline Water Reverse Osmosis (SWRO) unit with a capacity of 150 LPH at the primary school in Moti Khakhar Village. This installation benefits over 250 students and staff members by providing access to clean water.

Go Green Initiatives at Girls Hostel Deshalpar:

To build a sustainable and eco-friendly future by turning environmental challenges into impactful solutions and as part of corporate commitment towards sustainability and community welfare, MPL has facilitated the installation of 10 benches made from recycled plastic at the Deshalpar Girls hostel. The aim is to reduce plastic waste and promote a circular economy that benefits both society and the planet. These benches offer comfortable sequencing seating for 100 hostel residents.

6.2.6 EDUCATIONAL AWARENESS PROGRAM

Environmental awareness program were conducted at more than 18 schools and about 2000 students participated. In addition to this, villagers have also included in the awareness sessions and these sessions focused on sustainable practices and the importance of environmental conservation, particularly highlighting the need to reduce plastic usage and promote eco – friendly alternatives.

Education awareness sessions were conducted in fisherfolk Vasahat, Vadi vistar – Village Farm Residence areas of nearby villages to highlight the importance of education, particularly girl–child education. Our goal is to uplift the fishing community through education by encouraging students, particularly girls, to pursue higher studies. We aim to build strong parent-student school

engagement that fosters long-term academic growth and empowerment. Support for the student have been provided for higher education in the villages of Modhava and Tragadi.

To educate children on plastic free ecosystem, Eco-clubes were established for raise the climate change awarness. So, far 72 Utthan Sahayak have been trained who reaching over 6000+ studets through awarness seminar.

6.2.7 AGRICULTURAL FAIR FOR AWARENESS AMONG THE FARMERS

The agriculture fair is more than just an event; it is a celebration of agricultural heritage and a beacon of innovation for the future. By bringing together diverse stakeholders, including farmers and various entities within the agricultural spectrum, the fair plays a pivotal role in advancing agricultural practices in the surrounding area. At this fair, over 200,000 farmers shared their ideas, knowledge, and best farming practices.

6.2.8 LINKAGE WITH SUSTAINABLE DEVELOPMENT GOALS

	The education support initiative enhances quality education and equal access, directly contributing overall goal of inclusive, equitable education for all. Ensure that all girls and boys complete free equitable and quality primary and secondary education. Building and upgrading education facilities. Providing transportation and school stuffs to students to attend the hassle-free education system.
	The education support initiative promotes gender equality by ensuring equal educational opportunities and empowering girls. End all form of discrimination against all girls through education.
	The education support initiative fosters economic growth by providing skills and knowledge. Full and productive employment and decent work for all women and men Creating livelihood opportunities for all and youth through skilling programs.
	The education support initiative reduces inequalities by providing equitable access to education.

7. COMMUNITY HEALTH INITIATIVES

MPL's primary assessment of the project revealed that the local fisherman community is one of the most vulnerable communities. The project aimed to empower fisherman community including villages like Navinal, Tragadi, Modhva, and Zarpara by providing vital medical assistant and health education. Through preventive disease awareness drives, family planning workshops, menstrual hygiene, nutrition workshops, and general health sessions, the project aim to reached over 60,000 peoples in 16 villages. This holistic approach led to a lasting impact: women gained knowledge to plan their families and stay healthy, while adolescents and women received support for menstrual hygiene and proper nutrition. Most importantly, the project fostered a sense of community by forming a Self-Help Group, ensuring this newfound knowledge continues to empower future generations.

7.1 KEY INTERVENTIONS

Medical Support

Medical support in the form of medicine, vaccine, testing and blood testing facilities are provided by Mundra Petrochem under CER to the local community members.

Menstrual Hygiene Workshops

The workshop aimed to address the gap in knowledge and access to proper menstrual hygiene management (MHM) resources faced by women and girls in the area. During the workshop Adolescent and women are supported for Menstrual hygiene awareness and capacity building trainings.

Health Awareness Workshop

Awareness sessions were organized by the MPL team with a special focus on the importance of vaccination, clean water, sanitation, and mental health.

Nutrition Workshop

Workshops focused on promoting healthy eating habits and tackling malnutrition in the project villages. Local residents participated in interactive sessions led by nutrition experts. Participants learned practical tips on food preparation, storage, and techniques to maximize nutrient intake.

7.2 RESULT AND OUTCOMES OF THE "COMMUNITY HEALTH" INITIATIVE.

This chapter outlines the significant achievements of the Community Health Initiatives being implemented by Munda Petrochem Limited under CER, detailing improvements in Health, outcomes, increased awareness and enhanced well – being within the community.

7.2.1 MEDICAL CAMP FOR COMMUNITY

A medical health checkup camp is an initiative designed to provide comprehensive medical examinations and screenings to a community. These camps are instrumental in promoting health awareness, early detection of diseases and facilitating timely medical intervention.

The objectives of a medical health checkup camp are:

Early Detection	Health Awarness	Accessibility	Community Health
•Identifying health issues at an early stage allows for more effective treatment and management	•Educating the community about common health problems, preventive measures and healthy lifestyle choices.	•Providing healthcare services to underserved or remote areas where medical facilities may be limited.	•Improving the overall health status of the community by addresing prevalent health concerns.

Adani Foundation shows a strong commitment to community health through diverse healthcare initiatives. Insures accessible medical care for underserved and remote populations, better health outcomes and increased awareness. The foundation's proactive approach drives large – scale, meaningful impact in public health across rural and urban areas.

A comprehensive medical camp have been organized at nearby villages by Adani Foundation. This camp have been organized with a dedicated teams of doctors, the camp catered to diverse health needs of the community. Each patient received personalized attention through check -ups and tailored prescriptions.

The team of doctors have Eye specialist, Gynecologist, General Doctors and Pediatricians.

- Conducted eye examination, Consultations and advice on maintaining good eye health.
- Offered screenings, consultations and support for reproductive health issues.
- Addressed a wide range of health issues from common ailments to chronic conditions, providing diagnoses, treatments and referral as needed.
- Provided specialized care for children

7.2.2 HEALTHY FOOD AND MENSTRUAL HEALTH AWARNESS.

A comprehensive program on healthy eating and menstruation hygiene was conducted at nearby villages with aiming to educate and empower them on health management.

7.2.3 COMMUNITY HEALTH – CLEAN WATER FACILITIES

Kutch Region is a water scarcity region and having saline coastal area for Mundra & Mandavi taluka, the availability for clean water is less for the live. The main objective of providing saline water reverse osmoses units at village Moti Khakhar is to serve clean water for the students and other users as more than 250 students are benefiting from the services. This purified water will enhance the quality of life and promote health in rural areas. This service is ensuring that students have continued access to clean & safe drinking water.

250 + students have access to clean water

The installation of the RO plants has directly improved access to clean water, positively impacting the health and daily lives of the village community and school children.

7.2.4 AMBULANCE SUPPORT FOR COMMUNITY HEALTH

Ambulance services play a vital role in any health care system, but their importance is amplified in rural communities. These areas often face unique challenges such as remote locations, limited healthcare facilities and longer response times in emergencies. Reliable ambulance services bridge the gap between rural populations and critical healthcare, ensuring timely medical intervention and improving overall health outcomes. Mundra Petrochem Limited has provided Ambulance to "KARVAN – E – MUSTAFA" medical & Educational Trust to serve the service at nearby area i.e fisherman community residence at coastal villages like Dhrab, Zarpara, Navinal, etc.

7.3 LINKAGE WITH SUSTAINABLE DEVELOPMENT GOALS

	The healthcare initiative improved community well-being, aligning with the goal by enhancing access to essential health services and promoting healthy lives.
	The healthcare initiative reduced inequalities by providing equitable access to medical services, aligning with overall goal of reducing disparities.

8. SUSTAINABILITY LIVELIHOOD AND WOMEN EMPOWERMENT

This Section encompasses the impact of MPL's comprehensive program on women empowerment and skilling. Further, how this program empowers women, fosters sustainable livelihoods and cultivates environmental awareness within the community. This chapter highlighted MPL's focus on building a better future and emphasizing the program's multifaceted approach.

8.1 KEY INTERVENTIONS

Women Empowerment

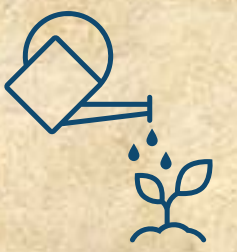
Women empowerment is a multifaceted concept that encompasses a range of activities at improving the economic, social and cultural status of women.

Skill Development

Skill development initiatives were caried out with the aim of building capacity for the local community members and help them become more employable through skill enhancement.

Sustainable Infrastructure

In an era marked by rapid urbanization and climate change, the pursuit of sustainable infrastructure has become imperative. Sustainable infrastructure refers to designing, constructing and maintaining systems that meet the needs of the present without compromising the ability of future generations to meet their own needs.



Climate Action

Community tree plantation and rural tree plantation activities have been carried out with aim to improve the green surface and carbon sequestration. Tree plantation is a vital activity that contributes significantly to the preservation of our environment. It involves planting trees in a planned to restore, conserve and enhance the natural landscape.

8.2 WOMEN EMPOWERMENT

To encourage the empowerment of women and promote gender equality, financial independence, and social development, Mundra Petrochem Limited (MPL has provided meaningful support to Self Help Groups (SHGs) in surrounding villages. These efforts are rooted in the belief that empowering women leads to positive outcomes not just for individuals, but also for families, communities, and society as a whole. SHGs from neighboring villages such as Moti Bhujpur, Zarapara, and Nani Bhujpur have received essential income-generating equipment. The provided resources include sewing machines, milk containers, and kitchen utensils, all intended to enable women to start or expand small businesses and improve their livelihoods. Through these targeted interventions, MPL and its partners are fostering economic opportunities and supporting the self-sufficiency of women in the region.

5 Self Help Groups over 250+ women

In each group to foster skill development and collective growth.

Financial empowering over 55+ marginalized fisherfolk community women.

40+ earning equipment like, sewing machines, Kitchen Utensils, Freezer, Milk storage cans, etc. provided to women from Self Help Groups.

30+ fisher women participated under awareness session.

8.3 HEALTH AND NUTRITION CAMP FOR WOMAN

Agenda

- ✓ Health awareness sessions focused on children's nutrition.
- ✓ Conducted based on Integrated Child Development Services, a government program in India focused on the wellbeing of children under 6 years and their mother.
- ✓ Educated mother on the role of essential nutrients and the impact of nutritional deficiencies.
- ✓ Provided practical example on incorporating nutritious, home-cooked meals and reducing junk food.
- ✓ Facilitated an interactive session where mothers actively participated and raised queries.

Impact

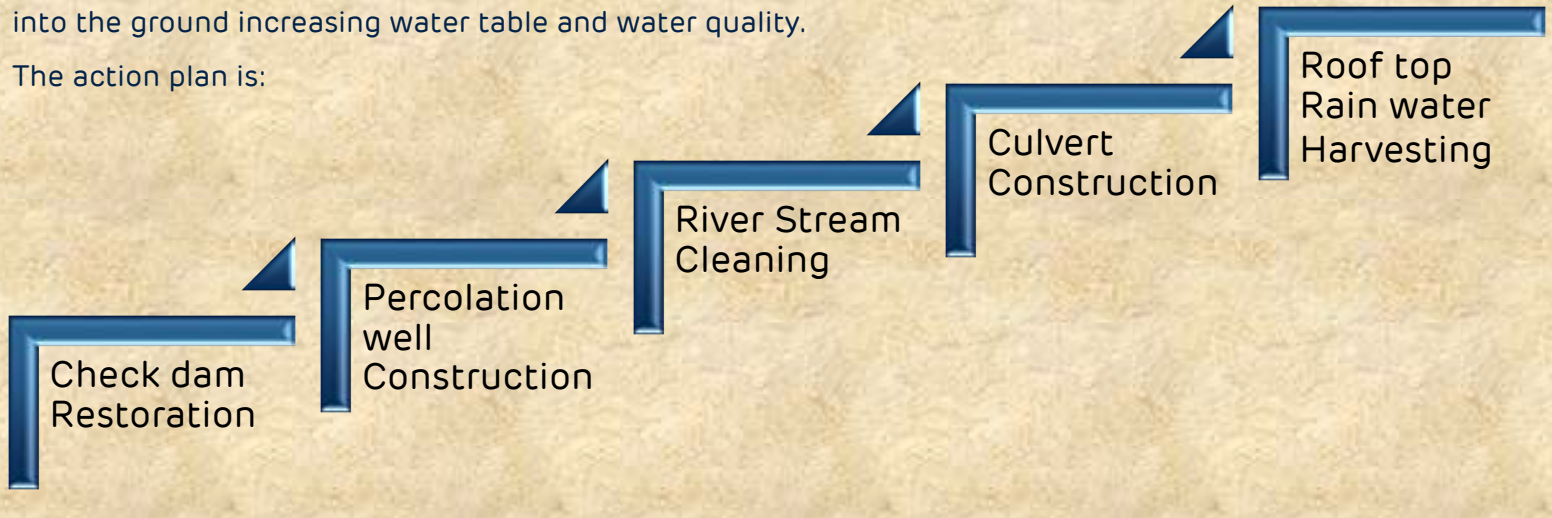
- ✓ Increased awareness among mothers about healthy dietary practices for their children.
- ✓ Empowered mothers to make informed nutrition choices, promoting healthier eating habits.
- ✓ Supported the prevention of malnutrition and improved the overall health and wellbeing of children in the community.
- ✓ Contributed to building a healthier, more informed community focused on child nutrition.

Further, with vision to empower women through comprehensive education, health initiatives and financial independence, fostering community support and sustainable development, MPL has provided training on menstrual health and hygiene and proper nutrition to 5000+ women.

8.4 SUSTAINABLE INFRASTRUCTURE

MPL's vision is to make 16 villages' water positive under MPL-CER activities through better percolation of water into the ground increasing water table and water quality.

The action plan is:



Check Dam Restorations at Moti Bhujpur:

170+ farmers benefited for agricultural purposes.

2,45,000+ cubic meter water stored.

Enough water resources for nearby villagers.

Percolation well construction:

122+ percolation well been constructed so far.

Water table level increases.

Salinity of ground water Decreases

Rever / Stream Cleaning & Pond Deepening:

cleaning of River / stream and pond deepening have been carried out at nearby villages like Zarpara, Moti Bhujpur, etc.

Free flow of water up to the dam or Pond have been ensured.

~22,000 Cu.m Water Storage Capacity increased.

Construction of Box Culvert for free flow of water into the Pond.

Controlling nearby land area from sheet (Soil) erosion or Rill (Soil) erosion.

Roof Top Rainwater Harvesting:

165 + RRWH constructed so far.

Increase clear drinking water capacity.

8.5 CLIMATE ACTION

The climate crisis is one of the most pressing challenges of this period. To preserve biodiversity, sustainably utilize ecosystems, maintain essential ecological process and local communities through innovative climate action.

8.5.1 TREE PLANTATION

Tree plantation plays a pivotal role in enhancing community well – being and addressing global environmental challenges. As urbanization accelerates and climate change becomes increasingly urgent, the act of planting trees offers both immediate and long – term advantages. Further, tree plantation is essential not only for fostering healthier, more resilient communities but also for combating climate change through carbon sequestration. By participating in carbon sequestration, communities can turn environmental action into economic opportunity, creating a cycle of sustainability that benefits people and the planet.

- These tree plantations will accelerate:
- Environmental Improvement and balancing life cycles.
- Improving air quality through absorbing carbon dioxide, filtering air pollutants and producing oxygen.
- Enhancing Public Health and economic advantages.
- Controlling soil erosion, maintaining water cycles and providing habitats for wildlife.

- Reduced surface heat, lower temperature and offer shades through which minimizing heat related illness.


GPS Map Camera
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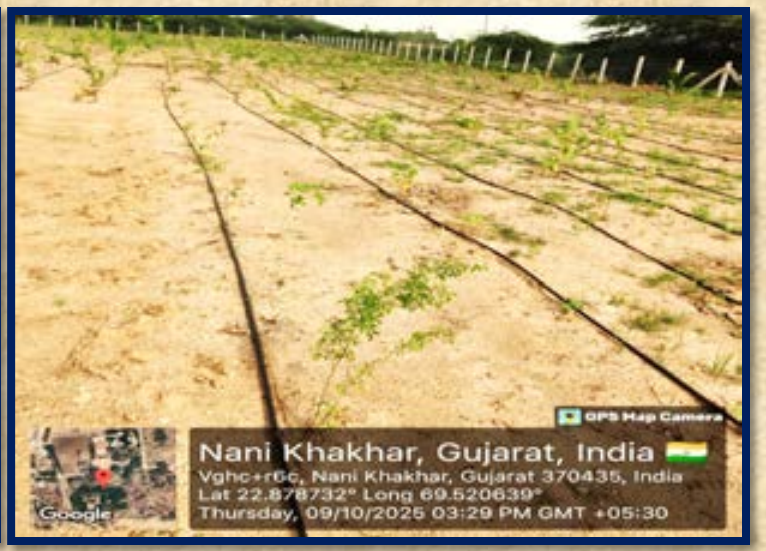
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Tree Plantation have been done with 2500+, 5000+ and 5000+ numbers of native species at villages Deshalpar, Nani Khakhar and Zarpara respectively by expert i.e M/s Yash Green with 2 year maintenance time period.

Total 12500+ trees have been planted (April – September, 2025) at nearby villages to combat climate change and enhance biodiversity. Further, 101036+ numbers of cumulative trees have been planted at nearby villages for the period up to September, 2025.

Miyawaki tree plantation & Drip irrigation methods were used.

M/s Manvseva Charitable Trust and M/s Yash Green are the Expert to maintain the trees to get survival rate more than 98%.

Survival rate of trees is 98% +

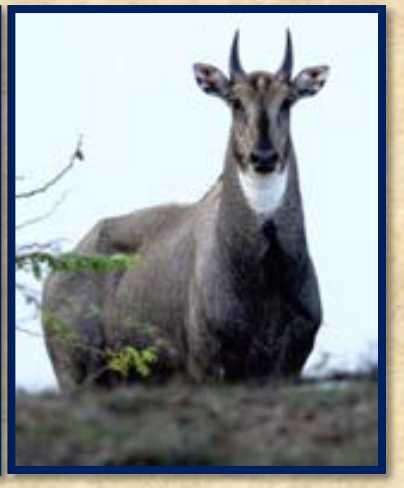
16.5 for the reporting period and 103+ acre (cumulative) land was used for tree plantation

CO_2 Sequestration

2424.864+ tCO_2e will Seq. (Cumulative)

Farmers were assisted in cultivating fruit – bearing trees.

Increasing their income and promoting sustainable agriculture.



Biodiversity Boost – Birds are resting & roosting at tree plantation area.

Icrease the organic fertility for the soil.

Increase the CO2 Sequestration, so as, clean air.

8.5.2 ECO – CLUB: AN INITIATIVE TOWARDS GREEN FUTURE

MPL is dedicated to promoting a sustainable and eco-friendly future. Thus, MPL is creating Eco-clubs in schools that educate students about environmental conservation, promote plastic – free living and inspire sustainable practices for climate action.

70 Schools

6000+ Students

Impact of the work:

- Establish Eco-Clubs in 70 schools, engaging more than 6,000 students in environmental activities.
- Conducting awareness session at schools by expert lecturers, focusing on plastic pollution and its impact on the environment.
- Introduced plastic recycling initiative, turning waste into useful products like recycled plastic pots and benches.
- Educate students about Reduce, Reuse and Recycle principles.
- Educate students about Mangrove conservation and its important to the coastal area.
- Eco days like Environment Day, Earth Day, Mangrove Day, etc. have been celebrated at the different schools.

8.5.3 MANGROVE CONSERVATION AND AWARNESS

Mangrove are salt tolerant trees and shrubs that thrive in coastal intertidal zones. These remarkable ecosystems are found in Mundra and Mandavi taluka' coastal area at the vicinity of the MPL premises. Mangrove forests are vital not only to the health of coastal environments but also to the communities that depend on them.

Mundra Petrochemical Limited had plated 75000 + numbers of Mangroves species in an area of 7 Ha at the Kotadi Creek. In addition to this, MPL is conserving mangroves through experts by constant supervision so that survival rate shall be more than 90%.

8.5.4 AWARNESS ON "ALTERNATIVE OF SINGLE USE PLASTIC"

Rejecting single use plastics means embracing sustainable alternatives that are kinder to our planet. To create awareness about the harmful effects of single use plastic, MPL has conducted awareness sessions at schools of nearby villages.

Students from nearby schools.

- Students learn the alternative of single use plastic.
- Students enhance their innovated knowledge for reusable items as they are excellent substitutes such as cloths bags, metal straws, Glass bottles and bamboo cutlery.

Further, to promote Reuse, Recover & Recycling, MPL has extended use of plastic to make plastic benches and provided to students of nearby villages.

10 Benches (Made from recyclable plastic) provided by MPL to Deshalpar Girls Hostel

8.6 AWARENESS DRIVE ON CONSERVE WATER, PROTECT EARTH AND ENVIRONMENT.

To raise awareness about water conservation, protect earth & environment and encourage students and surrounding community to adopt sustainable practices for optimal usages of natural resources and protect them.

8.7 LINKAGE WITH SUSTAINABLE DEVELOPMENT GOALS.

	MPLs initiative focused on livelihood generation and providing additional support to farmers works towards eliminating poverty.
	Enhance income generation opportunities provided to the local community and sustainable job creation will enable the local to fulfill basic needs like food and nutrition.
	Dedicated efforts through Workshop and promoting women farmers have created more equitable society.
	Major interventions were focused on building employability in the local community and creating a sustainable source of income.
	A non – discriminatory approach in beneficiary identification has reduced inequality.
	By integrating IEC based interventions and Eco club drive on awareness and community building will work towards building sustainable society.
	A significant effort has been put in promoting natural farming and conservation of local ecosystem through plantation and mangrove conservation.

9. COMMUNITY RURAL INFRASTRUCTURE DEVELOPMENT

community Rural infrastructure Development program by MPL encompasses a wide array of initiatives aimed at enhancing rural areas. It focuses on water conservation through measures like check dam restoration, de-siltation and bore well recharge structures. Infrastructure support includes sports facilities; renovation of educational and trailing centers and repair works in schools and infrastructure for fishing community across various villages. Additionally, the program addresses essential amenities like sheds along with "Gaman" (Cattle Food Pan) at Gaushala of nearby village.

9.1 KEY INTERVENTION

Road Repairing / construction work

Road construction work is a cornerstone of modern civilization. It drives economic growth, enhances connectivity, promotes social integration and supports environmental sustainability.

Common Gathering Infrastructure

In the heart of any thriving community, common gathering infrastructure serves as the backbone that fosters interaction, collaboration and a sense of belonging. These infrastructures are essential for the social fabric, ensuring that people have spaces to meet, share and grow together.

Sustainable Infrastructure

By adopting the development of sustainable infrastructure in rural areas, we can address the challenges of climate change, resources depletion and urbanization while promoting a more equitable and resilient future.

Educational Infrastructure

Developing educational infrastructure in villages is essential for fostering individual and community development. Despite the challenges, a combination of government support, community involvement, public – private partnership and innovative solutions can create sustainable educational opportunities for rural populations.

9.2 ROAD REPAIRING / CONSTRUCTION ACTIVITIES.

As roads are the key factor for development through transporting, shifting, movement of materials and other activities, MPL is giving the priority to provide good road for circulating economy as well as smooth functioning of rural development, specially in fisherfolk community.

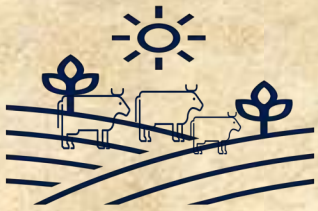
- Renovation work for approach road at Farm area (countryside area) of village Zarpara and School approach road at village SVC Nana Kapaya.
- Development of approach road and ground cleaning and leveling work at Daneshvar Mahadev mandir, village: Siracha
- Renovation of Damage Bund work to protect check dam at Nani Khakhar
- Renovation of approach road for vadi vistar area i.e Nana Bhadiya, Mota Bhadiya, Lalyara and chach vadi vistar at Zarapara.
- Renovation of approach road for vadi vistar and Fisherman vasahat area at Zarpara.
- Road cleaning work at village Siracha.

9.3 CLEANING OF "*GAUCHAR AREA*" (CATTLE FIELD AREA)

"*Gauchar*" land, also known as common grazing land, holds significant importance in rural and agrarian societies, especially in regions where agriculture and livestock form the backbone of the local economy. Considering this, Mundra Petrochem Limited has clear the unwanted Acacia trees (Babul Trees) from approximately 100 acres "*Gauchar*" land at village Zarpara so that grass can grow smoothly and so as cattle can feed their routine food chain.

In addition to this, land maintenance work comprises:

- Removal of debris and invasive species.
- Leveling and soil treatment to improve fertility.
- Plantation of native grass and fodder species.
- Installation of fencing to protect the land.



100+ Acres of "*Gauchar*" land have been fertile through Soil conservation, fertilization, Grass sapling and removal of unwanted trees.

9.4 CONSTRUCTION OF SHEDS

Sheds have proven to be valuable assets, enriching local spaces and enhancing the quality of life for animals. This shed is filling the gap to shelter more than 2350 cows at village Deshalpar and Zarpara. These sheds have been accomplished with "*Gaman*" (Cattle food serving pan) so that cattle have their food on better way.

9.5 SUSTAINABLE INFRASTRUCTURE

As water is an essential part of live and to fulfill this requirement, MPL has extended support through Roof top rainwater harvesting systems, repairing of check dams, cleaning of river / streams and percolation wells at nearby 16 villages from the plant premises.

Rooftop Rainwater Harvesting system

Clean water available at house step.

220+ farmers benefited for agricultural purposes through check dam repairing / construction and box culvert.

2,67,000+ cubic meter water stored.

122+ percolation well been constructed so far.

Water table level increases.

Salinity of ground water Decreases.

Saline water Reverse Osmosis Plant installed at primary school, Moti Bhujpur with capacity of 150Ltr/hr for students to have clean drinking water.

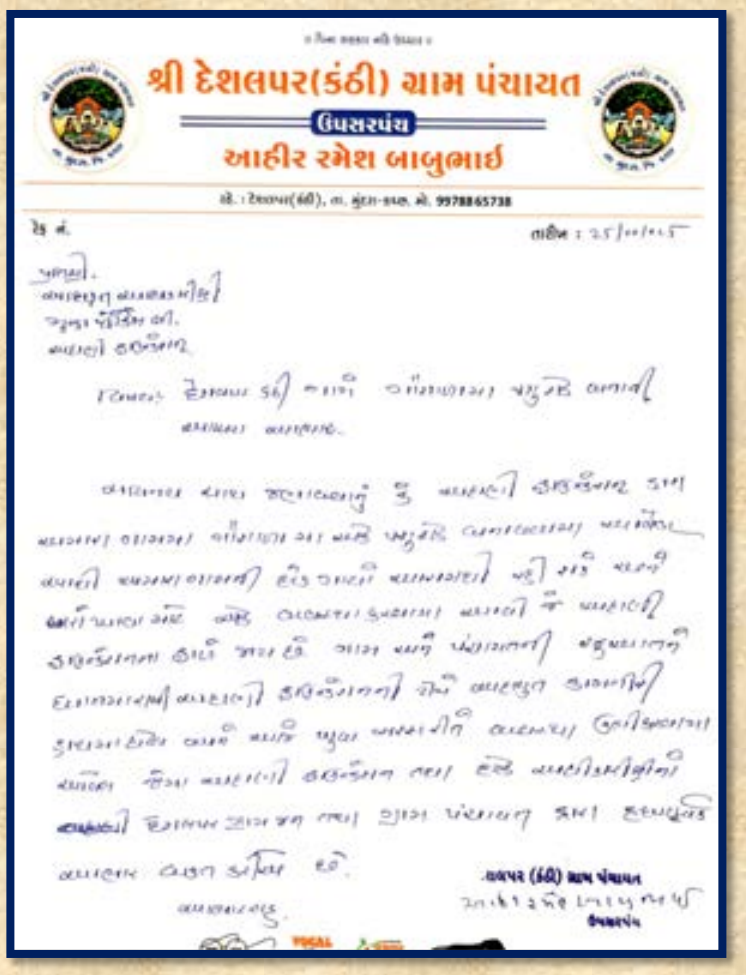
250+ Students benefited.

Construction of Box Culvert for uninterrupted free flow of water into the Pond.

9.6 LINKAGE WITH SUSTAINABLE DEVELOPMENT GOALS

2 ZERO HUNGER	Increased water availability and quality will boost agricultural production.
6 CLEAN WATER AND SANITATION	Dedicated efforts for enhancing rainwater storage will improve clean and safe drinking water option for household.
11 SUSTAINABLE CITIES AND COMMUNITIES	Improved recharge and harvesting options will make local communities reliant against water stress.
13 CLIMATE ACTION	The water conservation initiative significantly increased storage capacity, enhancing climate resilience and promoting sustainable water management.

10. STAKEHOLDERS' APPRECIATION / FEEDBACK



શ્રી દેશલપર(કંઠી) ગ્રામ પંચાયત

ઉપસરપંચ

આહીર રમેશ બાબુભાઈ

મો. : દેશલપર(કંઠી), તા. મુંદરા-કચ્છ, મો. 9978865738

શ્રી ઝરપરા કન્યા પંચાયતી પ્રાથમિક શાળા

ગામ- ઝરપરા તા.મુન્દ્રા-કચ્છ

શાળાનો ડાયસ કોડ :- 24010905701

તારીખ-21/07/2025

પ્રતિશ્રી,

અધિકૃત અધિકારીશ્રી,

મુન્દ્રા પેટ્રોકેમ લિ.

અદાણી ફાઉન્ડેશન -મુન્દ્રા.

વિષય: શાળામાં RO પ્લાન્ટની વ્યવસ્થા કરી આપવા બદલ કૃતજ્ઞતાપૂર્વક આભાર

માનનીય મહાશય,

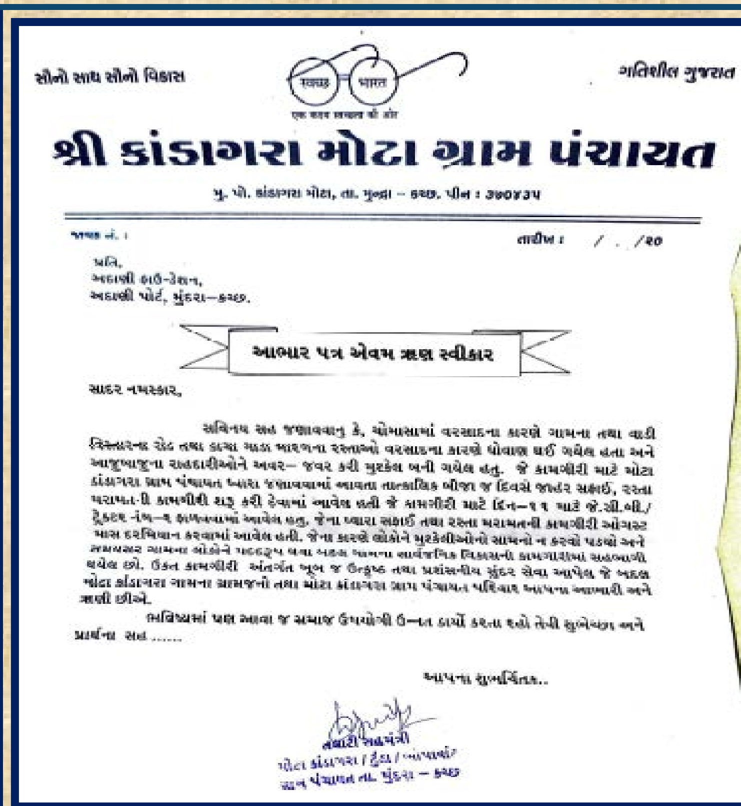
સવિનય સાથે જણાવવાનું કે અમારી શ્રી ઝરપરા કન્યા પંચાયતી પ્રાથમિક શાળામાં વિદ્યાર્થીનીઓને શુદ્ધ અને સ્વચ્છ પીવાનું પાણી મળી રહે તે માટેની બેઠક શાળાના રજૂઆતને અદાણી ફાઉન્ડેશને ગંભીરતાપૂર્વક પ્રધાનમાં લીધી અને શાળામાં RO પ્લાન્ટ ની વ્યવસ્થા કરી આપી છે. આ RO પ્લાન્ટથી અમારી શાળાની 265 વિદ્યાર્થીનીઓને હવે દરરોજ શુદ્ધ પાણી મળશે. જેનાથી તેમનું આરોગ્ય સુરક્ષિત રહેશે અને અભ્યાસમાં પણ પ્રધાન કેન્દ્રિત કરી શકશે. અને આમ પાણીથી સુરક્ષિત થઈ જશે. આ બદલ શાળા અને શાળા વ્યવસ્થાપન સમિતિ (SMC) તથા તમામ શિક્ષકગણ વતી મુન્દ્રા પેટ્રોકેમ લિ. અદાણી ફાઉન્ડેશનનો કૃતજ્ઞતાપૂર્વક આભાર વ્યક્ત કરીએ છીએ. આવા સહયોગથી અમારી બાલિકાઓના શિક્ષણ અને આરોગ્યમાં વધુ સુધારો થશે. ભવિષ્યમાં પણ આવા કાર્યોમાં સહભાગી થશો એવી આશા રાખીએ છીએ.

આભાર સહ,

K.B.Zala


શ્રી નાની ખાખર ગ્રામ પંચાયત
સરપંચશ્રી : જાડેજા પ્રેમસંગ જીલુભા, Mo. 9265283431

પ્રતિ,
અધિકૃત અધિકારીશ્રી,
અદાણી ફાઉન્ડેશન,
મુન્દ્રા, કચ્છ


સૌનો સાથ સૌનો વિકાસ · ગતિશીલ ગુજરાત

શ્રી કાંડાગરા મોટા ગ્રામ પંચાયત
મુ. પો. કાંડાગરા મોટા, તા. મુન્દ્રા – કચ્છ. પીન : ૩૭૦૪૩૫

જાવક નં. : તારીખ : / . /૨૦

પ્રતિ,
અદાણી ફાઉન્ડેશન,
અદાણી પોર્ટ, મુંદરા–કચ્છ.

આભાર પત્ર એવમ ઋણ સ્વીકાર

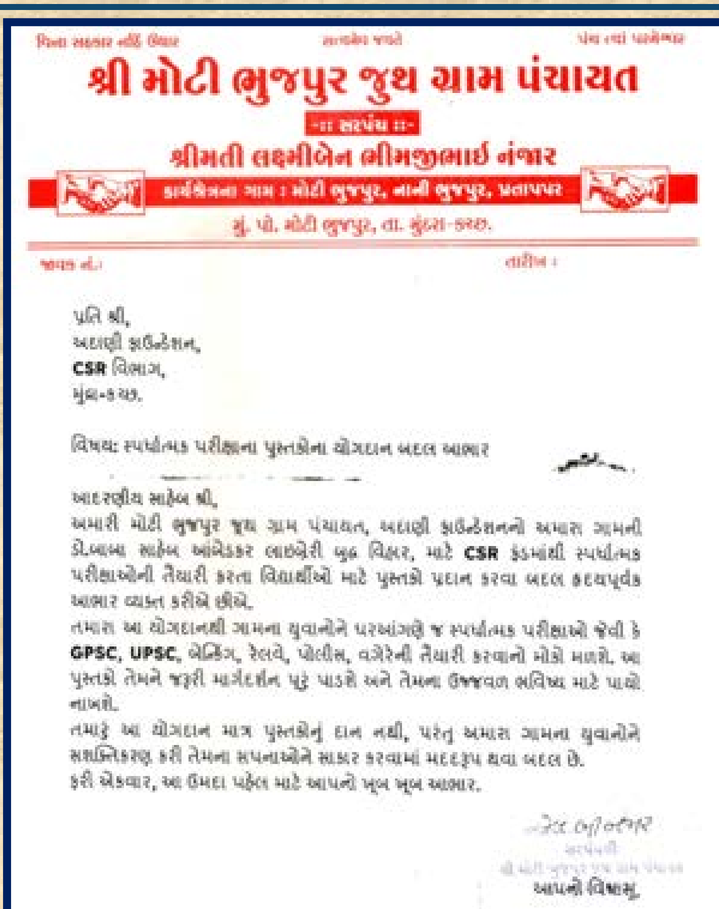
સાદર નમસ્કાર,

સવિનય સહ જણાવવાનું કે, ચોમાસામાં વરસાદના કારણે ગામના તથા વાડી વિસ્તારના રોડ તથા કાચા માર્ગ ખરાબ ના રસ્તાઓ વરસાદના કારણે ધોવાણ થઈ ગયેલ હતા અને આજુબાજુના રાહદારીઓને અવર– જવર કરી મુશ્કેલ બની ગયેલ હતુ. જે કામગીરી માટે મોટા કાંડાગરા ગ્રામ પંચાયત દ્વારા જણાવવામાં આવતા તાત્કાલિક બીજા જ દિવસે જાહેર સફાઈ, રસ્તા મરામત-ની કામગીરી શરૂ કરી દેવામાં આવેલ હતી જે કામગીરી માટે દિન–૧૧ માટે જે.સી.બી./ ટ્રેક્ટર નંગ–૨ ફાળવવામાં આવેલ હતુ. જેના દ્વારા સફાઈ તથા રસ્તા મરામતની કામગીરી ઓગસ્ટ માસ દરમિયાન કરવામાં આવેલ હતી. જેના કારણે લોકોને મુશ્કેલીઓનો સામનો ન કરવો પડ્યો અને સમયસર ગામના લોકોને મદદરૂપ થવા બદલ આપના સાર્વજનિક વિકાસની કામગારીમાં સહભાગી થયેલ છો. ઉકત કામગીરી અંતર્ગત ખૂબ જ ઉત્કૃષ્ઠ તથા પ્રશંસનીય સુંદર સેવા આપેલ જે બદલ મોટા કાંડાગરા ગામના ગ્રામજનો તથા મોટા કાંડાગરા ગ્રામ પંચાયત પરિવાર આપના આભારી અને ઋણી છીએ.

ભવિષ્યમાં પણ આવા જ સમાજ ઉપયોગી ઉન્નત કાર્યો કરતા રહો તેવી શુભેચ્છા અને પ્રાર્થના સહ ......

આપના શુભચિંતક..

તલાટી કમ મંત્રી
મોટા કાંડાગરા / ટુંડા / ભાગપરસાડ
ગ્રામ પંચાયત તા. મુંદરા – કચ્છ


શ્રી મોટી ભુજપુર જુથ ગ્રામ પંચાયત
:: સરપંચ ::
શ્રીમતી લક્ષ્મીબેન ભીમજીભાઈ નંજાર
કાર્યક્ષેત્રના ગામ : મોટી ભુજપુર, નાની ભુજપુર, પ્રતાપપર
મું. પો. મોટી ભુજપુર, તા. મુંદરા-કચ્છ.

જાવક નં.: તારીખ :

પ્રતિ શ્રી,
અદાણી ફાઉન્ડેશન,
CSR વિભાગ,
મુંદ્રા-કચ્છ.

વિષય: સ્પર્ધાત્મક પરીક્ષાના પુસ્તકોના યોગદાન બદલ આભાર

આદરણીય સાહેબ શ્રી,

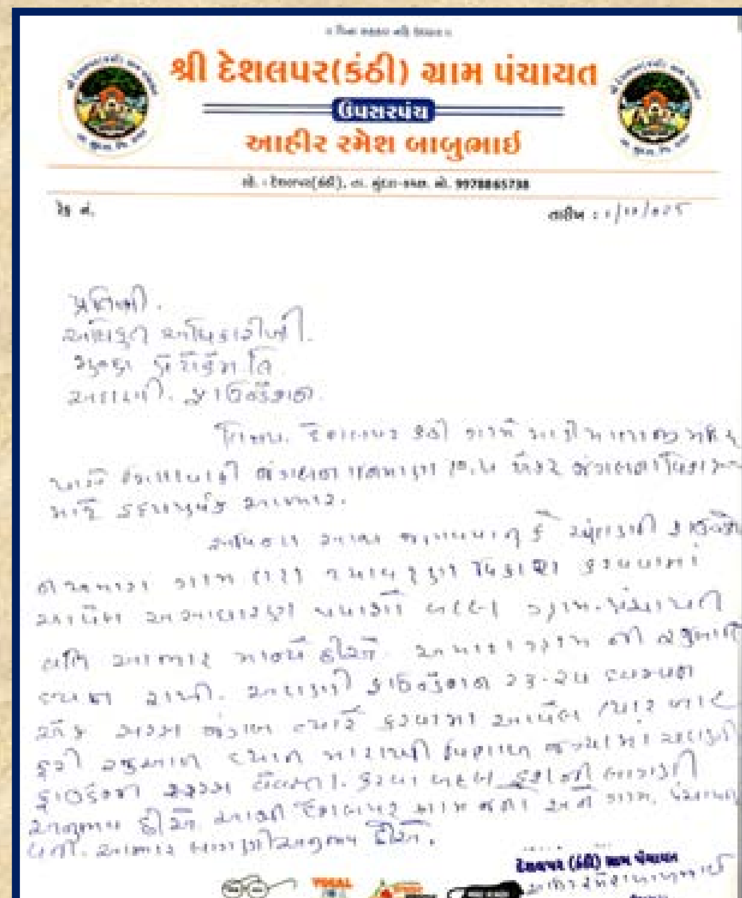
અમારી મોટી ભુજપુર જુથ ગ્રામ પંચાયત, અદાણી ફાઉન્ડેશનનો અમારા ગામની ડૉ.બાબા સાહેબ આંબેડકર લાઇબ્રેરી બુદ્ધ વિહાર, માટે CSR ફંડમાંથી સ્પર્ધાત્મક પરીક્ષાઓની તૈયારી કરતા વિદ્યાર્થીઓ માટે પુસ્તકો પ્રદાન કરવા બદલ હૃદયપૂર્વક આભાર વ્યક્ત કરીએ છીએ.

તમારા આ યોગદાનથી ગામના યુવાનોને પરબાંગણે જ સ્પર્ધાત્મક પરીક્ષાઓ જેવી કે GPSC, UPSC, બેન્કિંગ, રેલવે, પોલીસ, વગેરેની તૈયારી કરવાનો મોકો મળશે. આ પુસ્તકો તેમને જરૂરી માર્ગદર્શન પૂરું પાડશે અને તેમના ઉજ્જવળ ભવિષ્ય માટે પાયો નાખશે.

તમારું આ યોગદાન માત્ર પુસ્તકોનું દાન નથી, પરંતુ અમારા ગામના યુવાનોને સશક્તિકરણ કરી તેમના સપનાઓને સાકાર કરવામાં મદદરૂપ થવા બદલ છે.

ફરી એકવાર, આ ઉમદા પહેલ માટે આપનો ખૂબ ખૂબ આભાર.

સરપંચશ્રી
શ્રી મોટી ભુજપુર જુથ ગ્રામ પંચાયત
આપનો વિશ્વાસુ


શ્રી દેશલપર(કંઠી) ગ્રામ પંચાયત
ઉપસરપંચ
આહીર રમેશ બાબુભાઈ

11. NEWS HIGHLIGHTS

ન્યૂઝ ફોર કચ્છ દૈનિક

WEDNESDAY 03-09-2025

નાની ખાખરમાં મિયાવાકી પદ્ધતિથી જંગલનું સર્જન કરાશે

અદાણી ફાઉન્ડેશનની હરિયાળી પહેલ : નાની ખાખરમાં ત્રીજા જંગલની શરૂઆત

અદાણી ફાઉ.ની હરિયાળી પહેલ: નાની ખાખરમાં મિયાવાકી પદ્ધતિથી જંગલનું સર્જન

કચ્છમિત્ર

હું કચ્છનો પ્રભારી મંત્રી, હવે પ્રભારી મિત્ર બની ગયો છું : મંત્રી પ્રફુલ્લ પાનસેરિયા

કૃષિ ક્ષેત્રે કચ્છની ક્રાંતિ દેશ-દુનિયા માટે દાખલારૂપ

KISAN

અદાણી ફાઉન્ડેશનની મુન્દ્રા વિસ્તાર માટે હરિયાળી પહેલ

કચ્છમિત્ર

સોમ-મંગળવાર બે દિવસ મેળો બાકી

કૃષિ-ડેરી એક્સપો કિસાનોથી ધમધમી ઊઠ્યો

adani

Annexure – VI

Air Pollution Controlling Measures during construction phase at GPVC site.

Mundra Petrochem Limited has prepared and implemented an Environmental Management Plan for construction phase vide internal documentation no. MG000-HSE-000-BD-7002 Dated 21.03.2024 with incorporating the Air Pollution Controlling Measures during construction activities. Presently, The PVC project is currently in the final design, detailed engineering, and procurement stage. Simultaneously, construction activities are ongoing at the site. The following APC measures have been taken for the activities during construction phase.

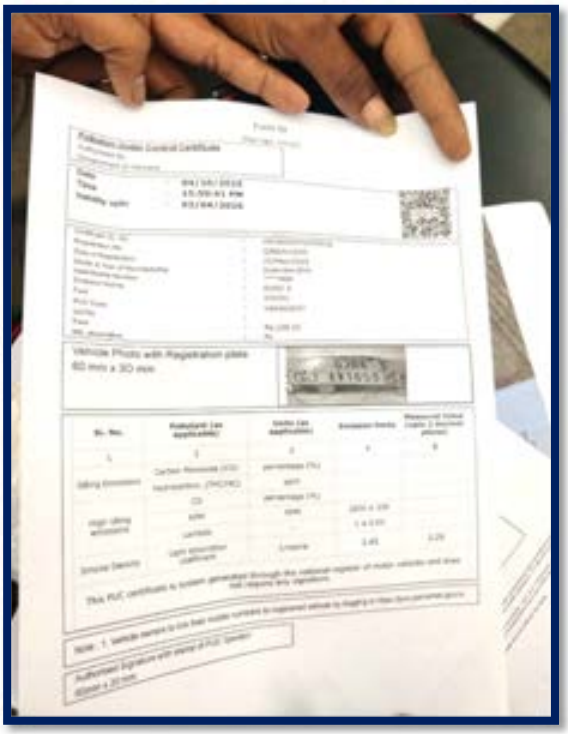
Sr. No.	Affected Environmental component	Likely Impacts in absence of mitigation measures	Mitigation measures have been taken	Remark
1	Air Quality	• Traffic congestion. • Increase in ambient air pollution (Increase in levels of NOx, SPM, Dust Hazards. Etc.) • Risk Accidents.	• On site use of concreate batching plant. • Only PUC certified vehicles are allowed to enter the premises. • Water sprinkling have been carried out to stabilize the dust prone areas. • Preventive maintenance of transport, heavy equipment and construction equipment have been carried out on regular intervals. • Low Sulphur fuel i.e Diesel are being used. • PPEs / masks have been used at high dust generating area. • AAQM have been carried out at construction site as well as at surrounding villages. • DG sets having complied with GPCB/CPCB norms are in used.	• Impacts are temporary and short distances, as coarse particles are settling within the short distance from the activities during the construction phase. • Water sprinkling details have been recorded. • Monthly Monitoring has been carried out through a recognized laboratory. • Record for the DG sets with complying GPCB/CPCB norms have been maintained with respective units / user.
2	Road Traffic due to vehicle movement for transportation of manpower, materials and equipment.	• Vehicular exhaust and dust emissions on the road. • Noise generation • Risk involved in transportation activity such as accidents damage to properties etc.	• Only PUC certified vehicles are allowed to enter the premises. • The speed of vehicles has been restricted to certain speed limits to control the spillage, emissions OR air born generation.	• Entry and exit of vehicles' registration / records have been maintained. • Vehicle movement security systems have been in service so that

			• Idling trucks and dumper on the roads are not allowed. • Construction materials are brought in batches with covered with tarpaulin sheets. • Defensive driving / awareness training has been provided to drivers on regular interval.	Photographs / video of each vehicle have been recorded during entry of vehicles.

Photographs:

Water Sprinkling on Internal Roads

Material Covered with Sheet during transportation



Checking Vehicle's documents like PUC, etc. at Entry Gate

Batching Units / Facilities have been set up inside the premises

Use of E-vehicles for construction / site activities

D.G. Sets having adequate stake height and Acoustic system covered on it.

Annexure – VII

Tree Plantation Activities

Tree plantation plays a pivotal role in enhancing community well – being and addressing global environmental challenges. As urbanization accelerates and climate change becomes increasingly urgent, the act of planting trees offers both immediate and long – term advantages. Further, tree plantation is essential not only for fostering healthier, more resilient communities but also for combating climate change through carbon sequestration. By participating in carbon sequestration, communities can turn environmental action into economic opportunity, creating a cycle of sustainability that benefits people and the planet.

These tree plantations will accelerate:

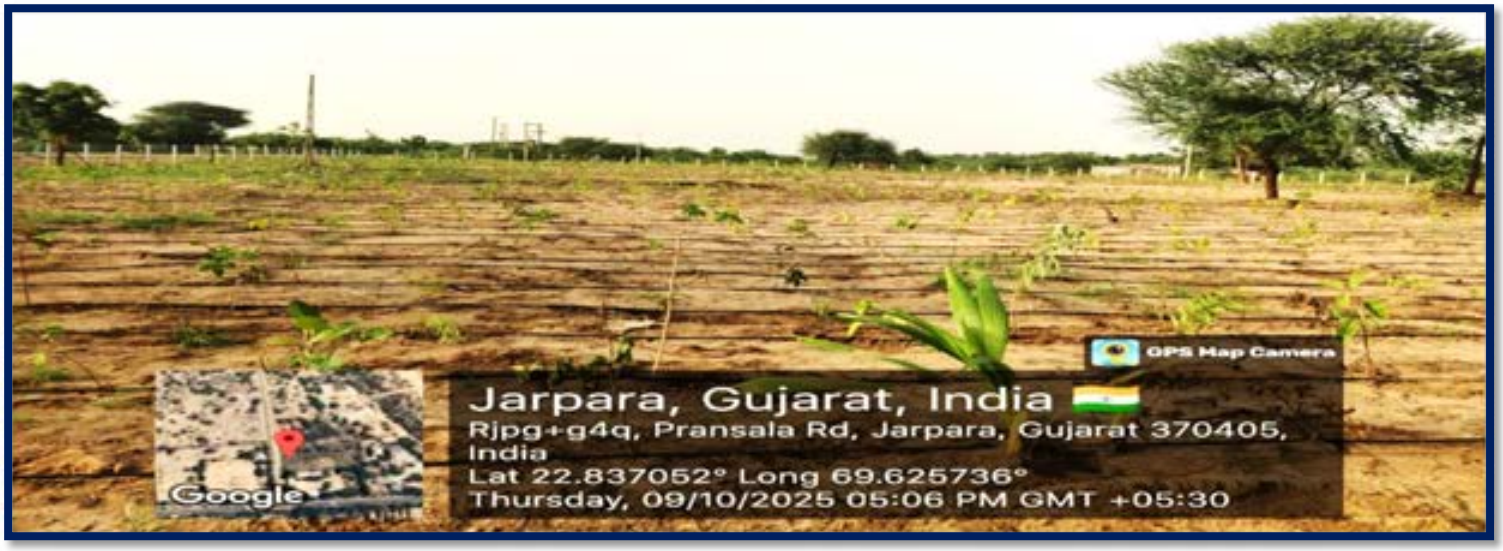
a) Environmental Improvement and balancing life cycles.
b) Improving air quality through absorbing carbon dioxide, filtering air pollutants and producing oxygen.
c) Enhancing Public Health and economic advantages.
d) Controlling soil erosion, maintaining water cycles and providing habitats for wildlife.
e) Reduced surface heat, lower temperature and offer shades through which minimizing heat related illness.


GPS Map Camera
Nani Khakhar, Gujarat, India
Vghc+r6c, Nani Khakhar, Gujarat 370435, India
Lat 22.878747° Long 69.520648°
Thursday, 09/10/2025 03:29 PM GMT +05:30
Google


GPS Map Camera
Nani Khakhar, Gujarat, India
Vghc+r6c, Nani Khakhar, Gujarat 370435, India
Lat 22.878732° Long 69.520639°
Thursday, 09/10/2025 03:29 PM GMT +05:30
Google


GPS Map Camera
Nani Khakhar, Gujarat, India
Vghc+r6c, Nani Khakhar, Gujarat 370435, India
Lat 22.878818° Long 69.520675°
13/10/2025 04:50 PM GMT +05:30
Google


GPS Map Camera
Nani Khakhar, Gujarat, India
Vgm9+vx5, Near Momay Marble, Nani Khakhar, Gujarat 370435, India
Lat 22.885776° Long 69.520835°
13/10/2025 05:20 PM GMT +05:30
Google


GPS Map Camera
Jarpara, Gujarat, India
Rjpg+g4q, Pransala Rd, Jarpara, Gujarat 370405, India
Lat 22.837052° Long 69.625736°
Thursday, 09/10/2025 05:06 PM GMT +05:30
Google

Tree Plantation have been done with 2500+, 5000+ and 5000+ numbers of native species at villages Deshalpar, Nani Khakhar and Zarpara respectively by expert i.e M/s Yash Green with 2 year maintenance time period.

Total 12500+ trees have been planted (April – September, 2025) at nearby villages to combat climate change and enhance biodiversity. Further, 101036+ numbers of cumulative trees have been planted at nearby villages for the period up to September, 2025.

Miyawaki tree plantation & Drip irrigation methods were used.

M/s Manvseva Charitable Trust and M/s Yash Green are the Expert to maintain the trees to get survival rate more than 98%.

Survival rate of trees are 98% +

16.5 for the reporting period and 103+ acre (cumulative) land were used for tree plantation

CO_2 Sequestration

2424.864+ tCO_2e will Seq. (Cumulative)

Tree Plantation Details

Sr. No.	Details of Expert Agency	Scientific Name	Quantity	Survival Rate
1	M/s Yash Green (Planting + 2year Maintenance) Village - Deshalpar (No. of Trees 2500)	Cordia gharaf (Forsk.) E.&.A.	75	98 – 100 %
2		Pithecellobium dulce (Roxb.) Benth.	180	
3		Moringa oleifera Lam.	75	
4		Derris indica (Lam.) Bennet	50	
5		Azadirachta indica A. Juss.	200	
6		Morus alba L.	40	
7		Tecomella undulata (Sw.) Seem.	40	
8		Commiphora wightii (Arn.) Bhandari	100	
9		Dalbergia sissoo Roxb.	40	
10		Zizyphus mauritiana Lam.	40	
11		Albizia lebbeck (L.) Bth.	25	
12		Terminalia arjuna (Roxb.) W. & A.	50	
13		Grewia tiliaefolia Vahl var. tiliaefolia	50	
14		Aegle marmelos (L.) Corr.	87	
15		Cassia fistula L.	100	
16		Cordia dichotoma Forst.	80	
17		Holoptelia integrifolia	50	
18		Murraya koenigii (L.) Spr.	10	
19		Psidium guajava L.	83	
20		Syzygium cumini	150	
21		Tamarindus indica L.	125	
22		Butea monosperma (Lam.) Taub.	50	
23		Manilkara zapota (L.) van Royen	75	
24		Mimusops elengi L.	50	
25		Plumeria rubra L.	10	
26		Ficus benghalensis L.	180	
27		Ficus religiosa L.	180	
28		Gmelina arborea L.	20	
29		Bauhinia racemosa Lam.	10	
30		Ficus racemosa	40	
31		Peltoform	60	
32		Phoenix Sylvestris & Phoenix dactylifera	25	
33		Coconut/ Cocos Nucifera	15	
34		Delonix Regia	50	
35		Mangifera Indica	35	
36		Millingtonia Hortensis	25	
37		Cassia Siamea	25	

Sr. No.	Details of Expert Agency	Scientific Name	Quantity	Survival Rate
1	M/s Yash Green (Planting + 2year Maintenance) Zarpara (No. of Trees: 5000)	Cordia gharaf (Forsk.) E.&.A.	150	98 – 100%
2		Pithecellobium dulce (Roxb.) Benth.	150	
3		Moringa oleifera Lam.	75	
4		Derris indica (Lam.) Bennet	100	
5		Azadirachta indica A. Juss.	500	
6		Morus alba L.	150	
7		Tecomella undulata (Sw.) Seem.	50	
8		Commiphora wightii (Arn.) Bhandari	100	
9		Dalbergia sissoo Roxb.	50	
10		Zizyphus mauritiana Lam.	50	
11		Albizia lebbeck (L.) Bth.	50	
12		Terminalia arjuna (Roxb.) W. & A.	75	
13		Grewia tiliaefolia Vahl var. tiliaefolia	50	
14		Aegle marmelos (L.) Corr.	150	
15		Cassia fistula L.	100	
16		Cordia dichotoma Forst.	130	
17		Holoptelia integrifolia	50	
18		Murraya koenigii (L.) Spr.	20	
19		Psidium guajava L.	150	
20		Syzygium cumini	175	
21		Tamarindus indica L.	175	
22		Butea monosperma (Lam.) Taub.	100	
23		Manilkara zapota (L.) van Royen	150	
24		Mimusops elengi L.	100	
25		Plumeria rubra L.	75	
26		Ficus benghalensis L.	400	
27		Ficus religiosa L.	400	
28		Gmelina arborea L.	50	
29		Bauhinia racemosa Lam.	25	
30		Ficus racemosa	400	
31		Peltoform	250	
32		Phoenix Sylvestris & Phoenix dactylifera	100	
33		Coconut/ Cocos Nucifera	50	
34		Delonix Regia	75	
35		Mangifera Indica	75	
36		Millingtonia Hortensis	50	
37		Cassia Siamea	150	
38		Adhatoda zeylanica Medic	50	

Sr. No.	Details of Expert Agency	Scientific Name	Quantity	Survival Rate
1	M/s Yash Green (Planting + 2year Maintenance) Village : Nani Khakhar (No. of Trees - 5000)	Cordia gharaf (Forsk.) E.&.A.	100	98 -100%
2		Pithecellobium dulce (Roxb.) Benth.	150	
3		Moringa oleifera Lam.	75	
4		Derris indica (Lam.) Bennet	125	
5		Azadirachta indica A. Juss.	500	
6		Morus alba L.	200	
7		Tecomella undulata (Sw.) Seem.	50	
8		Commiphora wightii (Arn.) Bhandari	150	
9		Dalbergia sissoo Roxb.	25	
10		Zizyphus mauritiana Lam.	50	
11		Albizia lebbeck (L.) Bth.	37	
12		Terminalia arjuna (Roxb.) W. & A.	50	
13		Grewia tiliaefolia Vahl var. tiliaefolia	38	
14		Aegle marmelos (L.) Corr.	150	
15		Cassia fistula L.	100	
16		Cordia dichotoma Forst.	75	
17		Holoptelia integrifolia	37	
18		Murraya koenigii (L.) Spr.	38	
19		Psidium guajava L.	125	
20		Syzygium cumini	150	
21		Tamarindus indica L.	200	
22		Butea monosperma (Lam.) Taub.	125	
23		Manilkara zapota (L.) van Royen	125	
24		Mimusops elengi L.	75	
25		Plumeria rubra L.	75	
26		Ficus benghalensis L.	500	
27		Ficus religiosa L.	500	
28		Gmelina arborea L.	50	
29		Bauhinia racemosa Lam.	50	
30		Ficus racemosa	400	
31		Peltoform	100	
32		Phoenix Sylvestris & Phoenix dactylifera	75	
33		Coconut/ Cocos Nucifera	75	
34		Delonix Regia	125	
35		Mangifera Indica	75	
36		Millingtonia Hortensis	50	
37		Cassia Siamea	150	
38		Adhatoda zeylanica Medic	25	
		Total	**12500**	

Annexure – VIII

Awareness Program on "Ban on Single Use Plastic"

Awareness program on "Ban on Single use plastic" has been conducted at Government Schools and Self Help Groups of nearby villages as per The Plastic Waste Management Rules 2016 and amended from time to time, inter-alia, mandated banning of identified Single Use Plastic (SUP) items with effect from 01/07/2022.

Awareness Program has covers CPCB Notifications, prohibited plastic items, complications created by plastic waste, awareness on plastic waste, plastic recycling numbers and its meaning.

The central aim of the plastic – free drive is to empower and enlighten students as key representatives of change, enabling them to disseminate awareness and instill the practice of reducing single use plastic within their community.

1. Educate: Spread awareness about the harmful effects of plastic on the environment, marine life, soil health and human well – being.

2. Engage: Mobilize community members, especially the youth and family members to actively participate in plastic waste reduction activities.

3. Implement: Introduce sustainable alternatives to ensure proper disposal and recycling.

Green School: Eco club for enlarging awareness on environment, sustainability, wildlife conservations, mangrove conservation, alternative of single use of plastics etc. have been established and under these 70 numbers of school from nearby villages, Mandavi and Mundra town area have been covered and more than 6000 students are participated in above said various awareness activities.

In line with this, "No Plastic Drive" – alternative of Single use plastic, in Utthan Schools has encouragingly motivated students behavior. Under this, Eco Clubs were established to further raise climate change awareness and promote a plastic free environment.

Rejecting single use plastics means embracing sustainable alternatives that are kinder to our planet. To create awareness about the harmful effects of single use plastic, MPL has conducted awareness sessions at schools of nearby villages.

- Students from nearby schools.
- Students learn the alternative of single use plastic.

- Students enhance their innovated knowledge for reusable items as they are excellent substitutes such as cloths bags, metal straws, Glass bottles and bamboo cutlery.

To build a sustainable and eco-friendly future by turning environmental challenges into impactful solutions and as part of corporate commitment towards sustainability and community welfare, MPL has facilitated the installation of 10 benches made from recycled plastic at the Deshalpar Girls hostel. The aim is to reduce plastic waste and promote a circular economy that benefits both society and the planet. These benches offer comfortable sequencing seating for 100 hostel residents.

Annexure - IX

Government of India
Ministry of Environment, Forest and Climate Change

Date: **19/11/2025**

ACKNOWLEDGEMENT

This is to acknowledge that MUNDRA PETROCHEM LIMITED has provided the information on PARIVESH Portal in respect of No change in production capacity and No increase in pollution load for the project proposal NIPL for Coal to Poly - vinyl Chloride (PVC) near village Vandh & Tunda, Taluka: Mundra, District Kuchchh, Gujarat in the format attached herewith under the provisions of para 7(ii) c of EIA Notification and its subsequent amendment S.O.980-(E), dated 2nd March 2021.

To claim exemption from obtaining prior Environment Clearance in respect of the provisions mentioned in para 7(ii)c of EIA notification 2006 and its subsequent amendment S.O.980-(E), dated 2nd March 2021, project proponent / SPCB or UTPCC shall follow the following process:

1.The project proponent shall inform the SPCB or UTPCC, as the case may be, in specified format along with:

(i) 'no increase in pollution load' certificate from the Environmental Auditor or reputed institutions empanelled by the SPCB or UTPCC or CPCB or Ministry;
(ii) last Consent to Operate certificate for the project or activity; and
(iii) online system generated acknowledgement of uploading of intimation and 'no increase in pollution load' certificate on PARIVESH Portal;

2.Based on the submission of above information, the project proponent may carry on the proposed activity as per the submitted details. However, if on verification the SPCB or UTPCC, as the case may be, holds that the change in configuration of plant or activity from environmental conditions will result or has resulted in change of production capacity and / or increase in pollution load, the exemption claimed under this clause shall not be valid and it shall be deemed that the project proponent was liable to obtain Prior Environmental Clearance before under taking such changes or increase, as per the clause (a) of sub-paragraph (ii) of paragraph 7 of EIA Notification, 2006 and the provisions of Environment (Protection) Act, 1986 shall apply accordingly.

Encl: Attached the Information provided by the project proponent.

Common Application Form

Project Details

1. Details of Project

1.1. Name of the Project	NIPL for Coal to Poly - vinyl Chloride (PVC) near village Vandh & Tunda, Taluka: Mundra, District Kuchchh, Gujarat
1.2. Project Proposal For	Expansion
1.3. Whether proposal expansion is made under 7 (ii) (a)?	NO
1.4. Project ID (Single Window Number)	SW/265935/2025
1.5. Description of Project	Application for No Increase in Pollution Load under Para 7(ii) (c) for change in configuration of an integrated Coal to Poly Vinyl Chloride (PVC) complex comprising of semi Coke Unit (2030 KTPA), cement Plant (6.0 MTPA), Clinker(4 MTPA), Calcium Carbide (2900 KTPA), VCM (2002 KTPA), PVC (2000 KTPA), Ethylene Glycol (400 KTPA), Acetylene (860 KTPA) & Caustic Soda (1310 KTPA).

2. Details of the Company/Organization/User Agency making application

2.1. Legal Status of the Company/Organization/User Agency	Company
2.2. Name of the Company/ Organization/User agency	MUNDRA PETROCHEM LIMITED

Registered address

2.3. Address	Adani Corporate House, Shantigram, Near VaishnoDevi Circle, SG Highway, Khodiyar, Ahmedabad, Gujarat, India 382421
2.4. State	GUJARAT
2.5. District	AHMADABAD
2.6. Pin Code	382421
2.7. E-mail address	vishnu.patidar@adani.com
2.8. Mobile number	xxxxxx6033

3. Details of the person making application

3.1. Name	Mayukh Sinha
3.2. Designation	Director

Correspondence address

3.3. Address	Adani Corporate House, Shantigram, Near VaishnoDevi Circle, SG Highway, Khodiyar, Ahmedabad, Gujarat, India 382421
3.4. State	GUJARAT
3.5. District	AHMADABAD

3.6. Pin Code	382421
3.7. E-mail address	vishnu.patidar@adani.com
3.8. Mobile number	xxxxxx3051

Project Location

1. Location of the Project or Activity

1.1. Upload KML	03. kml adani mpl site.kml
1.2. Whether the project/activity falling in the state/UT sharing international borders	NO
1.3. Shape of the Project	Non - Linear

Location Details

Toposheet No	State/UT	District	Sub District	Village	Plot/Survey/Khasra No.
F42J5	GUJARAT	Kachchh	Mandvi	NA	
F42J5	GUJARAT	Kachchh	Mundra	NA	
F42J9	GUJARAT	Kachchh	Mandvi	NA	
F42J9	GUJARAT	Kachchh	Mundra	NA	

Remarks
F42J5, F42J9 & F42J10

2. Land Requirement (in Ha) of the project or activity

Nature of Land involved in (Ha)	Area Existing in Ha [X]	Additional Area Proposed in Ha [Y]	Total Area required after expansion in Ha [X+Y]
Non-Forest Land [A]	323.69	0	323.69
Forest Land [B]	0	0	0
Total [A+B]	323.69	0	323.69

Project Activity Cost

1. Project/Activity Cost

1.1. Cost of the Existing Project at current price level (in Lakhs) [A]	3490000
1.2. Cost of the proposed expansion/ modernization of Project at current price level (in Lakhs) [B]	0
1.3. Total Cost of the project/ Activity (in lakhs) [A+B]	3490000

2. Employment likely to be generated

2.1. During construction phase

Permanent employment
Temporary employment

2.1.1. No. of permanent employment (No.s) [A]	5000
2.1.2. Period of employment (No. of days) [B]	365
2.1.3. No. of man-days [X]=[A]*[B]	1825000
2.1.4. Temporary / Contractual employment (No. of Man days) [Y]	2555000
2.1.5. Total [X] +[Y]	4380000

2.2. During operational phase

Permanent employment

	Existing	Proposed	Total
2.2.1. No. of permanent employment (No.s) [A]	3600	0	3600
2.2.2. Period of employment (No. of days) [B]	365	0	365
2.2.3. No. of man-days [X]=[A]*[B]	1314000	0	1314000

Temporary employment

2.2.4. Temporary / Contractual employment (No. of Man days) [Y]	2920000	0	2920000
2.2.5. Total [X] +[Y]	4234000	0	4234000

Others

1. Whether Rehabilitation and Resettlement (R&R) involved?	NO
2. Whether project area involves shifting of watercourse/road/rail/Transmission line/water pipeline, etc. required?	NO
3. Whether any alternative site(s) examined or part thereof for the non-site-specific component?	Not applicable as the project or activity is site specific
4. Whether there is any Government Order or Policy/ Court order relevant or restricting to the site?	NO

5. Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up?	YES

Court Name	Bench	Case Category	Status	Description of Court	Next Hearing Date	Order Copy
High Court	Gujarat High Court	WP (Civil)	Pending	This PIL NO. 36/2022 was filed by the petitioner (the Kheti Vikas Seva Trust) against Union of India (along with 6 respondents where AEL is one of the party) in Hon'ble Gujarat High Court with a prayer to stay the public hearing for the interlinked project of M/s Adani Enterprises Ltd. (transferred to Mundra Petrochem Ltd) scheduled for 30th April 2022. In the first hearing on the matter held on 26th April 2022, the Hon'ble court waived notice against AEL and did not order any stay to conduct the public hearing on the scheduled date. The public hearing was successfully completed by the Gujarat Pollution Control Board (GPCB) on 30th April 2022 with respect to all the provisions of EIA Notification and applicable office memorandums of MoEF&CC. Subsequently, the project was appraised by MoEF&CC and accorded Environmental Clearance (EC) for the above referred PVC project (interlinked project). The PIL matter was last posted for hearing on 7th February 2023. Presently the matter is still pending for hearing. Moreover, all processes related to EIA studies & public hearing for grant of Environment clearance complied with all the provisions of EIA Notification and applicable office memorandums of MoEF&CC.	21/11/2025	N/A

6. Whether the proposal involves violation of Act/Rule/Regulation/Notification of Central/State Government?	NO

Annexure - X

adani

O/C

Ref: AEL/MPL/ENV/EC/2022 -September/01 Date: 02/09/2022

To,
Ms. Praveena D.K. (IAS),
Collector & DM,
Collector Office, Jilla Seva Sadan,
Bhuj – Kachchh, 370 001

Subject: Environment Clearance (EC) for proposed Project "**VCM-2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat** by M/s Adani Enterprises Ltd.

Reference: EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022

Respected Ma'am,

With reference to above subject, this is to inform that Ministry of Environment, Forest and Climate Change has granted Environment Clearance for our project "**Industry-II activity i.e. VCM-2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA** (as a part of Proposed Coal to Poly-Vinyl Chloride (PVC) Project of AEL in land notified as Industrial area of APSEZ, Ta-Mundra, Dist-Kachchh, Gujarat, comprising of IND-I projects i.e. Semi Coke-2030 KTPA, Cement-6 MTPA; Clinker-4 MTPA, IND-II projects i.e. VCM- 2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA and IND-III projects i.e. Acetylene-860 KTPA & Caustic Soda-1310 KTPA) and Calcium Carbide-2900 KTPA (Not Specified in EIA Notification)) by M/s Adani Enterprises Ltd." vide EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022.

As required under general condition No. **B - (vi)** of EC, we are submitting herewith copy of Environment Clearance for the said project for your reference, please.

Thanking You.

Yours Faithfully,

Authorized Signatory for Adani Enterprises Ltd.

Praveen Anant (Environment - Head)

Encl: As Above

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

Registered Office: "Adani Corporate House", Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421

adani

Copy to:

1). **The District Development Officer,**
Jilla Pachayat, Opposite Surmandir Multiplex,
Bhuj – Kachchh, 370 001

2). **The Taluka Development Officer,**
Taluka Panchayat, Mundra
Ta: Mundra Dist: Kachchh, 370 421

3). **The General Manager,**
District Industries Center, Near New Green Hospital, Bhuj – Kachchh, 370 001

4). **The Regional Officer,**
Gujarat Pollution Control Board (Kachchh East),
Room no.215,216 & 217, 2nd Floor, Administration Office Building, Deendayal Port Trust,
Sector – 08, Gandhidham – Kachchh, 370 201

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

Registered Office: "Adani Corporate House", Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421

adani

Ref: AEL/MPL/ENV/EC/2022 –September/03

Date: 02/09/2022

To,
The Sarpanch, Shri / Talati Cum Mantri, Shri
Gram Panchayat,
Village: _____
Ta: _____, Dist: Kachchh (List Attached)

Subject: Environment Clearance (EC) for proposed Project "**VCM-2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat** by M/s Adani Enterprises Ltd.

Reference: EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022

Respected Sir / Ma'am,

With reference to above subject, this is to inform that Ministry of Environment, Forest and Climate Change has granted Environment Clearance for our project "**Industry-II activity i.e. VCM-2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA** (as a part of Proposed Coal to Poly-Vinyl Chloride (PVC) Project of AEL in land notified as Industrial area of APSEZ, Ta.-Mundra, Dist-Kachchh, Gujarat, comprising of IND-I projects i.e. Semi Coke-2030 KTPA, Cement-6 MTPA; Clinker-4 MTPA, IND-II projects i.e. VCM- 2002 KTPA, PVC-2000 KTPA, Ethylene Glycol- 400 KTPA and IND-III projects i.e. Acetylene-860 KTPA & Caustic Soda-1310 KTPA) and Calcium Carbide-2900 KTPA (Not Specified in EIA Notification)) by M/s Adani Enterprises Ltd." vide EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022.

As required under general condition No. **B - (vi)** of EC, we are submitting herewith copy of Environment Clearance for the said project for your reference, please.

Thanking You.
Yours Faithfully,

Authorized Signatory for Adani Enterprises Ltd.

Praveen Anant (Environment - Head)

Encl: As Above
Copy to:

1). **The Taluka Development Officer,**
Taluka Panchayat, Mundra
Ta: Mundra Dist: Kachchh, 370 421

2).
Gujarat Pollution Control Board (Kachchh East),
Room no.215,216 & 217, 2nd Floor, Administration
Office Building, Deendayal Port Trust,
Sector – 08, Gandhidham – Kachchh, 370 201

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

Ref: AEL/MPL/ENV/EC/2022 –September/06/01 Date: 02/09/2022

To,
Shri Naran Gadhavi,
President - Kheti Vikas Seva Trust,
Village: Zarpara, Taluka: Mundra,
Dist-Kutch- 370 405

Subject: Environment Clearance (EC) (for Industrial activities pertain to Industry – 2 & 3) of proposed Project "**Coal to Poly-Vinyl Chloride (PVC) Project in land notified as Industrial area of APSEZ near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Adani Enterprises Ltd"**. – reg.

Reference: 1. EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022
2. EC Identification No. - EC22A013GJ127411, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022

Respected Sir,

With reference to above subject, this is to inform that Ministry of Environment, Forest and Climate Change has granted Environmental Clearance for following Industrial activities pertain to Industry – 2 & 3 of proposed Project "**Coal to Poly-Vinyl Chloride (PVC) Project in land notified as Industrial area of APSEZ near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Adani Enterprises Ltd"**.

Sr. no.	Type of Activities	Name of Activities	Details of Environmental Clearance	Enclosed as
1	Industry – 2	VCM– 2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA	EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022	Annexure – I
2	Industry – 3	Acetylene–860 KTPA & Caustic Soda–1310 KTPA)	EC Identification No. - EC22A013GJ127411, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022	Annexure – II

Accordingly, in compliance of general condition no. B(VI) & B(VII) of above refer letter sr. no. 1 & 2 respectively, we are enclosing herewith copies of Environmental Clearances for your reference, please.

Thanking You.
Yours Faithfully,

Authorized Signatory for Adani Enterprises Ltd.

Praveen Anant (Environment - Head)

Encl: As Above

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

Annexure - XI

Vinay Kumar Singh

From: Vinay Kumar Singh
Sent: Monday, May 12, 2025 4:30 PM
To: uh-gpcb-kute@gujarat.gov.in
Cc: ms-gpcb; ro-gpcb-kute@gujarat.gov.in; IRO Gandhinagar
Subject: Environment Statement (Form – V) for the FY 2024-25 for the Project "Poly-vinyl Chloride (PVC)" near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Mundra Petrochem Limited – Reg.
Attachments: 02. Form V PVC Project 2024-25.pdf

Ref: MPL/ENV/GPCB – Form – V/2025 –May/02 **Date:12/05/2025**

To, **PCB ID:86184**

The Unit Head, (Kutch District)
Gujarat Pollution Control Board,
Paryavaran Bhavan, Sector-10A,
Gandhinagar – 382 010
E-mail : uh-gpcb-kute@gujarat.gov.in

Subject: Environment Statement (Form – V) for the FY 2024-25 for the Project "Poly-vinyl Chloride (PVC)" near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Mundra Petrochem Limited – Reg.

Reference : 1) CTE no. 59301 granted by GPCB vide letter no. GPCB/ (PCB ID: 86184)/ 16246 dated 13/12/2022.
2) Amended CTE letter no. PC/CCA-KUTCH-2104/GPCB ID 86184/738939 Dated 12/04/2023.
3) MPL/ENV/GPCB – Form – V/2024 – May/02 Dated 18/05/2024.

Respected Sir,

With reference to the Consent to Establish issued by GPCB vide above refer letter dated 13/12/2022, amended vide letter dated 12/04/2023 for the project "Poly-vinyl Chloride (PVC)" near Village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat by M/s Mundra Petrochem Limited.

The PVC project is currently in the final design, detailed engineering, and procurement stages, with construction activities also underway at the site. Enclosed is the soft copy of the Environment Statement (Form – V) for the fiscal year 2024–25 for your reference and records.

We hope you will find the above in order.

Thanking you,

Vinay Kumar Singh
CSO & BU Environment Head

Encl: As Above

Copy to : 1. Member Secretory, GPCB : ms-gpcb@gujarat.gov.in
2. Regional Office, GPCB (Kutch East): ro-gpcb-kute@gujarat.gov.in
3. Integrated Regional Office, MoEF&CC, Gandhinagar: iro.gandhingr-mefcc@gov.in

O/C

Annexure - XII

adani

Ref: AEL/MPL/ENV/EC/2022 – September/05 Date: 06/09/2022

To,
Shri Shrawan Kumar Verma, IFS (Addl. Charge)
Deputy Director General of Forests (C)
Integrated Regional Office, Gandhinagar,
Ministry of Environment, Forest and Climate Change,
A-Wing–407 & 409, Aranya Bhawan, Near CH-3 Circle,
Sector-10A, Gandhinagar – 382010

एकीकृत क्षेत्रीय कार्यालय, गाँधीनगर
Integrated Regional Office, Gandhinagar
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
Ministry of Environment, Forest & Climate Change.
Govt. of India / भारत सरकार
कक्ष क्र. 407 व 409 ए विंग अरण्य भवन
Room No.407 & 409, A wing Aranya Bhavan
गाँधीनगर (गुजरात) / Gandhinagar(Gujarat)
09/09/22

Subject: Environment Clearance (EC) for proposed Project **"VCM–2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA near village Vandh & Tunda, Taluka Mundra, District Kachchh, Gujarat** by M/s Adani Enterprises Ltd.

Reference: EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA II(I) dated 31/08/202

Respected Sir,

With reference to above subject, this is to inform that Ministry of Environment Forest and Climate Change has granted Environment Clearance for our project "Industry-II activity i.e. VCM–2002 KTPA, PVC–2000 KTPA, Ethylene Glycol– 400 KTPA (as a part of Proposed Coal to Poly-Vinyl Chloride (PVC) Project of AEL in land notified as Industrial area of APSEZ, Ta-Mundra, Dist-Kachchh, Gujarat, comprising of IND-I projects i.e. Semi Coke– 2030 KTPA, Cement–6 MTPA; Clinker–4 MTPA, IND-II projects i.e. VCM– 2002 KTPA, PVC– 2000 KTPA, Ethylene Glycol– 400 KTPA and IND-III projects i.e. Acetylene–860 KTPA & Caustic Soda–1310 KTPA) and Calcium Carbide–2900 KTPA (Not Specified in EIA Notification)) by M/s Adani Enterprises Ltd." vide EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022. Copy enclosed as **Annexure – A**.

Accordingly, in compliance of EC condition No. B(ix), we are submitting herewith copies of following News papers (**Annexure – B**) stating "*the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB (GPCB) and may also be seen at Website of the Ministry at https://parivesh.nic.in/* as well as on Company website at https://adanienterprises.com/-/media/e1f0a2365908404bbf62e8c4d4b83969.ashx" for your reference, please.

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

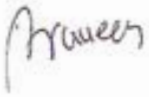
Registered Office: "Adani Corporate House", Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421

adani

Sr. no.	Name of News Paper	Language	Date of Publication
1	Kutch Mitra	Gujarati	05/09/2022
2	Gujarat Samachar	Gujarati	05/09/2022
3	The Times of India	English	05/09/2022

Thanking You.
Yours Faithfully,

Authorized Signatory for Adani Enterprises Ltd,



Praveen Anant (Environment - Head)

Encl: As Above

Copy to:

1). **The Member Secretory,**
Gujarat Pollution Control Board,
Paryavaran Bhavan,
Sector – 10 A,
Gandhinagar 382 010

2). **The Regional Officer,**
Gujarat Pollution Control Board
(Kuchchh East),
Room no.215,216 & 217, Second floor,
Administration Office Building,
Gandhidham – Kuchchh, 370 201

Adani Enterprises Ltd
"Adani Corporate House",
Shantigram, Near Vaishno Devi Circle,
S. G. Highway, Khodiyar
Ahmedabad 382 421
Gujarat, India
CIN: L51100GJ1993PLC019067

Tel. + 91 79 2656 5555
Fax + 91 79 2555 5500
info@adani.com
www.adani.com

Registered Office: "Adani Corporate House", Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad - 382421

અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ

શાંતિગ્રામ, એસ. જી. હાઈવે, અમદાવાદ - ૩૮૨૪૨૧. (ગુજરાત)

જાહેર નોટિસ

મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ, APSEZ ઔદ્યોગિક જમીન, વાંઢ & ટૂંડા ગામ નજીક, તા: મુન્દ્રા, જી: કચ્છ, ગુજરાત ખાતે પ્રસ્તાવિત **"ઇન્ડસ્ટ્રી - ૨ એકટીવીટી જેવીકે વી.સી.એમ - ૨૦૦૨ કે.ટી.પી.એ., પી.વી.સી. - ૨૦૦૦ કે.ટી.પી.એ., ઇથીલીન ગ્લાયકોલ - ૪૦૦ કે.ટી.પી.એ.** (જે સૂચિત કોલ ટુ પોલી-વિનાયલ (પી.વી.સી.) પ્રોજેક્ટ ના ભાગ રૂપે મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ દ્વારા પ્રસ્તાવિત, APSEZ ઔદ્યોગિક જમીન, વાંઢ & ટૂંડા ગામ નજીક, તા: મુન્દ્રા, જી: કચ્છ, ગુજરાત, જેમાં ઇન્ડસ્ટ્રી - ૧ પ્રોજેક્ટ - સેમી કોક - ૨૦૩૦ કે.ટી.પી.એ.; સિમેન્ટ - ૬ એમ.ટી.પી.એમ; ક્લિનકર - ૪ એમ.ટી.પી.એમ; ઇન્ડસ્ટ્રી - ૨ પ્રોજેક્ટ - વી.સી.એમ - ૨૦૦૨ કે.ટી.પી.એ., પી.વી.સી. - ૨૦૦૦ કે.ટી.પી.એ., ઇથીલીન ગ્લાયકોલ - ૪૦૦ કે.ટી.પી.એ, અને ઇન્ડસ્ટ્રી - 3 પ્રોજેક્ટ - એસિટિલિન - ૮૬૦ કે.ટી.પી.એ. અને કોસ્ટિક સોડા - ૧૩૧૦ કે.ટી.પી.એ અને કેલ્શિયમ કાર્બાઇડ - ૨૯૦૦ કે.ટી.પી.એ. (EIA નોટિફિકેશન માં દર્શાવેલ નથી) ના ભાગ રૂપે સમાવેશ થાય છે.)" માટે ની પર્યાવરણીય મંજૂરી મિનિસ્ટ્રી ઓફ એન્વિરોમેન્ટ, ફોરેસ્ટ અને ક્લાઇમેટ ચેન્જ, નવી દિલ્લી ના પત્ર ક્રમાંક : **EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022** ના રોજ પ્રાપ્ત થયેલ છે. સદરહુ માન્યતા અંગેનો પત્ર ગુજરાત પ્રદુષણ નિયંત્રણ બોર્ડ ની ઓફિસ માં તેમજ મિનિસ્ટ્રી ઓફ એન્વિરોમેન્ટ, ફોરેસ્ટ અને ક્લાઇમેટ ચેન્જ ની વેબ સાઈટ https://parivesh.nic.in પરથી પણ જોઈ શકાશે. તદ્ ઉપરાંત એન્વિરોન્મેન્ટ ક્લીયરન્સ ની કોપી કંપનનીની વેબસાઈટ https://www.adanienterprises.com/-/media/e1f0a2365908404bbf62e8c4d4b83969.ashx પર પણ જોઈ શકાશે.

sd-

પ્રોદ્યુત માજી (પ્રોજેક્ટ.હેડ)

મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ

News Paper: Gujarat Samachar, Page no:9, Date:05/09/2022,
Language: Gujarati

અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ

શાંતિગ્રામ, એસ. જી. હાઇવે, અમદાવાદ - ૩૮૨૪૨૧. (ગુજરાત)

જાહેર નોટિસ

મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ, APSEZ ઔદ્યોગિક જમીન, વાંઢ & ટૂંડા ગામ નજીક, તા: મુન્દ્રા, જી: કચ્છ, ગુજરાત ખાતે પ્રસ્તાવિત **"ઇન્ડસ્ટ્રી - ૨ એક્ટીવીટી જેવીકે વી.સી.એમ - ૨૦૦૨ કે.ટી.પી.એ., પી.વી.સી. - ૨૦૦૦ કે.ટી.પી.એ., ઇથીલીન ગ્લાયકોલ - ૪૦૦ કે.ટી.પી.એ.** (જે સૂચિત કોલ ટુ પોલી-વિનાયલ (પી.વી.સી.) પ્રોજેક્ટ ના ભાગ રૂપે મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ દ્વારા પ્રસ્તાવિત, APSEZ ઔદ્યોગિક જમીન, વાંઢ & ટૂંડા ગામ નજીક, તા: મુન્દ્રા, જી: કચ્છ, ગુજરાત, જેમાં ઇન્ડસ્ટ્રી - ૧ પ્રોજેક્ટ - સેમી કોક - ૨૦૩૦ કે.ટી.પી.એ.; સિમેન્ટ - ૬ એમ.ટી.પી.એમ; ક્લિનકર - ૪ એમ.ટી.પી.એમ; ઇન્ડસ્ટ્રી - ૨ પ્રોજેક્ટ - વી.સી.એમ - ૨૦૦૨ કે.ટી.પી.એ., પી.વી.સી. - ૨૦૦૦ કે.ટી.પી.એ., ઇથીલીન ગ્લાયકોલ - ૪૦૦ કે.ટી.પી.એ, અને ઇન્ડસ્ટ્રી - ૩ પ્રોજેક્ટ - એસિટિલિન - ૮૬૦ કે.ટી.પી.એ. અને કોસ્ટિક સોડા - ૧૩૧૦ કે.ટી.પી.એ અને કેલ્શિયમ કાર્બાઇડ - ૨૯૦૦ કે.ટી.પી.એ. (EIA નોટિફિકેશન માં દર્શાવેલ નથી) ના ભાગ રૂપે સમાવેશ થાય છે.)" માટે ની પર્યાવરણીય મંજૂરી મિનિસ્ટ્રી ઓફ એન્વિરોમેન્ટ, ફોરેસ્ટ અને ક્લાઇમેટ ચેન્જ, નવી દિલ્લી ના પત્ર ક્રમાંક : **EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022** ના રોજ પ્રાપ્ત થયેલ છે. સદરહુ માન્યતા અંગેનો પત્ર ગુજરાત પ્રદુષણ નિયંત્રણ બોર્ડ ની ઓફિસ માં તેમજ મિનિસ્ટ્રી ઓફ એન્વિરોમેન્ટ, ફોરેસ્ટ અને ક્લાઇમેટ ચેન્જ ની વેબ સાઇટ https://parivesh.nic.in પરથી પણ જોઈ શકાશે. તદ્ ઉપરાંત એન્વિરોન્મેન્ટ ક્લીયરન્સ ની કોપી કંપનીની વેબસાઇટ https://www.adanienterprises.com/-/media/e1f0a2365908404bbf62e8c4d4b83969.ashx પર પણ જોઈ શકાશે.

sd-
પ્રદ્યુત માજી (પ્રોજેક્ટ હેડ)
મે. અદાણી એન્ટરપ્રાઇઝીસ લિમિટેડ

News Paper: Kutchmitra, Page no:5, Date:05/09/2022,
Language: Gujarati

Adani Enterprises Limited

Shantigram, S.G. Highway, Ahmedabad-382421, (Gujarat)

PUBLIC NOTICE

M/s Adani Enterprises Limited, APSEZ Industrial Land, Near Village Vandh & Tunda, Taluka Mundra, District - Kachchh, Gujarat has been accorded Environmental Clearance (EC) for project **"Industry - II activity i.e. VCM - 2002 KTPA, PVC - 2000 KTPA, Ethylene Glycol - 400 KTPA** (as a part of Proposed Coal to Poly-Vinyl Chloride (PVC) Project of AEL in land notified as Industrial area of APSEZ, Ta. - Mundra, Dist - Kachchh, Gujarat, comprising of IND - I projects i.e. Semi Coke–2030 KTPA, Cement - 6 MTPA; Clinker - 4 MTPA, IND-II projects i.e. VCM - 2002 KTPA, PVC - 2000 KTPA, Ethylene Glycol - 400 KTPA and IND - III projects i.e. Acetylene - 860 KTPA & Caustic Soda - 1310 KTPA and Calcium Carbide - 2900 KTPA (Not Specified in EIA Notification)) by M/s Adani Enterprises Ltd." by Ministry of Environment, Forest and Climate Change, Government of India vide **EC Identification No. - EC22A020GJ133762, File No. - IA-J-11011/149/2021-IA-II(I) dated 31/08/2022.** The said clearance letter is available at website of the Ministry of Environment, Forest and Climate Change at https://parivesh.nic.in and also available at office of the Gujarat Pollution Control Board (GPCB). Copy of EC is also kept at website of the company at https://www.adanienterprises.com/-/media/e1f0a2365908404bbf62e8c4d4b83969.ashx

sd-
Pradyut Maji (Project Head)
M/s Adani Enterprises Limited

News Paper: The Times of India, Page no:11, Date:05/09/2022, Language: English