EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

The Executive Summary covers the following topics in brief:
1. Project Description
2. Description of Environment
3. Anticipated Environmental Impacts and Mitigation measures
4. Environmental Monitoring Program
5. Environment Management Plan
6. Additional studies
7. Project Benefits

1.1 PROJECT DESCRIPTION

GAIL (India) Limited is India's principal Gas Transmission and Marketing Company under the Ministry of Petroleum and Natural Gas, Government of India. GAIL is also in the business of Gas Processing, Petrochemicals, LPG, Transmission and Telecommunications. The company has also extended its presence in Power, Liquefied Natural Gas regasification, City Gas Distribution and Exploration & Production through equity and joint ventures participations.

GAIL has six LPG recovery plants across various states in India. LPG recovery Plant at Usar was commissioned in 1998 with design capacity to process 5.0 MMSCMD of rich gas. Presently, LPG Usar plant is under shutdown and is in preservation mode due to non availability of rich gas.

GAIL is planning to utilize the land and other facilities existing at Usar and set up GAIL Petrochemical Complex Project' Usar "wherein a 500 KTPA Propane Dehydrogenation unit integrated with Polypropylene unit is proposed to be set up.

The proposed facilities will be set-up along with the existing facilities at USAR. The proposed project shall benefit from the land in possession of GAIL as well as coastal location of the existing facility for both Propane Import and product evacuation, nearby port facility, proximity to highways and ease of getting environmental clearance.

As per the Ministry of Environment, Forests and Climate Change (MoEFCC), New Delhi, any new project or modernization or expansion project need to have an Environmental Clearance from MoEFCC. In accordance with this, GAIL decided to conduct Environmental Impact Assessment (EIA) study. Based on the TOR, three months non-monsoon baseline data of January, 2018-March, 2018 was collected and analyzed.

M/s GAIL has entrusted M/s Engineers India Limited (EIL) to carry out environment impact assessment study and preparation of environmental management plan for various environmental components of the proposed project. EIL is an accredited consultant for carrying out EIA studies by Quality Council of India (QCI-NABET) for Petro-chemical complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics) [Sl. no. 5(c), Category A as per 2006 EIA Notification].

The proposed project of is expected to be mechanically completed in 48 months.The total estimated cost of PDH & PP Complex is around Rs.7426.22 Crores.

1.2 Existing Environmental Status

The description of the existing environmental status of the study area is summarized here.

1.2.1 Air Environment

PM_{10}, $PM_{2.5}$, SO_2, NO_x, HC (Methane & Non Methane) CO, Benzene at six different locations during January, 2018 –March, 2018. A summary of the same is given in **Table 1.1.**

Table 1.1 Summary of Baseline data of AAQs

Particulates	Locations	Usar			NAAQS
		Min	Max	Avg.	
PM_{10}	*AAQ-1*	60	67	62.5	100
	AAQ-2	57	61	58.8	
	AAQ-3	57	62	59.0	
	AAQ-4	52	60	56.4	
	AAQ-5	64	73	67.8	
	AAQ-6	53	59	56.2	
$PM_{2.5}$	*AAQ-1*	26	31	28.2	60
	AAQ-2	27	30	27.6	
	AAQ-3	25	30	26.9	
	AAQ-4	24	29	26.7	
	AAQ-5	31	35	32.5	
	AAQ-6	23	28	25.5	
SO_2	*AAQ-1*	11.8	13.5	12.7	80
	AAQ-2	11.6	13.5	12.6	
	AAQ-3	12.1	14.1	13.2	
	AAQ-4	11.5	13.2	12.5	
	AAQ-5	13.5	15.7	14.7	
	AAQ-6	11.4	12.8	12.2	
NO_X	*AAQ-1*	14.2	15.7	15.0	80
	AAQ-2	13.5	15.5	14.6	
	AAQ-3	14.5	16.3	15.2	
	AAQ-4	13.1	14.9	14.2	
	AAQ-5	15.2	17.8	16.5	
	AAQ-6	13.2	14.6	14.1	
HC	*AAQ-1*	0.51	0.59	0.54	-
	AAQ-2	0.41	0.58	0.48	
	AAQ-3	0.26	0.48	0.39	
	AAQ-4	0.34	0.48	0.41	
	AAQ-5	0.68	0.79	0.72	
	AAQ-6	0.35	0.47	0.40	
NMHC	*AAQ-1*	BDL	0.04	0.02	-
	AAQ-2	BDL	0.03	0.01	
	AAQ-3	BDL	0.04	0.02	
	AAQ-4	BDL	0.06	0.02	
	AAQ-5	0.11	0.33	0.23	
	AAQ-6	0.01	0.05	0.03	

All parameters were found well within limits prescribed by NAAQS 2009 except for particulate matter due to geographical location.

1.2.2 Water Environment:

The Water quality results were obtained at 7 locations (03 Surface water & 04 Ground water) to assess pollution levels. The descriptions of sampling locations are discussed below:

Ramraj River (SW-1)

It is at a distance of 7.5km towards south-east direction from the GAIL plant. The surface water was steady and is used for domestic purposes by all nearby villages. No major industries or factories are located nearby this village.

UmteDharan Dam (SW-2)

This location is 8.2km away from the GAIL plant in South-east direction. No major industries or factories are located nearby this village. This surface water is used for domestic purposes by all nearby villages.

Dawale pond (SW-3)

This location is 3.8 km away from the GAIL plant in WNW direction. No major industries or factories are located nearby this village. This surface water is used for domestic purposes by all nearby villages.

Usar village (GW-1)

This location is 0.3km away from the GAIL plant in West direction. The water sample was collected at a distance of 0.06km from the plant towards West direction. The domestic water sample was collected at bore water.

Beloshi village (GW-2)

This location is 3.0km away from the GAIL plant in SE direction. The water sample collected from hand pump. The main source of water in this village is provided by bore well for drinking and domestic purpose.

Bherse village (GW-3)

This location is 1.3km away from the GAIL plant in NE direction. The water sample collected from bore well. The main source of water in this village is provided by bore well for domestic purpose.

Vave village (GW-4)

This location is 2.8km away from the GAIL plant in SE direction. The water sample collected from hand pump. The main source of water in this village is provided by bore well for drinking and domestic purpose.

Results and Discussions:

For assessing the quality of water around the 10 km radius of the proposed plant, 7 samples were collected from the nearby villages. These water samples were analysed as per prescribed methodologies and subsequently results were obtained. Out of 7 samples, three

(3) samples were collected from the surface water and the remaining four (4) samples were collected from ground water source of the nearby villages.

The results for 07 locations collected during the winter season are:

pH

pH is measure of hydrogen ion concentration of the water. The pH of water indicates weather the water is acid or alkaline. The measurement of pH ranges from 1 to 14 with a pH of 7 indicating a neutral solution, neither acid nor alkaline. Numbers lower than 7 indicate acidity, numbers higher than 7 indicates alkalinity. Drinking water with a pH of between 6.5 and 8.5 is generally considered satisfactory. Acid water tends to be corrosive to plumbing and faucets, particularly if the pH is below 6. Alkaline waters are less corrosive. Water with a pH of above 8.5 may tend to have a bitter or soda like taste. The pH of water may have an effect on the treatment of the water and also should be considered if the water is used for field application of pesticides. Water with a pH of 7 to 8.5 will require more chlorine for the destruction of pathogens than will water that is slightly acidic.

As per IS: 10500 and IS: 2296 standards, the pH value shall be between 7.42 and 7.71. The pH for all the surface water samples collected in the study area ranges from 7.30 to 8.2.

Temperature

Temperature values for all ground water locations were found in the range of 26 & 27^0C and for surface water locations were found to be as 26 & 27^0C.

Total Dissolved Solids (TDS)

High amounts of TDS are objectionable because of physiological effects, mineral tastes, or economic effects. TDS is the aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, and other salts of calcium, magnesium, sodium, potassium, and other substances. All salts in solution change the physical and chemical nature of water and exert osmotic pressure. As per IS: 10500 drinking water standards the maximum permissible limit is 2000 mg/L and for IS: 2296 surface water standards the limit is 1500 mg/L as per Class C type.

TDS values are ranging from 269 to 416 mg/L for all ground water samples. In case of surface water samples, the TDS was found to be 359 to 24765 mg/L respectively.

Dissolved Oxygen

Dissolved oxygen is important in natural water because many microorganisms and fish require it in aquatic system. Dissolved oxygen also establishes an aerobic environment in which oxidized forms of many constituents in water are predominant. Under anoxic conditions in water, reduced forms of chemical species are formed and frequently lead to the release of undesirable odours until desired conditions develop. As per IS: 2296 surface water standards the limit for Class C type is 4 mg/L.

The DO value for surface water samples was 2.7 to 3.7 mg/L respectively.

Biological Oxygen Demand (BOD)

BOD of water is an indirect measure of the amount of biologically degradable organic material present. It is thus indication of the amount of dissolved oxygen (DO) that will be depleted from water during the natural biological assimilation of organic pollutants. The discharge of wastes containing organic material imposes oxygen demand in the natural water and reduces the DO level. BOD values are expressed as the amount of oxygen consumed (mg/L) by organisms during 3 days period at 27^{o}C. As per IS: 2296 surface water standards the limit for class C type is 3 mg/L.

The BOD values were found to be in the range of 27 to 154 mg/L for all the surface water samples.

Chemical Oxygen Demand (COD)

Chemical Oxygen Demand (COD) also used to represent the organic matter in water and wastewater. COD value indicates the total amount of utilizable material present and includes BOD. The chemical oxygen demand (COD) test of natural water yields the oxygen equivalent of the organic matter that can be oxidized by strong chemical oxidizing agent in an acidic medium. Potassium permanganate is the oxidizing chemical. Silver sulfate is added as a catalyst and to minimize the interference of chloride on the COD test. Mercuric sulfate is also added to inhibit interferences of metals on the oxidation of organic compounds.

The COD values for all surface water samples were found to be 245 to 3601 mg/L respectively.

Heavy Metals

Heavy metals such as Lead (Pb), Iron (Fe), Copper (Cu), Zinc (Zn), and Manganese (Mn) are found below the detectable limits.

Toxic compounds

Water containing concentration of heavy metals (mercury, cadmium, copper, silver, chromium etc.) either individually or combination may be toxic to aquatic organisms and thus, have a severe impact on the water community. Other toxic substances include pesticides, ammonia-ammonium compounds, cyanides, sulfides, fluorides and petrochemical wastes. Severely toxic substances will eliminate algal growth, except the species that are able to tolerate the observed concentration of the toxicant. Chemicals released into the environment may affect surface water or ground water systems by direct discharge of wastes containing toxic compounds or from surface runoff which may come in contact with toxic material left as residue over the ground surface.

No Toxic compounds observed in all the 6 samples analyzed.

Sulphate (SO_4)

Sulphate concentration for all ground water samples were found to be in range of 6 to 125 mg/L, and are observed to be within the permissible limits of 400 mg/L for all locations. Beyond the permissible limit causes gastro intestinal irritation when magnesium and sodium are present.

For all surface water samples, Sulphate concentration was found to be 57 to 89 mg/L respectively.

Nitrate (NO_3)

The nitrate concentration was in the range of 1.2 to 4.3 mg/L for all ground water locations, and are observed to be within the desirable limits of 45 mg/L as per IS:10500. For all surface water locations, nitrate was found to be 4.2 to 12.4 mg/L respectively.

Total Phosphorous (P)

Phosphorous concentration was in the range of 0.01 to 0.03 mg/L for all ground water locations and for all surface water samples concentration was found to be 0.006 to 0.03 mg/L respectively.

Total Hardness as $CaCO_3$

Total hardness were found to be in the range of 110 to 195 mg/L for all ground water locations and are observed within the permissible limit of 600 mg/L for all locations. For all surface water locations, TH was found to be 125 to 5640 mg/L respectively.

Total Alkalinity as $CaCO_3$

Total Alkalinity were found to be in the range of 41 to 181 mg/L for all ground water locations which were observed to be within the desirable limit of 200 mg/L as per IS:10500. For all surface water locations, total alkalinity was found to be 62 to 119 mg/L respectively.

Chlorides (Cl)

Chlorides concentration were found in the range of 21 to 107 mg/L for all ground water locations and are observed within the permissible limit of 1000 mg/L as per IS: 10500. For all surface water locations, chloride concentration was found to be 90 to 13374 mg/L respectively.

Total Suspended Solids (TSS)

TSS concentration was found to be in the range of 4 mg/L for all ground water locations and for all surface water locations, the TSS was found to be 12 to 14 mg/L respectively.

Sodium (Na)

Sodium concentrations were found to be in the range of 10 to 95 mg/L for all ground water locations and for all surface water locations, the sodium concentrations were found to be 70 to 6164 mg/L respectively.

Potassium (K)

Potassium concentrations were found to be in the range of 1.0 to 2.0 mg/L for all ground water locations and for all surface water locations, the concentration was found to be 2.0 to 8.0 mg/L respectively.

1.2.3 Noise Environment:

Noise levels were monitored at 4 different locations within the study area. The day time equivalent noise level ranges from 51.5dB(A) to52.1 dB(A) and the night time equivalent noise levels ranges from 40.4 dB(A) to42.6dB(A). However, these levels are found to be well within the permissible industrial limits (75 dB (A)).

1.2.4 Soil Environment:

Soil samples were collected from 4locations within the study area out of which one location falls within the proposed site area. Soil in study area is based on particle sizes of the samples collected from the site; they are mostly falling in loam, sandy loam and Clay loam category. Sand percent was varying from 31 to 46.5%, Silt percent was in the range of 28.5 to 33.5% and Clay was varying in range of 24 to 38.5%.

The concentration of OM in soils generally ranges from 0.07% to 0.29% of the total topsoil mass for most upland soils. Soils whose upper horizons consist of less than 0.51% organic matter are mostly limited to desert areas, while the OM content of soils in low-lying, wet areas can be as high as 90%.

1.2.5 Biological Environment:

The study area is located in AlibagTaluka of District Raigad, Maharashtra. Substantial areas under Alibag Forest Division and Roha Sub Division fall in the study area. The topography of the area within 10 km radius of the proposed project site is mostly hilly, rugged and in some places highly precipitous with general slope towards west. The chief hill range in the study area is the Western Ghats running north-south and occupying a major proportion of the area. This range forms the eastern boundary for the Kolaba Forest Division and the proposed project site at Usar. Another rugged belt of hills run along west. In between these two hill ranges, there is an intricate network of numerous and irregular minor hill ranges with spurs and shoot stretches of the Western Ghats in the east. The elevation of these hills range between 40 and 400 m above MSL. All the hill ranges are extensively cut by numerous rivulets and rivers forming many irregular ravines and valleys

For recording the detailed information on the ecological/biological parameters within the study area, the area within the 10 km radial distance was further categorised into the following three zones.

Core zone:

This included the area between the project site and the radial distance of 2.5 km. The core zone represents the hub of the major activities and is therefore likely to receive the maximum impacts of the project related activities. Most of the changes in the landscape are also expected to occur in this zone.

Middle zone:

This included the area beyond 2.5 km but well within 5 km of the radial distance from project site. This zone is likely to receive perturbations of secondary nature.

Outer zone:

This included the area beyond 5 km but well within 10 km of the radial distance from the project site. This zone represents the area outside the impacts of project related disturbance.

The objective of inclusion of this area in the study has been to ascertain the spatial limits of project related impacts.

Selected areas within each of these zones were intensively surveyed to evaluate the existing status of terrestrial wildlife habitats in different patches of Reserved and Protected Forests and the aquatic habitats comprising of maritime zones, coasts, mangroves, creeks, rivers, reservoirs, ponds and lake.

The parameters that were considered for the evaluation of the status of wildlife habitats in terrestrial habitats and wildlife species include: habitat and sub habitat types, structure and quality of habitat types, habitat size, floral and faunal species richness and rarity.

The forest areas of Vave, Ambepur, Bapale, Chinchoti, Bagmala and Chaul fall in the middle zone. These areas have been mainly used by the Forest Department to raise plantations. The two dominant tree species that are raised in these plantations are *Acacia auriculiformis* and *Tectonagrandis*. The overall ground cover in all these areas is in highly degraded form. The PF and RF areas of Belkade of the outer zone were generally in degraded form as a result of high biotic disturbances.

At present, the State Forest Department has planted *Acacia auriculiformis* in this area. Other naturally occurring species were *Mangiferaindica*, *Phoenix sylvestris* and *Tectonagrandis*. The shrub layer comprised mainly of *Lantana camera* and *Carissa congesta*. The overall ground cover was fairly low. The PFs near Dhavar and Umte villages also located in the outer zone are fairly well stocked and relatively free from biotic pressures. These are generally confined to hillocks. *Acacia auriculiformis* was the major species. The RF comprised of thickets of *Lantana camera* and *Carissa congesta*.

1.2.6 Socio-economic conditions:

The socio-economic aspects of the study area are assessed using Primary and Secondary data. Secondary data was also collected from published sources like, census data of 2011. A person aged 7 years and above who can both read and write with understanding any language has been taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. The number and the percentage of literates within the study area is 76.66 %and 48472for the total study area among the total population of 63226.Total nos. of workers is 29276. Population breakup within 10 km radius of the plant as per 2011 census is 31868 male and 31358 female which makes up a Total population about 63226 respectively, with 02.28 % of SC and 15.03 % of ST Population.

1.3 ANTICIPATED ENVIRONMENTAL IMPACTS

The environmental impacts associated with the proposed project during construction and operational phases of the project on various environmental components have been identified and are given in **Table 1.2**.

Table 1.2: Impact Identification Matrix

Activities	Physical				Biological		Socio-economic	
	Ambient air quality	Ground / surface water (quantity / quality)	Ambient noise	Land (land use, topography & drainage, soil)	Flora	Fauna	Livelihood & occupation	Infrastructure
CONSTRUCTION PHASE								
Site preparation	*		*	*	*	*	*	
Civil works	*		*			*		
Heavy equipment operations			*					
Disposal of construction wastes				*				
Generation/disposal of sewerage		*		*				
Transportation of materials	*		*					
OPERATION PHASE								
Commissioning of Process units, utilities and offsite	*	*	*					
Product handling and storage	*							
Emissions &Waste management – Air, liquid and solid waste	*	*		*				

Impacts have been assessed considering spatial, temporal, intensity and vulnerability scales and its overall significance value is given in **Table 1.3**.

Table 1.3: Impact Assessment Summary

Environmental component		Construction	Operation
Air		Low	Low
Water	Consumption of Raw Water	Low	Medium
	Generation of Effluent	Low	Low
Land	Land use & Topography	Low	-
	Soil Quality	Low	Low
Noise		Low	Low
Biological		Low	Low
Socio-Economic		Low	Low

1.4 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

1.4.1 AIR ENVIRONMENT

Construction Phase

Impacts (Significance - Low)

- Dust will be generated from earth-moving, grading and civil works, and movement of vehicles on unpaved roads.
- PM, CO, NOx, & SO_2 will be generated from operation of diesel sets and diesel engines of machineries and vehicles.

Mitigation Measures

- Ensuring preventive maintenance of vehicles and equipment.
- Ensuring vehicles with valid Pollution under Control certificates are used.
- Implementing dust control activities such as water sprinkling on unpaved sites.
- Controlling vehicle speed on site

Operation Phase

Impacts (Significance - Low)

The resultant SO_2 with ambient air quality concentration is estimated as 18.45μg/m^3 which is well within the standard limits for 24 hourly average for industrial area i.e. 80 μg/m^3.

The resultant NOx ambient air quality concentration is estimated as 19.91μg/m3 which is less than which is well within the standard limits for 24 hourly average for industrial area i.e. 80 μg/m^3.

Mitigation measures

- Ensuring preventive maintenance of equipment.
- Regular monitoring of air polluting concentrations.

1.4.2 WATER ENVIRONMENT

Construction Phase

Impacts (Significance –Low)

- The effluent streams will be generated regularly that will comprise of Sewage, grey water from site area and washing water for vehicle and equipment maintenance area.

Mitigation Measures

- Monitoring water usage at work sites to prevent wastage.

Operation Phase

Impacts (Significance –Medium)

For proposed project additional treated water requirement is 500m3/hr. The water required will be sourced from Maharashtra Industrial Development Corporation (MIDC) which is provided through water supply pipeline upto battery limit/boundary wall of petrochemical complex.

The impact on water environment during the operation phase of the proposed changes shall be in terms of water consumption and waste water generation due to process activities. There shall be 15 m3/hr of liquid effluent generation from proposed plant.

Mitigation Measures

- The proposed unit is a Zero Liquid Discharge (ZLD) process plant during normal operation.

- 15 m3/hr of liquid effluent generation from proposed plant is feed of RO recycle plant for its tertiary treatment.

- From the RO based DM Plant / Tertiary Treatment Plant (TTP), the approximate quantity of reject generated is 26 m3/ hour. For achieving zero liquid discharge from the complex a Multiple Effect Evaporator/ Crystalliser Plant (MEE) followed by Solar Evaporation Pond is considered.

- The RO reject stream is envisaged to be routed to a Multiple Effect Evaporator/ Crystalliser Plant for further water recovery and for reducing the quantity of high total dissolved solids (TDS) stream. The water recovered from the Multiple Effect Evaporator/ Crystalliser Plant shall be reused as raw water/ cooling water makeup within the complex. The high TDS concentrate stream from Multiple Effect Evaporator/ Crystalliser Plant shall be disposed safely in to a Solar Evaporation Pond within the complex of approximate size of 60 m x 60 m for evaporation by natural means thereby achieving Zero Liquid discharge from the complex. The required facility is considered to be located adjacent (south) to the ETP plant in the complex.

1.4.3 NOISE ENVIRONMENT

Construction Phase

Impacts (Significance –Low)

- Noise generation due to operation of heavy equipment and machinery, movement of heavy vehicles in site preparation and civil works.

Mitigation Measures

- Ensuring preventive maintenance of equipments and vehicles.

Operation Phase

Impacts (Significance –Low)

Noise level measurements were carried out in day and night times at numerous locations around the existing operating units within the refinery. No additional impact is envisaged.

Mitigation Measures

- Avoiding continuous (more than 8 hrs) exposure of workers to high noise areas.
- Provision of ear muffs at the high noise areas
- Ensuring preventive maintenance of equipment.

1.4.4 LAND ENVIRONMENT

Construction Phase

Impacts (Significance –Low)

- Generation of debris/construction material, but being the modifications limited to existing area, the generation of such waste shall be minimal.

Mitigation Measures

- Restricting all construction activities inside the project boundary.
- Ensuring any material resulting from clearing and grading should not be deposited on approach roads, streams or ditches, which may hinder the passage and/or natural water drainage.
- Developing project specific waste management plan and hazardous material handling plan for the construction phase.

Operation Phase

Impacts (Significance – Low)

- Spent Catalyst after every 4 years will be generated.

Mitigation Measures

- Spent catalyst will be sent to authorize recyclers.
- Other solid waste shall be sent directly to MoEFCC/SPCB approved TSDF site.

1.4.5 BIOLOGICAL ENVIRONMENT

Construction Phase

Impacts (Significance –Low)

- The proposed facilities are to be developed in the land owned by GAIL. The project site does not harbor any fauna of importance. Therefore, the impact of construction activities on fauna will be insignificant.

Mitigation Measures:

- Closing of trenches as soon as possible of construction.
- Prevent littering of work sites with wastes, especially plastic and hazardous waste.
- Training of drivers to maintain speed limits.

Operation Phase

Impacts (Significance – Low)

- The impacts due to proposed project activities during operation phase shall be insignificant due to minimal additional air emissions. There is no SO2 generation envisaged due to proposed project. Hence, no additional harmful effects are envisaged on surrounding agricultural fields.

Mitigation measures

- Develop the greenbelt already developed
- Plant additional trees during operation phase as per greenbelt development plan

1.4.6 SOCIO-ECONOMIC ENVIRONMENT

Construction Phase

Impacts (Significance – Low)

- Generation of temporary employment of very substantial number of personnel. The average temporary manpower requirement is 4500 people for the first two years and subsequently for next two years 5500 people shall be required.
- Transport requirements will arise during the construction phase due to the movement of both the personnel and materials.
- An impact on basic necessities like shelter, food, water, sanitation and medical facilities for the temporary workers and truck drivers.
- The majority of skilled and unskilled laborers are available in the impact area itself, the incremental effect on housing during the construction phase will be minimal.

Mitigation measures

- Conducting awareness programmes for workers.
- Monitoring speed and route of project-related vehicles
- Determining safe, legal load limits of all bridges and roads that will be used by heavy vehicles and machinery.
- Determining allowable traffic patterns in the affected area throughout the work week will be made based on community use, include a consideration of the large turning requirements of certain vehicles/machineries that might increase congestion and traffic hazards.
- Consolidating deliveries of materials and personnel to project sites, whenever feasible, to minimize flow of traffic.
- Minimizing interruption of access to community for use of public infrastructure
- Providing prior notice to affected parties when their access will be blocked, even temporarily.
- Preventing use of drugs and alcohol in project-sites
- Preventing possession of firearms by project-personnel, except those responsible for security.

Operation Phase

Impacts (Significance – Low)

- Employment generation, effects on transport and other basic infrastructure.
- Transport requirements will arise due to the movement of both the personnel and materials.

Mitigation measures

- Extending reach of CSR Program.
- Monitoring speed and route of project-related vehicles.

1.5 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

Budget has been estimated for implementation of environmental management plan during construction and operational phases and is given in **Table 1.4**&**1.5** respectively.

Table 1.4: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Capital Cost)

Sl. No.	Activity	Cost
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Plantation Activities (Trees and Shrubs)	**250.0**
1.2	Online analyzers & monitoring	**200.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric tests	**5.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**50.0**
3.2	New Packaged ETP	**500.0**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**20.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
	Budget for EMP (Capital Cost)	**1025.0**

Table 1.5: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Recurring Cost Per Annum)

Sl. No.	Activity	Cost
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Additional Plantation Activities (Trees and Shrubs)	**100.0**
1.2	Air quality monitoring	**20.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric tests	**3.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**5.0**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**10.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
	Budget for EMP (Recurring Cost per Annum)	**138.0**

1.6 ADDITIONAL STUDIES

1.6.1 RAPID RISK ASSESSMENT

RRA study carried out and mostly evaluates the consequences of potential failure scenarios, assess extent of damages, based on damage criteria's and suggest suitable measures for mitigating the Hazard.

The detailed consequence analysis of release of hydrocarbon in case of major credible scenarios is modeled in terms of release rate, dispersion and flammability which have been discussed in detail in the report. The Observations and recommendations arising out of the Rapid Risk analysis study for units under upcoming Usar Petrochemical project are summarized below:

Analysis of high frequency failure scenarios in PDH and PP unit is as given below:

PP Unit

- Instrument tapping failure at Propylene charge pump, it is observed that LFL may reach a distance of 46 m and may extend beyond the unit boundary. The jet fire radiation intensities of 37.5 and 12.5 kW/m2 may be realized upto 45 and 55 m respectively. The 5 & 3 psi overpressure blast waves may reach a distance of 51 m and 55 m respectively. Similarly in case of Instrument tapping failure at Recycle pump discharge, it is observed that LFL may reach a distance of 46 m from the source. The jet fire radiation intensities of 37.5 and 12.5 kW/m2 may be realized upto45 and 54 m respectively. The 5 & 3 psi overpressure blast waves may reach a distance of 51 m and 55 m respectively. However the effects are observed to be largely restricted within the unit provided the equipments are suitably sited.

PDH

- In case of high frequency failure scenarios in PDH unit such as Instrument tapping failure in Propane line at B/L, It is observed that LFL may reach a distance of 42 m and may

cross the unit boundary. The jet fire radiation intensities of 37.5 and 12.5kW/m2 may cause escalation within the unit. The 5 & 3 psi overpressure blast waves, if realized may have an effect zone of 50 m and 54 m respectively. Also in case of Instrument tapping failure at De-ethanizer bottom pump it was observed that LFL may reach a distance of 49 m from the source. The jet fire radiation intensities of37.5 and 12.5kW/m2 may reach a distance of 42 m and 51 m respectively with possible localized escalation. The 5 & 3 psi overpressure blast waves may reach a distance of 51 m and 56 m respectively. Similar effect distances are noticed in case of Instrument tapping failure at De-ethanizer feed dryer inlet line and Instrument tapping failure at Reject C4 Pump.

***Note**: The loss of containment scenarios, equipment locations and conditions are indicative and need further assessment during detailing. It may also be noted that, there exists a possibility of other loss of containment scenarios, whose blast overpressure waves may affect the new control room based on the location of equipment in the unit and technology selected.*

LPG unit

- From the high frequency failure scenarios such as Instrument tapping failure at LPG column bottom line/NGL pump inlet, it is observed that LFL may reach a distance of80 m from the source. The jet fire radiation intensities of 37.5 and 12.5kW/m2 may lead to localized escalation. The Late pool fire radiation intensities of 12.5 kW/m2may be realized at a distance of 33 m from the source. The 5 psi overpressure blast wave may possibly affect the control room. The existing Lab building may be subjected to 3 psi overpressure blast waves.

  In case of a 20mm Leak in LP separator bottom outlet, it is observed that LFL may reach a distance of 86 m from the source. The jet fire radiation intensities of 37.5 and12.5 kW/m2 may lead to a localized escalation. The 5 & 3 psi overpressure blast waves may reach a distance of 99 m and 107 m which may affect the existing control room and PDH unit partially. Similar effects are noticed in case of 20mm Leak in HP separator bottom outlet.

  Hence based on the above consequences, following are recommended:

- *Provide adequate number of gas detectors (H2 &/HC) at suitable locations within unit (PDH/PP/LPG) for early leak detection. Also philosophy for quick isolation (through ROV's) for vessels and columns containing inventories of C4/C5 and lighters should be developed for PDH/PP plants as a part of good safety design practice.*

- *In PP unit, it is suggested locate the extrusion and pellet handling sections towards the western side for enhanced safety.*

- *It is advisable to consider blast resistant construction of new MCR.*

- *It is suggested to relocate the existing lab building to a safe location beyond the explosion effects based on scenarios arising out of LPG unit.*

- *Ensure LPG control room is of blast resistant construction (or) explore integration of the same with New MCR.*

  In case of low frequency high consequence credible failure scenarios in PDH unit such as:

Large hole at Product Splitter bottom, it is observed that LFL distances may reach upto112 m. The jet fire radiation intensities of 37.5 kW/m2 and 12.5 kW/m2 may reach a distance of 82 m and 100 m (@2F condition) respectively. The 5 & 3 psi over pressure blast waves may

reach a distance of 131 m and 140 m respectively and may affect new MCR and existing MCR depending on the location of equipment in the unit. Similarly in case of large hole at de-ethanizer reflux drum bottom, it is observed that LFL distances may be realized up to 131 m and may affect MCR, control room and LPG recovery unit depending on the location of the equipment. The jet fire radiation intensities of 37.5 & 12.5 kW/m2 may reach a distance of 78 m and 95 m respectively (@2F condition). The 5 & 3 psi overpressure blast waves may reach a distance of 155 m and 164 m respectively.

In case of low frequency high consequence credible failure scenarios in PP unit such as:

- Large hole at Propylene dryer bottom: it is observed that LFL distance of 157 m may reach SRR, warehouse and PDH plant. The jet fire radiation intensities of 37.5 and 12.5 kW/m_2 may be realized upto 103 and 125m respectively @ 2F condition. The 5 & 3 psi overpressure blast waves may reach a distance of 178 m and 188 m and may affect SRR, Sub Station, PDH unit and warehouse depending on the location of equipment.

Based on the above consequence, following are recommended:

- Include these scenarios outcomes as an input to the Disaster Management Plan (DMP) & Emergency Response Plan (ERP).

OFFSITES

In case of high frequency failure scenarios in Off-sites such as:

Instrument tapping failure at Propane Pump discharge it is observed that LFL may reach a distance of 43 m from the source. The jet fire radiation intensities of 32 and 8 kW/m2 may reach a distance of 45 m and 58 m respectively and may have a localized effect. The 5 & 3psi overpressure blast waves may reach a distance of 51 m and 55 m respectively. Similar effect distances are noticed in case of Instrument tapping failure at Propylene Pump discharge and Instrument tapping failure at metering area.

In case of Instrument tapping failure at H2 Bullet, it was observed that LFL may reach a distance of 48 m from the source. The jet fire radiation intensities of 32 and 8 kW/m2 may reach a distance of 19 m and 23 m respectively and may affect the adjacent bullet. The 5 &3 psi overpressure blast waves may reach a distance of 48 m and 51 m respectively.

Based on the above consequence, following are recommended:

- *Provide gas and optical flame detectors at pump houses, metering station and H2 bullet area for quick detection and early action in loss of containment.*

- *Consider fireproofing of H2 bullet for jet fire hazards.*

Disaster Management Plan

Emergency Response and Disaster Management Plan (ERDMP) will be prepared based on recommendations of Risk Assessment study. Both offsite and onsite disasters will be addressed in the report as well as the team to be contacted in case of emergency.

1.7 PROJECT BENEFITS

The benefits of polymer addition project are as follows:

1. Profitability and value addition being higher in producing polymer products.
2. Reducing import from other countries.

1.8 Corporate Environment Responsibility (CER)

Corporate Environment Responsibility (CER) is planned for next 5 years and 18.56 crores (INR) shall be spent in various activities such as Solar Lighting/Solar pump (Irrigation) system, Drinking Water Facilities, Resource Upliftment at Schools, Resource provision for Talent Development and Plantation.