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 Environment Management Plan
4. Environmental Monitoring Programme
5. Risk Assessment
6. Project Benefits

1.1 PROJECT DESCRIPTION

M/s. Bharat Petroleum Corporation Ltd. (BPCL) is one of the three major integrated Petroleum refining and marketing companies in India. Mumbai Refinery (MR) of Bharat Petroleum Corporation Limited (BPCL) is located at Mahul, Mumbai, Maharashtra, India.

The refinery was commissioned in 1955 with a crude oil processing capacity of 2.2 MMTPA in a plot area of 450 acres. The refining capacity has subsequently been augmented through progressive revamps, addition of various process units and incorporating advanced refining technologies. This refinery has a current nameplate capacity of 12 MMTPA and a typical operating capacity of 13.5 MMTPA.

BPCL intends to diversify into Petrochemical products with major focus on Ethylene/ Propylene based petrochemical products to further improve refinery profitability. BPCL has recently carried out a Bottoms upgrading Study which recommended the setting up of a Petrochemical Resid FCC (PRFCC) complex with the intent of maximizing Polymer Grade Propylene production which will feed a Polypropylene complex being planned at Rasayani, 50 km from MR.

M/s BPCL has entrusted M/s Engineers India Limited to carry out Environment Impact Assessment study and preparation of Environmental Management Plan for various environmental components of the proposed Installation of Polypropylene (PP) unit at Rasayani and Interconnecting Pipelines from BPCL Mumbai Refinery (MR) to Rasayani project. EIL is an accredited consultant for carrying out EIA studies by Quality Council of India in petroleum refining industry.

Based on the review of the Form-1 & associated documents submitted by propject proponent, the EAC Committee recommended the Terms of Reference (TOR) vide letter no. No.IA-J-11011/168/2018-IA-II(I) dated 17th June, 2018 for incorporating the same in the EIA report.

1.1.2 Process Descrirption of Proposed Rasayani Polypropylene Plant

2.1 PROPOSED POLYPROPYLENE PLANT FACILITIES AT RASAYANI

The Polypropylene Unit will produce Homopolymer, Random Copolymer and High Impact Copolymer. The feed stock is Polymer Grade Propylene and Polymer Grade Ethylene produced at PRFCC unit at Mahul Refinery and transported by pipeline from Mahul Refinery to Rasayani Site. Ethylene is required to produce copolymers. It is recommended to produce polymer grade propylene and ethylene at MR as producing Refinery grade at MR and upgrading to Polymer Grade at Rasayani will not be economically attractive.

Propylene is supplied in liquid form and received in mounded bullets at 16 kg/cm^{2}g @ ambient temperature. From the bullet, Propylene is pumped to PP unit. Ethylene is supplied in gaseous form and supplied directly to the PP unit battery limit at 20 kg/cm^{2}g @ ambient temperature. Ethylene Booster Compressor is installed in PP unit to boost the pressure as required in the process.

The Polypropylene unit will comprise of the following sections:

- Feed Purification
- Catalyst & Co-Catalyst Handling, Storage and Metering
- Reaction Section
- Polymer Degassing and Monomer Recovery Section
- Powder Conveying
- Extrusion and Additivation
- Pellet Conveying and Blending
- Bagging and Dispatch
- Auxiliary Facilities

1.1.2.1 Rasayani PP Plant Material Balance

Feeds

Feed	KTPA (TMTPA) Only Homopolymer	KTPA (TMTPA) Homo: Co: 88:12	KTPA (TMTPA) Homo: Co: 60:40
Propylene	452	447	434
Ethylene	-	5.3	18.5

Products

Product	KTPA (TMTPA) Only Homopolymer	KTPA (TMTPA) Homo: Co: 88:12	KTPA (TMTPA) Homo: Co: 60:40
PP Homo polymer	450	270	400
PP Random Copolymer	-	45	10
PP Impact Copolymer	-	135	40
Propane*	1.7	1.7	1.7
Losses (%)	0.07	0.18	0.13

* Propane Purge is used as fuel in steam generation plant

Utility System Details

Utility System	Description
Water System:	Makeup Raw Water 290m^3/h.
	Recirculating Cooling Water: 16500m^3/h.
	Cooling Tower Cells: 6X 3000 m^3/h.
	Cooling Water Pumps: 5500 m^3/h. (3 operating, 2 standby)
DM Water:	877 m^3/day
Steam Generation:	1+1 Steam Boiler
	HP steam: 12 MT/h; LP steam: 25 MT/h
Air System	1+1 Compressor; 5000 Nm^3/h
Hydrogen Generation System	2 lines each 100 Nm^3/h
Nitrogen System	2 lines each 3150 Nm^3/h

Offsite Storages

S. No.	Service	Storage Basis	Number	Working Volume m^3	Type of Tank	Remarks
1.	Treated Water	8 hours storage	1	5000	FCR	Receiving & Delivery
2.	DM Water	24 hours	2	878	FCR	
3.	Potable Water	8 hours	1	40	FCR	Receiving & Delivery
4.	Treated Water Ex ETP	24 hours	1	2400	FCR	
8	Fire Water	4 hours	1	6600	FCR	
9	Propylene	3 days	3	9144	MB	Propylene required for PP plant
10	Hydrogen	3 days	1	139	MB	Backup & Storage

FCR: Fixed Cone Roof

MB: Mounded Bullet

1.2 Project Cost and Implementation Schedule

The proposed project will be implemented within the existing Hindustan Organic Chemicals Limited (HOCL) plant area in Rasayani. The total area is 360 acres. The total project cost of the project is Rs. 3826 Crores.

The proposed project for Installation of BPCL Rasayani PP Plant and Associated Facilities is expected to be mechanically completed in 32 months from the Zero date (i.e. Award of contract to process licensor).

1.3 Health Safety & Environment

Health, Safety and Environment will be awarded topmost priority in selection of technology, equipment and processes to minimize hazards. Licensor design basis will request Licensors to submit write up on safety features of the process and its impact on persons, environment and asset. Material selection and design conditions will be

validated and be robust to avoid any catastrophic failure. The key focus will be to have minimal impact on Persons, Assets and Environment. For Polypropylene Unit, technologies considered have high safety integrity level and pose no health and environment hazards. The considered processes produce minimum effluents and include proper treatment for handling any hazardous material like Alkyl Aluminum (used as co-catalyst) and handling/treatment of systems contaminated with Alkyl Aluminum.

For gaseous effluents, no stream containing hydrocarbon is released to atmosphere. Relief system will be designed to safeguard against all credible emergency scenarios and disposed in flare system. Gaseous streams which are released to atmosphere are of following categories:

- Blanketed nitrogen from the vessels in the catalyst section during filling operation. All such streams are collected and passed through a vessel containing mineral oil to scrub the nitrogen before release to atmosphere.
- Air from the centrifugal drier in the extruder section. This is basically moist air after drying the wet pellets
- Nitrogen or air stream from the additive bins and powder silos. These streams contain fine PP powder or additives. These are collected in header and passed through bag filter to separate the fine powder and release only nitrogen or air to avoid any dust pollution.
- Air from homogenization pellet silos or bagging silos may contain fine PP dust. These are separated in the elutriators installed over bagging silos. To mitigate dust formation during pellet transfer, pellet pneumatic conveying lines use shot peened lines
- Gas detectors are provided in areas of the plant to detect any hydrocarbon leakage.
- The steam generation boiler uses clean natural gas from RLNG. Hence there is no Sox or NOx emission.
- Relief system will be designed to safeguard against all credible emergency scenarios and disposed in flare system.

For liquid effluents, there will be no treated liquid effluent discharge for Rasayani site. The liquid effluent treatment plant will be designed for zero liquid discharge and the treated effluent will be recycled for use as cooling tower make up, fire water make up, horticulture and other services. Liquid effluent will be of following categories from different sources

• PP unit generates minimal oily waste water from the process area and water with fine pellets from the extruder area.

- Filter back washes from the raw water treatment plant in OSBL
- Cooling tower blowdown and steam boiler blowdown
- DM water plant regeneration streams
- The oily water stream will be subject to Biotreatment and filtration to reduce TOC, BOD, COD. The sludge collected from the Membrane Bio Reactor (MBR) or Biotreatment facility will be collected, dewatered and dried. Dried sludge will be disposed as landfill, material.
- The treated stream from Bio Filtration or MBR is mixed with blowdown stream from Cooling Tower and Boiler along with the neutralized stream from Demineralized Water plant to treat in RO plant to reduce the TDS to acceptable limit.
- The reuse water will be of same quality as that of the fresh water received from the MIDC.
- The reject stream from the RO plant will be evaporated and crystalized to recover the solids separated in RO plant. The solids separated will be used for landfill.
- Treated water will be stored in Treated Water Storage Tank of capacity 2925 m3/h and pumped to consumers.

All PP technologies use Tri Ethyl Aluminum (TEAL) which is a pyrophoric material. This material is handled completely in closed system. Blanketed nitrogen from this system is scrubbed in mineral oil to remove and neutralize trace of TEAL and routed to closed sand pit. All TEAL contaminated system is neutralized with oil and nitrogen purged before opening and the waste contaminated oil is neutralized and Aluminum content measured before draining to oil drums. This treated contaminated oil is incinerated. Solid effluents generated in the complex are of the following category:

• PP Powder dumped from the system in case of upsets. This material will be treated and neutralized before dumping to ground.
• PP extruder machine wastes generated during extruder start up from barrel purging and/or agglomerates in agglomerate catcher.
• Floor sweeps generated in extruder area, bagging area which are sold as floor sweep material.
• PP fine pellets from PCW tank
• PP powder dump from the reactor will have active catalyst. The PP powder will be neutralized by steaming and drying to kill the active catalyst before dumping.
The above solid wastes are collected and sold.
Spent catalysts from ethylene and propylene treater, once in 4 years. These are disposed of for land fill or can be worked out with supplier to take back.
Bag filter elements whenever the filter elements are replaced. These are disposed off along with scrap material.

2.0 DESCRIPTION OF ENVIRONMENT

Environmental baseline data has been collected around the proposed Rasayani site during the period of March- June, 2018. The baseline data for various environmental components related Ambient Air Quality, Water Quality, Noise Level, Traffic Density, Soil, Meteorology and Socio-Economic Data were monitored and collected in an area of 10 km radius from the plant site.

2.1 MICRO – METEOROLOGY

During the study period the predominant wind directions were observed from North (Predominant). The minimum and maximum temperature recorded during the study period was 17 °C and 34 °C respectively.

2.2 AIR ENVIRONMENT

In order to obtain baseline air quality status, total Nine (09) nos. air quality monitoring stations were set up in and around the proposed site. The locations were identified considering the location of human settlements and predominant wind directions in the area. Air samples were collected round the clock and analyzed for Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X), Carbon Monoxide (CO), Particulate Matter (PM_{10}), Particulate Matter ($PM_{2.5}$), Ozone (O_3) and Total Hydrocarbons (Methane & Non-methane), VOCs [Benzene and Benzo (O) Pyrine (B-a-P)].

PM_{10}: The maximum value for PM10 is observed at Near Prathamik Aarogya Kendra (A1), as 79 µg/m^3 with the minimum value observed at Near Z.P.School (A8), as 69.0µg/m^3 during the study period.

$PM_{2.5}$: The maximum value for $PM_{2.5}$ is observed at Near Prathamik Aarogya Kendra (A1) & Near Z.P.School (A2) , as 46µg/m^3 with the minimum value observed at Near Prathamik Aarogya Kendra (A9), as 32 µg/m^3 during the study period.

SO_2: The maximum value for SO_2 is observed at Near Prathamik Aarogya Kendra (A9),as 32 µg/m^3 with the minimum value observed at all the locations, as 16 µg/m^3 during the study period.
NOx: The maximum value for NO_2 is observed at Near Z.P.School (A5), as **29 µg/m^3** with the minimum value observed at Near Prathamik Aarogya Kendra (A9) as **25µg/m^3** during the study period.

It can be seen that the 98th percentile values at various monitoring stations for gaseous pollutants like PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO, HC (Methane and Non-Methane), Benzene, Benzo (O) Pyrene (B-a-P) and Ozone were found well below the National Ambient Air Quality standards for residential/industrial areas. For Benzene the 98 percentile values computed were found below 5 µg/m^3 except at BPCL Main Gate.

2.3 WATER ENVIRONMENT

Baseline water data was collected at Eighteen (18) nos. locations (09 nos. ground water locations, 01 no. sea water and 09 nos. surface water sources) at around 10 km radius area of proposed site. The samples were analyzed for Colour, Odour, Taste, Temperature, pH, Turbidity, Total Dissolved Solids, Total Suspended Solids, Total Hardness (as CaCO3), Sulphides, Sulphate, Chloride, Sodium, Potassium, Silica, Oil & Grease, Fluoride, Nitrates, Calcium, Magnesium, Free Chlorine, Phosphorus, Ammonical Nitrogen, Salinity, Dissolved oxygen, BOD, COD, Total Coliform, Faecal coliform. Collected baseline water data is summarized in Table 1.

Table 1: Summary of physicochemical data collected for water environment

Parameter	Unit	Ground water		Surface water	
		As per data collected	Permissible Limit	As per data collected	Permissible Limit
Temperature	˚C	26.2-27.3	-	26.2-27.5	-
Turbidity	NTU	1-8.1	-	1.7-6.4	-
pH		7.1-8.2	6.5-8.5	7.0-8.2	6.5-8.5
TDS	mg/lit	140-612	2000	68-332	1500
Dissolved Oxygen	mg/lit	NA	Not Specified	1-6.1	4
COD	mg/lit	NA	Not Specified	12-24	-
BOD	mg/lit	NA	Not Specified	BDL	3
Calcium	mg/lit	22-87		7-50	
Magnesium	mg/lit	5-49		2-15	
Chlorides	mg/lit	19-110	1000	8-41	600
Sodium	mg/lit	11.2-82.4	Not Specified	5-28	-
Total coliform	MPN/100ml	BDL-17	Nil	4-26	5000

2.4 NOISE ENVIRONMENT

The monitoring and Traffic survey noise survey was conducted to assess the background noise levels at Nine (09) nos. locations around the proposed site. Ambient monitored noise values are summarized in Table 2.

Table 2: Description of Noise Monitoring Locations and measured values

Sr. No	Location	Unit	Monitoring Time	Noise level	
				Minimum	Maximum
1	Near Prathamik Aarogya Kendra	**dB(A)**	9:10 AM	41.3	55.6
2	Near Z.P.School	**dB(A)**	9:20 AM	42.6	55.6
3	Near Gram Panchayat Kendra	**dB(A)**	9:45 AM	42.4	59.6
4	Near Gram Panchayat	**dB(A)**	10:15 AM	40.3	52.9
5	Near Z.P.School	**dB(A)**	10:40 AM	42.1	53.4
6	Near Z.P.School	**dB(A)**	11:00 AM	42.6	53.2
7	Near Z.P.School	**dB(A)**	11:40 AM	43.2	56.8
8	Near Z.P.School	**dB(A)**	12:20 PM	41.0	54.2

Noise level of the study area varied from 38 to 62 dB (A) in day time and from 35 to 52 dB (A) in the night time

3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1 AMBIENT AIR ENVIRONMENT

SO_2 value (maximum 24 hr Ground Level Concentration (GLC)) of proposed project scenario is predicted as 5.6 $\mu g/m^3$. The maximum GLC for SO_2 occurs 700 m from plant boundary in S-E direction. By superimposing the same with background SO_2 level (i.e. 98 percentile maximum baseline collected value), the maximum resultant GLC observed is 24.6 $\mu g/m^3$**.** The predicted resultant SO_2 GLC value is well within the standard limit of 80 $\mu g/m^3$ for 24 hourly average for industrial and residential areas.

NO_2 value (maximum 24 hr Ground Level Concentration (GLC)) post PRFCC project scenario is predicted as 28.2 $\mu g/m^3$.The maximum GLC for NO_2 occurs 700 m from plant boundary in S-E direction. By superimposing the same with background NO_2 level (i.e. 98 percentile maximum baseline collected value), the maximum resultant GLC observed as 57.2 $\mu g/m^3$**.** The predicted resultant NO_2 GLC value is well within the standard limit of 80 $\mu g/m^3$ for 24 hourly average for industrial and residential areas.

Mitigation Measures for Minimizing Air Emission Impact

In order to minimize the impact of the project on the environment, due attention is given for implementing effective pollution control measures. SO_2 and NO_x are the main air pollutants from the point source emissions. Various steps taken by BPCL to monitor and control the emission of SO_2 and NO_x are summarized below:

- ❖ Use of gaseous or liquid fuels in all the furnaces / heaters / boilers to minimize emission of particulate matter.
- ❖ Low sulfur fuel oil, nil H2S amine treated refinery fuel gas, Re-gasified Liquefied Natural Gas (R LNG) with nil sulfur is used as fuel for control of SO2 emission.
- ❖ Implementation of efficient technologies for minimizing fuel consumption.
- ❖ Flare gas recovery system has been provided for recovery of flare gas
- ❖ Flare tip is designed to ensure smokeless conditions.
- ❖ Ambient air quality is monitored regularly.
- ❖ Provision of low – NO_X burners in heaters / furnaces / boilers to minimize NO_X emission.
- ❖ Provision of high efficiency furnaces (more than 90% efficiency) to minimize fuel consumption
- ❖ Provision of Analyzers for continuous monitoring of stack emissions (SO_2, NO_x), stack temperature and O_2.
- ❖ Use of stack of sufficient height as required by per CPCB's guidelines for better dispersion of the pollutants from to all the furnaces / heaters / boilers.
- ❖ All floating roof tanks along with crude oil tanks are provided with primary and secondary seal.
- ❖ Provision of three continuous Ambient Air Quality Monitoring (AAQM) Stations in the plant.
- ❖ A new 125 m high demountable smokeless flare system is being installed. The flare elevation and location shall be such so that there is no impact of thermal radiation on the operating personnel in the plant.

- ❖ Developing Green Belt: As Green cover acts as a natural sink to pollutants.

3.2. WATER ENVIRONMENT

There will be 290 m3/h raw water required for proposed project and will be met from MIDC.

A new Waste Water Treatment plant is proposed for Rasayani PP plant. The capacity of the ETP will be 160 m3/h. The ETP will treat the effluent generated in Polypropylene unit and its associated Utilities and Offsites, majority of which comes from the cooling tower blowdown. This will be a Zero-Liquid Discharge (ZLD) plant. The treated water will be reused as cooling tower make up & horticulture service. So it can be noted that there is no impact on account of the waste water generation.

Mitigation Measures (Construction Phase)

Construction activities are anticipated to take place over a period of at least three years from Zero date of Construction.

Potential emissions sources during construction phase include the following:

- Site preparation and civil works
- Storage and handling of construction material (e,g. sand, cement) at proposed project site.
- Operation of temporary Diesel Generator (DG) sets
- Movement of vehicles carrying equipment, construction material and project-related personnel

Mitigation Measures (Operation Phase)

- Ensuring preventive maintenance of vehicles and equipment.
- Ensuring vehicles with valid Pollution under Control certificates are used.
- Avoiding unnecessary engine operations.
- Implementing dust control activities such as water sprinkling on unpaved sites.
- Controlled vehicle speed on site
- Ensuring vehicle are covered during transportation of material

3.3 NOISE ENVIRONMENT

The main sources of noise during construction will be:

- Site preparation, Civil works
- Heavy equipment operations
- Transportation of construction material

Mitigation Measures (Construction Phase)

- Ensuring preventive maintenance of equipment's and vehicles.
- Avoiding unnecessary engine operations (e.g. equipment's with intermitted use switched off when not working).
- Ensuring DG sets are provided with acoustic enclosures and exhaust mufflers.

Mitigation Measures (Operation Phase)

- 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

3.4 LAND ENVIRONMENT

During Construction Phase, Surplus earth (if any) and Construction debris may be generated as well as Metal scrap and packaging materials whereas during Operational phase, Hazardous Wastes expected to be generated from the proposed new facilities like oily sludge, spent catalysts etc

Spent absorbent material, spent bag filter materials, spent filter elements shall be handed over to approved Transport, storage, disposal facility (TSDF) waste operator for suitable disposal. BPCL MR has membership of two TSDF namely Mumbai Waste Management Limited (MWML), and Trans Thane Creek Waste Management Association (TTCWMA). Other solid waste like spent catalyst, PP powder etc. shall be sold to the recyclers. All the solid waste shall be handled and treated as per Hazardous Waste Management Rules. Hence the impact on land environment will be very minimal.

3.5 BIOLOGICAL ENVIRONMENT

The proposed facilities are to be developed within the plant area. This area is a graded land without any significance vegetation. The project site does not harbor any fauna of importance. Therefore, the impact of construction activities on fauna will be insignificant.

Mitigation Measures (Construction Phase)

- 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.

Mitigation measures (Operation Phase)

- Maintenance of greenbelt will be continued
- Plant additional trees during operation phase

3.6 SOCIO-ECONOMIC ENVIRONMENT

The issues need to be addressed during the construction phase of the project include the effect of employment generation and additional transport requirements on local infrastructural facilities. These are only short term impacts lasting during the construction phase of the project.

Mitigation Measures (Construction Phase)

- 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.

Operational phase of the plant covers the entire life span of the plant. Hence the impacts of the operational phase extend over a long period of time. These impacts include effects on transport and other basic infrastructure.

Mitigation Measures (Operation Phase)

- Provide necessary facilities under CSR/CER Program
- Monitoring speed and route of project-related vehicles

3.7 ESTIMATED COST FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

Considering all measures suggested above, cost is worked out for implementation of environmental management plan and is given in **table 3 & 4**. The total estimated budget for implementation of EMP is worked out as Rs. 10295 Lakhs towards capital cost and Rs. 150 Lakhs towards recurring cost per annum.

Table 3: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Capital Cost)

Sl. No.	Activity	EMP Budget
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Plantation Activities (Trees and Shrubs)	**150.0**
1.2	Air pollution control devices	**100.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric test/ Occupational Health Check-up	**5.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**10.0**
3.2	Water sampling/monitoring	**5.0**
3.3	ETP and STP	**10000**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**20.0**
4.3	Soil sampling/monitoring	**5.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
	Budget for EMP (Capital Cost)	**10295.0**

Table 4: BUDGET OF ENVIRONMENTAL MANAGEMENT PLAN (Recurring Cost per Annum)

Sl. No.	Activity	EMP Budget
		(Rupees in Lakhs)
1.0	**Air Environment**	
1.1	Additional Plantation Activities (Trees and Shrubs)	**50.0**
1.2	Air pollution control devices	**50.0**
2.0	**Noise Environment**	
2.1	Additional Plantation Activities	Included in 1.1
2.2	Audiometric test/ Occupational Health Check-up	**5.0**
3.0	**Water Environment**	
3.1	Rain water Harvesting pits	**5.0**
3.2	Water sampling/monitoring	**5.0**
3.3	ETP & STP	**20.0**
4.0	**Land Environment**	
4.1	Additional Plantation Activities	Included in 1.1
4.2	Solid waste management	**10.0**
4.3	Soil sampling/monitoring	**5.0**
5.0	**Biological Environment**	
5.1	Additional Plantation Activities	Included in 1.1
	Budget for EMP (Recurring Cost per Annum)	**150.0**

4.0 ENVIRONMENTAL MONITORING PROGRAMME

The environmental monitoring program during construction & Operation phases are presented in Table 5 & Table 6.

Table 5: Proposed Environmental Monitoring Programme for proposed project

During Construction Phase				
Sl. No.	**Potential impact**	**Action to be Followed**	**Parameters for Monitoring**	**Frequency of Monitoring**
1	Air Emission	Vehicle trips to be minimized to the extent possible.	Vehicle logs	Periodic during site clearance & construction activities
2	Noise Emission	Acoustic mufflers / enclosures to be provided in large engines	Mufflers /enclosures in place.	Prior to use of equipment.
3	Health	Employees and migrant labour health check ups records to be submitted by contractor supervisor, for issue of permission to the labour to work at the site.	All relevant parameters including audiomerty	Regular checkups
4	Waste Management	Identification & characterization of every waste arising from proposed activities as per prevalent waste management plan and which also identifies the procedures for collection, handling & disposal of each waste arising.	Comprehensive Waste Management Plan in place and available for inspection on-site. Compliance with Hazardous Wastes (Management and Handling Rules),2008	Periodic check during construction activities
5	Water and waste water	Take care in disposal of Waste water generated such that soil and groundwater resources are protected.	Discharge norms for effluents as given in permits	Periodic during construction activities
During Operational Phase				
S.No.	**Potential impact**	**Action to be Followed**	**Parameters for Monitoring**	**Frequency of Monitoring**
1	Air Emissions	Stack emissions to be optimized and monitored.	Gaseous emissions (SO_2, NO_x, PM_{10} & $PM_{2.5}$).	6 samples per year
		Ambient air quality within the premises of the proposed unit and nearby habitations to be monitored. Exhaust from vehicles to be minimized by use of fuel efficient vehicles and well	PM_{10}, $PM_{2.5}$, SO_2, NOx, CO, HC	Use of existing ambient air quality monitoring stations

		maintained vehicles having PUC certificate.		
		Measuring onsite data of Meteorology	Wind speed, direction, temp., relative humidity and rainfall.	Periodic during operation Phase
2	Noise	Noise generated from operation pumps/compressors/motors to be optimized and monitored.	Spot Noise Level recording; Leq(night), Leq(day), Leq(dn)	3 times per year
3	Water Quality and Water Levels	Monitoring groundwater quality and levels around plant premises	Comprehensive monitoring as per applicable standards	Once in a year
4	Wastewater Discharge	Routing of waste water to ETP.	Monitoring of water quality	Once in a year
5	Biological Environment	Vegetation and greenbelt / green cover development inside the plant	No. of plants species	Periodic during operation phase
6	Health	Migrant labour health check ups reports from authorized doctors are mandatory for issue of gate pass.Validity of medical checkup report is 6 months..	Valid gate passes	Random checks for people working in high risk jobs, as advised by supervisors/BPCL employees.

Table 6: Summary of impacts and Environmental Management Plan for proposed Project

During Construction Phase					
Sl. No	**Environmental Component**	**Activity/Aspect**	**Impacts**	**Mitigation Measures**	**Element of Environmental Management Plan**
1	Air Environment	• Modification works • Movement of traffic	Very less conventional pollutants will be released during this phase	• Dust pollution will be suppressed using water sprinklers • Periodic maintenance of machinery,	Regular monitoring of levels of conventional pollutants as per MPCB guidelines **Frequency**: 6 samples per year

				heavy vehicles	
2	Water Environment	Water demands for domestic needs	No additional impact	• Existing sanitation facilities will be used	Regular monitoring of water quality **Frequency**: 2 samples per year
3	Noise Environment	Operation of construction, heavy vehicle movements	Noise level will be more but within the permissible limits (45-75 dB(A))	• Using ear muffs for workers while construction	Regular monitoring of noise levels **Frequency** : 3 times per year
4	Socio-economic Environment	Requirement of manpower	No additional impact due to availability of local man power	Employment of locally available manpower	Use of existing welfare & health facilities
5	Biological Environment	Marginal release of additional pollutants	No additional impact	Conservation of biodiversity	Tree plantation at various locations.

During Operation Phase

Sl. No	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
1	Air Environment	Marginal release of additional pollutants	• Insignificant impact as conventional pollutants emission will be within the permissible limits.	• Compliance to standards • Continuous monitoring	Regular monitoring of the levels of conventional pollutants as per MPCB requirements **Frequency** : 6 samples per year
2	Water Environment	Operation of new process units and utilities	No additional impact	• Minimization of losses	Regular monitoring of the levels of conventional pollutants as per MPCB norms **Frequency** :2 samples per year
3	Land Environment	Disposal of spent catalysts	No additional impact	• Management of plant and domestic solid waste	Regular transfer of solid waste to authorized TSDF/authorized recyclers

4	Noise Environment	Noise from plants,	No additional impact	• Follow occupational health and safety measures	Regular monitoring of noise levels **Frequency** : 3 times per year
5	Socio-economic Environment	Requirement of manpower	No additional impact due to availability of local man power	Employment of locally available manpower	Use of existing welfare & health facilities
6	Biological Environment	Marginal release of additional pollutants	No additional impact	Conservation of biodiversity	Tree plantation at various locations.
7	Health, Safety & Environment	Conventional emissions	Health effects of pollutants	• Safety in plant design • Monitoring & compliance to OSHA standards	• Safety in plant design as per OSHA norms • Regular monitoring of the pollutant levels in different components of surrounding environment • Regular health check-up of the workers • Hazard analysis and safety measures in work place to reduce the undue risk to employees, members of public & environment as per OSHA requirements • EMP implementation and environmental monitoring programme to evaluate the effectiveness of environmental management systems.

5.0 ADDITIONAL STUDIES

5.1 Emergency Response and Disaster Management Plan (ERDMP)

BPCL has developed a comprehensive ERDMP for their Mumbai Refinery. The document is prepared in line with the Petroleum and Natural Gas Regulatory Board (PNGRB) guidelines which defines and specifies roles and responsibilities, classification of emergencies, coordination within and outside agencies etc. The document is strictly in

compliance with the PNGRB guidelines and no deviation from the guidelines. ERDMP for proposed Rasayani project shall also be developed in line with the existing ERDMP for BPCL Mumbai Refinery.

For proposed Rasayani PP project the emergency response plan guidelines are discussed below.

The project manager shall ensure that suitable instructions are issued to both BPCL and contractors personnel, identifying the action to be taken by each one in an emergency. This shall be achieved by display of organization chart/posters not only for fire fighting but also other emergencies of large magnitude. A detailed Emergency/Disaster response plan (or DMP) will be drawn out in co-ordination with police authorities, fire brigade, hospitals, and neighboring industries. The plan considers organization set up, communication cell for information exchange, availability and mobilization procedure of resources for emergency situation and provision of mutual aid.

The best way to manage any emergency is to prevent it. The guidelines to be ensured for emergency prevention shall be as follows:

- Sound engineering practice in the design fabrication, installation and maintenance of facilities
- Careful selection and correct use of equipment
- Observance of safety and security requirement
- Proper and constant training and guidance to all personnel working in the plant, with particular reference to product knowledge and maintenance practices
- Good house keeping
- Constant supervision

BPCL will develop integration of existing on-site Emergency Response Plans (ERPs) with the proposed facilities to enable it to respond effectively to an emergency. These plans will address the following issues:

- Emergency Response Organization
- Alarm and Communication Rules
- Contingency Plans for dealing with the emergency
- Co-ordination between the various emergency response teams, both within the complex as well as emergency response teams from outside the Refinery Complex
- Incident notification procedures
- Community notification and Evacuation

Existing Emergency Control Centre (ECC) shall be the focal point to co-ordinate emergency response activities. An alternative control centre will also be selected if it is anticipated that the ECC is likely to be affected by heat wave radiation of other hazards from the proposed facilities. Adequate personal protective/safety equipments will be provided at the ECC.

Emergency procedures shall be displayed along with the telephone numbers at appropriate locations in the proposed facilities.

On-site Emergency Response Plan

The existing on-site ERP shall be integrated with the emergency response plan for the proposed facilities. This shall deal with steps the complex staff will take to control an

emergency within the proposed facilities. It has been developed in accordance with BPCL principles and local regulations, and shall include information on the following:

Procedure for activation of the ERP

- The emergency response training and drill programs required to maintain emergency response preparedness
- The company's emergency response organization, including a description of the make up, function and purpose of the emergency response teams. Alternates will be identified to assume responsibilities in case disaster occurs in the absence of principal coordinators.
- Checklists will be developed for each member on the emergency response teams, which include a written description of the duties, responsibilities and authorities for each designated employee
- Role of local authority when responding to emergencies
- Alarm and communication system, including procedures for ongoing emergency communications
- Detailed contingency plans for dealing with the most likely types of emergencies that can occur. These will include emergency procedures for safely shutting down operations
- Procedure for reporting incidents to the appropriate authorities
- Plan appraisal and updating

5.2 RISK ASSESSMENT STUDY