

## EXECUTIVE SUMMARY

### ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR PROPOSED EXPANSION OF PETROCHEMICAL COMPLEX BY SETTING UP BUTENE-1 & HPG (2<sup>nd</sup> STAGE) UNITS AT LEPETKATA BY M/s BCPL



Report No.: B323- 1742- EI-2001

September, 2020

Project Proponent:

Environmental Consultant:



**Brahmaputra Cracker  
and Polymer Limited**

Baseline Data Collection Agency:  
FILE No. J-11011/390/2006-IA-II (I)

**Category- A**



इंजीनियर्स  
इंडिया लिमिटेड  
(भारत सरकार का उपक्रम)

ENGINEERS  
INDIA LIMITED  
(A Govt. of India Undertaking)

M/s Eko Pro Engineers Pvt. Ltd.  
Sector-18 (NABET) & Sector - 5 (C) (MoEFCC)  
EIL - CERTIFICATE NO.: NABET/EIA/1619/RA 0041



## 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 Programme
5. Environment Management Plan
6. Project Benefits
7. Additional studies

## 1.1 Project Description

### Introduction

Brahmaputra Cracker and Polymer Limited (BCPL) implemented the prestigious Assam Gas Cracker project at Lepetkata, Distt. Dibrugarh, Assam. It was approved by the Cabinet Committee on Economic Affairs (CCEA) on 18th April, 2006. GAIL (India) Limited is the major promoter having 70% of equity participation and the rest 30% is equally shared by Oil India Ltd (OIL), Numaligarh Refinery Limited (NRL) and Government of Assam (GoA).

M/s Brahmaputra Cracker and Polymer Limited (BCPL), Complex is at Lepetkata, distt. Dibrugarh, Assam, comprising of a Gas Sweetening unit, C2+ Liquid recovery unit, Gas + Naphtha based Ethylene Cracker Unit, C4 Hydrogenation unit, Pyrolysis Gasoline unit, LLDPE/HDPE unit and PP unit. Apart from the process units, the complex will have integrated Utility Generation and Offsite Storage Facilities along with various infrastructure facilities. The capacity of the Ethylene Cracker unit is 220,000 TPA of ethylene and about 60,000 TPA of propylene.

### Proposed Project Recommendation

Expansion of Petrochemical Complex by setting up Hydrogenated Pyrolysis Gasoline - 2nd stage & Butene-1 units at Lepetkata by M/s Brahmaputra Cracker and Polymer Limited and for the petrochemical unit there is requirement of 10000 MTPA Butene-1.

For the petrochemical unit there is requirement of Butene-1. At present requirement of Butene-1 is being catered by sourcing from external sources. However in order to ascertain long term availability of Butene-1, setting up of Butene-1 plant at BCPL Lepetkata is recommended.

Further, Hydrogenated Pyrolysis Gasoline (HPG), a by-product at BCPL, cannot be directly used as MS blend component due to high Benzene content. At present BCPL has made interim arrangements for sale/evacuation of HPG to ensure smooth running of the cracker. Looking into the inherent characteristics of HPG being carcinogenic and prone to adulteration in MS, a long term solution for safe and convenient evacuation of HPG is required, in view of above setting up of HPG(2nd stage) is recommended.

M/s BCPL has entrusted M/s Engineers India Limited (EIL) to carry out Environmental Impact Assessment (EIA) study for various environmental components of the proposed expansion project. EIL is an accredited consultant for carrying out EIA studies by Quality Council of India in **Category A – “Petro-chemical complexes”**; **Sector 18 as per NABET Scheme & Category 5 (C) (MoEFCC)**.

Environmental Monitoring was undertaken at various locations in the study area within impact zone of 10 km radial distances around the proposed project. The environmental baseline data collection involved the assessment of various environmental parameters like ambient air, water, noise, land, soil, traffic, flora fauna, meteorology and socio – economic aspects. The study has been conducted for one year i.e. January- March, 2020.

### 1.1.1 Configuration of Proposed Petrochemical Complex Expansion project

The following units are envisaged in the additional Petrochemical Complex:

1. Butene-1 Unit,
2. HPG 2nd Stage Unit.

The main products are:

- ❖ Butene-1
- ❖ Benzene Saturated pyro gasoline

The estimated capital cost for the proposed expansion project is **Rs. 386.75 crores**.

The proposed project is expected to be mechanically completed in **30 months** from the Zero date (After receipt of Environmental Clearance).

The following utilities will be used for the proposed expansion project:

- No additional power is required for the proposed project; the all requirement for proposed expansion shall be accommodated within an existing power demand of 53 MW which will be sourced by existing CPP (in-house) & State Grid.
- Total Raw Water requirement for post expansion project is 600 m<sup>3</sup>/Hr. Present raw water requirement in existing petrochemical complex draws 570 m<sup>3</sup>/Hr.
- BFW requirement for the proposed project is 0.5 TPH.
- Boiler blow down will be routed to ETP for reuse and recovery.
- Sufficient storage shall be provided for sour water at the generation points, so that during start up and shut down sour effluent can be diverted to these storage tanks instead of diverting to wastewater treatment plant.

## 1.2 Brief Description of the Environment

Environmental baseline data has been collected around BCPL site during the period of January 2020 to March 2020 by M/s EKOPRO Labs, Ghaziabad (U.P.) which is one of the MoEFCC recognized and NABL accredited approved environmental laboratory. 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.

### 1.2.1 METEOROLOGY

To record the prevailing meteorological conditions at the site, a meteorological observatory was set up at a height 10m above the ground level at the BCPL project site. The micro-meteorological parameters of interest in the context of Impact Assessment are wind speed, wind direction, relative humidity, ambient temperature and rainfall.

During the study period the predominant wind directions were observed from NE followed by SW with an avg. speed of 3.80 m/s. The minimum and maximum temperature recorded during the study period was 7.55 °C and 33.25 °C respectively.

### 1.2.2 AMBIENT AIR ENVIRONMENT

In order to obtain baseline air quality status, total eight (08) nos. air quality monitoring stations were set up in and around 10 km radius area of BCPL Petrochemical Complex. The locations were identified considering the location of human settlements and predominant wind directions in the area.

PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO, C<sub>6</sub>H<sub>6</sub>, NH<sub>3</sub>, O<sub>3</sub>, HC and VOC were selected parameters for the Baseline study. Parameters like PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub> and NH<sub>3</sub> were analyzed on 24 hourly basis, whereas CO and O<sub>3</sub> on 8 hourly basis. Sampling was carried twice a week during 12 weeks study period.

All the sampling sites are monitored at a height ranging from 3-5 m and free from any obstructions. Location wise highest 98th percentile values for collected parameters are given in below **Table 1.1**.

**Table 1.1 Summary of Air Monitoring Data Analysis**

S.No.	Location	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	NH <sub>3</sub> (µg/m <sup>3</sup> )	O <sub>3</sub> (µg/m <sup>3</sup> )
1	Japara Gaon	74.6	49.6	13.9	24.7	0.88	BDL	19.66
2	Digala Gaon on NH-52B	73.5	48.3	13.6	23.7	0.89	BDL	19.86
3	Lepatkata Gaon	73.9	48.9	13.9	23.8	0.89	BDL	19.43
4	Kuthua Kachai Gaon	70.7	49.4	13.3	24.9	0.90	BDL	19.25
5	Chamoguri Bengali Gaon	74.3	49.8	13.6	24.9	0.89	BDL	19.56
6	Gabhrujan Gaon	73.9	49.5	13.1	24.2	0.90	BDL	19.8

S.No.	Location	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	NH <sub>3</sub> (µg/m <sup>3</sup> )	O <sub>3</sub> (µg/m <sup>3</sup> )
7	Rewomari Gaon Opp.CISF Camp	75	49	13.8	24.3	0.89	BDL	19.42
8	BCPL Plant	74.4	49.6	13.9	24.5	0.89	BDL	18.97

From **Table 1.1**, it can be seen that the 98<sup>th</sup> percentile values at various monitoring stations for gaseous pollutants like PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO and NH<sub>3</sub>, benzene were found well below the National Ambient Air Quality standards for residential/industrial areas.

### 1.2.3 WATER ENVIRONMENT

Baseline water data was collected at Sixteen (16) nos. locations (08 nos. ground water locations, and 08 nos. surface water sources) at around 10 km radius area of BCPL. The samples were analyzed for Colour, Odour, Taste, Temperature, pH, Turbidity, Total Dissolved Solids, Total Suspended Solids, Total Hardness (as CaCO<sub>3</sub>), Sulphides, Sulphate, Chloride, Sodium, Potassium, Silica, Oil & Grease, Fluoride, Nitrates, Calcium, Magnesium, Phosphorus, Ammonical Nitrogen, Salinity, Dissolved oxygen, BOD, COD, Total Coliform, Faecal coliform. Collected baseline water data is summarized and given in Chapter-3 under table no. 3.20 & 3.21. The results are given as below:

#### Ground water Quality

Total of eight (08) ground water samples were collected.

pH values are ranging from 7.11 to 7.34, which was found to be well within the IS :10500 limits. Total hardness values are ranging from 98 to 116 mg/l. Results are well within the permissible limits. Chlorides concentrations are ranging from 16.5 to 22.9 mg/l. It was observed that maximum all the locations of ground water is slightly saline in nature.

Sulphates concentration was observed in the range of 28.9 to 39.2 mg/l. Maximum sulphate concentration was observed at BCPL Plant (Bore Well), which is well within the desirable limits (200 mg/l).

Total dissolved solids observed between 142 and 170 mg/l. Maximum TDS was observed at BCPL Plant (Bore Well). TDS values for all the ground water samples were within the permissible limits (2000 mg/l). All the heavy metals concentrations were found to be well within limits as per IS: 10500.

#### Surface water Quality

Total of eight (08) surface water samples were collected.

For surface water samples, the pH found to be neutral. However, the use of surface water for potable and drinking purpose must be sterilized before use with suitable disinfectant.

Surface water samples were compared with Water Quality Criteria, published by CPCB and falling under A category of surface water.

#### 1.2.4 NOISE ENVIRONMENT & TRAFFIC SURVEY

The noise monitoring and Traffic survey was conducted to assess the background noise levels and traffic density at Eight (8) nos. locations near to the Petrochemical Complex.

The observations were taken of ambient noise levels at 8 locations around the project site. The noise levels were recorded during the day time were from 50.9 Leq dB to 74.9 Leq dB (A) at Kuthua Kachai Gaon & BCPL Plant respectively and level of noise during night time were from 40.9 Leq dB (A) to 60.5 Leq dB at Lepatkata Gaon & BCPL Plant respectively. Thus, noise levels at all locations were observed within the tolerance limits as prescribed by the CPCB and State Pollution Control Board.

Traffic analysis was carried out by understanding the existing carrying capacity of the roads near to the project site. The maximum observed traffic density has been taken as existing volume and is divided against the capacity of the road as per Indian Road Congress Code 64-1990 to calculate the existing level of service of the road, the calculation based on the baseline monitored data are given in table nos. 3.12, 3.13 & 3.14 of chapter-3.

The passenger car unit conversion of above data shows that the level of services at these traffic monitoring locations were excellent and falls under "Category - A" as per baseline data collection in study area. The LOS value from the proposed project will not change; LOS value for Roads will remain same as Excellent. Therefore, an additional load on the carrying capacity of the concern roads is not likely to have any major impact due to this forthcoming project.

#### 1.2.5 LAND ENVIRONMENT

There will be no requirement of new land for the proposed Petrochemical Complex capacity expansion project and all the project related activities will be limited to within BCPL boundary. Land use and land cover pattern have been studied through interpretation of satellite imageries (thematic maps) are attached as **Annexure- IX**.

#### 1.2.6 SOIL ENVIRONMENT

For establishing the baseline status of soil within the probable impact zone, Soil Samples were collected at eight (08) locations in and around the BCPL for the following soil parameters: pH, Bulk Density, Specific Gravity, Electrical Conductivity, Porosity, Sodium Adsorption Ratio, Organic Matter, Total Nitrogen, Phosphate, Potassium and Sodium Adsorption Ratio. Results are found as per baseline data collection within the study area:

- The bulk density of the soil is varied from 1.38 to 1.56 g/cc. Its shows the infiltration rate is medium.
- The pH of the soils is varied from 7.82 to 8.12 shows basic in nature.
- The EC levels are very low and not harmful to germination.
- The nitrogen levels found low with range in between 0.05 to 0.15.
- Organic Matter was found very low at all the locations.

The good amount of concentration of Nitrogen, Phosphorus and Potassium has been found in the Soil Samples. Soil texture is clay to Sandy Loam at all the locations and is good for agricultural purposes.

### 1.2.7 BIOLOGICAL ENVIRONMENT

There is no national park / wild life sanctuary / eco sensitive area/ reserve forest is within 10 Km from BCPL Petrochemical Complex.

### 1.2.8 SOCIO-ECONOMIC ENVIRONMENT

Socio-economic profile of human settlements around 10 km radius area of BCPL has been collected and presented in sec 3.8 of chapter-3 in this EIA study report.

## 1.3. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 1.3.1 Ambient Air Environment

#### 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<sub>2</sub> and NO<sub>x</sub> are the main air pollutants from the point source emissions. Various steps taken by BCPL to monitor and control the emission of SO<sub>2</sub> and NO<sub>x</sub> are summarized below:

- ✓ To ensure that all the pollution control facilities envisaged at the design stage have been implemented and are functioning properly.
- ✓ Stack monitoring to ensure proper functioning of different pollution control facilities attached to major stacks. Existing On-line analyzers will be used for monitoring SO<sub>2</sub> and NO<sub>x</sub>.
- ✓ A flue gas scrubber will be provided to reduce the SO<sub>x</sub> and particulate emissions from flue gases to local emissions stipulations.
- ✓ Combination of SCNR and SCR technologies along with low NO<sub>x</sub> burners will be used in CO incinerators to reduce NO<sub>x</sub> emissions.
- ✓ Air monitoring in the Work-zone to ensure proper functioning of fugitive emission control facilities.
- ✓ Vehicles and machineries would be regularly maintained so that emissions confirm to the applicable standards.
- ✓ Monitoring of ambient air quality through online AAQ monitoring system at three locations to measure/monitor the pollution level.
- ✓ Workers will be provided with adequate protective measures to protect them from inhaling dust.
- ✓ Design of the plant system to meet the OISD & Indian Factory act requirements.

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- ✓ Provisions of the Safety Systems in the design with redundancy, and reliability are considered in depth.
  - ✓ Operation of the plant by qualified manpower.
  - ✓ Regular monitoring and review to ensure safe operation.
  - ✓ Regular monitoring by Environmental Cell to demonstrate the compliance with Statutory limits in the public domain.
  - ✓ Flare is envisaged for combustion of Petrochemical Complex off-gases.

### Mitigation Measures for Fugitive emissions

The major sources of such fugitive emissions of Volatile Organic Compounds (VOCs) in the Petrochemical Complex are the main processing area, tank farm area having storage tanks for crude oil and lighter products and the loading/unloading gantry area. These fugitive emissions originate from the static and dynamic joints and seals used in flanges, pumps, mixers, valve packing and connection joints to the atmosphere like sampling and relief valves etc. In order to minimize the fugitive emissions of VOCs, the following measures were taken during design stage:

- ❖ Provision of Close – Blow down (CBD) system for all the process units to minimize VOC emission from the operations.
- ❖ Minimum number of flanges, valves etc;
- ❖ High grade gasket materials for packings;
- ❖ Usage of state-of-the-art low leakage valves for new units
- ❖ Usage of pumps with (single/double) mechanical seals;
- ❖ Provision of floating roof storage tanks for volatile products storage;
- ❖ Internal aluminium floating roof on tanks on lighter hydrocarbon service
- ❖ Annual fugitive hydrocarbon emission monitoring survey as per Leak Detection and Repair (LDAR) program is in place in Petrochemical Complex. Mitigation measures for minimization of Fugitive emissions of VOCs include minimum number of flanges, valves, etc., high grade gasket material for packing, usage of state of art low leakage valves preferably with bellow seals, etc.

### 1.3.2 Water Environment

During the operational phase impact on water environment can be due to two reasons, firstly due to use of raw water and secondly due to disposal of treated effluent from the plant.

For proposed project, additional raw water requirement is 30m<sup>3</sup>/hr.

The required raw water will be sourced from existing BCPL petrochemical complex. Irrigation department, Dispur, Govt. of Assam was permitted to BCPL for withdraw the

2300 m<sup>3</sup>/hr raw water from Buridehing River vide letter no. IGN (W) 10 / 2005 / 108; dated: 07.12.2010. Water allocation letter is attached as **Annexure-VIII**.

BCPL having additional approval from CGWB to extract the raw water from 5 nos. of bore well within BCPL complex vide letter no.1462 / D27 / CGWB / NER / 2007-2008; dated: 25.08.2010. This is used as an intermittent source of raw water. The CGWB permission letter is attached as **Annexure-VIII**.

Existing Water Systems are adequate to meet the requirement of new facilities of this Project. Thus, no new utility facilities are envisaged in this Project. 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.

The Effluent generated from the floor wash shall be in the tune of ~15m<sup>3</sup>/hr and is Intermittent.

Existing ETP is adequate to handle the above liquid effluent stream generated from HPG (2<sup>nd</sup> stage) and Butene-1 plants. The final treated effluent will be disposed into Brahmaputra River as per the current Petrochemical Complex existing practice.

### 1.3.3 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 units etc.

The solid waste that is produced during operation phase will be either sold as manure for agricultural fields or to brick and cement industries. All statutory rules / guidelines of MoEFCC / CPCB will be complied prior to recycle, reclamation or sale of spent catalyst.

### 1.4 Environmental Monitoring Program

The proposed environmental monitoring program of the proposed project is given below:

**Table 1.2: Proposed Environmental Monitoring Program during Construction Phase**

Component	Parameters	Location / Frequency of Monitoring	No. of Samples / year (Locations X Monitoring Frequency)
Air	SO <sub>2</sub> , NO <sub>x</sub> , PM <sub>10</sub> & PM <sub>2.5</sub>	At two locations, one at project site and another is at plant boundary. Twice in a season (except monsoon) per year for 2 years	4 x 3
Water	Surface Water: CPCB surface water criteria; Ground Water: IS:10500	One surface water in the project site per season. Two Ground Water: One Up-gradient and One Down-gradient of project site per season.	3 x 3
Noise	Noise Levels Leq (A)	At two locations, one at project site and another is at plant boundary. Once in a season (except monsoon) per year for 2 years	2 x 3
Soil	As per standard practice	At one location, in the project site. Twice in a year.	1 x 2

**Table 1.3: Proposed Environmental Monitoring Program during operational phase**

SI.No.	Potential impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring
1	Air Emissions	All equipment is operated within specified design parameters.	Random checks of equipment logs/ manuals	Periodic
		Vehicle trips to be minimized to the extent possible.	Vehicle logs	Periodic during site clearance & construction activities
		Any dry, dusty materials stored in sealed containers or prevented from blowing.	Absence of stockpiles or open containers of dusty materials.	Periodic during construction activities
		Compaction of soil during various construction activities	Construction logs	Periodic during construction activities
2	Noise	Night working is to be minimized.	Working hour records	Daily records
		Generation of vehicular noise	Maintenance of records of vehicles	Daily records
		Acoustic mufflers / enclosures to be provided in large engines	Mufflers / enclosures in place.	Prior to use of equipment.
		Vehicle trips to be minimized to the extent possible	Vehicle logs	Periodic during construction activities
3	Soil Erosion	Protect topsoil stockpile wherever possible.	Effective cover in place.	Periodic during construction activities
4	Health	Employees and migrant labour health check ups	All relevant parameters including audiometry	Regular check ups
5	Construction camps	Away from settlements and ensure disciplinary procedures.  Avoid use of public infrastructural facilities such as power, gas and water and maintain hygienic conditions	Regular monitoring	Pre-construction
6	Waste Management	Identification & characterization of	Comprehensive Waste	Periodic check during

Sl.No.	Potential impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring
		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.	Management Plan in place and available for inspection on-site. Compliance with Hazardous Wastes (Management and Handling Rules), 2008	construction activities
7	Fuel and oil leaks	Use designated fuel storage methods and ensure that oil spill response plan is in place	Visual inspection and monitoring of soil and ground water quality	Throughout construction period
8	Non-routine events and accidental releases	Plan to be drawn up, considering likely emergencies and steps required to prevent/limit consequences.	Mock drills and records of the same	Periodic during construction activities
9	Public and animal safety	Erection of warning barriers	Routine monitoring and checks	Throughout construction period
10	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

## 1.5 Environmental Management Plan

The EMP in the design stage endeavors to mitigate the problems related to health, safety and environment at the process technology selection stage and at the design stage.

A summary of proposed impacts, mitigation measures and proper environmental management plan for both construction and operational phase is given in **Table 1.4 and 1.5, respectively.**

**Table 1.4: Summary of Impacts and Environmental Management Plan for Post Expansion Phase of BCPL Petrochemical Complex during Construction Phase**

Sl. No.	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
1	Air Environment	<ul style="list-style-type: none"> <li>Foundation work</li> <li>Digging, leveling work</li> <li>Structural works</li> </ul>	Very less conventional pollutants will be released during this phase due to construction works, vehicle exhausts which will not cross the specified limits because low value of background levels	<ul style="list-style-type: none"> <li>Dust pollution will be suppressed using water sprinklers</li> <li>Periodic maintenance of machinery, heavy vehicles</li> </ul>	Regular monitoring of levels of conventional pollutants as per PCB, Assam guidelines
2	Water Environment	Maintenance of drainage and water supply network for Sanitation and waste water generation	Limited impact on surrounding water bodies/aquatic ecosystems/ground water due to soil erosion, leaching, waste water generation	<ul style="list-style-type: none"> <li>Water requirement through existing raw water source</li> <li>Proper sanitation</li> <li>Waste water treatment through existing treatment plant</li> </ul>	<ul style="list-style-type: none"> <li>Provision for appropriate sanitary facility for construction workers</li> </ul>
3	Land Environment	Land use change due to drilling, excavating	<ul style="list-style-type: none"> <li>Land pollution of small magnitude due to solid waste generation</li> <li>Overburden and construction waste will also be produced</li> </ul>	<ul style="list-style-type: none"> <li>Management of solid waste</li> <li>Management of excavated solid and construction waste</li> </ul>	<ul style="list-style-type: none"> <li>Composting bio-degradable waste and disposal of non-bio-degradable waste in land fills</li> <li>Construction waste will be used for back filling</li> </ul>
4	Noise Environment	Noise from construction, heavy vehicle movements	Noise level will be more but within the permissible limits	<ul style="list-style-type: none"> <li>Noise protection measures</li> <li>Using ear muffs for workers while construction</li> </ul>	<ul style="list-style-type: none"> <li>Rules &amp; regulations of Noise Standards will be followed</li> <li>Greenbelt development for attenuating the noise levels</li> </ul>

Sl. No.	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
5	Socio-economic Environment	Rehabilitation & resettlement	More benefits to the local people	<ul style="list-style-type: none"> <li>• Employment opportunities to local skilled and unskilled people</li> <li>• Development of infrastructure, communications facility, drinking water supply, health etc.</li> <li>• Social and cultural development</li> </ul>	<ul style="list-style-type: none"> <li>• Regular health camp surrounding the plant</li> <li>• Implementation of BCPL CSR Policy</li> </ul>
6	Biological Environment	Land use change	<ul style="list-style-type: none"> <li>• Impact on flora and fauna will be minimal</li> <li>• Less impact on marine ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>• Creation of landscape with plantation</li> <li>• Conservation of biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>• Biological diversity Act and MoEF guidelines for conservation of species will be followed</li> <li>• Greenbelt development with more fruit bearing trees, avenue plantation etc. will be made</li> </ul>

Table 1.5: Summary of Impacts and Environmental Management Plan for Post Expansion Phase of BCPL Petrochemical Complex during Operation Phase

S. No.	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
1	Air Environment	<ul style="list-style-type: none"> <li>Air emissions (Conventional)</li> <li>Movement of vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Insignificant impact as conventional pollutants emission will be within the permissible limits.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance to standards</li> <li>Continuous monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Control air emissions at source</li> <li>Treatment to reduce air emissions</li> <li>Regular monitoring of the levels of conventional pollutants as per PCB, Assam requirements</li> <li>Regular maintenance of vehicles and equipment</li> </ul>
2	Water Environment	Operation of new process units and utilities	Limited impact on surrounding water bodies/aquatic ecosystems/ground water	<ul style="list-style-type: none"> <li>Proper management of active and domestic waste water</li> <li>Proper design of condenser Cooling systems</li> <li>Rain water harvesting</li> </ul>	<ul style="list-style-type: none"> <li>Liquid effluents discharge will be much below discharge limits of CPCB norms</li> <li>Treatment of domestic waste and reuse of water for irrigation of plantation/green belt</li> <li>Regular monitoring of the levels of conventional pollutants as per PCB, Assam norms</li> <li>Implementation of rain water harvesting</li> </ul>
3	Land Environment	Disposal of solid waste	Land pollution of small magnitude due to solid waste generation	<ul style="list-style-type: none"> <li>Management of plant and domestic solid waste</li> <li>Development of green belt</li> </ul>	<ul style="list-style-type: none"> <li>Treatment and disposal of solid waste as per CPCB/PCB, Assam norms</li> <li>Disposal of non-degradable waste in proper land fills</li> <li>Development of green belt in</li> </ul>

S. No.	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
					the plant area
4	Noise Environment	Noise from plants, DG sets etc.	Insignificant noise levels in public domain	<ul style="list-style-type: none"> <li>Control of noise levels within permissible limits</li> <li>Development of barriers to control noise</li> <li>Follow occupational health and safety measures</li> </ul>	<ul style="list-style-type: none"> <li>Noise levels due to plant activities will be controlled within permissible limits</li> <li>Noise generating units will be housed in acoustic enclosures</li> <li>Development of green belt will act as a barrier</li> <li>Personal Protective Equipment (PPE) will be provided to workers wherever required</li> </ul>
5	Socio-economic Environment	CSR Activities	More benefits to the local people	<ul style="list-style-type: none"> <li>Employment generation</li> <li>Awareness camps</li> <li>Medical camps</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of social welfare schemes for the local people</li> <li>Awareness on Social benefits among local people through seminars, workshops, exhibitions</li> <li>Preference will be given to local people</li> <li>Ensure participation of local people in cultural events to create social harmony and goodwill</li> </ul>

S. No.	Environmental Component	Activity/Aspect	Impacts	Mitigation Measures	Element of Environmental Management Plan
6	Biological Environment	Discharge/ releases to air & water.	Impact on terrestrial flora and fauna	<ul style="list-style-type: none"> <li>Adequate protection measures should be ensured in design for conservation of flora and fauna</li> </ul>	<ul style="list-style-type: none"> <li>Development of green belt with indigenous tree species</li> <li>Control of eutrophication by treatment and reuse of waste water</li> <li>Regular monitoring of biodiversity and listing the same</li> <li>The plant design will envisage the conservation of flora &amp; fauna.</li> </ul>
7	Health, Safety & Environment	Conventional emissions	Health effects of pollutants	<ul style="list-style-type: none"> <li>Occupational health &amp; safety</li> <li>Safety in plant design</li> <li>Monitoring &amp; compliance to OSHA standards</li> </ul>	<ul style="list-style-type: none"> <li>Safety in plant design as per OSHA norms</li> <li>Regular monitoring of the pollutant levels in different components of surrounding environment</li> <li>Regular health check-up of the workers</li> <li>Hazard analysis and safety measures in work place to reduce the undue risk to employees, members of public &amp; environment as per OSHA requirements</li> <li>EMP implementation and environmental monitoring program to evaluate the effectiveness of environmental management systems.</li> </ul>

## 1.6 Project Benefits

BCPL is continuously taking measures to improve sustainability activities to ensure staying on track and in balance with the three sustainability dimensions of economic, environmental and social impact at all times. The triple bottom line i.e. people, profit, planet approach is the cornerstone of all our social interventions which have been designed to schematically meet all three goals.

The benefits of the proposed project can be summarized as:

- To establish significant presence in the northeast region in petrochemical sector by way of production / sourcing and marketing of quality products, deploying efficient distribution and marketing channels to cater to the needs of target customers.
- A bio remediation facility is available at BCPL Lepetkata complex which will reduce sludge by converting it into mud.
- Development of facilities around the Petrochemical Complex thereby enhancing the livelihood of the people in the Petrochemical Complex vicinity.

## 1.7 Summary of Risk Assessment Study

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

Risk Analysis involves identification of various potential hazards & credible failure scenarios for various units and other facilities including off-site storages & pumping, etc., based on their frequency of occurrence & resulting consequence. Basically two types of scenarios are identified spanning across various process facilities; Cases with high chance of occurrence but having low consequence, e.g., Instrument Tapping Failure (20mm) or Flange Leakage (10mm) or Seal Failure (6mm) and cases with low chance of occurrence but having high consequence, e.g., Catastrophic Rupture of Pressure Vessels or large hole. Effect zones for various outcomes of failure scenarios (Flash Fire, Jet Fire, Pool Fire, Blast overpressure, etc.) are studied and identified in terms of distances on plot plan. Based on effect zones, measures for mitigation of the hazard/risk are suggested.

Detailed Risk Analysis report will be attached as **Annexure-XI**.

### 1.7.1 MAJOR OBSERVATIONS & RECOMMENDATIONS

The detailed consequence analysis of release of hydrocarbon in case of major credible scenarios are modelled in terms of release rate, dispersion, flammability and toxic characteristics, which have been discussed in detail in the report. The major findings and recommendations arising out of the Risk Analysis study are summarized below (directions based on plant north):

#### **Butene-1 Unit**

- a) In case of **flange leakage at ethylene guard bed outlet, Instrument tapping failure Reactor effluent pump discharge and Instrument tapping failure at Butene-1 on-spec pump discharge**; Jet fire thermal radiation intensity of 37.5 kW/m<sup>2</sup> covers a portion of offsite pipe rack on the northern side of unit.

**It is recommended to**

- Locate these equipments during detail engineering in such a way that Jet fire thermal radiation intensity of 37.5 KW/m<sup>2</sup> shall not reach up to offsite pipe rack on the northern side of Butene-1 unit.
- Ensure fire proofing shall be provided on the pipe rack located on the northern side of the Butene-1 unit falling under 12.5 kw/m<sup>2</sup> jet fire thermal radiation intensity.

- b) In case of **Instrument tapping failure at Reactor pump around discharge, Instrument tapping failure at Recycle Column feed pump discharge, Instrument tapping failure at Reactor effluent pump discharge, Instrument tapping failure at Reactor column feed pump and Instrument tapping failure at Butene-1 column reflux pump discharge**; the flash fire zone covers the road on the southern and eastern side of Butene-1 Unit.

**It is recommended to**

- Restrict vehicle movements on the road on the southern and eastern side of Butene-1 Unit through suitable means. Only emergency vehicles or authorized vehicles shall be allowed on this road.
- c) In case of **Instrument tapping failure at Recycle column feed pump discharge and Instrument tapping failure at Butene-1 column reflux pump discharge**; Jet fire thermal radiation intensity of 37.5 kW/m<sup>2</sup> covers a portion of offsite pipe rack on the northern and eastern side of unit.

**It is recommended to**

- Locate these pumps during detail engineering in such a way that Jet fire thermal radiation intensity of 37.5 kW/m<sup>2</sup> shall not reach up to offsite pipe rack on the northern and eastern side of Butene-1 unit.
  - Ensure fire proofing shall be provided on the pipe rack located on the northern and eastern side of the Butene-1 unit falling under 12.5 kw/m<sup>2</sup> jet fire thermal radiation intensity.
- d) In case of **Catastrophic rupture recycle column feed surge drum**, fire ball thermal radiation intensity of 12.5 kW/m<sup>2</sup> and blast overpressure effects of 3 and 5 psi extend beyond the unit.

It is recommended to utilize the results of this scenario while updating/ formulation of Emergency Response Disaster Management Plan (ERDMP).

**HPG Second Stage Unit**

- e) In case of Instrument tapping failure at PGH Second stage Reactor feed pump discharge and flange leakage at PY Gasoline product at B/L; the flash fire zone covers the western side road of ethylene cracker unit.

**It is recommended to**

- Restrict vehicle movements on the western side road of ethylene cracker unit through suitable means. Only emergency vehicles or authorized vehicles shall be allowed on this road.
- f) In case of Instrument tapping failure at PGH Second stage Reactor Feed Pump and Instrument tapping failure at BenSat Reactor feed pump discharge; IDLH concentration (500 ppm Benzene) effects extend beyond the unit and BCPL Complex from northern and southern boundary.

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**It is recommended to**

- Ensure all the manned buildings coming under IDLH conc. zone of benzene should be positively pressurized.
  - Install adequate number of benzene detectors in the HPG Second stage unit and develop the SOP to isolate the major inventory source to restrict escalation of toxic effect outside the BCPL Complex.
  - Locate these pumps during detail engineering in such a way that IDLH Concentration zone of benzene shall not cross northern side boundary of BCPL Complex.
  - Ensure no permanent habitation around the area outside plant boundary coming under IDLH Concentration zone of benzene.
- g) In case of Instrument tapping failure at splitter bottom, IDLH concentration (500 ppm Toluene) effects extend beyond the unit and covers manned buildings.

**It is recommended to**

- Ensure all the manned buildings coming under IDLH conc. zone of toluene should be positively pressurized.
  - Install adequate number of gas detectors in the HPG Second stage unit and develop the SOP to isolate the major inventory source to restrict escalation of toxic effect to other units.
- h) In case of catastrophic rupture of PGH Second stage HP Flash drum, IDLH concentration (500 ppm Benzene) effects extend beyond the unit and covers manned buildings.

It is recommended to utilize the results of this scenario while updating/ formulation of Emergency Response Disaster Management Plan (ERDMP).

**Offsite**

- i) In case of Instrument tapping failure at Hexane tank manifold, Jet fire thermal radiation intensity of 12.5 kw/m<sup>2</sup> covers a portion of offsite pipe rack on the southern side of pump house.

**It is recommended to**

- Ensure fire proofing shall be provided on the portion of pipe rack located on the southern side of the hexane tank falling under 12.5 kw/m<sup>2</sup> jet fire thermal radiation intensity.

**Inputs for Emergency Planning**

- Cases like catastrophic Rupture are low probability events and pose significant consequence hence their Results should be utilized while formulating/updating of Onsite & Offsite emergency plan.
- Safe Escape Route and Access route during high severity situation like catastrophic Rupture and high frequency cases like instrument tapping failure should be identified. Ensure sign boards/markings are provided for escape route/assembly points inside the complex.
- Emergency Mock drills & Fire Drill to be carried out at organization level to ensure preparation of the personnel working in BCPL Complex for handling any emergency situation.

**General Recommendations:**

- Quantitative Risk analysis needs to be carried out for entire facility for overall risk assessment.
- It is recommended to follow and implement licensor's safety guidelines for handling and storage of chemicals such as TEAL etc. in Butene-1 Unit.

- To enable rapid detection of leak/ fire, flammable & toxic gas detector shall be located in strategic location in the Butene-1, HPG 2nd Stage, PSA, near tankage area & Pump house.
- For positively pressurized building, both Hydrocarbon & Toxic detectors need to be placed at suction duct of HVAC. HVAC to be tripped automatically in event of the detection of any Hydrocarbon / toxic material by detector.
- Proper checking of personnel at entry gates for Inflammable materials to be ensured to avoid presence of any unidentified source of ignition
- It shall be ensured that all the vehicles entering the plant shall be provided with spark arrestors at the exhaust.
- Employees and Truck drivers must be well trained and must be aware of the hazards involved in the loading/unloading operation.
- Ensure that SOP & Do's/Don'ts for critical activities like startup/ shutdown/ emergency shutdown is displayed near critical equipment like reactor, boiler, turbine, compressor, fired heater, storage area & Hazardous chemical handling areas.
- Proper material movement path within the BPCL Complex to be identified during the construction phase of the project.
- Loading/ Unloading operations shall be immediately suspended in the event of leak, a fire in the vicinity, lightning and thunder storm.
- Active fire protection system shall be provided throughout the plant for preventing escalation of fire.
- Recommended to use portable gas detector during sampling and maintenance etc.

#### **i. Mitigating Measures**

Mitigating measures are those measures in place to minimize the loss of containment event and hazards arising out of Loss of containment. These includes:

- Rapid detection of an uncommon event (HC/Toxic leak, Flame etc.) and alarm arrangement and development of subsequent quick isolation mechanism for major inventory
- Measures for controlling / minimization of Ignition sources inside the operating area.
- Active and Passive Fire Protection for critical equipment's and major structures.

#### **ii. Preventive Maintenance for Critical Equipment's**

In order to reduce the failure frequency of critical equipment's, the following are recommended:

- Instrument tapping, small bore tapping and process vessels should be inspected regularly for integrity check. Periodic health check of equipment, instruments and maintenance of all equipment & piping are required to be ensured. Periodic calibration of instruments and testing of alarms, trips, interlocks should be given due attention.
- High head pumps, which are handling Toxic material/HC, are needed to be identified:
  - a. Their seals, instruments and accessories are to be monitored closely
  - b. A detailed preventive maintenance plan to be prepared and followed.
- Surge Drums , Reflux drums and high inventory vessels whose rupture may lead to massive consequences , to be identified and following to be ensured:
  - a. Monitoring of vessel internals during shut down.
  - b. A detailed preventive maintenance plan to be prepared and followed.

## 1.8 Budgets for Corporate Environment Responsibility (CER)

Corporate Environment Responsibility (CER) is planned for next 5 years and **3.15 crores** (INR) shall be spent as per MoEFCC notification vide F.No.22-65/2017-IA.III; dated: 01.05.2018 and the total project cost is **Rs. 386.75 crores** which is coming under Brownfield project and Detailed activities plan of CER plan with cost break up over the 5 years are provided in EMP (Chapter-10) of EIA report.

Activities to be covered in CER	2020-21	2021-22	2022-23	2023-24	2024-25
Solar Lighting / Solar pump (Irrigation) system, Drinking Water Facilities, Resource Upliftment at Schools, Resource provision for Talent Development and Plantation etc.	0.63 Crores	0.63 Crores	0.63 Crores	0.63 Crores	0.63 Crores

## 1.9 Conservation Plan for Schedule - I species

The Conservation Plan would focus on conservation of habitats of Schedule-I species identified during the EIA process. Support in the form of donation of funds and active participation in awareness campaigns will be provided to the existing management plans undertaken by the Forest Department in the area. Awareness drives will be undertaken targeting different group of society at different times. During these, dialogue with locals will be established and importance of co-existence of these species will be explained.

BCPL is committed to earmarked funds and utilized it only for purpose specified through forest department. Details of utilization of funds (amount is in lakhs) are given in following table.

**Table 1.6: Details of utilization of funds (amount is in lakhs)**

Sr. No.	Activity	Years from commencement of project				
		I	II	III	IV	Total
<b>I</b>	<b>Direct &amp; Indirect involvement of BCPL</b>	<b>Amount in lakhs</b>				
1.	To associate with forest department, and other agencies for effective implementation of conservation programme	2.0	1.5	1.5	2.0	7.0
2.	Identification of nesting sites for birds and habitat for reptiles and birds	1.5	1.0	1.5	1.0	5.0
3.	Cost of capacity building of forest department staffs	2.0	1.5	1.5	2.0	7.0
4.	Awareness Generation Meetings at villages (Development of Brochure; Arrangement of Meeting; Development of Posters)	1.0	1.0	0.5	1.0	3.5
	<b>Total</b>	<b>6.5</b>	<b>5.0</b>	<b>5.0</b>	<b>6.0</b>	<b>22.5</b>

BCPL will spend total Rs. 22.5 lakhs (for first 4 years of implementation of project) towards wildlife conservation in the surrounding areas of project site.





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