

Environment Management Plan (EMP) FOR

**Proposed establishment of Grain Based Ethanol Distillery of
capacity 100 KLPD with 2.5 MW co-generation power plant**

**at Village – Nayagaon Kushahar, Khijirpura, Tehsil – Kesaria,
District - East Champaran, Bihar, Pin - 845424 , India**

Reference

- National Policy on Biofuels,- 2018 on dated 04th June 2018 (Approved by the Cabinet on dated 16-05-2018) and Amendments to the National Policy on Biofuels - 2020
- MoEF&CC Notification S. O. 2339 (E) dated 16th June 2021

Category: B2, 5(ga) as per MoEF&CC Notification & its amendment

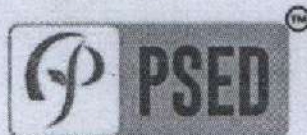
Applicant



M/s Tirhut Udhog Private Limited

**Registered Office: Kalpana Residency, Satsang Nagar, Kolhua
Paigamberpur, District – Muzaffarpur, Bihar - 843108**

Consultant



PARAMARSH

SERVICING ENVIRONMENT AND DEVELOPMENT

QCI/ NABET Certificate No: NABET/EIA/2124/RA 0224

(Valid up to May 01, 2024)

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December 2023



ENVIRONMENTAL MANAGEMENT PLAN

1.0 PROJECT DESCRIPTION

It is a proposal for Establishment of Grain Based Ethanol Distillery capacity 100 KLPD with 2.5 MW co-generation power plant at Village – Nayagaon Kushahar, Khijirpura, Tehsil – Kesariya, District - East Champaran, Bihar, Pin - 845424, India.

The plant configuration details and salient features of the plant are given below in **Table 1.1 and 1.2** respectively.

Table 1.1: PROJECT DETAILS

Sl No	Facility	Capacity
1.	Grain based Distillery	Ethanol -100 KLD
2	Co – generation Power Plant	2.5 MW

Table 1.2: Salient Features of the Project

Annexure 1.2: Salient Features of the Project					
Sr No	Particulars	Details			
1	Name	M/s Tirhut Udhog Pvt Ltd			
2	Registered Office	Kalpana Residency, Satsang Nagar, Kolhua Paigamberpur, District – Muzaffarpur, Bihar - 843108			
3	Name of Applicant	Mr. Harendra Kumar Bajpayee			
4	Designation	Managing Director			
5	Email ID	bajpayeehk@gmail.com			
6	Mobile No	9326899052			
7	Nature and Size of Project	Particulars	Quantity		
		Distillery	100 KLD		
		Power	2.5 MW		
		DDGS (Dried Distillers Grains with Soluble)	45 TPD at 10-12% W/W Moisture (14995 MT/annum)		
		CO ₂ Recovery	0.55 kg / per ltr(Recovery)		
		Theoretical CO ₂ generation during Fermentation	76.0 TPD		
8	Category of the Project	As per EIA Notification dated 14 th Sep., 2006 as amended from time to time; the project falls in Category 'B2' as the proposed Grain based distillery based on Zero Liquid Discharge (ZLD), Project or Activity - 5(ga).			
9	Locations Details				
	Plot No./Khasra No./Survey No.	Sr.no	Khata no	Khasra	Area(dismil)
		1	249	4229	33.350
			249	4229	40.66
		2	258	4224	33
		3	257	4265	98.310
			257	4265	62.350

Proposed Establishment of Grain Based Ethanol Distillery capacity 100 KLPD with 2.5 MW co-generation power plant at Village - Nayagaon Kushahar, Khijirpura, Tehsil - Kesaria, District - East Champaran, Bihar, Pin - 845424, India

M/s Tirhut Udhog Pvt Ltd

EMP

Sr No	Particulars	Details			
			257	4265	31
		4	88	4263	9.425
		5	278	4266	93.960
		6	119	4219	32
			119	4219	31.19
			119	4220	66.99
		7	33	4255	46.400
		8	234	4288	16.458
		9	103	4253	12.180
			103	4253	22.91
			103	4275	14.79
		10	248	4251	37.41
		11	172	4252	20.44
		12	277	4255	69.31
			277	4254	6.96
		13	208	4247	23.20
			208	4248	23.20
		14	184	4553	87
		15	218	4230	46.40
		16	80	4225	98.89
		17	155	4226	80.91
			155	4227	29.87
			Total		1168.563
Village		Nayagaon Kushahar			
PO		Khijirpura			
Tehsil		Kesharia			
District		East Champaran			
State		Bihar			
Pin code		845424			
Coordinates of Proposed project		Pillar	Latitude	Longitude	
		A	26°22'33.65"N	84°49'35.86"E	
		B	26°22'38.99"N	84°49'37.56"E	
		C	26°22'38.38"N	84°49'39.61"E	
		D	26°22'40.09"N	84°49'40.09"E	
		E	26°22'38.24"N	84°49'46.95"E	
		F	26°22'37.21"N	84°49'46.59"E	
		G	26°22'37.30"N	84°49'45.52"E	
		H	26°22'31.83"N	84°49'43.73"E	
		I	26°22'32.63"N	84°49'40.90"E	
		J	26°22'32.19"N	84°49'40.77"E	
Toposheet No		72B/15			
Area Details					
10	Total Plot Area	Description	Area in m ²	Percentage	



Sr No	Particulars	Details		
				(%)
		Green Belt Area	17311.00	35.80
		Road Area	8936.00	18.60
		Parking Area	7745.00	16.00
		Open Area	2236.00	4.60
		Ground coverage area	12100.00	25.0
		Total Area	48328.00	100.00
	Greenbelt / Plantation Area	17311.00 m ² 35.80 % of the project area will be covered under green belt and plantation		
11	Cost Details			
	PARTICULARS			
	Total Project Cost	Rs. 137.50 Crore		
	Cost for Environment Management Plan	Capital Cost – Rs. 6.42 Crore Recurring Cost – Rs. 1.48 Cr/annum		
	CER	Rs. 206.0 Lakh (1.5% of total project cost as per the OM 2018 of MoEFCC)		
12	Basic Requirements for the project			
	Total Water Requirement	- One Time Total Water Requirement to run the distillery = 1495 KLD - Total Water Requirement for Distillery Process = 400 KLD (@4.0KL/ KL of Ethanol production) - Net water requirement including Co gen Power (Power Turbine Ct Make-Up Water) of 2.5 MW = 65 KLD - Domestic Water requirement: 15 KLD Total = 480KLD (@4.8 KL/KL of Ethanol)		
	Source of Water	Ground water (Fresh water same will be sourced from ground water after obtaining permission from CGWA)		
	Wastewater Discharge	Unit is based on Zero Liquid Discharge		
	Power Requirement	2500 KWH		
	Source of Power	Co Generation Power Plant: 2.5 MW (In House)		
	Steam Requirement	25 TPH		
	D.G. Set Capacity with stack height	1 x 750 KVA (6.0 Meter Stack Height)		
	Man Power Requirement	- Total Employees Regular – 67 - Casual / Contractual employment - 27 - Total: 94 Workers		



Sr No	Particulars	Details
13	Product Mix	Ethanol (Absolute Alcohol with 99.85% v/v)
14	By Products	
	CO ₂	0.55 kg / per ltr (Recovery)
	DDGS	45.0 TPD
15	Working Days	330 days / Annum
16	Raw material	
	Major Raw Material	- Broken Rice Flour with minimum enzymatically convertible starch content of 68% w/w. - Corn flour with minimum enzymatically convertible starch content of 60% w/w. - Damaged Grain & Coarse grain (like broken rice, maize, jowar, bajra etc) which is not fit for human consumption
	Raw Material requirement	231.48 MT/day (76,388 MTPA)
	Source of Raw Materials	Bihar as State is rich in paddy & maize cultivation and crop pattern study in nearby Districts indicates that Rice has occupied a major place in the crops in these States. These states have advantage as to availability of Raw Material in the form of Broken Rice & Maize in Bihar and bordering state like UP is rich in paddy cultivation. The unit is situated in the sugar cane and food grains rich area of Bihar. The availability of grains is sufficient 100 KLPD grain distillery. In all there are about 400 rice mills currently operating in these States which can supply Broken Rice and ample maize crop would ensure supply of basic raw material needed for the day to day operations.
	Storage of raw material	3500 MT X 2 Nos. (Grain Silo with all system for 30 days Storage with accessories)
17	Proposed Boiler Capacity	25.0 TPH, 45Kg/Cm ² (g) (Bagasse/Rice Husk Fired)
	Fuel and its quantity used in boiler (Rice Husk)	Boiler has been proposed for 2.5 MW Captive power plant with fuel as Rice Husk. Rice Husk 190 Ton/day
18	Steam Consumption	
	Liquefaction + MPR Distillation Section + Int Thin Slops Evaporation + DWGS Dryers @ 68% starch based feedstock (On Total Spirit)	Pressure 3.5 kg/cm²(g) & 148°C for Liquefaction, Distillation & Evaporator 25 TPH (3.5 Kg /Liter of TS) OR (3.72 Kg/ Lt of Ethanol)
	Liquefaction + MPR	Pressure 3.5 kg/cm ² (g) & 148°C for Liquefaction,



Sr No	Particulars	Details
	Distillation Section + Int Thin Slops Evaporation + DWGS Dryers @ 60% starch based feedstock (On Total Sprit)	distillation & Evaporator 25 TPH (3.8 Kg / Liter of TS) OR (4.05 Kg/ Lt of Ethanol)
19	Domestic Solid Waste	40.0 Kg/day
20	Air pollution control devices	ESP with 60 Meter stack height
21	Spent wash treatment scheme	Grain based 100 KLPD distillery generated effluent / spent mash will be first decanted in centrifuge decanted where the wet cake will be get separated and balance mash will be concentrated in evaporators and generated syrup will mixed with wet cake, which will sold as DDGS to cattle feed manufacturers.
22	Other effluent treatment scheme	Other effluent like process condensate, spent lees will be treated by condensate polishing unit (CPU) comprises of Equalization Tank, Buffer Tank, Anaerobic Digester, Extended Aeration Tank I & II, Secondary Clarifier, High-rate solid contact clarifier, Ultra filtration then followed by two stage RO Plant.
23	Discharge from Distillery Unit	Zero Liquid Discharge (ZLD).

1.1 INTRODUCTION

Environmental Management Plan consists of the set of mitigation, management, monitoring and institutional measures to be taken during implementation and operation of a plant to eliminate adverse environmental impacts or reduce them to acceptable levels. The present environmental management plan addresses the components of environment affected during the different activities forming part of the processes of plant. In view of above and based on the evaluation of impacts and baseline conditions, an Environmental Management Plan (EMP) has been delineated to mitigate the adverse impacts on environment of the area due to the project. The EMP is herein outlined after taking into account the various Acts, Rules and Regulations/ Standards concerned with the environmental management.

Aims of EMP

- Overall conservation of the environment and minimization of environmental impacts.
- Minimization of waste generation and pollution.
- Judicious use of natural resources and water.
- Safety, welfare and good health of the work force.
- Ensure effective monitoring of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and long-time impacts.



1.2 ENVIRONMENT POLICY

M/s Tirhut Udhog Private Limited has a well-defined policy to keep the Environment clean and green. The company has decided that all effective steps shall be taken to ensure that flow of information from working level to top level should flow in a smooth and coordinated manner, so that in case any deficiency is noted, it is brought to the notice of top management and preventive and corrective action is initiated in a systematic manner.

Environment Management Cell of our Distillery Project will be headed by CEO/Managing Director of our Project and non compliances will be reported to them.

The company will form an EMC (Environment Management Cell) & its responsibilities will be as follows:

1.2.1 Interaction with the State Pollution Control Board

EMC shall be in regular touch with SPCB and shall send them environmental monitoring reports regularly in the prescribed format, as per the prevailing practice. Any new regulations considered by State/Central Pollution Control Board for the Industry shall be taken care of by EMC.

1.2.2 Provide Training

EMC would be responsible for the implementation of the EMP. For the project, additional training facilities will be developed for environmental control. For proper implementation of the EMP, the officials responsible for EMP implementation will be trained accordingly.

In-plant training facilities will be developed for environmental control. The training will be given to employees to cover the following fields:

- Awareness of pollution control and environmental protection to all.
- Operation and maintenance of specialized pollution control equipment.
- Organize field monitoring, maintenance and calibration of pollution monitoring instruments.
- Laboratory testing of pollutants.
- Repair of pollution monitoring instruments.
- Occupational health/safety.
- Environmental management.
- Afforestation / plantation and post care of plants.
- Risk assessment and Disaster Management.



1.2.3 Other Responsibilities of the Cell will Include-

MoEF&CC/NABL approved lab will be retained to generate the environment quality data in respect of air, water, noise, soil and meteorology and prepare the Environmental Report.

- Timely renewal of Consents & Authorization will be taken care of.
- Submitting environmental monitoring report to SPCB. The cell will also take mitigative or corrective measures as required or as suggested by the Board.
- Conduct and submit annual Environmental Statement to SPCB.
- Prepare and submit six monthly reports on the compliance with the conditions of



the environmental clearance.

- Keeping the management updated on regular basis about the findings / results of monitoring activities and proposes measures to improve environmental performance.
- Conducting regular safety drills and training programs to educate employees on safety practices. A qualified and experienced safety officer will be responsible for the issues related to occupational safety and health.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

1.2.4 SOP for Flow of Information

The Environmental Management Group would consist of executives and supporting staff headed by senior official reporting to CEO. During the construction of the project, Project Review Team (PRT) meetings will be held every month wherein officials from the project and corporate centre will participate and discuss the progress and problems related to implementation of schedules of activities for construction, completion and commissioning. It will be ensured that all pollution control measures identified are implemented in a coordinated manner, linking the overall project implementation plans.

Monthly Operation Review Team (ORT) meetings for the project will be also held during project operation. In these meetings in addition to routine Operation and Maintenance (O&M) problems issues related to environment will also be discussed. The issues related to the compliance of environmental norms including problems associated with the mitigation measures identified will be included in the agenda for quarterly review meetings, wherein action plan for remedial measures will be drawn and monitored.

The Head-Environment will brief the ORT about the environmental performance of the plant and all compliances/non-compliances are brought to the notice of MD. Action plan is drawn for rectifying the Non-compliance.

1.3 EMP DURING CONSTRUCTION PHASE

The land has been acquired at Village – Nayagaon Kushahar, Khijirpura, Tehsil – Kesaria, District - East Champaran, Bihar, Pin - 845424, India. The area of land is 48328.0m². During construction this land will be used for installation of plant and machineries, storage sheds for raw materials, construction of internal roads, parking area and temporary storage of construction materials including oil and chemicals, domestic waste etc.

The impacts due to construction activities will be limited to above area only. Construction activities will have cumulative impact on environment due to impact on land, soil, air, water and noise environment and their management as follows:

1.3.1 Land Environment

The site for project is flat and already levelled, hence no levelling is required. Earth excavated during civil foundations will be reused for raising the plinth and backfilling the



columns. Dust generated due to earthwork including excavation and transportation activities, especially during dry weather conditions, will be controlled by water sprinkling.

1.3.2 Air Environment

Dust will be generated during any levelling of site (if required), dumping of earth and fill material generated from site during excavation for foundations, waste pit construction and other site related activities. These activities will open-up the ground to wind action and will result in dust generation. Impact on Air Quality -The air quality in the project area may slightly deteriorate for the time being during construction due to poorly paved service lane, excavation, delivery of construction materials, mixing of construction materials, construction of temporary structures, installation of equipment etc. Movement of trucks bringing plant and machinery shall also generate dust and noise. During construction phase, dust generation will be the main pollutant. However, concentration of NO_x and CO may also slightly increase due to increased vehicular traffic movement. The overall impact of the pollution on the environment during construction phase is localized in nature, reversible and is for a short period. Various measures planned for management of air environment are given below;

- ⬇ Vehicles with valid Pollution under Control certificates will be used.
- ⬇ Preventive maintenance of vehicles and equipment.
- ⬇ Unnecessary engine operations to be minimized.
- ⬇ Implementing dust control activities such as water sprinkling on unpaved sites.
- ⬇ Controlled vehicle speed on site.
- ⬇ Vehicle to be covered during transportation of material.
- ⬇ Providing dust collection equipment at all possible points

Following additional care would be taken for management of air quality during construction phase:

- ❖ The storage and handling of soil, sub-soil, top soil and materials will be carefully managed to minimize the risk of wind blow down material and dust
- ❖ There will be no on-site burning of any waste arising from any construction activity.
- ❖ Dust masks shall be provided to construction workers, while carrying out operations that may entails potential for dust generation.

1.3.3 Water Environment

Temporary drainage work will be maintained, removed and reinstated as required, and all other precautions will be taken for avoidance of damage by flooding and silt. During construction phase, used construction water is the only effluent generated due to construction activities and most of the effluent generated will be so small that it will either get percolated to ground or get evaporated. Sedimentation pit of sufficient capacity will be constructed to trap silt-laden water during monsoon. The wastewater, if any, will be reused as far as possible for dust suppression.

Noise Environment

The noise generated during the constructed phase will be due to the movement of vehicles and construction equipment. Construction equipment and transport vehicles will



be properly maintained so that noise generation is minimized. Regular maintenance schedule will be adopted for all construction equipment and vehicles.

The following measures will also be adopted:

- ❖ Preventive maintenance of equipment and vehicles.
- ❖ Unnecessary engine operations to be minimized (e.g. equipment with intermitted use switched off when not working)
- ❖ DG sets to be provided with acoustic enclosures and exhaust mufflers

1.3.5 Solid and Hazardous Waste Management

Careful design, planning and good site management would minimize waste of materials such as concrete, mortars and cement grouts. Construction waste will be segregated as much as possible at site itself to increase the feasibility of recycling concrete and masonry as filling material and steel pieces as saleable scrap.

Muck shall be generated from drains and sedimentation pits. The muck shall be collected daily and stored at earmarked place. It shall be finally disposed within the plant premises for plinth raising purpose. Litter disposal and collection points shall be established around the all construction work sites. Construction waste shall be segregated as much as possible at site itself to increase the feasibility of recycling concrete and masonry as filling material and steel pieces as saleable scrap.

Care shall be taken in selecting the site for vehicle maintenance, so as to prevent the ground water contamination due to the spillage of oil. Both diesel and petrol engine vehicles will be maintained properly. Unauthorized dumping of waste oil will be prohibited. Wastes will be disposed off to the SPCB approved vendors.

1.3.6 Sanitation & Safety Measures of Construction Workers

Construction workers will be taken from surrounding villages. They will be made aware of possible hazards and safety measures that need to be taken during construction activities through organized training. Personal Protective Equipment (PPEs) such as dust masks, goggles, earplugs/ earmuffs, safety gloves, safety belts, safety shoe with toe protection, gumboots will be made available at construction site. Construction workers and vehicle drivers will be provided with drinking water, canteen and toilet/washroom facility. Rest room facility for truck drivers will be provided. Training will be given contractors workers on company safety policy requirements. Also monitoring of speed and route of project-related vehicles within the project area will be carried out.

1.4 EMP DURING OPERATION PHASE

1.4.1 Air Pollution Dispersion Modelling Studies

Introduction

The dispersion of a pollutant is completely governed by the local meteorological parameters and therefore this information is a crucial input for dispersion modelling. The vertical mixing of air pollutants strongly depends on the depth and stratification of planetary boundary layer (PBL) which is in-turn governed by the sensible heat flux, large-scale vertical motion, horizontal advection and entrainment at the boundary layer top. Air quality models incorporating parameterization for PBL, turbulence, dispersion in the convective boundary layer and terrain interactions of pollutant plume are best suited for



the estimation of spatial dispersion of pollutants. Evaluation of some commonly used dispersion models to quantify their predictive capacity and performance. The study showed that despite several limitations and assumptions used in Gaussian air pollution dispersion models, these models are comparatively more accurate and consistent with the random nature of turbulence in the atmosphere and are best suited for pollutant dispersion. The urban scale modelling systems designed using such models are being increasingly employed to reliably provide urban air quality forecasts for protection of public health, recreation purpose, etc.

In this study, seasonal variation of fugitive dust has been observed due to the activities involved in the sponge iron plant. Based on the results, control strategies have been suggested which will reduce the dispersion of fugitive dust to the significant level.

Air Pollution Sources

During operation there will be two numbers of point sources of air emissions. These are stacks attached with DG sets (one number) and one with Boiler. 1DG sets of 750 KVA with stack height of 6.0 m will be used for power backup & Boiler of 25 TPH capacity with 60 meter will be proposed for the project.

Potential Air Emissions

Fugitive emission under proposed activity of distillery shall be mainly dust emissions. Source of same are internal kuccha roads, ash storage yard in plant and improper function of APC equipment etc. Trouble with dust in work zone and ambient atmospheres shall be controlled by certain dedicated measures. An action plan has been prepared in industry that includes- monitoring of proper working of pollution control equipment, proper handling, storage and disposal of dust collected, augmentation of proposed green belt with adequate density and type to control and attenuate dust transfer in the premises, provision of properly surfaced internal roads and works premises (tarred and concrete).

Process Emissions

The CO₂ generation shall take place in fermenter of the distillery. CO₂ to the tune of 76.0 TPD will be released from 100 KLPD distillery operations. CO₂ has been labelled as one of the major gases responsible for the green-house effect, its release in the atmosphere has to be properly controlled.

1.4.2 Air Dispersion Modelling Methodology

Modelling Approach

The assessment methodology for the air dispersion modelling exercise follows the guidance specified in the US EPA user guide for AERMOD. The model of selection is the commercially available AERMOD View dispersion model, developed by Lakes Environmental. This model is used extensively to assess pollution concentration and deposition from a wide variety of sources. AERMOD View is a true, native Microsoft Windows application and runs in Windows applications. The AMS/EPA Regulatory Model (AERMOD) was specially designed to support the EPA's regulatory modelling programs. AERMOD is a regulatory steady-state plume modelling system with three separate components:

- ✓ AERMOD (AERMIC Dispersion Model),



- ✓ AERMAP (AERMOD Terrain Pre-processor), and
- ✓ AERMET (AERMOD Meteorological Pre-processor).

The AERMOD model includes a wide range of options for modelling air quality impacts of pollution sources, making it a popular choice among the modelling community for a variety of applications. Some of the modelling capabilities of AERMOD include the following:

- The model may be used to analyze primary pollutants and continuous releases of toxic and hazardous waste pollutants.
- Source emission rates can be treated as constant or may be varied by month, season, hour-of-day, or other optional periods of variation. These variable emission rate factors may be specified for a single source or for a group of sources. For this project all emission rates were treated as constant.
- The model can account for the effects of aerodynamic downwash due to buildings that are nearby point source emissions.
- Receptor locations can be specified as gridded and/or discrete receptors in a Cartesian or polar coordinate system.
- For applications involving elevated terrain, the U.S.-EPA AERMAP terrain pre-processing program is incorporated into the model to generate hill height scales as well as terrain elevations for all receptor locations.
- The model contains algorithms for modeling the effects of settling and removal (through dry and wet deposition) of large particulates and for modeling the effects of precipitation scavenging for gases or particulates.
- AERMOD requires two types of meteorological data files, a file containing surface scalar parameters and a file containing vertical profiles. These two files are provided by the U.S. EPA AERMET meteorological preprocessor programme.

1.4.3 Model Inputs

Source Emissions

a) Meteorological data

Meteorological inputs required are temperature, relative humidity, wind speed, wind direction, cloud cover etc. which was recorded at site during whole of the year.

b) Stack emissions the emission details are given in table below:

The continuous source of emissions in the proposed project will be from Boiler that would be used to generate steam and power. The Slop / bagasse/Rice Husk fired boiler capacity will be 25 TPH. Emission from the Slop fired boiler will be controlled by installation of efficient pollution control systems i.e. ESP and stack height of 60 m.

Table No. 1.3: Details of the sources

Sr. no	Parameter	Proposed Boiler	Proposed DG set
1	Major Pollutant	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x & CO	
2	No of Stack	01 No.	01
3	Stack attach to	25 TPH Boiler through ESP of Efficiency 99 %	DG set
4	Material of Construction	MS/RCC	MS



Sr. no	Parameter	Proposed Boiler	Proposed DG set
5	Height of Stack	60 Meters	6 m
6	Capacity of Boiler	25 TPH Boiler	750 KVA
7	Diameter at the top of Stack	1.2 meters	0.35 m
8	Temperature	150°C	130°C
9	Flue gas Exit velocity	13 m/s	16.3 m/s
	Type of Fuel	Bagasse/Rice Husk Fired	HSD

Table : 1.4 Emission factors for boilers (ESP)				ESP	Fuel Consumption (Rice Husk)
Pollutant	Emission Factor (kg/t)	Emission Rate (kg/day)	Emission Rate (g/sec)	Emission Rate (controlled)(g/sec)	190 ton/day
Carbon monoxide	2.61	495.90	5.7396	5.7396	
Oxides of Nitrogen	0.76	144.40	1.6713	-1.6713	
Particulate matter $\leq 10.0 \mu\text{m}$	6.15	1168.50	13.5243	1.3524	
Particulate matter $\leq 2.5 \mu\text{m}$	3.51	666.90	7.7188	0.7719	
Sulfur dioxide	0.25	47.50	0.5498	0.5498	

Table 1.5: Emission factors for DG (HSD)

Pollutant	Fuel - HSD		
	Emission Factor Based on Power Output (kg/kWh)	Emission Factor Based on Power Output (g/kWh)	Emission Factor Based on Power Output (g/sec)
CO	0.0033	3.3400	0.5567
NOx Controlled	0.0079	7.9000	1.3167
PM10	0.0004	0.4260	0.0710
SO2	0.00005	0.0492	0.0082

NOTE: Emission rates are taken as per USEPA AP-42

1.4.4 Model Domain, Receptor Network and Terrains

Considerations

The selected model domain was 10 km in both the east-west and north-south directions, with the centre of the domain being the centre of the project site.

Receptor Network

The selection and location of the receptor network are important in determining the maximum impact from a source and the area where there is significant air quality impact. Impacts were assessed at locations beyond the fence line. Consequently, the receptor



locations were selected as a grid that is defined by discrete Cartesian receptors, square in shape, and with origin at the centre of the proposed project site.

Terrain Considerations

The classification of the land use in the vicinity of the proposed project is needed because dispersion rates differ between urban and rural areas. In general, urban areas cause greater rates of dispersion because of increased turbulent and buoyancy-induced mixing. This is due to the combination of greater surface roughness caused by more buildings and structures and greater amounts of heat released from concrete and similar surfaces. The USEPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land-use type, and the other is based on population density. Both procedures require an evaluation of characteristics within a 3-km radius from the subject source, but the land-use methodology is considered more accurate. Hence, this method was applied and it was determined that the rural dispersion coefficient be selected for this modelling project.

1.4.5 Meteorological Data

The AERMOD model requires hourly surface data values for wind speed, wind direction, temperature, rainfall, relative humidity, pressure, cloud cover and ceiling height and solar radiation and at least once daily mixing height data. Surface data (temperature, rainfall, relative humidity, pressure, cloud cover and solar radiation as well as wind data (direction and speed) for the four season was utilized for the study.

Both data files for the surface and mixing heights were then used to generate the meteorological file required by the AERMOD dispersion model using the AERMET meteorological pre-processor programme. This AERMET programme has three stages to process the data. The first stage extracts meteorological data and assesses data quality through a series of quality assessment checks. The second stage merges all data available for 24-hour periods and writes these data together in a single intermediate file. The third and final stage reads the merged meteorological data and estimates the necessary boundary layer parameters for dispersion calculations by AERMOD.

The 2022-23 meteorological pre-processed data was used to determine its corresponding Wind Rose plot (see Figure 1). Wind rose shows that predominantly wind blow from west to east

1.4.6 Model Results

With the various sources identified, a model domain established of 10km in the north to south-east direction and centred in the middle of the proposed project, and the necessary input files created, model predictions were made for the pollutants PM₁₀ for 24 hrs averaging periods for which there are National Ambient Air Quality Standards. Model runs were conducted for the proposed project's air pollutant sources air quality impact in combination with the other defined sources in the vicinity of the project. All the results are coming below permissible limits at project site. Detailed results are shown in table given below;



Table 1.6: Results of Air Modelling

Sl. No.	24 Hrs. Concentrations	PM10 ($\mu\text{g}/\text{m}^3$)	PM2.5 ($\mu\text{g}/\text{m}^3$)	SO2 ($\mu\text{g}/\text{m}^3$)	NOX ($\mu\text{g}/\text{m}^3$)	CO (mg/m^3)
1	Predicted Max. GLC (24 Hrs.)	0.636	0.27	0.193	4.12	0.00839
2	NAAQS - Industrial Limits	100	60	80	80	2

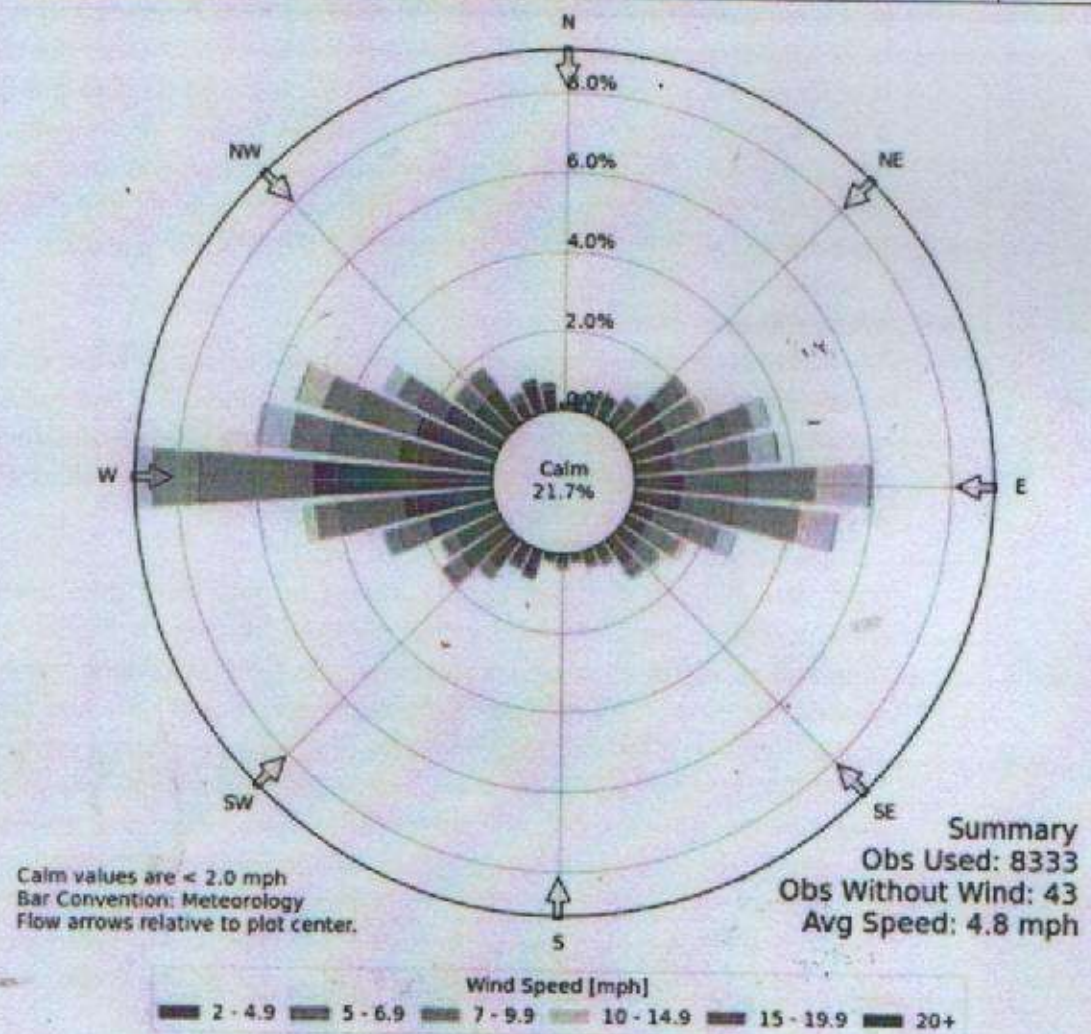
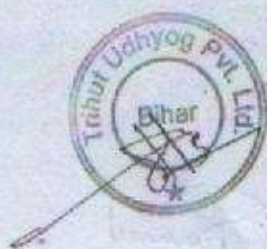


Figure 1.1: Wind Rose



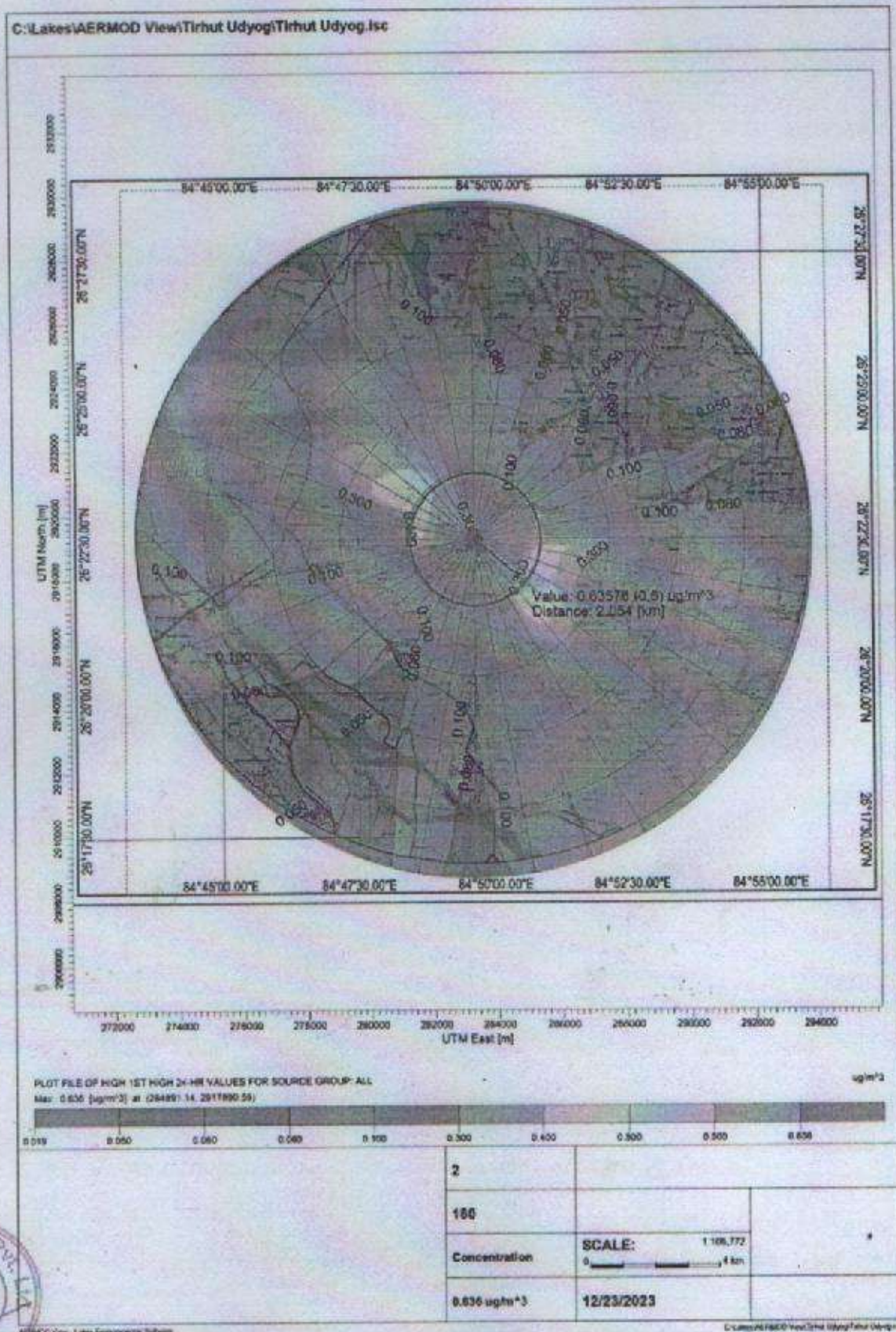


Figure 1.2: Isopleths showing incremental values for PM_{10}

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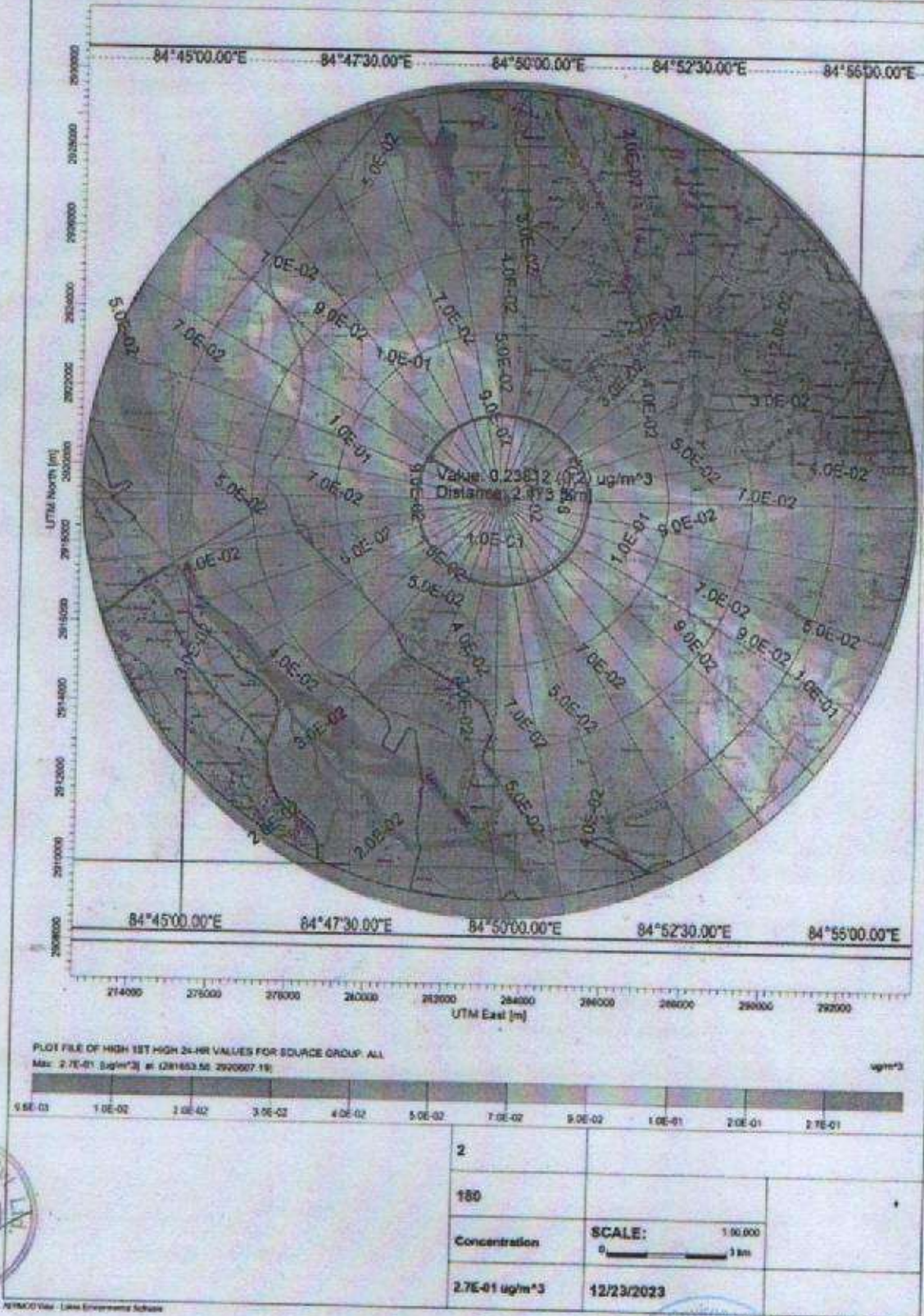
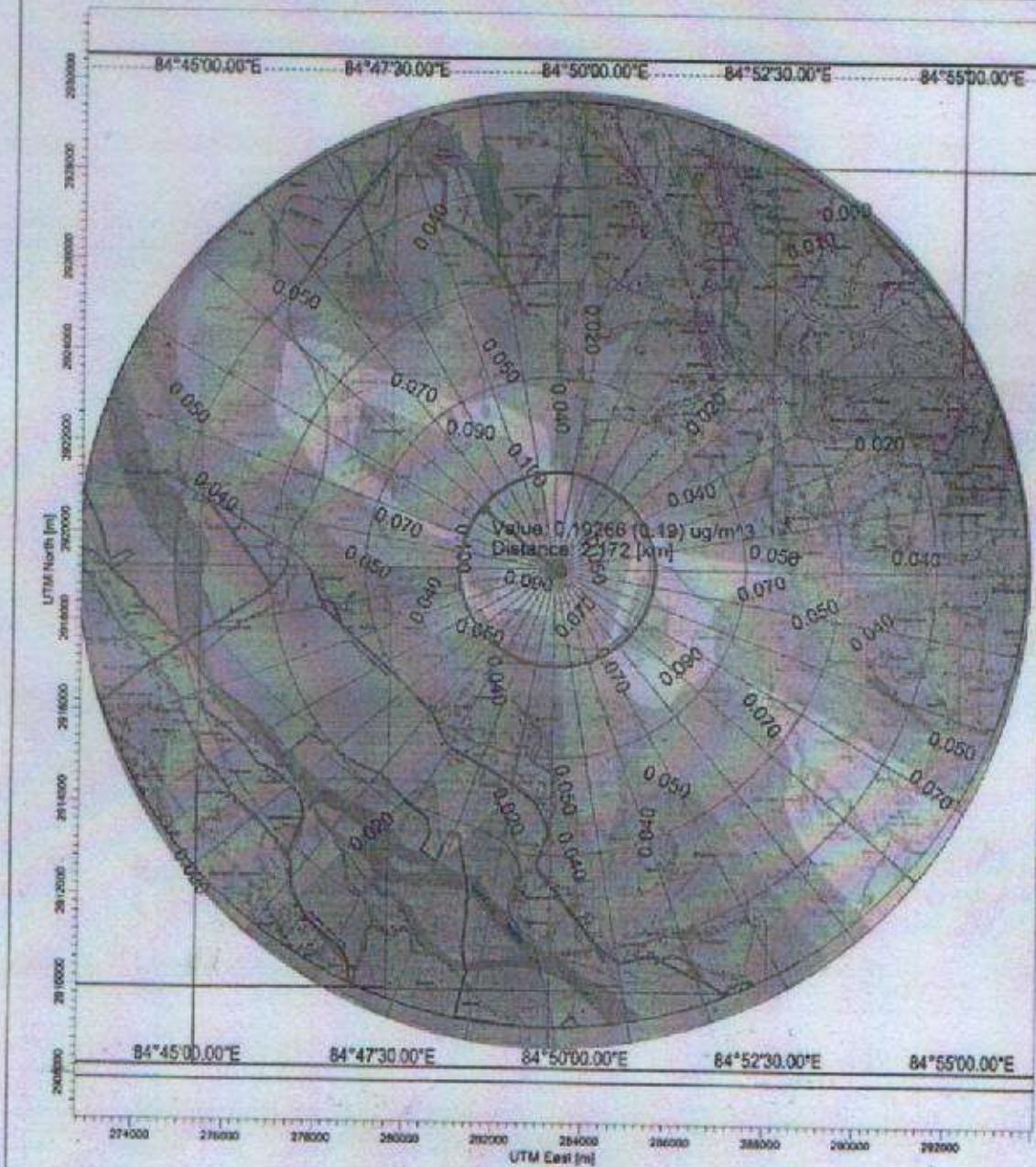


Figure 1.3: Isopleths showing incremental values for PM2.5

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PLOT FILE OF HIGH 1ST HIGH 34-HR VALUES FOR SOURCE GROUP. ALL
Max: 0.193 (ug/m³) at (281553.58, 2920007.19)

ug/m³



2

180

Concentration

0.193 ug/m³

SCALE:

1:10,000

0 3 km

12/23/2023

FIGURE 1.4: ISOPLETHS SHOWING INCREMENTAL VALUES FOR SO2

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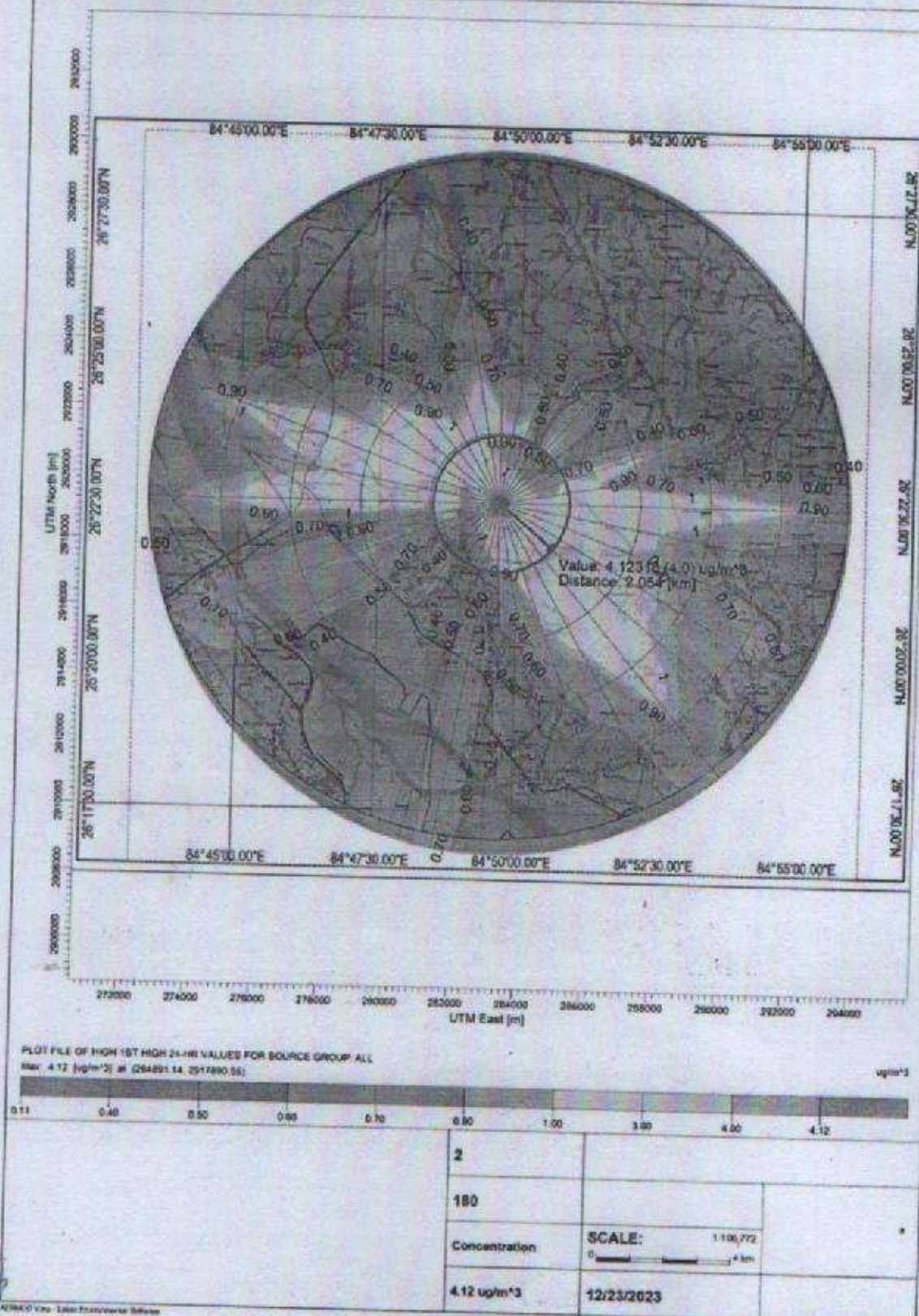


FIGURE 1.5: ISOPLETHS SHOWING INCREMENTAL VALUES FOR NOx

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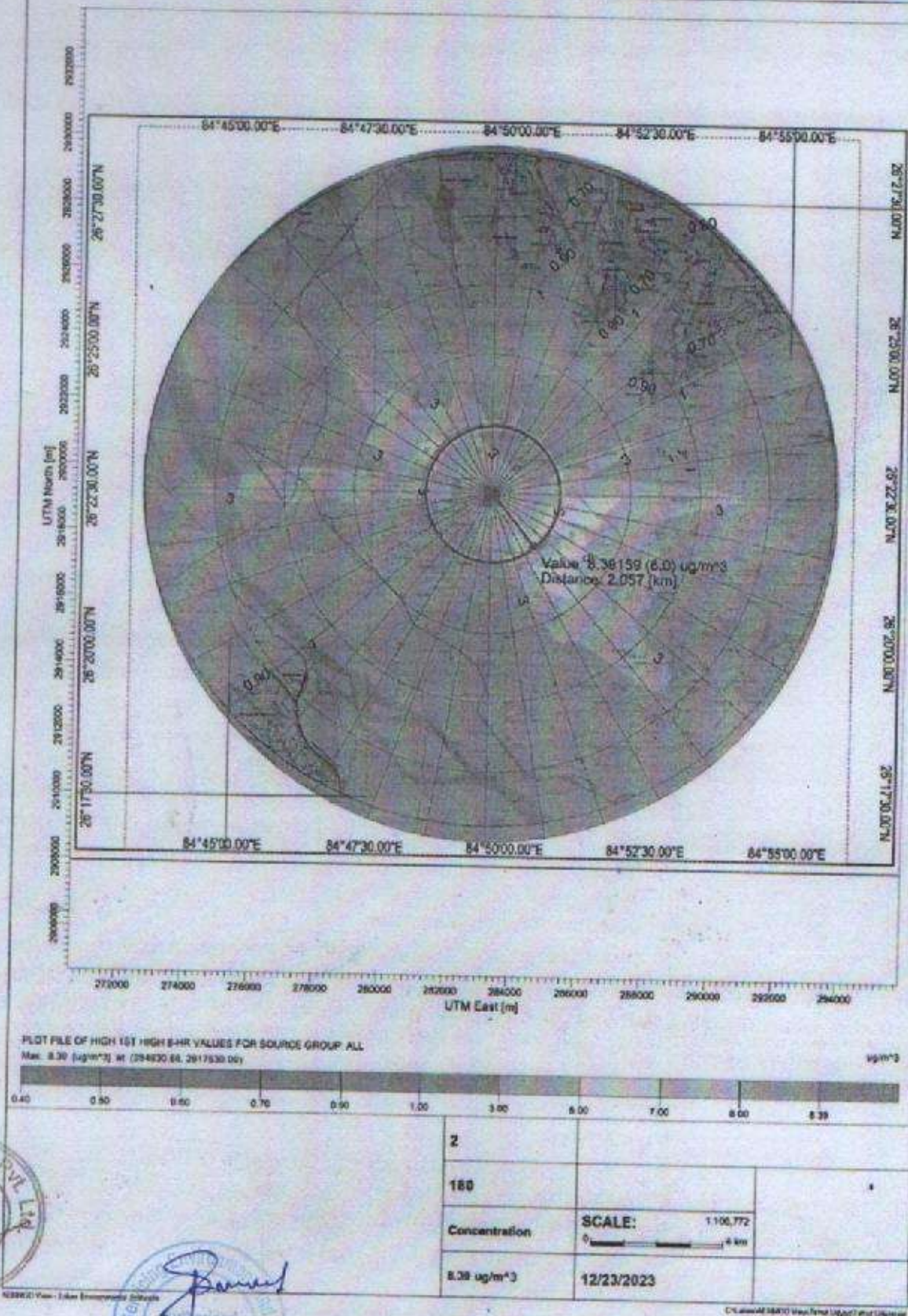


FIGURE 1.6: ISOPLETHS SHOWING INCREMENTAL VALUES FOR CO

1.4.7 Air Pollution Management Plan

Stack emissions

- ❖ Online stack monitoring system will be provided to keep a check on emissions and implement proper measures in case of any failure or violation of prescribed standards.
- ❖ Regular cleaning, inspection and maintenance of air pollution control equipment will be carried out.
- ❖ Ensuring preventive maintenance of equipment.
- ❖ Workers will be trained regarding emergency actions to be taken during equipment failure.
- ❖ The whole distillery unit will be provided with facility of inter locking so that any failure of equipment or APCE will result in instant shut down of the complete process.
- ❖ DG sets will be used only for emergency purpose and in case of power failure.

1.4.8 Action Plan for Control and Monitoring of Fugitive Emissions

The fugitive dust (PM) emissions shall occur from road, raw material unloading and loading, vehicle movement leading the re-suspension of settled dust, etc. Following mitigation measures are recommended for its control:

- ❖ Apply water to suppress dust generation
- ❖ Stabilized concreted earthworks with stone, soil, geo-textiles, vegetation, compacting.
- ❖ Use enclosures – covering for stockpiles – tarpaulin, plastic, fences, screens
- ❖ Keep proper shape of stockpiles (avoid steep slopes and faces)
- ❖ Remove muck from truck tyres and under bodies prior to leaving the plant premises
- ❖ Minimize the drop height of raw materials
- ❖ All road surfaces for permanent movement of trucks shall be paved (Concreted)
- ❖ Use mechanical road sweeping machine for regular cleaning of roads
- ❖ Use industrial vacuum cleaner for cleaning all shop floors and roofs.

1.4.9 Noise Pollution Management Plan

During proposed project, the major noise-generating source will be machinery and equipment. The proposed equipment of the project would be designed for noise levels not exceeding 75 dB (A) at plant boundary. In general the following methods will be adopted to control the noise pollution.

- ❖ The use of barricades
- ❖ The use of vibration insulation techniques at foundation of fans and other moving machinery.
- ❖ The use of mufflers and acoustic louvers in DG sets.
- ❖ Proper plantation of trees.
- ❖ Providing earmuffs and earplugs to the plant personnel.
- ❖ Avoiding continuous (more than 8 hrs) exposure of workers to high noise areas.



1.4.10 Water Pollution Management Plan

Water Requirement:

One Time Total water requirement for the project will be 1495 KLD. Total fresh water demand for distillery operation is 400 KLD @ 4.00 KL of water / KL of Ethanol.

Net fresh water requirement including domestic 15 KLD and power plant of 2.5 MW (65 KLD) is 480 KLD @ 4.8 KL/KL of ethanol production, which will be sourced from ground water augmented with rain water. Permission of withdrawal of ground water shall be taken from CGWA before commencement of operation.

The water demand and balance of the distillery is shown below in Table 10.

Table 1.7: Water Balance & Fresh Water Requirement

Total Water Inputs - First Run	1495 KLD
Total Water Outputs - First Run	1495 KLD
Total Water Recycle	1095 KLD
Net Fresh Treated Water / Day - Distillery	400 KLD
Additional for Power Plant	-
Power Turbine Ct Make-Up Water	65 KLD
Domestic Use - Drinking Water & Toilets	15 KLD
Total Daily Fresh Water	480 KLD

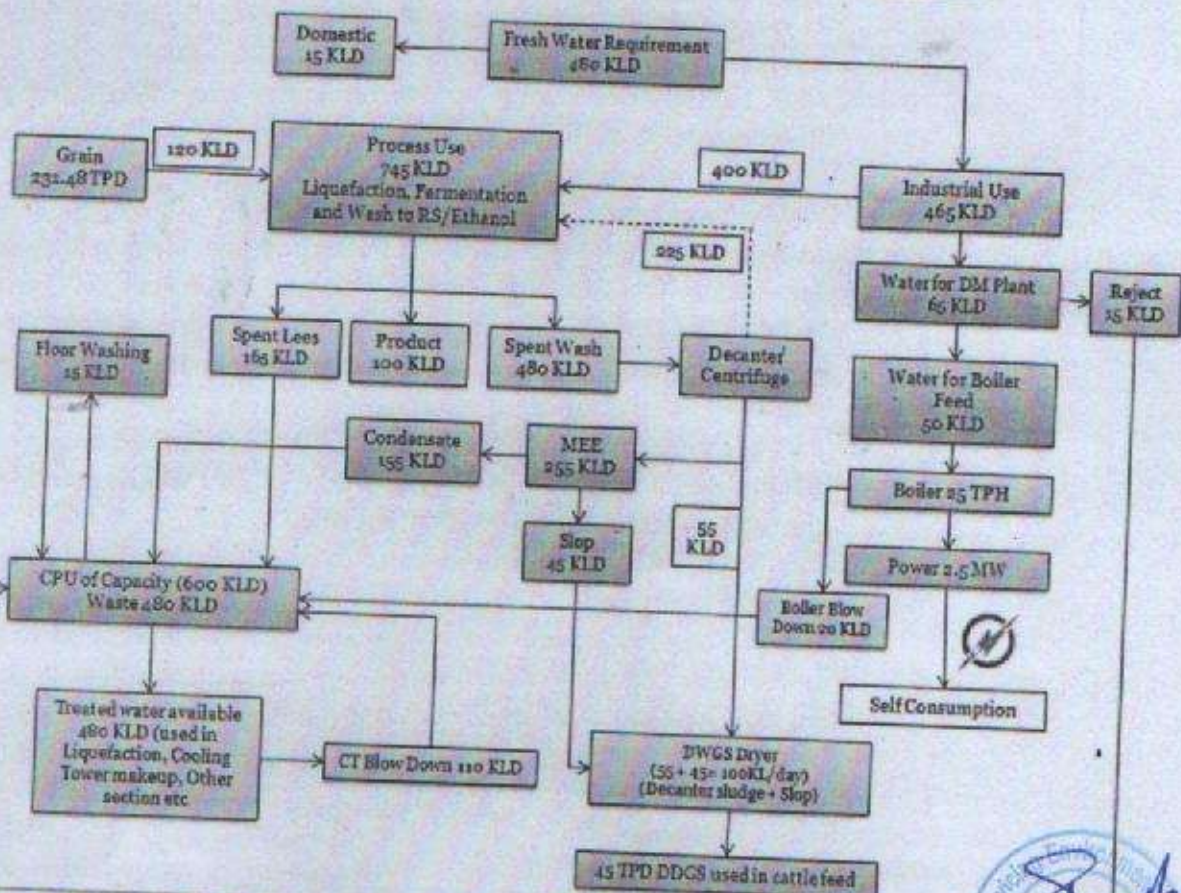


Figure 1.7: Water Balance

Effluent of 480 m³/day quantity will be treated through Condensate Polishing Unit of capacity 600 m³/day. Raw stillage (480m³/day) will be sent to decanter followed by MEE and dryer to produce DDGS. STP of capacity 30 m³/day will be installed to treat sewage generated from factory premises. The plant will be based on Zero Liquid discharge system and no effluent/treated water will be discharged outside factory premises.

In order to reduce the water requirement, it is also proposed to use harvested rainwater in the plant. From the use of collected rain water, the total water requirements are reduced ~ 9%. The basis for this reduction and quantity estimation are given below:

1.4.11 Rain Water Harvesting:

Runoff Calculation = Rain Water Harvesting:

Average rainfall intensity of the area is considered as 1241.60 mm or 1.24m. The runoff coefficients for rooftop, green area and paved are 0.9, 0.2 and 0.7 respectively.

Rooftop area available for rain water harvesting: 12100.0m²

Runoff Water from roof top = $12100.0 \times 1.24 \times 0.9 = 13503.60 \text{ m}^3$

Total Rainwater can be harvested in Monsoon season (60days) = 13503.60 m^3 say 100 % of this rain water will be used during distillery process.

Total water consumption of distillery in normal operation = 500 KLPD or 165000 m³/year
Thus total water saved by the company in year = $13503.60 / 165000 \times 100 = 8.18 \%$ per year

Hence, total percentages saving due to rainwater use~ 9.0 % per year and total water will be reused in distillery process.

1.4.12 Water Quality Management

The entire wastewater from the plant will be reused and there will be no discharge of wastewater outside the plant premises under normal circumstances. The distillery will be based on "Zero Liquid Discharge" concept. Following measures will be followed:

- ❖ Online monitoring System consisting of flow meter to analyze CPU effluent quality will be installed.
- ❖ Proper maintenance of state of the art CPU will be carried out.
- ❖ Regular testing of samples at every outlet of CPU will be carried out to monitor the outcome after every treatment process.
- ❖ Regular monitoring and maintenance of equipment/machineries will be done and records maintained.
- ❖ Periodic checking to find out any leakages or areas susceptible to leaching will be undertaken in order to save the ground water contamination.
- ❖ Regular cleaning of all equipment and machineries will be done in order to avoid water clogging areas or any corrosion in the machinery and equipment.



1.5 Treatment of Effluents:

To ensure Zero Discharge effluent industry, Industry has decided to install Multi effect evaporator technology, Decanter, DDGS Dryer along with CPU unit.

The alcohol stripped whole stillage or spent mash or thick stillage coming out of distillation section is subjected to decantation by centrifugation to separate the suspended fibrous mass called wet cake and the thin stillage. Wet cake has about 30 % w/w solids as removed from the bottom of the decanter and can be directly loaded on the trolleys parked below. Wet cake can be used directly in the formulation of animal feed.

Table 1.8: Composition of Grains & Wet cake (after decantation)

Content	Rice / Broken rice	
	Grains	Wet cake
Total Solids (%)	88 - 90	28 - 30
Moisture (%)	10 - 12	70 - 72
Starch (%)	65 - 70	1.9 - 2.1
Proteins (%)	4 - 7.0	4 - 7.0
Oils/Fats (%)	0.4 - 1.0	0.4 - 1.0
Crude Fibres (%)	0.8 - 1.6	1.0 - 1.7
In-org. Ash (%)	0.4 - 1.2	0.45 - 1.3

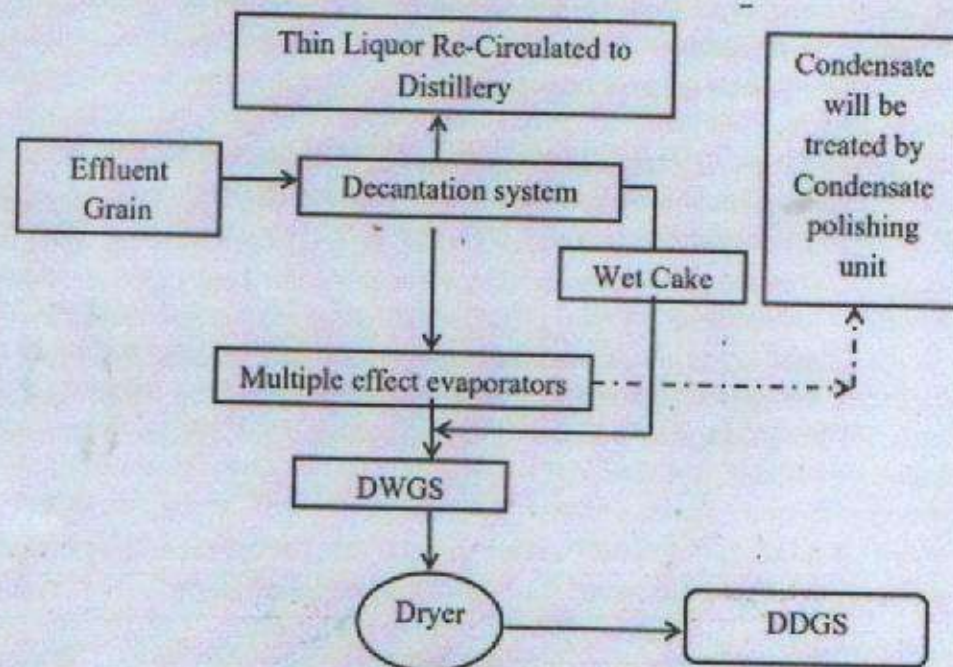


Figure 1.8: Flow sheet for primary treatment

1.5.1 Multiple Effect Evaporation Section

The thin slops from decantation section is first taken into a feed tank and then fed to the evaporation system through pre-heater in 1st effect feed mode and it flows from first to second to third to fourth to fifth effects. The concentrated syrup with 28 - 30 % w/w solids is taken out from the second effect. The low-pressure steam at 3.5 kg/cm² (g) is supplied to the first effect shell side. Vapours generated in the first effect are used as a heating medium in the second effect & vapours generated in the second effect are used as a heating medium in the third effect and vapours generated in the third effect are used as a heating medium in the fourth effect. Vapours generated in the fourth effect are used as a



heating medium in the fifth effect. The slop feed is concentrated from the initial concentration of 4 % w/w TS to 28 - 30 % w/w TS as it travels through the multi effect evaporator.

The vapours evolved from the fifth effect are condensed in the surface condensers. Each effect is provided with re-circulation pump. The first effect steam condensate can be recycled back to boiler as it is a fresh steam condensate. The condensate from second, third, fourth, fifth and surface condensers is collected in a condensate tank. The condensate are transferred to further treatment (Secondary ETP) using a centrifugal pump. The system operates under pressure & vacuum. Water ring vacuum pumps are used to maintain vacuum in the last effect. The last effect is at lowest temperature. Cooling water from cooling tower is used in the surface condensers for condensing the vapours from the last effect.

1.5.2 Dryer

Dryers are usually based on conduction method of drying. The heated and dried products only contacts steam heated tubes and not directly steam. Tube bundles functions on the counter-flow principle and the dryers are widely designed based on the lump crust formation tendency, wet and dry product flow characteristics, and thermal sensitivity of the material in dry condition.

1.5.3 Secondary Effluent Treatment Plant

The effluent treatment system also includes the secondary effluent treatment section where various spent lees, CIP liquid, fermented washing water etc. are treated together. The pump & blower sealing water and boiler blow down etc. having lower COD values are taken directly to the secondary polishing reactor for final treatment. Process condensates and other moderately polluted sources are treated separately and the treated water is used for gardening (Greenbelt), sprinkling on dust generating roads, etc. The characteristics and quantities of influents for Secondary Effluent Treatment plant are as follows.

Table 1.9: Inlet and Outlet characteristics of for secondary effluent treatment plant

Parameter	Combined effluent	Treated Effluent
pH	3.2 – 3.5	7.0 – 8.0
BOD (mg/lit)	1800 – 2000	< 30
COD (mg/l)	3500 - 4000	< 250
TSS	50	< 30
TDS	815	< 300

Process Condensate Polishing for Effluent

Condensate polishing unit is a unit in which all the liquid effluents of industry are treated. The detailed process to treat the wastewater generated from the Distillery Unit is given below:



(A) Bar Screen

Bar Screens are mechanical filter are normally installed as the first line of defence to remove large objects primarily, rags, woods, Plastics that manage to escape and find their way through the drainage systems. Usually these objects can be of extreme nuisance because if left around going to the main treatment plant, they pose a significant risk of damaging pumps and blocking valves.

The racks (of Bar Screen) require constant attention to clean it manually or mechanically and whatever collections of materials are stored in a waste bin before sent to sanitary landfill for disposal.

Bar screens come in many designs. Some employ automatic cleaning mechanisms using electric motors and chains, some must be cleaned manually by means of a heavy rake. Items removed from the influent are called screenings and are collected in dumpsters. As a bar screen collects objects, the water level will rise, and so they must be cleared regularly to prevent overflow.

(B) Oil and grease pit (Oil Skimmers)-

Organic toxic waste (oil and grease (O&G)) causes ecology damages for aquatic organisms, plant, animal, and equally, mutagenic and carcinogenic for human being. They discharge from different sources to form a layer on water surface that decreases dissolved oxygen. O&G layer reduces biological activity of treatment process where oil film formation around microbes in suspended matter and water. This lead to decrease dissolved oxygen levels in the water. Then oxygen molecules are difficulty to be oxidative for microbial on hydrocarbon molecules and cause ecology damages to water bodies.

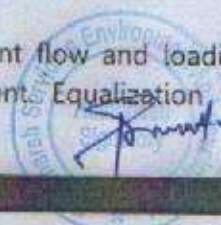
The conventional techniques remove oil and grease using skimming tanks with skimmer and oil and grease traps in treatment plants.

The skimmer is a rotating cylindrical device design to remove the surface oil layer. It consists of using cohesive force between the oil and the surface of the material to be move up. The metal part must be immersed in 1cm to 3cm of the free oil layer floating on the top of the water. The oil catches in the rotary device drop in a conveyor which evacuates oil in a container for oil recovery. After bar screen waste water will move to Oil and grease pit. Here all the oil and grease will be removed from the waste water.

The remaining oil has the potential of clogging of pipes in treatment units that need cleaning and sometimes replacement of pipes. We plan to take a biochemical route (enzymes and lipases) to slow down clogging and impact. Microbial activity will play significant role in performance, strength purification process, and elimination of pre-treatment process in wastewater treatment plant utilizing enzymes. Environmental studies described prevention of fat blockage or filming in waste systems before discharging wastewater into sewage system. The use of lipase enzymes will clean holding tanks, septic tanks, grease traps, and other systems.

(C) Equalization Tank

An equalization tank providing consistent flow and loading to a biological process is important to maintain optimal treatment. Equalization (EQ) Basins are designed to



provide consistent influent flow to downstream processes by retaining high flow fluctuations. Due to the additional retention time, aeration and mixing is required in equalization basins to prevent the raw wastewater from becoming septic and to maintain solids in suspension. We plan to use equipment to mix EQ Basin to keep suspended solids in solution, add fine bubble aeration to minimize odors, and also ensure predictable and constant flow equalization.

Effluent from the oil and grease pit comes to the equalization tank in wastewater treatment. The main function is to act as buffer and to collect the incoming raw effluent that comes at widely fluctuating rates and position to the rest of the ETP at steady (Average) flow rate. During the peak hours ETP comes at high flow rate. The equalization tank stores this effluent and lets it out during the non-peak time when there is no /little incoming effluent.

(D) Aeration Tank

Aeration is the most critical component of a treatment system using the activated sludge process. A well designed aeration system has a direct impact on the level of wastewater treatment it achieves. Aeration provides oxygen to bacteria for treating and stabilizing the wastewater.

Microorganism such as bacteria and protozoa can use the small particles and dissolved organic matter, not removed in primary treatment, as food. Biological treatment is performed in a tank containing a "soup" of starved microbes called activated sludge. These microbes require air to live (they are aerobic organisms) and thus air is pumped into the tank via diffused aeration system. Microorganisms in this aeration tank use the dissolved and particulate organic matter as food, producing more organisms. Thus the waste materials that left the primary clarifier are changed into microorganisms which can be collected and separated from the next step.

Oxygen is needed by the bacteria to allow biodegradation to occur. The supplied oxygen is utilized by bacteria in the wastewater to break down the organic matter containing carbon to form carbon dioxide and water. Without the presence of sufficient oxygen, bacteria are not able to biodegrade the incoming organic matter in a reasonable time.

In the absence of dissolved oxygen, degradation must occur under septic conditions which are slow, odorous, and yield incomplete conversions of pollutants. During this process a mass of biologically active flocks called Activated Sludge is formed.

(E) Secondary Clarifier:

A circular basin in which effluent from the activated sludge process is held for a period of time during which the heavier biomass (microorganisms) settles to the bottom as "activated sludge." This sludge, teaming with hungry microorganisms, can be returned to the aeration basin to begin the activated sludge treatment process all over again.

Secondary clarifier built with mechanical means for continuous recycling of Activated Sludge. Clarifiers work on the principle of gravity settling. The heavier suspended solids



settle in the clarifier due to the quiescent conditions provided in the Clarification zone. Settled culture from secondary tank will be recycling to Aeration to maintain the Mixed Liquor Suspended Solids (MLSS) in aeration tank.

(F) Sludge drying Beds:

Sludge is a residual, semi-solid by-product left from industrial or refining processes. It is a separated solid suspended in a liquid, typically containing major quantities of interstitial water between its solid particles.

A sludge drying bed is a common method utilized to dewater sludge via filtration and evaporation. Perforated drain situated at the bottom of the bed are used to drain seepage water or filtrate. A reduction of about 35% or less in moisture content is expected after drying. Sludge drying beds are provided to allow surplus sludge that is withdrawn from the process to dry for easier handling. Sludge drying relies on an underground drainage system as well as sunshine.

Liquid from the under drains should be returned to the effluent treatment process for further treatment. Sludge drying beds are usually situated beside treatment plants to readily receive and treat incoming sludge coming from primary or secondary treatment facilities. A sludge drying bed usually consists of a bottom layer of gravel of uniform size over which is laid a bed of clean sand. Open jointed under drains are laid in the gravel layer to provide positive drainage as the liquid passes through the sand and gravel. Under drains are made of vitrified clay pipes or tiles, laid with open joint.

The sludge should be deposited evenly to a depth of not greater than 20 cm. when digested sludge is deposited on a well-drained bed of sand. The major portion of liquid drains off in a few hours after which drying commences by evaporation. This produces cracks in sludge cake. In about 2 to 3 weeks sludge cake dries up completely with 20% to 40% volume reduction and can be removed. Dried or treated sludge offers a wide range of applications, mainly including agricultural land application. When the drying is completed to produce bio-solids, these bio-solids act as a fertilizer for crop harvesting.

The organic nitrogen and phosphorous found in bio-solids are used quite efficiently by crops as these plant nutrients are released slowly throughout the growing season. This allows the crop to absorb these nutrients as the crop grows. Besides the application of crop harvesting, the treated sludge can also be used as top dressing on golf course fairways, soil conditioner for construction of parks, and other athletic fields, a soil substitute in final landfill cover, etc.

(H) Tertiary Treatment Plant:

1- Pressure Sand Filter

To remove TSS and any other pollutants in the form of particle. This filter is also useful to protect the Activated Carbon Filter (ACF) from overloading by pollutants such as particulates, organics.



2- Activated Carbon Filter

Carbon adsorption is a proven process in tertiary treatment for the processing biologically treated wastewaters and is one of the many processes used in the advanced treatment of wastewaters. The ACF is used to remove relatively small quantities of refractory organics, as well as inorganic such as sulphides and heavy metals remaining in an otherwise well-treated wastewater.

(I) Ultra Filtration Unit –

In wastewater treatment, ultra-filtration (UF) devices are used to recycle and reuse water that contains virtually no physical solids. Ultra-filtration (UF) is a variety of membrane filtration in which forces like pressure or concentration gradients lead to a separation through a semi-permeable membrane. Suspended solids and solutes of high molecular weight are retained in the so-called retentate, while water and low molecular weight solutes pass through the membrane in the permeate.

(J) Reverse Osmosis Unit –

Reverse osmosis (RO) is a water purification process that uses a partially permeable membrane to remove ions, unwanted molecules and larger particles from drinking water. Reverse osmosis can remove many types of dissolved and suspended chemical species as well as biological ones (principally bacteria) from water and is used in both industrial processes and the production of potable water.

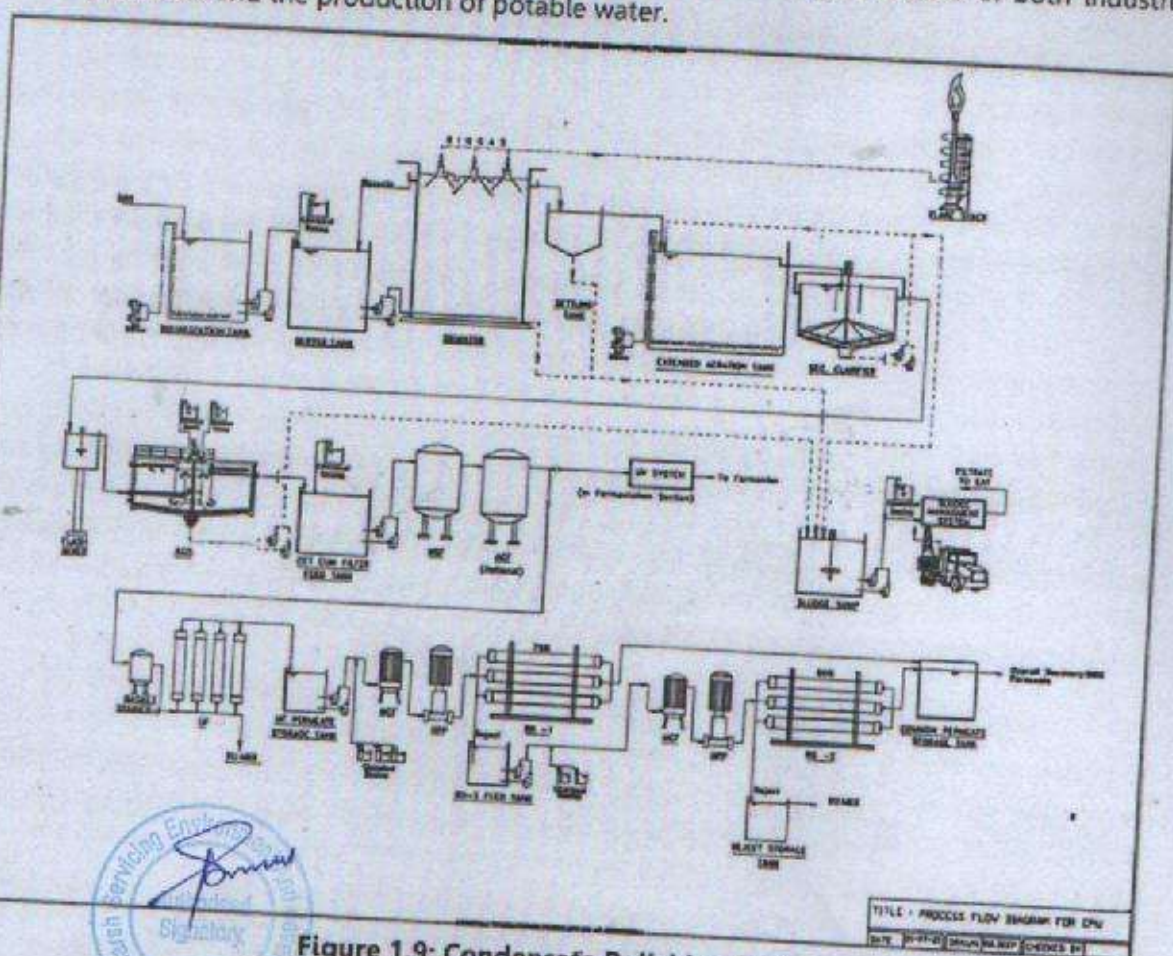


Figure 1.9: Condensate Polishing Unit

1.5.4 Action plan to control groundwater pollution

The distillery will be based on "Zero Liquid Discharge". The following measures will be adopted to prevent groundwater pollution:-

- ❖ During operation phase, spent wash will be treated and will not be discharged on soil/water.
- ❖ Treatment of secondary streams like spent lees, condensates, blow downs, etc. shall be in closed loop & any discharge outside the distillery shall not be done.
- ❖ Spillage of chemicals/ oils/ etc. will be avoided as best possible.
- ❖ The spent wash holding tank will be made up of RCC & steel.
- ❖ Regular checking of spent wash storage lagoon will be carried out in order to check for any leakages or leaching.
- ❖ Monthly monitoring of water will be done in and around spent wash storage lagoon under environmental monitoring program and parameters will be checked in correlation with drinking water standards IS 10500-1991.
- ❖ In case of accidental spillage, proper measures will be undertaken immediately in order to prevent the substance from entering into ground water route.
- ❖ Storm water drains will be made along the plant boundary. Sedimentation pits will be provided along the storm water drains. The runoff will be discharged to municipal sewer.
- ❖ Garland drains will be provided along the raw material stock yard. The water will be collected in sedimentation tank, treated and then reused for dust suppression

Water Conservation

The following measures will be adopted to minimize use of ground water –

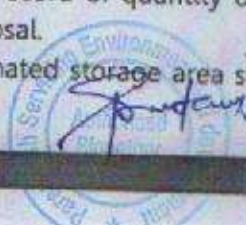
- ❖ Maximum recycling and reuse of wastewater after treatment. Condensate water will be re used & recycled.
- ❖ Total percentage saving due to rain water use ~8% per year and total water will be reused in distillery process.
- ❖ Tracking of consumption of water.
- ❖ Periodic preventive maintenance of water distribution system.
- ❖ Optimum use of process cooling water.
- ❖ Training and awareness on water conservation measures.

In addition to above, rainwater harvesting will be done at project site to harvest rainwater from the roof tops and use for various activities at the plant site to conserve fresh water and reduce the water requirement from other sources. Rain water will be collected through open channel & pipelines in to storage tank

1.5.5 Solid Waste Generation & Disposal

The following will be the solid waste generation from the existing plant and method of disposal:-

- ❖ Maximum re-cycling and utilization of generated solid waste shall be done as per the guidelines.
- ❖ Unit will prepare Hazardous waste disposal plan, as per applicable statutory conditions under the Hazardous Wastes Act, 2016 and same will be implemented.
- ❖ EMC will keep a record of quantity of solid and hazardous waste generated and their proper disposal.
- ❖ A separate designated storage area shall be provided with sign boards/labels for



storage of hazardous waste.

- ❖ The concerned person will prepare a site manual on the total program and activities of solid/hazardous waste management.
- ❖ Regular training of employees engaged in solid waste management works

1.5.6 Hazardous waste generation, storage & disposal

Waste oil generation: 0.5 KL / Annum

This will be stored in covered HDPE drums in a designated area and will be given to SPCB approved vendors. The lead acid battery or dry battery will be given to authorized recycler having authorization from competent authority. E-waste generated from the plant will be given to authorized recycler having authorization from competent authority.

Details of solid and hazardous waste generated along with their method of collection and mode of disposal are tabulated below in table 1.8:

Table 1.10: Solid & Hazardous Waste Generation & Its Disposal

S. No.	Solid waste / Hazardous waste	Quantity /day	Method of collection	Mode of disposal
1.	Boiler fly Ash	40.0 TPD	Mechanical conveyor into common silo for further disposal	Sold to bricks manufacturers
2.	DDGS	45 TPD	Mechanical Conveyor	Sold as Cattle Feed, Poultry & Fisheries
3.	Domestic solid waste	30.0 kg/day	Labour force. Domestic organic solid waste will be composted, while the inorganic solid waste will be handed over to municipality.	Segregated in separate colored bins at designated places. Disposed to authorized vendors.
4.	Used oil from DG set.	1.0 KL/A	Stored in leak proof sealed barrels	Disposed to SPCB authorized recyclers.
5.	Steam turbine oil waste	1.0 KL/A		
6.	Spent Resin from DM Plant	0.6 KL/A	HDPE drums in covered shed	Given to authorized recycler

1.5.7 Odour management

Odour Management Plan outlines the methods by which odorous emissions will systematically be assessed, reduced and prevented potentially from the distillery unit.

- ❖ A horticulturist will be employed to develop greenbelt according to CPCB guidelines and
- ❖ Plantation of such trees that are known to prevent odors.
- ❖ Areas having odorous emissions will be covered from all sides with greenbelt/plantation.



1.6 DISASTER MANAGEMENT PLAN

The Company will make provisions for on-site and off-site disaster management plan: For On-site disaster management plan, following points will be taken into consideration:

- ❖ To identify, assess, foresee and work out various kinds of possible hazards, their places, potential and damaging capacity and area in case of above happenings.
- ❖ Review, revise, redesign, replace or reconstruct the process, plant, vessels and control measures if so assessed.
- ❖ Measures to protect persons and property of processing equipment in case of all kinds of accidents, emergencies and disasters.
- ❖ To inform people and surroundings about emergency if it is likely to adversely affect them.
- ❖ For off-site disaster management plan, following points will be taken into consideration:
 - ❖ The plan will identify an emergency coordinating officer who would take overall command of the off-site activities.
 - ❖ Proper co-ordination will be there between the company and outside regulatory authorities.

1.7 MEASURES FOR IMPROVEMENT OF ECOLOGY

There is no ecologically sensitive area within 10 km radius of the project. No wildlife exists in the vicinity of the project. Plantation programme will be undertaken at several areas.

Development of greenbelt is of prime importance due to their capacity to reduce noise and air pollution impacts by attenuation/assimilation and for providing food and habitat for local macro and micro fauna.

A greenbelt of 1.73 Ha (35.80%) will be developed in the plant premises. 8- 10 m wide greenbelt will be developed around the plant premises.

Site Preparation: The location earmarked for greenbelt shall be fenced. The soil quality of the plant area is fit for plantation.

Plant propagation: Nursery raised saplings of 2-3 feet height of trees and shrubs will be purchased from local nursery and Forest Dept.

Plantation: This will include digging pits with proper spacing, filling pits with prepared soil, plantation of seedlings and watering. The size of the pit will be 1m x 1m x 1 m for trees and 0.5 m x 0.5 m x 0.5 m for shrubs.

The pits will be filled with soil mixture. The soil will be irrigated soaking wet prior to placing of seedling. The water required for greenbelt development will be met from the treated effluents generated during plant operation. During construction period water supply will be met from available sources.

Plantation will start from the beginning of construction activity (after the site is made clear and demarcating the green portion). Soil proposed to be filled in the pit after plantation will be mixed with compost (1:1). Plantation will be done after first rainfall.



Adequate protection will be ensured for achieving high survival rate of the planted saplings. Water and nutrients / manure will be given at appropriate intervals.

Total Trees required as per CPCB/MoEF&CC Norms@2,500/Ha = $1.7311 \times 2,500 = 4330$ No's. The species selection will depend upon type of soil and local species with good survival rate will be selected. Against the requirement of 4330 Nos of Trees, industry will do plantation for 4500 Nos of tree.

The list of plantation of proposed trees is given below in Table 1.9 –

Table 1.11: List of Blg Trees for Proposed Plantation

Sr. No.	Name of the plant	Common Name
1	Azadirachta indica	Neem
2	Putranjivaroxburghii	Putrajevaka
3	Mimusopselengi	Moleshree
4	Dalbergia sissoo	Shisav, Shisham
5	Mimusopselengi	Bakul
6	Pongamia pinnata	Karanj
7	Acacia Catechu	Khair
8	Tectona grandis	Saag
9	Neolamarckiacadamba	Kadamb
10	Cassia fistula	Bahava
11	Gmelina arborea	Shivan
12	Pithecellobium dulce	Wilayati Chinch
13	Alstoniascholaris	Saptaparni
14	Swietenia mahogani	Mahogani
15	Aegle marmelos	Bel
16	Holigarnagrahamii	Ran Bibba
17	Ficus macrocarpa	Nandruk
18	Melia azedarach	Limbara
19	Bauhinia racemosa	Apta
20	Butea monosperma	Palas
21	Lagerstroemia speciosa	Tamhan
22	Phyllanthus emblica	Amla
23	Polyalthia longifolia	Ashoka



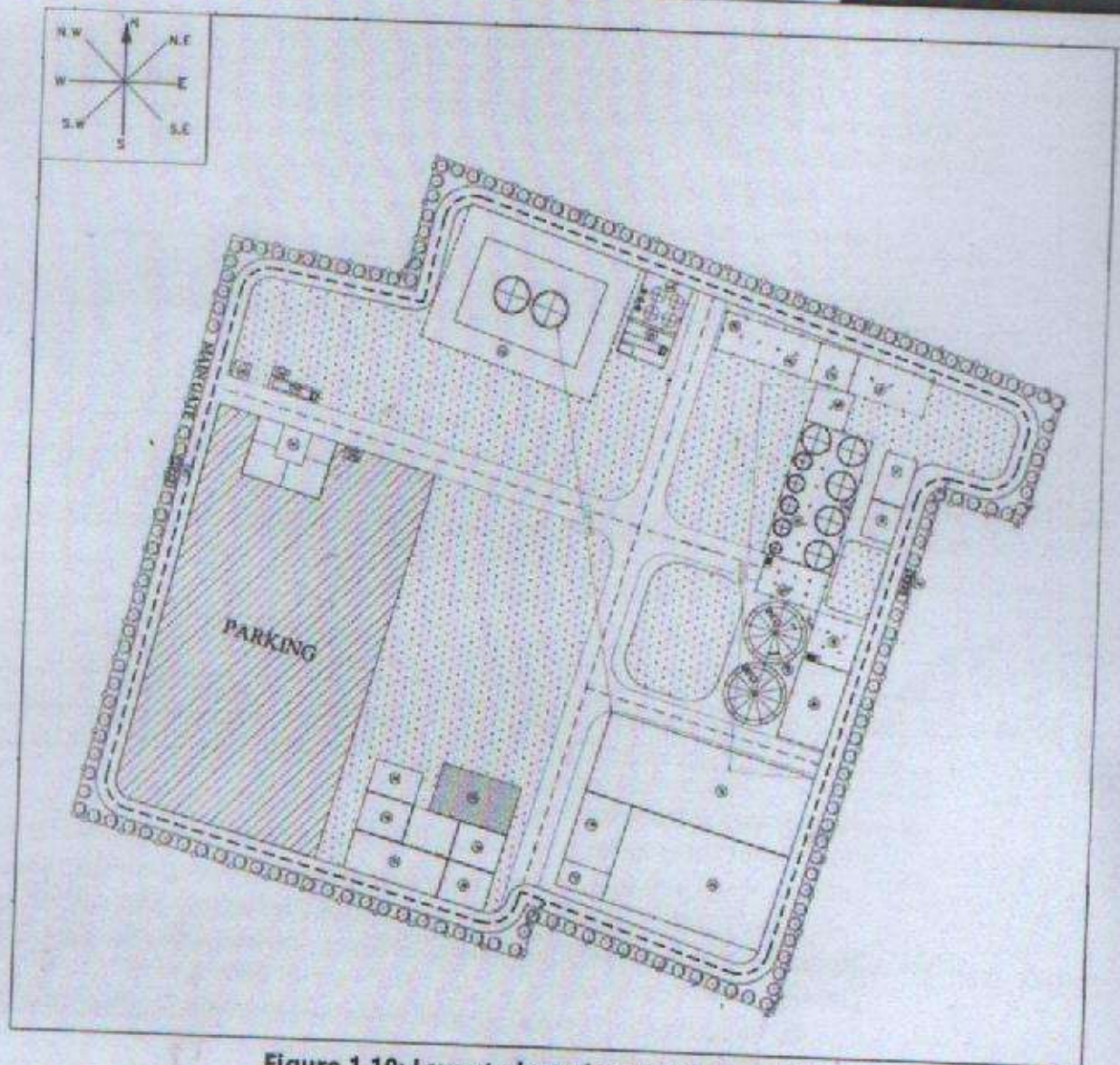


Figure 1.10: Layout plant along with green Belt

Species has been selected on following basis:-

- ❖ Fast growth;
- ❖ Capacity to endure water stress and climate extremes after initial establishment;
- ❖ Tolerance to specific conditions or alternatively wide adaptability to eco physiological conditions;
- ❖ Differences in height and growth habits;
- ❖ Pleasing appearances;
- ❖ Providing shade; and

The plant layout showing the proposed green belt is given in Figure no 8.

1.8 BUDGETS FOR EMP

The capital cost for environmental management of the project is estimated to be Rs. 6.42 Crore & Rs. 1.48 Crore per year will be required as annual recurring expenses to meet the recurring expenditure for implementing the measures. The break-up of the investment is shown in Table 1.10.



Table 1.12: Investments on Environmental Protection Measures (Rs. in Crore)

S. No	Particulars	Capital Cost	Annual Recurring
		In Cr	Cost in Cr
1	Air pollution control system (ESP) on 25 TPH low pressure boiler	1.00	0.20
2	Scrubbing system, compressing system, liquefying system and storage for CO2 removal	0.80	0.15
3	Spent wash treatment including concentration-using MEE (Multiple effect evaporator).	0.85	0.25
4	Condensate Polishing unit	0.65	0.35
5	Rainwater harvesting systems	0.25	0.10
6	OCEMS- Online Continuous Emission/Effluent Monitoring System	0.24	0.10
7	Occupational Health Management	0.25	0.10
8	Green Belt Development	0.22	0.10
9	Environment monitoring	--	0.03
10	Solid/ hazardous waste management	0.10	0.10
11	CER	2.06	--
	Total	6.42	1.48

1.9 Corporate Environment Policy

M/s Tirhut Udhog Private Limited will be committed to environmental leadership in all of its business activities. The company will be providing policies to provide a safe, healthy workplace, protecting the environment, conserving energy and natural resources. With these policies in place the company shall achieve a safe environment. The company is committed to do and will:

- ✦ Integrate the consideration of environmental concerns and impacts into all the decision making and activities,
- ✦ Provide a safe and healthy workplace and ensure that personnel are properly trained with the appropriate safety and emergency equipment.
- ✦ Conserve natural resources by adopting pollution prevention practices.
- ✦ Develop and improve operations and technologies to minimize waste, and other pollution, minimize health and safety risks, and dispose waste safely and responsibly.
- ✦ Promptly report all non-compliance issues in accordance with applicable governmental reporting requirements, evaluate causes of noncompliance, and implement corrective actions.
- ✦ Establish procedures for periodic review of environmental compliance with all laws and regulations. Promptly correct any practice or condition not in compliance with this policy.



1.9.1 Corporate Environment Responsibility

(A) Education

- ✓ Assistance in construction and repairing of schools.
- ✓ Promotion of education programs.



- ✓ Promotion of Adult Education program.
- ✓ Efforts in Substantial Improvement in Literacy rates.
- ✓ Encouragement of school & College Students in Competition.
- ✓ As per requirements facilities will be provided in educational Institution.
- ✓ Scholar students of nearby schools will be encouraged
- ✓ Support for Sports to nearby schools.
- (B) **Health and Family Welfare**
 - ✓ Preventive medical care for rural population shall be promoted.
 - ✓ Awareness to improve health and hygiene standards.
 - ✓ Contribution in AIDS awareness programme.
 - ✓ Support for general Health Camp for men, women & kids.
 - ✓ Support for Family Planning Operation Camp.
 - ✓ Support in Pulse Polio, Immunization, Hepatitis-B, MMR Immunization.
 - ✓ As per requirements support will be provided to hospitals nearby the project site.
- (C) **Sustainable Development and Livelihood**
 - ✓ Self-Employment Training Programs - Covering all nearby eligible village youths.
 - ✓ Assistance for self-employment.
 - ✓ Assistance through social forestry programme.
- (D) **Rural Infrastructure Development**
 - ✓ Active participation in renovation of school, temple, community centre as per requirement in nearby areas of Project site.
 - ✓ Support in infrastructure development of Hospitals of nearby areas.
 - ✓ Active participation in facilitating drinking water in summer season.
 - ✓ Construction of Rainwater harvesting Structures.
- (E) **Social Reform**
 - ✓ Support in Supply of water to rural areas.
 - ✓ Supporting rural socio cultural programme with villagers & with District Administration.
 - ✓ Encouragement of youth for sport competition.
 - ✓ Distribution of plants at free cost for plantation in nearby villages
 - ✓ Religious & Cultural program in village- Support to all villages.
 - ✓ Awareness program through Govt. Agencies.

1.9.2 Year wise expenditure for Corporate Environment Responsibility (CER)

The company proposes to spend Rs. 206.0 Lakhs in the coming years till completion of project for carrying out various activities under Corporate Environmental Responsibility. The company also proposes to spend towards infrastructure creation for drinking water supply, sanitation, health, education, skill development, roads, electrification including solar power, solid waste management facilities, rain water harvesting, avenue plantation, plantation in community areas, etc. (Beneficiaries villages will be decided with the concern local authority).



Table-1.13: Corporate Environmental Responsibility

S. No	Description	Total (Lakh)	Timelines
1	Providing sanitation and drinking water facilities in village Khijirpura and Gopalpur Khap	30	Six months from the commencement of plant operations ; Water Purifiers shall be maintained by the project proponent during its entire life time
2	Maintenance of Existing, Infrastructure/Roads in village Khijirpura and Gopalpur Khap	40	Three months from the commencement of plant Operations
3	Setting up solar panels/Solar light distribution in village village Khijirpura and Gopalpur Khap	15	Six months from the commencement of plant Operations
4	Avenue Plantation in nearby villages and roads in village village Khijirpura and Gopalpur Khap	25	Plantation will be started by November 2023
5	Education-Construction/ operation./ provision of facilities e.g. school building, Class rooms, Play ground, Laboratory, Library, Computer class, Toilets, Drinking Water Facilities etc. in village village Khijirpura and Gopalpur Khap	36	Six months from the commencement of plant Operations
6	Training & Skill Development of local youths in village village Khijirpura and Gopalpur Khap	60	Three months from the commencement of plant Operations
	Total	206.0	

1.10 RISK ASSESSMENT & EMERGENCY PROCEDURES

Accidents related to industrial hazards results in great loss in human and financial capital and have significant impact on the environment. These risks can be sometimes so drastic and fatal that they can easily jeopardize the financial viability of a business along with other hardships. Therefore, the risk assessment deals with the objective of analyzing hazards associated with each and every activity being carried out in an industry in the most simple and comprehensive ways to bring out a well-designed and feasible plan in the Indian context.

Risk is the probability that the hazard will occur (i.e. an adverse effect or/event that will result from a given set of exposure condition). Since the risk is typically expressed as a mathematical probability, the range of risk can be stated as zero (having no possibility of adverse effect or event). Risk is the mathematical product of hazard and exposure. This relationship can, be expressed by the following formula.

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$$



1.10.1 PRIMARY POTENTIAL HAZARD IN THE PROJECT

The proposed project deals with various instruments like handling and storage of grains, biomass, for boiler.

The products of the industry include Ethanol (Absolute Alcohol - Fuel Grade). All these instruments and product/by-products can be hazardous due to their mechanical and chemical properties. The plant possesses high risk of accident if they are not properly taken care of.

As per the Manufacture, storage and import of Hazardous Chemical rules, 1989, the flammable chemicals are categorized into the following three categories:

Class I, A: Liquids having flash point below 73° F and boiling point below 100°F

Class I B: Liquids having flash point at or above 140 °F and below 200 °F

Class I C: Liquids having flash point at or above 73°F and below 100 °F

1.10.2 SECONDARY POTENTIAL HAZARD FOR THE PROJECT

The secondary potential hazards can arise from the processes undertaken during the transport or transfer of materials from storage or during storage in the plant. It includes:

- Spilling or leakage during loading/unloading of materials into the storage tanks
- Leakage in the storage tanks due to some technical or mechanical default, poor maintenance and defects in the tanks.
- Spilling during transport or transfer of products due to damaged pipeline or other factors.

The list of products stored as identified under MHSIC are given in the table

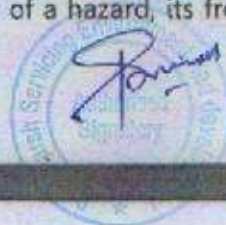
Table 1.14: List of products to be stored

S. No	Chemical	Properties/Hazard associated with the chemical	Major Hazards to health
01	Ethanol	Ethanol 99.8 % v/v Chemical name – Ethyl alcohol Colorless, alcoholic odor Flash point -53°F Boiling Point- 78°C Explosion limit value -3.5-15 Extremely volatile liquid	Highly volatile and hence can cause sudden explosion and fires even with little exposure. • It is severe eye irritant. • Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. • Repeated exposure may impact kidney, liver, spleen and blood

(Source: Safety Data sheet, <http://sds.chemtel.net/webclients/ram/XQ6210.pdf>)

1.10.3 Hazard Identification & Risk Assessment (HIRA)

Hazard identification involves the enlisting of hazards in each unit of the ethanol plant and HAZOP study will be conducted on the basis of it. Risk assessment involves the finding of impact evaluation of a hazard, its frequency, its probability of major accidents etc.



Major on site and off site hazards in ethanol plant are given below:

On-site

- ❖ Uncontrolled exposure to fugitive dust, noise, and other emissions
- ❖ Contact with chemicals and solid wastes
- ❖ Accidents like uncontrolled emissions/spillages due to handling of product and raw material

Off-site

- ❖ Exposure to pollutants due to release from offsite/ storage/related activities
- ❖ Unpredicted contamination due to accidental explosions/release due to a natural hazard
- ❖ Possible sudden releases and deposition of toxic pollutants in vegetation

1.10.4 ON SITE EMERGENCY PLAN

Identification of hazards and proposed safety systems The following types of hazards are identified at the site.

Table 1.15: Hazard identification in an Ethanol Plant

S. No.	Name	Description	Severity	Hazard
1	Transport of raw material and storage	Grains	Minor	Leakage, Accidents, Fire
		Biomass/coal	Minor	Leakage, Accidents, Fire
		HSD Storage	Major	Leakage, Fire, explosion
		Chemicals (Caustic soda, acids etc)	Major	Inhalation & Exposure to skin, Fire
		Enzymes, yeast, nutrients etc	Minor	Inhalation & Exposure to skin
2	Ethanol Manufacturing	Distillation	Major	Fire, explosion & Heat
3	Power room & DG Sets	Transformer area	Major	Noise Fire & electrocution
		Electrical rooms	Major	Electrocution, short circuit
4	Other Units	DG Sets, electrical rooms	Major	Noise, fire, explosions, heat & electrocution
5	Products	Alcohol	Major	Leakage, Fire, Explosion

1.10.5 Assessment of Risk along with mitigation measures

Qualitative risk assessment is done based on both probability and impact which provides greater insight into the absolute risk severity. The study of risk and its impact evaluation finds out the influence on a project due to a particular risk including positive and negative and its impact on objective such as schedule, cost, quality, or performance. Description of hazards identified, risk assessment and mitigation measures are below.



Table 1.16: Ethanol Plant operations (working area)

Activity	Associated hazards	Health impact	Risk rating	Proposed control & mitigation measures
Working near distillation column	Heat, Fire, Slipping, falling from stairs	Physical injury and burning	High	• Use of Personal protective equipment • Fire-fighting facilities • Provision for immediate availability of first aid • Proper maintenance of all distillation equipment and periodic checking

Table 1.17: Power room & D.G. Set operation

Activity	Associated hazards	Health impact	Risk rating	Proposed control & mitigation measures
Working near DG	High noise	Hearing impairment	Medium	• Use of PPEs • Acoustic enclosures
Maintenance operations for DG	Physical hazard and electrocution	Physical injury and burns	High	• Use of PPEs • Restricted entry of staff • Use of flame proof fittings
HSD storage area	Leakage / Fire	Severe burns and physical injury	High	• Storage will be away from ignition source • Regular monitoring to check the leakages and spillages • Firefighting facility will be provided • PPEs will be provided • First aid box





Proposed Establishment of Grain Based Ethanol Distillery capacity 200 KLPD with 6.0 MW co-generation power plant at Village – Nayagaon Kushahar, Khajirpura, Tehsil – Kesaria, District - East Champaran, Bihar, Pin - 845424, India

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Table 1.18 Handling and storage of raw material and products

Activity	Associated hazards	Health impact	Risk rating	Proposed control & mitigation measures
Transportation of raw materials and products	Physical hazards, spillage of material	Injury due to road accidents	Medium	• Trained drivers to be employed • Proper first aid kits to be provided in all vehicles • SDS training to be provided for hazardous chemicals • Transport Emergency (TREM) cards to be provided to the drivers
Handling & storage of grains/ Biomass/coal	Spillage from silo	Physical injury	Less	• Proper handling of grains/biomass/coal • Training to workers involved in handling and storage • Concerned PPEs to be provided to workers • Inspection and regular monitoring of storage area • Provision of level indicators for storage tanks
Handling and storage of chemicals	Spillage and leakage of hazardous chemicals	Physical injury	High	• Proper labeling of harmful chemicals • Immediate First aid provisions • Discarded containers to be stored properly • Training of SDS to be provided to workers • Proper ventilation to avoid fuming in the storage area
Handling and storage of alcohol	Inhalation, ingestion & fire	Exposure to over 1000 ppm may cause headache, drowsiness and lassitude, loss of appetite, and inability to Concentrate, throat Irritation. • Ingestion causes depression of central nervous system,	High	• Avoid all possible sources of ignition like spark or flame. • Use spark/flame proof hand tools • Electrical wiring will be flame proof type • Proper cleaning provisions if any spillage occurs • Proper fire safety systems • Training for proper handling of alcohol • Provision of level indicators for storage tanks of alcohol • Avoidance of plastics, rubber and coatings in the storage area.

Proposed Establishment of Grain Based Ethanol Distillery capacity 200 KLPD with 6.0 MW co-generation power plant at Village – Nayagaon Kushahar, Khijirpura, Tehsil – Kesaria, District – East Champaran, Bihar, Pin - 845424, India

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Activity	Associated hazards	Health impact	Risk rating	Proposed control & mitigation measures
		nausea, vomiting, and diarrhea • Liquid or vapor may cause eye and skin irritation • Burn injury		

1.10.6 Hazard identification and Risk Assessment Matrix

Defining scales based on assumptions

Scale, S1		Scale, S2				Risk classification	
		Likelihood		Level of Consequence			
0-5	Low	0-5	Rare	0-5	Low	0-50	Low
6-8	Medium	6-8	More often	6-8	Medium	51-80	Medium
9-10	Severe	9-10	frequent	9-10	High	81-100	High



Proposed Establishment of Grain Based Ethanol Distillery capacity 200 KLPD with 5.0 MW co-generation power plant at Village – Nayagaon Kushahar, Khajirpura, Tehsil – Kesaria, District – East Champaran, Bihar, Pin - 845424, India

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Activity/Services	Hazard	Hazard/ Associated risk identification							Scale S1	Risk assessment					Overriding factor (LC/DC/Any others)	Risk Management Measure required
		Condition			Adequacy of measures		Risk			Severity S2= L x C		Detect ability (D)	Total S1+S2 +D	Risk classification		
		D/I	R/NR	N/A N/E	Measures	Gaps, If any	Likelihood	Consequences		Likelihood (L)	Level of Consequence (C)					
Ethanol Plant	Falling or slippage from stairs	D	NR	E	Helmets	N	Physical injury	Injury on head	8	6	8	10	66	Medium	-	Mandatory use of helmets, PPEs in the plant premises.
Handling & storage of grains/ Biomass/coal	Spillage e	D	NR	E	Proper labelling and storage	N	Burning of property y and persons	Loss of life	7	7	8	10	73	Medium	-	Safety data sheet (SDS) and proper labelling of materials
Handling of alcohol & storage	Fire & explosion	D	NR	E	Fire extinguishers	N	Burning of property and persons	Loss of life	9	7	8	10	75	Medium	-	On site availability of Fire extinguishers
Handling & storage of Chemicals	Spillage	D	R	E	Proper labelling and storage	N	Burning, rashes on skin	Major burns on skin	7	7	8	10	73	Medium	-	Safety data sheet (SDS) and proper labelling of materials

Legend: D: Direct, I: Indirect, R: Routine, NR: Non-Routine, N: Normal, AN: Abnormal, E: Emergency

Mitigation Planning:

Mitigation planning is an integral part after hazard identification, mitigation measures counts for all the measures needed to be taken in order to prepare for avoiding any hazard at first, and devise the emergency plan layout. This helps to localize the emergency or eliminate it and minimizes the affects of the accident overall. Elimination of emergency requires prompt actions to be taken by the emergency staff- fire fighting equipments, water sprays, while for minimizing the effects first aid, evacuation plan, rescue and rehabilitation is required.

