

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

FOR

2* 45 KLPD Grain Based Distillery Unit
2*3 MW Co-Generation
2*8000 Case/Day of IMFL/IMIL Bottling Unit

AT

VILLAGE – Goud-Sargiguda,
TALUKA – Junagarh
DISTRICT-KALAHANDI, ORISSA

MONITORING DONE BY M/S. VARDAN ENVIROLAB (NABL ACCREDITATION TC-
6299, MOEFCC NO. S.O. 1783 (E)

[PROJECT OR ACTIVITY 5(g) CATEGORY-A DUE TO MOLASSES/GRAIN BASED
DISTILLERY]

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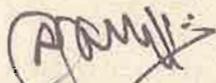
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Signed for and on behalf of NABL

N. Venkateswaran
Program Director



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Anil Relia
Chief Executive Officer

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Chapter – 1

PROLOGUE

1.1 INTRODUCTION

India, the fourth largest economy in the world, has been maintaining a GDP growth rate of around 8 % for more than a decade. Analysts have projected that India has the potential to almost double her present rate of growth with labour and capital productivity improvements. Industrial development plays an essential supportive role in improving labour and capital productivity. Investment in industrial sector is also an indicator of economic growth in all market economies. Reform process in industrial sector has garnered unprecedented momentum. With vast untapped opportunities, India could well be the desired location for the industrial sector in the non-too-distant future.

Ethanol is a basic raw material for the utilisation in chemical industry, for potable purposes and now it is being used for mixing in the petrol as fuel. Keeping in view of the future growth requirements of ethanol, M/s Starlight Energy Ltd. are planning to set up a 2 x 45 KLPD capacity grain based distillery unit having 2 x 3.0 MW cogeneration power plant alongwith around 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist Kalahandi, Odisha.

The project is planned to be established in two phases. In phase 1, the company would install a 45 KLPD grain based distillery unit having 3.0 MW cogeneration power plant along and 8000 cases/day of IMFL/IMIL bottling unit.

After the commissioning of the phase 1, the promoters of the project would implement the phase 2 having replica project of 45 KLPD grain based distillery unit with 3.0 MW cogeneration power plant and additional 8000 cases/day of IMFL/IMIL bottling unit.

Keeping in line with the requirements of Ministry of Environment and Forests (MoEF), Government of India notification dated 14th September, 2006 and State Pollution Control Board, M/s Starlight Energy Ltd. has retained M/s Vardaan Environet, Gurgaon as their consultants for the environmental clearance of their proposed distillery plant including conduction of Environmental Impact Assessment

(EIA) study as per the Terms of Reference approved by the MoEF. Vardaan Environet has conducted the EIA study as per the terms of reference approved by the EAC in their meeting held on 1 - 2 December, 2014.

1.2 METHODOLOGY

The methodology adopted for carrying out the environmental impact assessment study is based on the guidelines issued by the Ministry of Environment & Forests (MoEF), Government of India. An effective EIA requires sufficient background data on various environmental components through reconnaissance survey, sampling, data available with the government departments, etc.

The methodology adopted in preparing the rapid environmental impact assessment report is described below.

1.2.1 Screening

The project is covered under Category 5 (g) – grain/molasses based distilleries with daily production capacity of more than 60 KLPD. The industry had applied to the MoEF for the approval of Terms of Reference for the Environmental Impact Assessment Study. The approved TOR by MoEF is enclosed as annexure 1.

1.2.2 Scope of the study

The Environmental Impact Assessment (EIA) study was undertaken to incorporate the environmental and social considerations in to the project planning and design process in order to ensure that the proposed distillery project under consideration is environmentally sound. The EIA report is based on data collected from primary and secondary sources that include:

- Collection of information on existing baseline conditions in order to identify the existing environmental quality of the study area
- Ambient air, water and soil quality and noise level monitoring
- Identification of environmentally sensitive locations (if any) in the impacted area
- Consultation with stakeholders
- Assess the adverse impacts on the environment and to avoid the impacts, suggest cost effective mitigation and management measures to mitigate the negative

impacts

- Preparation of Environmental Management Plan, which will include associated costs for execution of mitigation and enhancement works; development of an environmental monitoring program for construction and operational phases; detailing of the requirements for administrative requirements and training.
- Addressing the derived issues involving occupational health and safety, and emergency/disaster management to limit/contain the adverse effects

1.2.3 The methodology

Methodology adopted for the Environmental Impact Assessment is in accordance with the requirements of the TOR approved by the MoEF. The methodology adopted for the EIA is discussed in the following paragraphs.

1.2.3.1 Environmental screening and scoping

Environmental screening exercise of the proposed project has been undertaken to ascertain the major environmental issues and define the scope of work (TOR) for conducting environmental impact assessment. As per the recommendations of the MoEF, detailed Environmental Impact Assessment has been carried out for the proposed project.

1.2.3.2 Surveys for collection of baseline data

A reconnaissance of the study area was conducted to map the data collection requirements. Baseline data collection has been planned as per the TOR finalized.

Baseline data describes the existing environmental status of the identified study area. Site specific primary data has been monitored and it has been supplemented by the secondary data available from various govt. and other agencies.

Data was collected on the various environmental components of soil, climate, geology, hydrology, water quality, flora and fauna, habitat, demography, land use, cultural properties etc, to establish the baseline environmental setup. Secondary data about the study area was collected from published and other relevant sources.

For baseline environmental setting of the study, data collection (primary and secondary) has been done from 1st January, 2015 to 31st March, 2015 (winter season).

1.2.3.3 Environment sampling and analysis

In order to assess the environmental conditions of the study area, different locations were identified for sampling and analysis (monitoring) of ambient air, soil, water quality, noise level etc. Monitoring has been carried out at various rural/ residential, and sensitive locations to establish the baseline conditions of the project area according to the standard accepted procedures.

1.2.3.4 Environmental impact assessment

The project details have been thoroughly assessed from environmental angle for identification of significant environmental issues of concern (with emphasis on potential environmental hazards), applicable statutory norms and their feasible remedial measures (including avoidance, mitigation and enhancements). Potential and significant impacts were assessed on the basis of analytical review of anticipated significant environmental issues in relation to the baseline environmental setting.

1.2.3.5 Mitigation measures

To contain adverse impacts, as well as to enhance positive impacts, suitable corrective options have been identified and implementable measures have been specified.

1.2.3.6 Environmental management plan

The EMP concentrates on effective implementation of mitigation measures, system for controls and checks for achieving the desired results. It covers detailed action plan during the construction and operational phases of the project with an effective management system for its successful implementation.

1.3 STRUCTURE OF THE REPORT

The report has been divided into 9 chapters including this Prologue and Annexures. Following paragraphs present an outline of the main chapters of the report.

- **Chapter 2 – Project Description.** In this chapter, the project process is described from an environmental perspective and outline of various utilities, consumption of raw materials, water consumption details, water balancing etc. have been described.
- **Chapter 3 – Baseline Environmental Setting.** The chapter gives details of

physical environment in the study area – geology and topography (including drainage and drainage basins), water resources (qualitative and quantitative characteristics), local meteorology, ambient air quality, soil characteristics, sound and noise – biological and ecological conditions (including sensitive areas), socio-economics and cultural resources (including unique areas, demographic information), energy scenario, transportation pattern, and infrastructural services. The data and information presented in the chapter is gathered from primary and secondary sources.

- **Chapter 4 – Environmental Impact Assessment.** This chapter identifies and assesses various impact determinants and anticipated environmental impacts due to the proposed project.
- **Chapter 5 – Environmental Management Plan.** The chapter addresses the requirements to contain adverse impacts. This covers detailed action plan on proposed mitigation measures and their implementation, and monitoring of environment, and also related sundry issues, such as, occupational health and safety, emergency response planning, administrative mechanism for effective implementation including budgetary requirements.

Chapter – 2

PROJECT PROFILE

2.0 THE PROJECT

Starlight Energy Ltd. are planning to set up 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 M W cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist.

Kalahandi, Odisha. The company would be installing the project in two phases. In phase 1, 45 KLPD capacity grain based distillery unit, 3.0 MW cogeneration power plant and 8000 cases/day of IMFL/IMIL bottling unit would be installed. After the commissioning of the phase I, the company would start the installation of the identical similar unit in phase 2.

The estimated cost of project for the phase 1 plant is around Rs. 40.00 Crores. The cost does not include the cost of the land. The estimated cost of project for the phase 2 would be around 30 % more as the phase 2 commissioning would take at least 2 years from the date of commissioning of the phase 1. The implementation of the project shall be as below:

Phase	Project Description	Installed Capacity	Expected COD
I	Integrated distillery unit with IMFL/IMIL plant, biomass based power plant - Phase I	45 KLPD grain based distillery, 8000 cases/day of IMFL/IMIL bottling plant and 3.0 MW captive power plant	Dec-2019
II	Integrated distillery unit with IMFL/IMIL plant, biomass based power plant - Phase II	45 KLPD grain based distillery, 8000 cases/day of IMFL/IMIL bottling plant and 3.0 MW captive power plant	Dec-2020

2.1 SELECTION OF THE SITE

The basic criteria for the selection of site for the grain based distillery project and cogeneration power plant are as below;

- a) Raw material and biomass availability
- b) Raw material cost
- c) Transportation cost
- d) Accessibility to markets within and nearby states
- e) Availability of water
- f) Availability of land in abundance
- g) Connectivity of road/rail network.
- h) Market for final Product

Based on the above assumptions, following states are fit for the installation of the grain based distillery projects;

- a) West Bengal
- b) Punjab
- c) Haryana
- d) Odisha
- e) Jharkhand
- f) Chhattisgarh

Advantages of the location at Village - Goud-Sargiguda, Taluka Junagarh, Dist. Kalahandi (Odisha) for setting up of the proposed project.

The promoters of the project plans to acquire 128.34 acres of land at the site. Out of the proposed total land area, the project promoters are already having 91.48 acres of land at village Goud-Sargiguda, Taluka Junagarh, Dist. Kalahandi. The rest of the land would be acquired by the state Government and given to the company.

Out of the total land area, the promoters of the project would earmark 40 acres of land for the proposed 2 x 45 KLPD grain based distillery, 2 x 8000 cases/day of IMFL/IMIL bottling plant and 2 x 3.0 MW captive power plant project. Besides this, the other benefits of the location are as below;

- a) Required raw material is abundantly available in the nearby adjoining area.

- b) Raw materials can also be easily procured from grain surplus nearby states such as Chhattisgarh, West Bengal, Jharkhand
- c) Good availability of water
- d) Well connected by road/rail network
- e) Proximity to spirit and ethanol consuming market
- f) Manpower available for industrial purposes

The detailed breakup of the land for various uses would be as follows;

S. No.	Particulars	Land Area (sq. meters)
1.	Area for plantation/green area	55000
2.	Area for roads	20000
3.	Area for fuel/ash storage	20000
4.	Area for sheds	15000
5.	Area for other plant and machinery	20000
6.	Area for CPU	5000
7.	Area for Admn. Building	5000
8.	Parking area for Vehicles	5000
9.	Water storage lagoon area and spent wash storage lagoon area	15000
	Total land area	160000

2.2 RAW MATERIALS

2.2.1 Raw Materials Requirements for Grain based Distillery

The distillery will use grains such as broken rice, maize, bajra, jowar and other starch containing grains etc. as basic raw material. Besides this, processing chemicals would be used for the production of ENA/RS/ethyl alcohol. Phase wise daily consumption of raw materials for the distillery plant is given below;

S. No.	Item	Unit	Phase 1	Phase 2	Total
1.	Broken rice, maize, bajra, jowar and other starch containing grains etc.	MT	115	115	230
2.	Enzymes	Kgs.	100	100	200
3.	Sodium Hydroxide	Kgs.	50	50	100
4.	Urea	Kgs.	225	225	450
5.	Anti-foam agent	Kgs.	25	25	50
6.	Yeast	Kgs.	100	100	200

2.2.2 Fuel Requirements for Boiler

Starlight Energy Pvt. Ltd. would be installing 2 x 3.0 MW cogeneration power plant along with the distillery unit. The cogeneration power plant would be installed in two phases. After the commissioning of the first phase, the company would start the installation of the similar second unit in phase 2.

The industry would install 30 TPH boiler for the cogeneration power plant and steam requirements of the project. The daily fuel (biomass) requirements for the 30 TPH boiler furnace would be around 6.5 MT/hour or 160 MT/day. Phase wise daily consumption of biomass for the cogeneration power plant is given below;

S. No.	Item	Unit	Phase 1	Phase 2	Total
1.	Biomass consisting of rice husk, cotton stalk, mustard stalk etc.	MT	160	160	320

2.2.3 Raw Material Availability

Agriculture occupies a vital place in the economics of Kalahandi District. It provides direct and indirect employment to around 68 % of the total work force of the district. The total cultivable area of the district is 391000 hectares covering 49.3% of the total geographical area of the District.

In Kalahandi district, there are 93 nos. of rice mills established by different

entrepreneurs for milling paddy with a total capacity 258 MT/Hour. So the total rice husk generation is around 2,25,000 tonnes/year. The surplus biomass available for the power generation purpose in and around Kalahandi district is around 3,00,000 tonnes/year, which mainly consists of rice husk and other crop & agricultural residues. The total power potential available in Kalahandi district is around 30 MW. Hence the biomass is readily available for the proposed total capacity of 6 MW (2 x 3.0 MW).

2.3 PRODUCTION

2.3.1 Production from Grain based Distillery

Phase wise daily production of products and by-products from the distillery plant is given below;

S. No.	Item	Unit	Phase 1	Phase 2	Total
1.	ENA/RS/Ethyl Alcohol	KL	45	45	90
2.	By-products				
	CO ₂	MT	40	40	80
	Fusel Oil	MT	1	1	2
	DDGS	MT	25	25	50
	Corn Oil (in case of maize used as raw material)	MT	2	2	4

2.3.2 Production from Bottling Plant

Phase wise daily production of IMFL/country liquor from the bottling plant is given below;

S. No.	Item	Unit	Phase 1	Phase 2	Total
1.	IMFL/country liquor	Cases	8000	8000	16000

2.3.3 Production from Cogeneration Power Plant

Phase wise daily production of power and steam from the cogeneration power plant is given below;

S. No.	Item	Unit	Phase 1	Phase 2	Total
1.	Electrical Power	MW	3.0	3.0	6.0
2.	Steam	MT	600	600	1200

2.4 GRAIN BASED DISTILLERY PROCESS/OPERATIONS

The grain based distillery process will have following steps/operations. Similar process steps would be followed in both the phases. Accordingly, common process steps/operations for both the phases of the distillery project are described below;

- a) Grains receiving and storage
- b) Grains handling and milling
- c) Slurry preparation/liquefaction
- d) Saccharification and instantaneous fermentation
- e) HIFERM Fermentation
- f) Multi-pressure distillation
- g) Decantation
- h) Multi-effect evaporation
- i) Spirit storage

Figure 1 shows the schematic flow diagram of the process operations.

2.4.1 Grain receiving and storage

Grains such as broken rice/rotten rice, rotten wheat and other edible grains are procured from various sources, and are stored in gunny bags in covered storage godowns. Grains may also be stored into silos.

2.4.2 Grain handling and milling

The grain would be lifted in bucket elevators, screened followed by removal of stones and iron matter. Cleaned grains would then be milled using dry milling process in hammer mills. The flour would be fed through the bucket elevators and conveyed to the batch tipping machine through a screw conveyor. The flour addition would be metered through the batch tipping machine with load cell arrangement, before transferring the flour to the slurry tank through another screw conveyor (pre-masher) for slurry preparation process.

2.4.3 Slurry preparation/liquefaction

In liquefaction process, starch is hydrolyzed to dextrin. The Liquefaction is carried out in Single stage Liquefaction Tank. Feedstock Flour is transferred to Premasher and mixed with Recycle Streams and liquefying enzyme. Slurry from Premasher is taken to Liquefaction tank where temperature is maintained by means of steam. Necessary retention time is maintained in the Liquefaction Tank. Slurry pH is maintained by supplying dilute caustic solution. Contents in Slurry Tank are kept in suspension by Agitation. The Liquefied Slurry is then cooled in Slurry Cooler using cooling water supply and transferred to Pre-fermentation and Fermentation section.

2.4.4 Saccharification and instantaneous fermentation

Yeast seed material is prepared in Prefermentor by inoculating sterilized mash with yeast. Optimum temperature is maintained by circulating cooling water. The contents of the Prefermentor are then transferred to Fermenter.

The purpose of Fermentation is to convert the fermentable substrate into alcohol. To prepare the mash for Fermentation, it is diluted with water. Yeast is added in sufficient quantity to complete Fermentation to produce alcohol.

At the start of the cycle, the Fermenter is charged with mash and contents of the Prefermentor. Significant heat release takes place during Fermentation. This is removed by passing the mash through heat exchangers to maintain an optimum temperature. The recirculating pumps also serve to empty the Fermenters into Beer Well. CO₂ can then be taken to CO₂ vent line where it is vented out. After emptying of Fermenter, it is cleaned with CIP using cleaning nozzles.

After CIP, Fermenter is ready for next batch to be filled.

2.4.5 HIFERM Fermentation

The Fermentation process is engineered to operate in batch mode depending upon the quality of raw material. The purpose of Fermentation is to convert the fermentable sugars into alcohol. During Fermentation, sugars are broken down into alcohol and carbon-dioxide. Significant heat release takes place during Fermentation. The fermenter temperature is maintained at around 30 – 32 °C by forced recirculation flow through plate heat exchangers. We have given a provision for spent wash recycled to Fermentation depending on solids concentration in fermented wash.

2.4.6 ECOFINE – MPR WE Multi-Pressure Distillation

Multi-Pressure Distillation system has Seven Distillation columns operating at various pressure conditions. Heat energy from columns operating under high pressure is

utilized for columns operating under low pressure to optimize the operation for energy consumption.

Wash to ENA Mode:

Following Columns will be under operation:

1. Analyser Column
2. Degasser Column
3. Pre-Rectifier Column
4. ED Column
5. Rectifier cum Exhaust Column
6. Recovery Column
7. Simmering Column

Pre-heated fermented wash will be fed to Degasser column. Fermented wash is stripped off alcohol by ascending vapors in Analyser column. Rectifier vapors provide energy to Analyser column through a Thermosyphon reboiler. Vapors of Degasser column are condensed and taken to Recovery Feed Tank. The condensed Analyser vapors are taken to Pre-Rectifier Column. Analyser Condensate is concentrated in Pre-Rectifier column, which operates under pressure. Condensing steam provides energy to pre-rectifier column through a vertical Thermosyphon reboiler. A Technical Alcohol cut of about 1-2% of total spirit is taken from the Pre-Rectifier column.

Concentrated alcohol draw from Pre-Rectifier column is fed to ED column for purification. Dilution water in the ratio of 1:9 is added in this column for concentrating higher alcohol at the top. Top of this column is condensed in its condensers and fed to recovery feed tank while bottoms are fed to Rectifier cum Exhaust Column for concentration. Rectifier Column operates under pressure and condensing steam provides energy to this column through a vertical Thermosyphon reboiler. Technical Alcohol cut is taken out from the top of this column while ENA draw is taken out from appropriate upper trays and fed to Simmering Column after cooling. Fusel Oil build up is avoided by taking fusel oil draws from appropriate trays.

These fusel oils along with the condensate of Degasifying & Extractive Distillation columns are fed to recovery column for concentration. A technical alcohol cut is taken out from the top of this column.

Simmering Column is operated under high reflux for better separation of methanol and di-acetyls. Final ENA product draw is taken from the bottom of this column.

2.4.7 Decantation & Thin Slops Recycle Section

Decantation section comprises of a Centrifuge Decanter for separation of suspended solids from Spent Wash coming out of Grain Distillation Plant. Wet cake has 30-32% w/w solids as removed from bottom of Decanter which can be sold directly in wet form as cattle feed (DWG).

Thin slops coming out of Decanter are collected in a tank and partly recycled into the process & further for Evaporation for concentration upto 35-40% w/w solids. The concentrated thin slops called as Syrup is mixed with Wet cake and sold in wet form as cattle feed (DWGS) or the entire mixture can be dried in a DDGS Dryer and then sold in dry form as Cattle feed (DDGS).

2.4.8 ECOVAP Evaporation System - Integrated Evaporation Scheme

The suggested treatment scheme Effect working on the principle of falling film & Force Circulation

- a) Analyzer vapors is fed to the first effect evaporator shell side and steam is fed to shell side finisher at the given pressure and temperature as the heating medium.
- b) Vapors from last effect are condensed in Surface Condenser. A Shell & tube type Multi-pass Surface condenser is employed for condensing the shell side vapors.
- c) The product at the desired concentration 35-40% is obtained at the outlet of Finisher.
- d) Each effect is provided with recirculation cum transfer pump.
- e) The condensate from surface condensers is collected in a common condensate pot. The condensate is transferred for further treatment / Recycle by using centrifugal pump.
- f) The Pure steam condensate are collected in receiving vessels and can be pumped to desired battery limit
- g) Highly efficient operating pumps have been provided for pumping the required fluid.
- h) The plant is having high level of automation to get consistent output at required concentration.
- i) The system operates under vacuum. Water-ring vacuum pumps are used to maintain a desired vacuum.
- j) Cooling water from cooling tower is used in the surface condensers for condensing the vapors.

2.4.9 DWGS Dryer with Cooling and Conveying System

System Description for Dryer

- a) Wet distiller's grains shall be fed into the dryer housing at controlled rate through a suitable feeding system. The Rotary Tube Bundle is enclosed in an insulated dryer housing and its outer flights are fixed. Dry saturated steam is to be supplied to the tube bundle through rotary joint at one end & the condensate is discharged through rotary joint mounted on another end.
- b) During the course of rotation, these flights pick up the material and shower them on to the tube bundles. The heat transfer is primarily by conduction. The water vapors are exhausted through an Exhaust Blower & passed through a cyclone separator for separating fines.
- c) Dry product partially recycled back to Feed conditioner for feed conditioning through Product Screw & Recycle Conveyor.
- d) Entire operation of the Dryer is controlled through Control panel.

2.4.10 Spirit storage

Spirit storage would be divided into two sections. One would be daily spirit receiver section and the other would be bulk storage section. The spirit coming out of distillation would be transferred to daily spirit receivers (separated from Ethanol/RS/ENA). Subsequently, after gauging, the spirit would be transferred to respective bulk storage tanks.

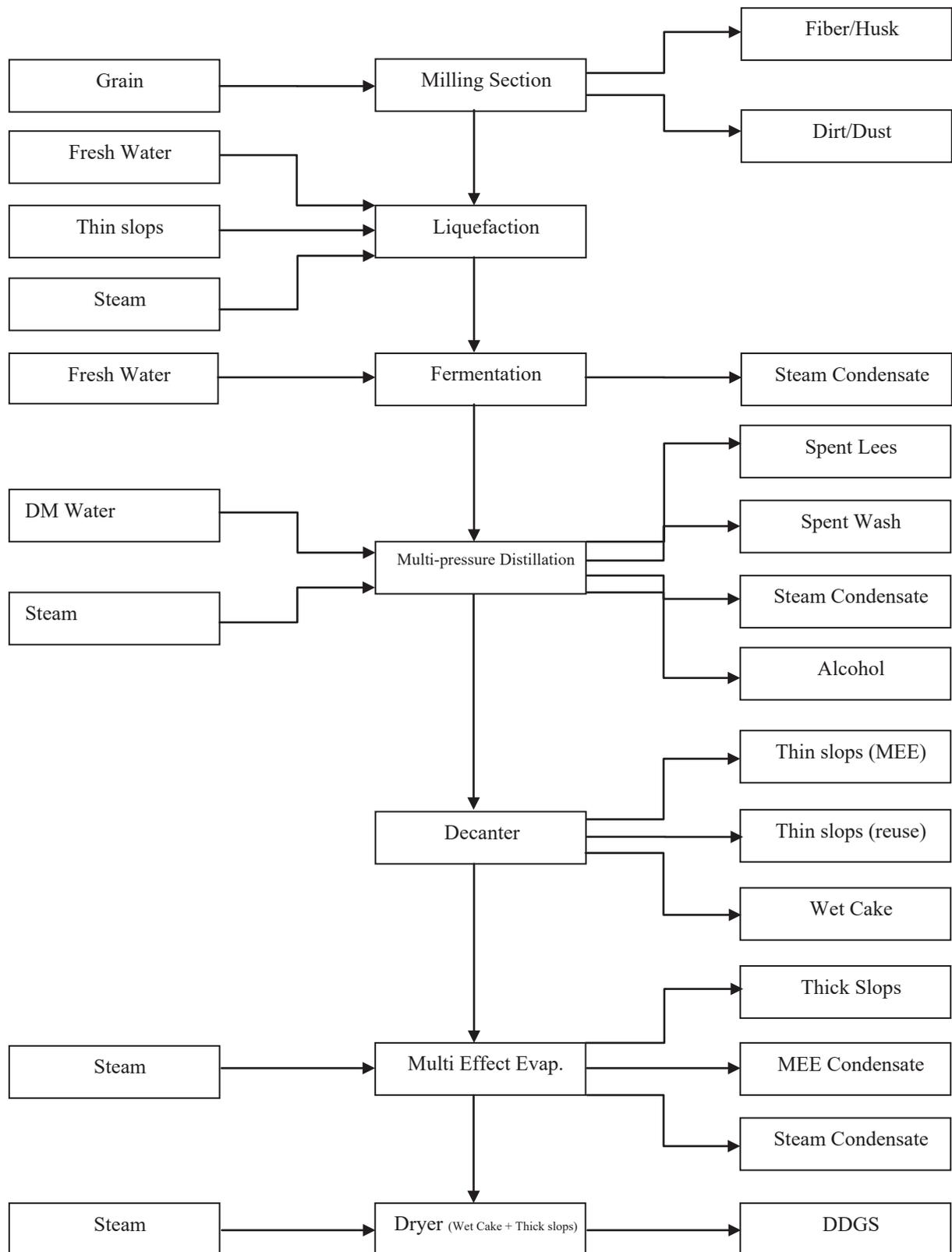


Figure 2.1 : Process Flow Chart of Grain based distillery

2.5 BOTTLING OF ENA BASED CHEAP LIQUOR/IMFL

Starlight Energy Pvt. Ltd. are planning to set up 8000 cases per day of bottling plant (8000 cases per day in phase 1 and phase 2, totaling 16000 cases per day after the commissioning of both the phases) for the production of Indian Made Foreign Liquor and country Liquor at Village Goud Sargiguda, Taluka Junagarh, Dist Kalahandi, Odisha.

The process would involve mixing of ENA with DM water along with liquor essence blends, caramels, and colours in stainless steel blending tanks. The ratio of spirit to DM water would be controlled by proof requirements in the end product. For example, one case (equivalent to 9 litres) of IMFL (75% proof) requires 4 litres of spirit and 5 litres of DM water. The blend would be subjected to physical filtration. Subsequently, the blend would be filled in bottles. The bottles would be labeled, packed, and stored for final dispatch. The industry would install 4 bottling lines in phase 1 and similarly 4 bottling lines in phase 2 would be installed for the production of Indian Made Foreign Liquor and country Liquor.

2.6 CO-GENERATION POWER PLANT

Starlight Energy Pvt. Ltd. are planning to set up 2 x 3.0 MW biomass based cogeneration power plant (3.0 MW each in phase 1 and phase 2, totaling 6 MW after the commissioning of both the phases) for the production of power and extraction of steam for distillery process use at Village Goud Sargiguda, Taluka Junagarh, Dist Kalahandi, Odisha.

The industry would install 3.0 MW extraction cum condensing turbine for the cogeneration power plant. Once the industry commissions the phase 1 for whole of the project, the promoters of the project would install another 3.0 MW cogeneration power plant of similar configuration.

The cogeneration power plant is divided in three parts, namely;

Boiler & Auxiliaries

Turbine & Auxiliaries

Generator & Auxiliaries

2.6.1 Boiler & Auxiliaries

Boiler : The industry plans to install a 30 TPH capacity fluidized bed boiler (FBC) for the production of 3.0 MW of cogeneration of power with steam. FBC boiler is most

suitable technology for the biomass fuel to be used. When air passes upward at low velocities through a mass of finely divided solid particles (such as ash & crushed refractory) the particles are not disturbed. As air flow is gradually increased, the particles become suspended. Further increase in the air flow gives rise to bubble formation and vigorous turbulence. The bed of solid particles has the same characteristics of the liquid and thus the bed is termed as Fluidised Bed. Combustion of fuel in this bed is termed as Fluidised Bed Combustion (FBC). The boiler would be having other auxiliaries as described below;

Drum: The feed input, separation of steam and water & blow down are all carried through the drum.

Furnace: It is the primary part of boiler where the chemical energy available in the fuel is converted to thermal energy by combustion. It is designed for efficient & complete combustion.

Super Heater : These are meant for raising the steam temperature above the saturation temperature to a maximum of around 550 °C (due to the metallurgical problem, the percentage of heat to super heater is approx 30%).

De-Super Heater: To control the super heater temperature & always try to maintain the steam temperature constant during variation of load, de-super heater is used.

Draft System: The combustion process in a furnace can take place only when it receives a steady flow of air & has the combustion gases are continuously removed.

Economizer: The economizer absorbs heat from the flue gas mainly as sensible heat to the feed water. By this, the efficiency of boiler is improved.

Water Wall/Evaporator: Where water converted into steam by latent heat addition.

Support: All modern boilers are top support units. The hanger rods are designed for the direct tensile stress resulting from the weight of units & the bending stress from the pressure part expansion.

Soot Blower: Deposits result from combustion of husk & relatively smaller extent from oil. Means have to be provided to prevent an accumulation of deposit from choking the boiler gas passes & to maintain boiler heating surface in a suitably clean condition for effective heat transfer whilst on load. Steam is used for soot blowing.

Air Heater: It is now an essential boiler auxiliary because hot air necessary for rapid & efficient combustion in the furnace & also for the husk & to recover waste heat from the flue gas to increase boiler efficiency.

Primary Fluidising Air Fan: It is used for fluidising the bed of fuel and giving the upward movement.

Forced Draft Fan: To take air from atmosphere at ambient temperature to supply essentially the combustion air required, in addition to fluidising air.

Induced Draft Fan: To evacuate the gases out of the furnace & exhaust through the stack. The ID Fan maintains the negative draft inside the furnace.

Ash Collection: The method used for removal of ash from the flue gas consists of mechanical dust collector & electro static precipitator. The mechanical dust collector removes the coarser particles through cyclones. The ESP consists of two sets of electrodes. Wires which are charged at HVDC are called emitting electrodes. The collecting electrodes are in the form of plates, which are at earth potential. The dust particles in the flue gas get charged while coming in contact with the emitting electrodes. The charged particles are attracted to the earthed collecting particles and get discharged and fall down the hopper. Very high efficiency of ash collection upto 99.90% can be achieved in the ESP.

Boiler Feed Pump: It is multistage pump provided for pumping feed water from the deaerator storage tank to economizer of the boiler. Generally two pumps each of 100% capacity are provided.

Boiler Feed Water

The boiler shall be capable of operating with the following feed water quality * requirements;

a) pH	:	8.8-9.2
b) Oxygen	:	0.005 ppm
c) Hardness	:	0
d) Total Iron	:	0.01 ppm
e) Total Copper	:	0.01 ppm
f) Total Silica	:	0.02 ppm
g) Hydrazine	:	0.01-0.02 ppm
h) Specific electrical conductivity	:	0.5 micro ohms/cm

* At 25°C measured after cation exchanger in the H⁺ form and after CO₂ removal (max.)

Steam Purity

The boiler shall be capable of supplying uninterrupted steam at the MCR rating with following steam purity levels.

- a) Total dissolved solids : 0.1 ppm (max)
b) Silica (max) : 0.02 ppm

2.6.2 Turbine & Auxiliaries

Turbine : The turbine shall be horizontal, single cylinder, extraction cum condensing design coupled to a generator to generate the rated output of 3.0 MW of electricity with the steam inlet parameters as specified in this specifications. The steam turbine, gear box, main oil pump with its interconnecting piping and its supports shall be assembled and aligned on a single skid and shall be delivered. All the cabling within the skid shall be laid in the metal conduits and shall be fixed to the base frame with respective junction boxes mounted on the skid. Main component & associated system of the turbine are described below;

Casing : It is essentially a pressure vessel, which must be capable of withstanding the working pressure & temperature of the steam. The casing is supported on each end, with provision to permit expansion at one end. The fixed blades (Orifice) are supported in the casing.

Rotor : It supports the moving blade.

Blades : These are the most important component of turbine as these are responsible for the converting heat energy to mechanical.

Gland Sealing System : Glands are used on turbine to prevent or reduce the leakage of steam air between rotating & stationary components which have a pressure difference with the atmosphere. If the cylinder pressure is higher than the atmospheric pressure then there will be a leakage of steam outward (HP sides). If the cylinder is below atmospheric pressure, then there will be leakage of air (LP side). Steam is generally used for sealing of labyrinth glands.

Condensate System : Water Cooled Condenser which minimizes the water requirement by 85%.

Condenser : It is basically a heat exchanger which condenses the exhaust steam from turbine into water (Condensate). It helps maintain negative pressure at the turbine exhaust thus enabling maximum utilization of enthalpy of the steam and thus improving cycle efficiency. An air cooled condenser shall be provided to reduce the requirement of water.

Condensate Extraction Pump : These are multi stage, vertical centrifugal pumps which pump the condensate from the condenser to the deaerator through the water cooled condenser shall be provided.

Air Ejector System : Is needed to continuously remove air & other non-condensable gases from the condenser to maintain vacuum in the condenser. Steam jet air ejectors and vacuum pumps are used for this purpose.

LP Heater : The condensate pumped by the condensate pump is heated in the LP heater by steam extracted from the turbine after it has performed some useful work. This improves the cycle efficiency.

Deaerator : The presence of certain gases like oxygen, carbon dioxide, & ammonia dissolved in water is harmful because of their corrosive action on boiler metal parts particularly at elevated temperatures. The condensate is sprayed inside the deaerator and it is heated by the extraction steam from the turbine. The air etc are thus liberated from the condensate. The deaerated condensate thus comes to the storage tanks, from which the boiler feed pump pumps the condensate to the boiler.

Turbine Oil System : The high pressure hydraulic oil for turbine control, oil for bearing lubrication of turbine generator are received from the turbine shaft mounted main oil pump. Start up AC and emergency DC pumps are provided for start up and maintain bearing oil flow during turbine trip. Turbine Oil Coolers are provided to cool the bearing oil.

Turbine Governing System : The main purpose of governor is to maintain speed of turbine during fluctuation of load on the generator by varying steam input to the turbine. The governing system consists of hydraulically operated Control Valves. It helps to start the turbine from rest to rated speed and synchronizing with the grid. The load on the generator can be controlled in a pre-determined manner by the control valves. Emergency stop valve is provided to shut off the steam supply to the turbine completely in abnormal & emergency situation.

2.6.3 Generator & its Auxiliaries

Generator: The generator shall be of CACW, brushless design with horizontal shaft mounted AC exciter driven by a steam turbine through reduction gearing and fitted with one PMG on the extended shaft of alternator. Supplier shall clearly specify the excitation arrangement in case PMG is not applicable. The Generator shall be capable of delivering the maximum output obtainable from the steam turbine under any

operating conditions at 0.8 power factor lag, 11 kv output with a frequency of 50 Hz. Main component & associated system of the generator are described below;

Stator : The stator houses the armature winding also supports the rotor bearings. The insulation of the windings is Class “F”, but designed for temperature rise for Class “B” insulation.

Rotor : The generator rotor is cylindrical in construction and carries the DC field windings. The field is normally of 2 or 4 pole design.

Generator Bearing : These are the pedestal type of spherical sealing to show self-alignment & are supported on separate pedestal on suffering sides & turbine side.

Generator Cooling System : The heat loss in the generator windings are dissipated by air circulated by the rotor mounted fans. This heat should be taken off for safe operation of the generator. The air in turn could be generator air coolers, located at four corners. Water is the cooling medium.

Generator Excitation System : The DC Power supply to the field winding will be given either through a static excitation system or through shaft mounted brush-less excitation system. The control system varies the DC Current to change the terminal voltage or reactive power.

Generator Protection : Generator has to be protected from faults occurring within generator stator or rotor & also from external faults/ abnormal operating condition in the grid which affected the generator. Various devices are used to detect which can give warning alarm or trip the unit automatically as required.

2.7 SUNDRY UTILITIES (EACH PHASE)

2.7.1 Condensate system

To maximize energy conservation, water utilization and plant efficiency, condensate would be recovered throughout the plant and returned for boiler feed make up. Allowance has been made for the necessary condensate receivers, pipes work, valves and traps sets, etc. About 85% of the steam supply to process is recoverable as condensate for re-feeding it into the boiler.

2.7.2 Water treatment plant – 300 m³/day

It is proposed that the water to be used will be received from the river water. Ground water would be used only in case river water is not available. The water quality will require pre-treatment to satisfy the quality required for boiler feed water, process

requirement, and blending during bottling. Treatment will involve sedimentation, sand filtration, activated carbon filtration, softening and ion exchange treatment (as required for different process requirements), suitable for quality of water required.

2.7.3 Electrical system

The plant power requirement (including that for power plant auxiliaries) will be about 2.0 MW each phase. Out of total installed power generation capacity of about 3 MW for each phase, the surplus power, after meeting in-house requirements, will be exported to state grid.

2.7.4 Standby electrical generator

It is proposed to install two 500 kVA diesel generator set to provide standby power in case of state power supply failure. They would be complete with synchronization panel.

2.7.5 Cooling water – 1000 m³/hour

The maximum process and power plant cooling water requirement will be 1000 m³/hour for each phase. The cooling tower will be counter/cross flow induced draft divided into 2 cells. The cooling tower shall be designed for a cooling range of 8°C, and an approach of 5°C while operating under the atmospheric wet bulb temperature of about 27°C. The cooling tower shall be carefully sited such that there is no re-entrainment of the vapors into the cooling tower. Evaporation and drift loss will depend on season and an average figure will be about 1.10 %. Whole of the quantity lost will be made-up by adding fresh water/treated condensate from the process.

2.8 SOURCES AND NATURE OF POLLUTION

2.8.1 Water pollution

The impending water uses and consequent water pollution may be because of the following;

- a) Process and dilution water
- b) Boiler feed water make-up
- c) Cooling water make-up
- d) Washing (fermentor, bottle, floor, etc.)
- e) DM water for bottled liquor blending
- f) Water treatment plant maintenance
- g) Domestic consumption

- h) Fuel spray
- i) Ash quenching

2.8.1.1 Process and dilution water

The fresh water requirements in the process (in fermentation, liquefaction, ENA etc.) would be about 215 m³/day for each unit (45 KLPD) of distillery plant. Besides this, 40 MT/day of direct steam would be consumed in the process for liquefaction section, in each unit. This figure is after adjusting for all recycle and reuse potential of various streams.

2.8.1.2 Boiler feed water make-up and boiler blow-down

The average boiler feed water requirement will be about 600 m³/day for each of the boilers, out of which around 85%, i.e., about 510 m³/day, will be met through return condensate. Thus about 15 %, of the steam generated, will be either used (in the industrial processes) or lost as blow-down (in order to maintain desired TDS concentration in the boiler feed water, continuous or intermittent blow-down of condensate is employed). Remaining feed water requirement will be met through D.M. water. The D.M. water required for the purpose will be about 90 m³/day for each of the boilers. The boiler blow down, contributing to wastewater generation will be a maximum of 15 m³/day from each of the boiler.

S. No.	Purpose	Phase 1	Phase 2	Total
1.	Boiler water requirements	90 m ³ /day	90 m ³ /day	180 m ³ /day

2.8.1.3 Cooling water make-up and blowdown

The cooling water throughput rate will be a maximum of 1200 m³/hour for each unit. Around 1.60 % of the total recirculation water is lost in evaporation, drift, and blow-down losses. A part of the process water generated (150 m³/day of condensate from Multi effect evaporation and 60 m³/day of spent lees) would be reused for the cooling tower makeup water for each of the unit. Thus, fresh make-up water requirement will be about 250 m³/day. The blow-down rate will be less than 35 m³/day for each of the unit.

2.8.1.4 Washing

The wash water requirement (for washing of fermentor and floor) will be about 20 m³/day for each of the unit. Whole of this water will contribute to wastewater generation.

2.8.1.5 Fresh Water for bottled liquor blending

The average water requirement for blending during bottling of country liquor/IMFL will be about 25 m³/day, for each of the unit, which will completely be present in final product. There will be no wastewater generation. Besides this, around 10 m³/day of water would be required for the bottle washing and equipment washing.

S. No.	Purpose	Phase 1	Phase 2	Total
1.	Water requirements for blending	25 m ³ /day	25 m ³ /day	50 m ³ /day
2.	Washing Requirements	10 m ³ /day	10 m ³ /day	20 m ³ /day

2.8.1.6 Water treatment plant maintenance

The DM water treatment requirement is about 300 m³/day (soft water – for boiler, process, bottling, etc., requirements) for each of the unit. Treatment plant maintenance will generate about 15 m³/day of reject water for each of the unit. Whole of this water will contribute to wastewater. The effluent streams may be acidic/alkaline (depending on regeneration of cationic/anionic ionic exchanger) and will have high TDS. There is no other pollution parameter of concern.

2.8.1.7 Domestic consumption

Some of the water will be required for cooking, drinking, sanitation, etc. Average daily requirement is expected to be about 10 m³/day, for each of the unit. Of this, less than 90%, i.e., ~9 m³/day will be obtained as domestic wastewater for each of the unit.

2.8.1.8 Overall water requirement

Total average fresh water consumption for the project can be summarized as under;

S. No.	Purpose	Phase 1	Phase 2	Total
	Grain based distillery process			
1.	Process & dilution water	115 m ³ /day	115 m ³ /day	230 m ³ /day
2.	Cooling water	155 m ³ /day	155 m ³ /day	310 m ³ /day
3.	Washing Requirements	20 m ³ /day	20 m ³ /day	40 m ³ /day
4.	Water treatment plant	15 m ³ /day	15 m ³ /day	30 m ³ /day
5.	Domestic requirement	10 m ³ /day	10 m ³ /day	20 m ³ /day
	Bottling process			
1.	Water requirements for blending	25 m ³ /day	25 m ³ /day	50 m ³ /day
2.	Washing Requirements	10 m ³ /day	10 m ³ /day	20 m ³ /day
	Boiler Water Requirements			
	Boiler water requirements	90 m ³ /day	90 m ³ /day	180 m ³ /day
	Total	440 m ³ /day	440 m ³ /day	880 m ³ /day

2.7.1.9 Waste Water Generation

The industry would generate less than 100 m³/day of wastewater from each phase of operation of the project from different streams. The combined wastewater stream (washing and domestic wastewaters) is expected to have following characteristics;

1.	Flow (Total)	–	192 m ³ /day
	Phase – 1		96 m ³ /day
	Phase – 2		96 m ³ /day
2.	pH	–	6.5-8
3.	BOD	–	1300-1500 mg/l
4.	COD	–	2700-3000 mg/l
5.	TSS	–	600-700 mg/l

A part of the wastewater would be reused for spraying in fuel storage area and ash

storage and the remaining wastewater will be disposed onto land for irrigation. The treated wastewater must conform to the following standards;

1. pH – 5.5-9.0
2. BOD₅, 20°C – ≤100 mg/l
3. Total suspended solids – ≤100 mg/l

The details of effluent generation from each unit are as given below;

S. No.	Purpose	Phase 1	Phase 2	Total
1.	Grain based distillery process			
	Spent Wash	270 m ³ /day	270 m ³ /day	540 m ³ /day
	Spent Lees	60 m ³ /day	60 m ³ /day	120 m ³ /day
	MEE Condensate	150 m ³ /day	150 m ³ /day	300 m ³ /day
	Fermentor/floor washing	20 m ³ /day	20 m ³ /day	40 m ³ /day
	Cooling tower blow down	25 m ³ /day	25 m ³ /day	50 m ³ /day
	Domestic Effluent	9 m ³ /day	9 m ³ /day	18 m ³ /day
	D M plant reject	15 m ³ /day	15 m ³ /day	30 m ³ /day
2.	Bottling Section			
	Bottle washing and spillages	12 m ³ /day	12 m ³ /day	24 m ³ /day
3.	Boiler Section			
	Boiler Blowdown	15 m ³ /day	15 m ³ /day	15 m ³ /day

2.8.2 Air pollution

The air pollution will be due to combustion emissions released by the boiler furnaces. The boiler furnaces, AFBC type, will use chiefly rice husk as fuel, with a maximum consumption of about 5.5 MT/hour for each of the boiler.

The critical SPM concentration in the flue gas will be less than 30.0 g/Nm³. Majority of the particulates (about 60-70%) will have sizes in the range of 2-10 µm. The emissions are expected to have temperature in the range of 140-150°C.

As per the statutory norms (as applicable to the industry), the flue gas emission shall not have SPM levels (in the stack) exceeding 100 mg/Nm³. Additionally, the stack

height requirements for discharge of emissions will need to be complied with.

2.8.3 DG set

The industrial unit is planning to have two DG sets, each of 500 kVA as backup to state power supply. As per the applicable norms, the DG sets will be housed in an acoustic chamber. The combustion emission outlet, of the DG set, will be provided with a muffler along with a minimum stack height of 5.5 m above the height of nearest building.

2.8.4 Solid wastes

The grain based fermentation will result in high protein solids @ 25 MT/day from each of the unit. It has potential to be used for cattle feed making.

The boiler furnace will result in ash generation @ 15 MT/day from each of the unit.

2.8.5 Hazardous waste

The plant facility will result in generation of about 1 kL/year of spent oils (lubricants and transformer oil), which will be stored on site and sold to authorised recyclers.

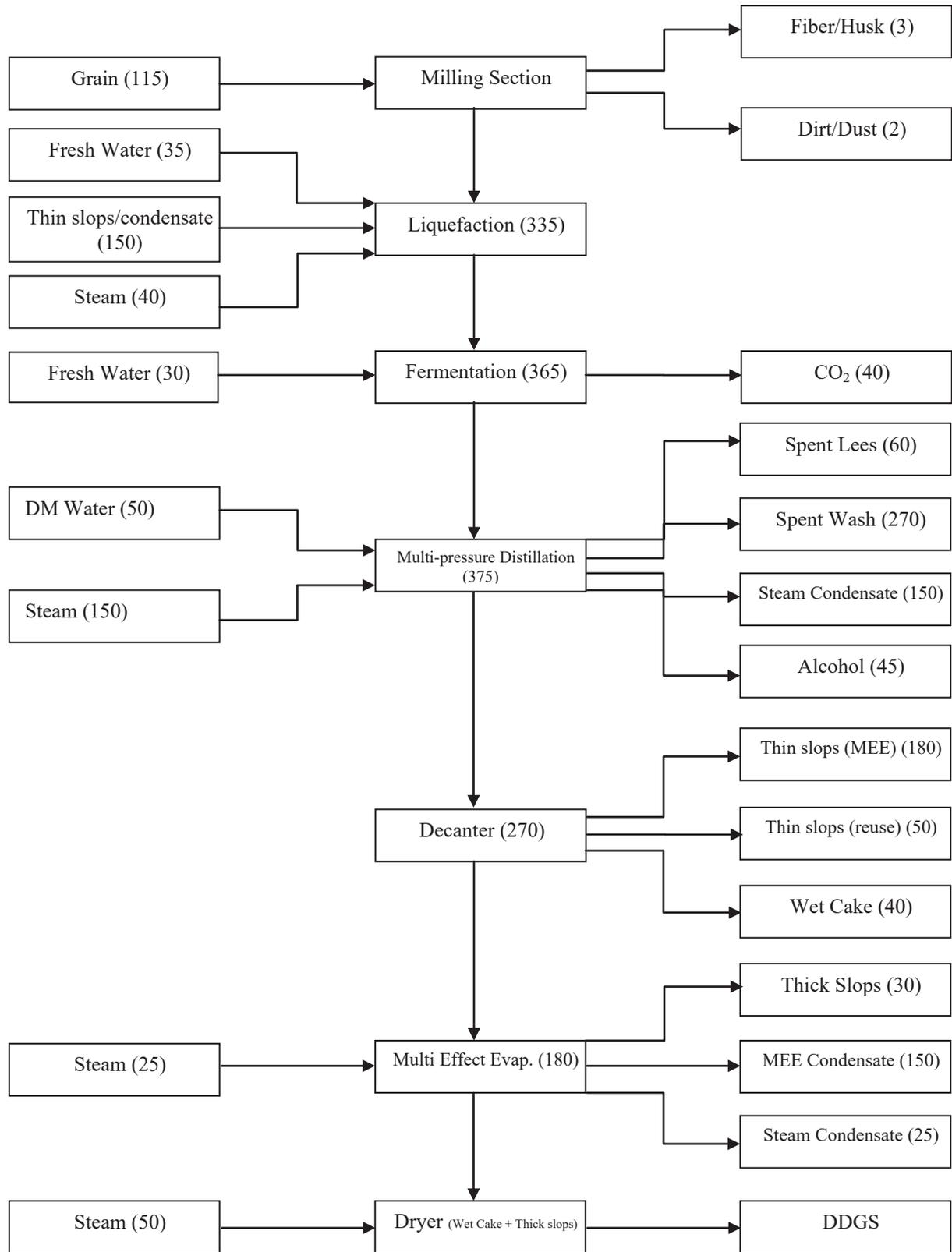
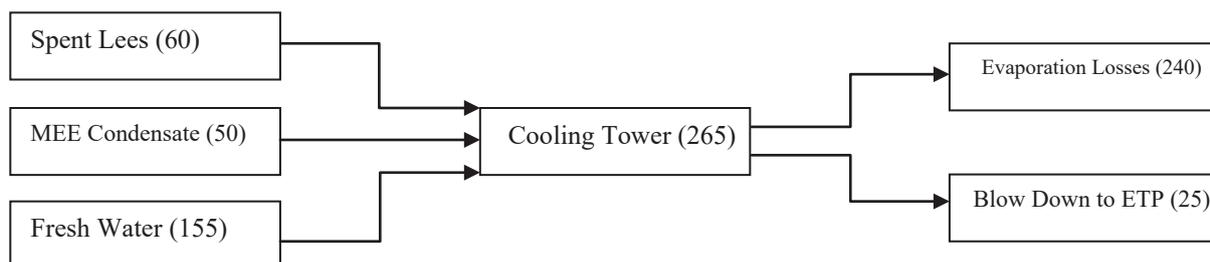


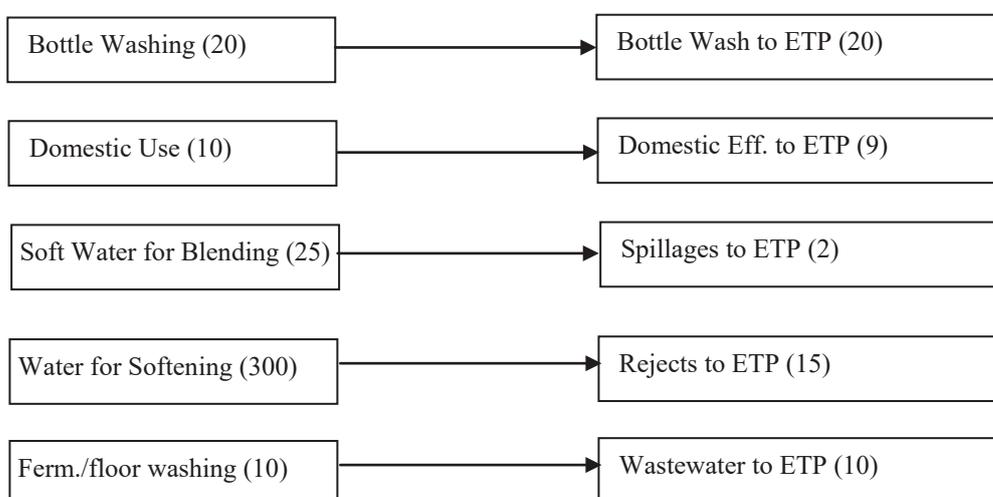
Figure 2.2 : Idealised Water Balance (for 45 KLPD distillery plant)

All values are in V/V except grains which are in MT/day

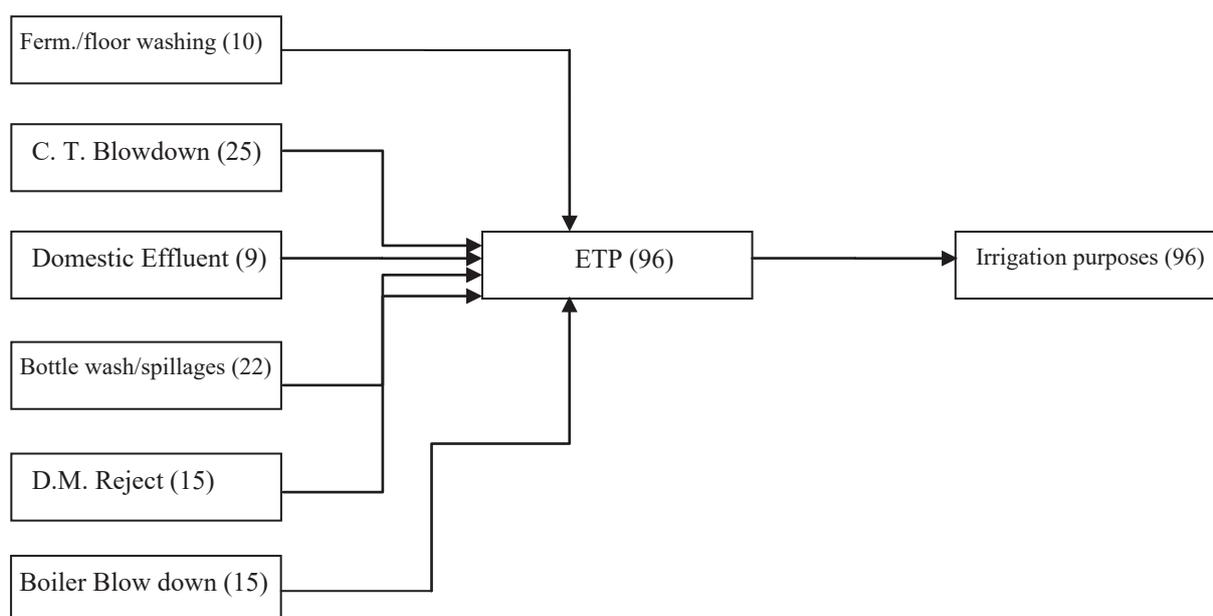
Cooling Tower Balance



Water Balance for Misc. use



Water Balance for Misc. Streams Effluent Treatment



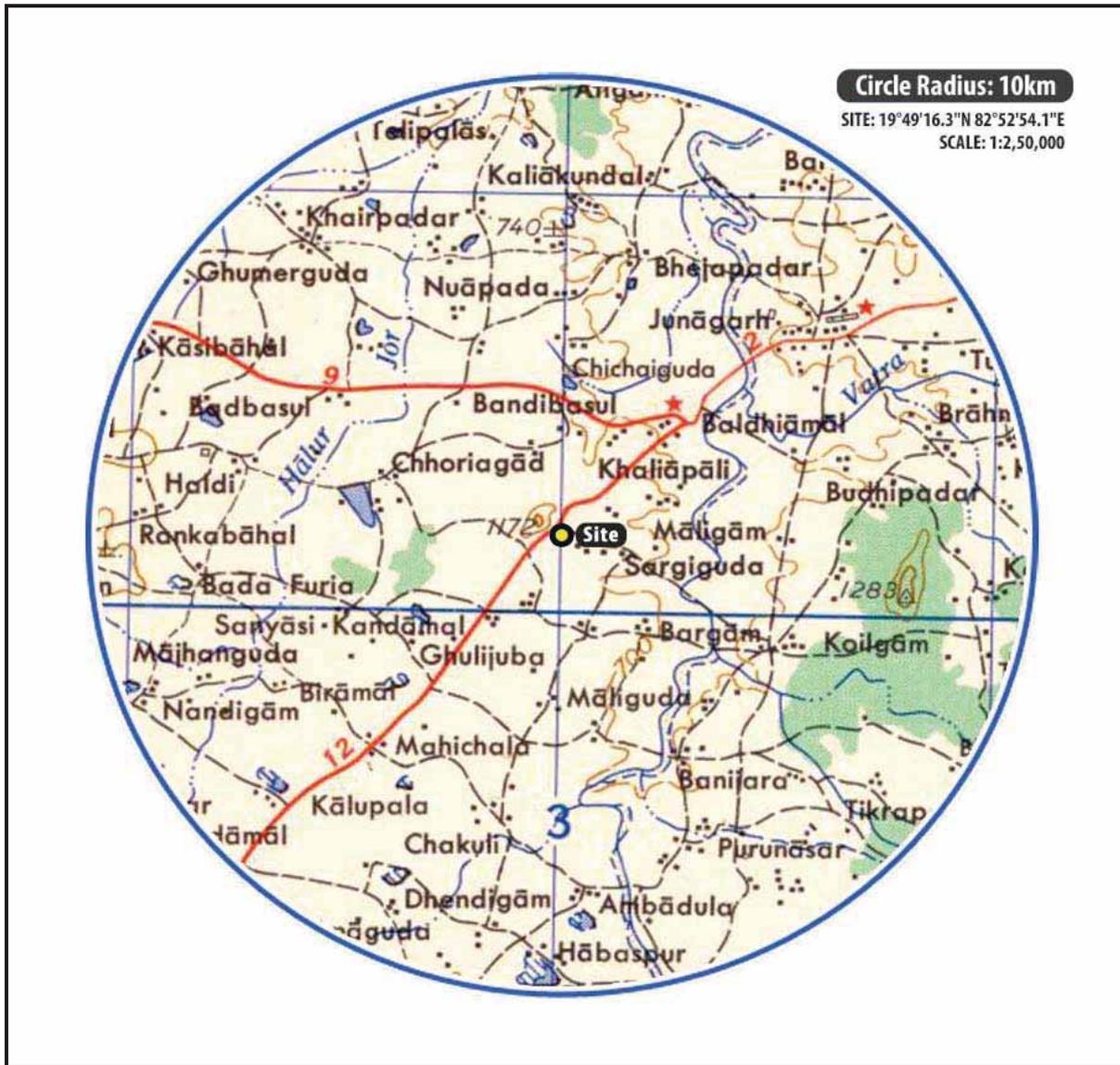
Chapter – 3

BASELINE ENVIRONMENTAL SETTING

As a precursor for the prediction of various types of environmental impacts likely to arise due to implementation of the project, it is essential to establish the baseline environmental setting of the physical, natural and socio-cultural environmental parameters along the project and within the project influence area. Details of the baseline environmental parameters are required for decision making for the project design, implementation and operation from the environmental point of views. The data is to be generated through primary data collection (direct monitoring) and secondary sources (published data).

Starlight Energy Ltd. are planning to set up 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 MW cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sariguda, Taluka Junagarh, Dist. Kalahandi, Odisha. The company would be installing the project in two phases. In phase 1, 45 KLPD capacity grain based distillery unit, 3.0 MW cogeneration power plant and 8000 cases/day of IMFL/IMIL bottling unit would be installed. After the commissioning of the phase I, the company would start the installation of the identical similar unit in phase 2. This chapter incorporates the description of existing environmental status in an area encompassed within 10 km radius around the proposed project of the company. The topographical map of the study area and satellite imagery is shown in figure 3.1 and 3.2.

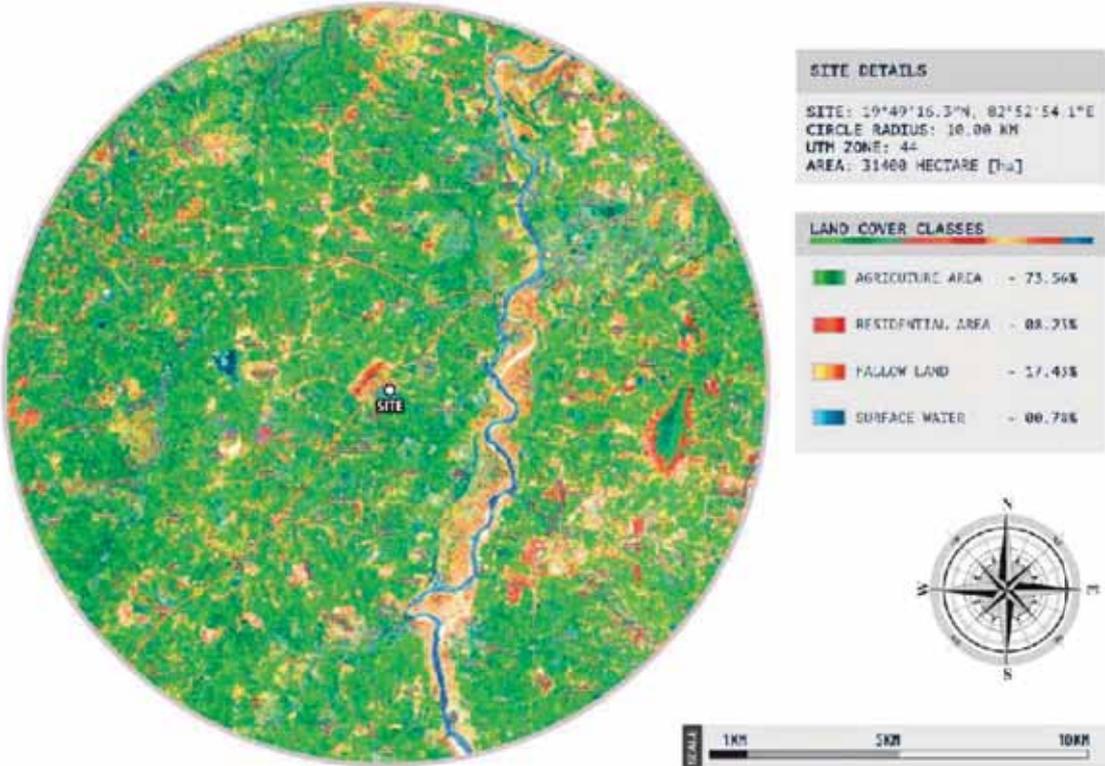
The environmental monitoring for the EIA Study, for the proposed distillery plant, has been conducted for the winter season. Initially, a reconnaissance survey of the study area was carried out and then field monitoring for measuring meteorological parameters, ambient air quality, water quality, soil quality and noise levels was carried out from 1st January 2015 to 31st March 2015. In addition, certain aspects like land area, socio-economic status, past meteorological conditions, etc., have been analysed based on secondary information available from sources like district census reports, district gazetteers, Indian meteorological department, etc. The baseline status of various environmental components is described in the succeeding sections. The baseline information on micro-meteorology, ambient air quality, water quality, noise levels, soil quality and floristic descriptions are largely drawn from the data generated by M/s Vardaan Envirolab, Gurgaon (NABL Accredited Lab, Certificate no. TC-6299 valid up 4-8-2019).



Topographical Map of the Study Area

Figure – 3.1

SATELLITE IMAGERY



Satellite Imagery of the Study Area

Figure – 3.2

3.1 METEOROLOGY

3.1.1 Climatic conditions

The study of micrometeorological conditions of the region is an essential requirement for the proper interpretation of the existing air quality status and for the prediction of impacts on air environment through mathematical models. Pollutants emitted into the atmosphere undergo transportation, dispersion, transformation and finally removal from the atmosphere. Pollutants are transported through the action of mean wind velocity whereas dispersion results from the turbulent characteristics of the atmosphere and helps in diffusing the pollutants in all directions. Since most of the pollutants are injected into the atmosphere near the surface of the earth, the physics of the atmospheric boundary layer controls the transport and dispersion of pollutants.

The data is used for measuring the capacity for dispersion and diffusion of pollutants during the construction and operation stages of the project. This data also plays a vital role in locating the construction plants to avoid or reduce the pollution concentrations on the settlements during the construction stage of the project. The meteorological data is also useful for the modeling of the air pollutant levels during the operation of the project. Since the meteorological data show wide variations with time, meaningful interpretation can only be drawn from the long term and reliable data.

The project zone lies in the sub tropical region with four distinct seasons;

- Winter – December to February
- Summer – March to May
- Monsoon – June to September
- Post Monsoon – October to November

In order to study the meteorology of the project area, site specific winter season meteorological data was collected.

3.1.2 Temperature

The climate of Kalahandi is quite extreme. It is mostly dry throughout the year except for the monsoon. There is a lot of variation in the day and night temperatures. The maximum temperature in Kalahandi goes upto 45°C and the minimum temperature recorded is 8° C.

The mean of daily maximum and minimum temperature at site, during study period, has been tabulated below (*Table 3.1*). It can be observed from the table that the daily mean range of temperature variation was from 9.9 - 33.9 °C.

Table 3.1: Monthly average range in dry bulb temperatures (°C)

Month	Mean temperature (maximum)	Mean temperature (minimum)
January	26.6	9.9
February	28.8	11.5
March	33.9	16.5

3.1.3 Rainfall

The average rainfall in this region is 1273.9 mm. The monsoon season starts during late June and mostly ends till September. During these months 90% of rainfall is received out of which about 28% of rainfall is received in the month of August.

The details of monthly total rainfall occurred, during study period, in the study area is presented in *Table 3.2*.

Table 3.2: Total monthly rainfall

Month	Rainfall (mm)
January	22
February	24
March	28

3.1.4 Humidity

The nature and characteristics of the pollutants will vary with change of the humidity in the atmosphere. Fog provides possibility for suspended particles to coalesce and also enhances chemical reaction of the gaseous pollutants.

On annual basis, it can be noted that high humidity occurs in the month of December, July, August and September and low humidity occurs in the month of April, May and June.

The details of the average monthly relative humidity (RH) recorded at 8.30 AM and 5.30 PM, during study period, is presented in *Table 3.3*.

Table 3.3: Monthly average range of relative humidity

Month	0830 hours	1730 hours
January	76%	65%
February	69%	58%
March	48%	56%

3.1.5 Cloud cover

On annual basis, the general trend is that clear sky will prevail during the months of October and November and more cloud cover will prevail during the month of July and August.

The details of monthly average variations of the cloud cover in *Okta* during the morning and evening are presented in *Table 3.4*.

Table 3.4: Monthly average range of cloud cover (*Okta*)

Month	0830 hours	1730 hours
January	1.2	1.6
February	1.8	1.9
March	1.5	2.3

3.1.6 Wind speed and direction

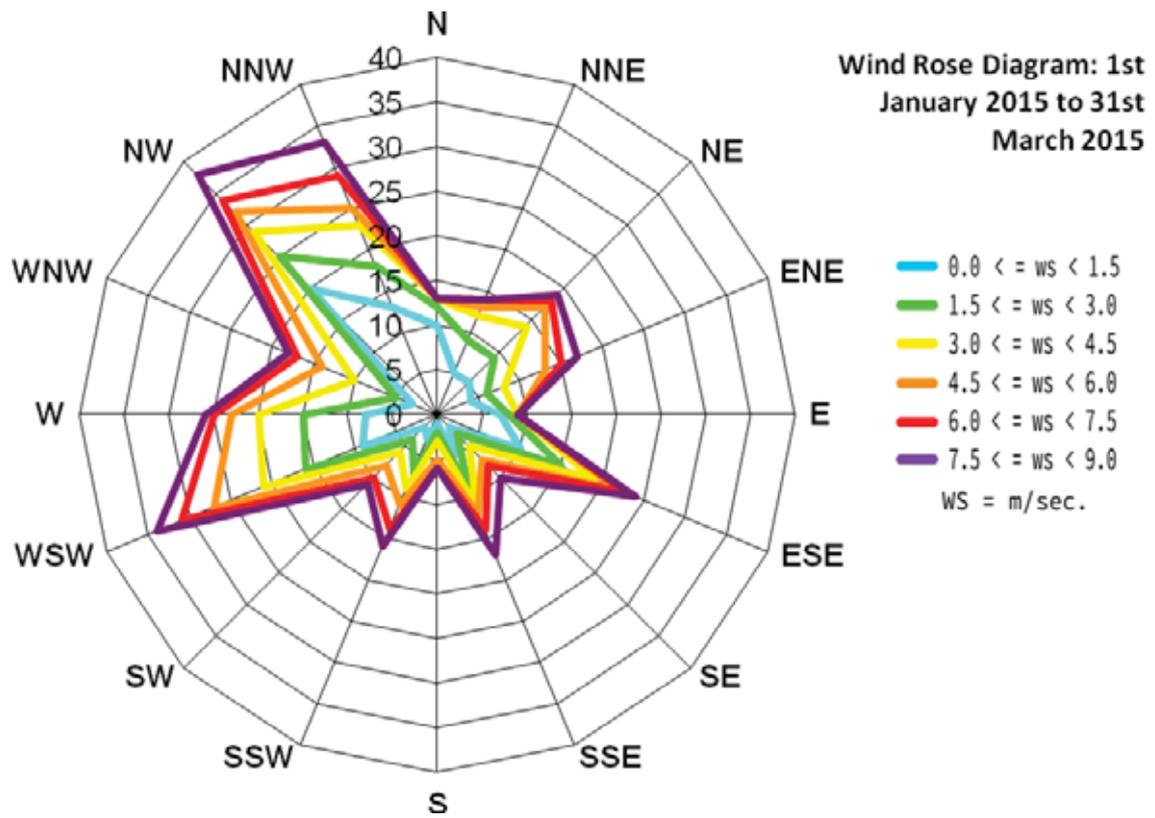
Wind speed and wind directions have a significant role in the dispersion of atmospheric pollutants and therefore, in the air quality of the area. Ground level concentrations for the pollutants are inversely proportional to the wind speed in the down wind direction, while in the upwind direction no effect will be observed and in cross wind directions partial effect due to the emission sources is observed.

Annual trend indicates mean wind speeds to be highest in the months of March, April, May, June and July (7.8-9.5 km/hour) and lowest in the month of October, November and December (2.5-3.5 km/hour). Monthly mean wind speeds at site for the winter season are presented in *Table 3.5*.

Table 3.5: Monthly Average Wind Speed

Month	Wind speed (km/hour)
January	6.8
February	5.4
March	5.9

Wind rose diagram of site for the study period is presented as *figure 3.3*. The wind rose diagram indicates that the most predominant wind direction is towards *North-West* during the study period



Wind Rose Diagram

Figure- 3.3

3.2 AIR ENVIRONMENT

The knowledge of ambient air quality plays an important role in assessing the environmental scenario of the study area. The baseline studies on air environment includes identification of specific air pollutants expected to have significant impact and assessing their existing levels in ambient air within the study area. The baseline status of air environment can be assessed through air quality surveillance program with scientifically designed ambient air quality monitoring network.

Micrometeorological data collection is an indispensable part of any air quality monitoring. The meteorological data collected during air quality surveys, is used for prediction of impacts.

3.2.1 Ambient air quality monitoring stations

The following criteria were taken into account in the design of *ambient air quality monitoring* network and fixing of monitoring stations;

- Meteorology of the study area
- Topography/terrain of the study area
- Population density distribution within the region
- Residential and sensitive areas
- Proximity of industries
- Representation of regional background

3.2.2 Ambient air quality monitoring (AAQM)

To establish the existing baseline status of ambient air quality, 6 AAQM stations were selected based on the guidelines of network siting criteria. Two locations in the downwind side, one in the upwind side, and two in the crosswind direction were selected. Annual windrose diagram available from Indian Meteorological Department Titlagarh was used for the selection of ambient air quality monitoring stations. The locations of the 6 AAQM stations are presented in figure 3.4. Distances and directions of these stations with respect to site are given in table 3.6.

Table 3.6 : Distance and directions of ambient air quality monitoring stations w.r.t. the site

S. No.	Location of AAQM station	Distance of AAQM station from site (km)	Direction of AAQM station w.r.t. site
1.	Project Site	-	-
2.	Village Goud Sargiguda	1.89	SE
3.	Village Junagarh	7.2	NE
4.	Village Bandibasal	3.0	NW
5.	Village Badbasul	5.58	NW
6.	Village Mahichala	5.68	S

Various pollutants monitored were Particulate Matter (PM₁₀ and 2.5), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x) and HC (Methane or Non-methane). The ambient air quality monitoring for PM₁₀ and 2.5, SO₂, NO_x and HC were carried out for 24 hours on continuous basis per station, twice a week for the winter season. The ambient air quality monitoring data of the entire study period is given in *table 3.7*.

3.2.3 Baseline status

Table 3.7 : Ambient Air Quality results

Name of Village	PM ₁₀		PM _{2.5}		NO _x		SO ₂		HC (methane & non-methane) (µg/m ³)
	(µg/m ³)								
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
Project Site	69.6	52.6	34.9	30.2	24.5	17.5	12.5	8.1	<0.20
Village Goudsargiguda	70.5	53.1	38.6	32.3	26.5	18.6	16.3	10.3	<0.20
Village Junagarh	75.6	62.3	44.6	35.3	28.6	19.6	16.3	10.3	<0.20
Village Bandibasal	64.6	55.3	36.3	30.2	25.7	18.6	14.7	9.4	<0.20

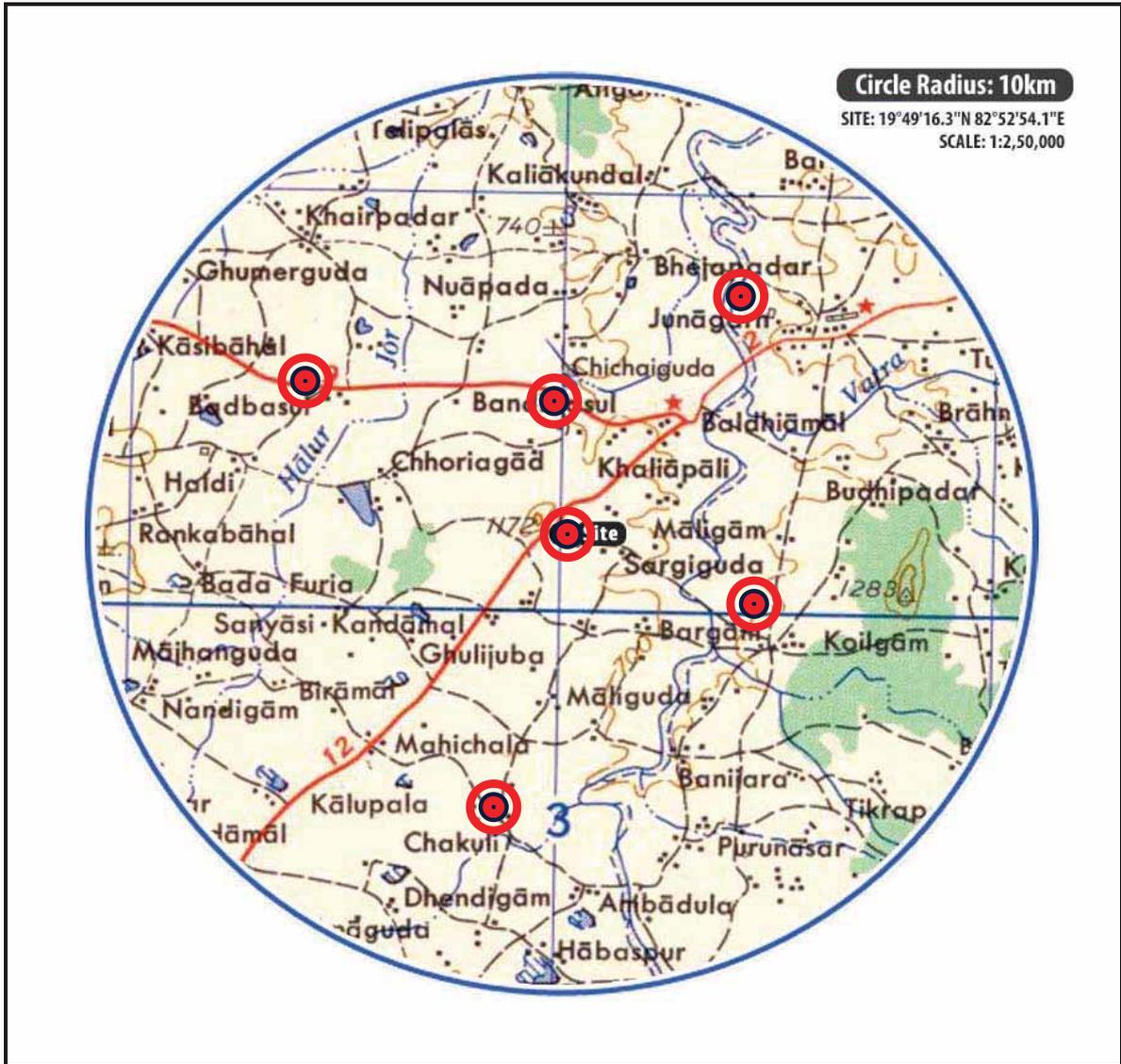
Village Badbasul	68.6	58.2	35.8	28.6	25.8	18.6	15.7	9.6	<0.20
Village Mahichala	60.2	52.3	35.6	25.3	23.4	17.5	12.5	7.5	<0.20

During the study period, PM₁₀ concentrations have ranged from 52.3 to 75.6 µg/m³. The maximum value of PM₁₀ has been observed at village Junagarh and minimum value of PM₁₀ has been observed at village Machiala.

PM_{2.5} concentrations have ranged from 25.3 to 44.6 µg/m³. The maximum value of PM_{2.5} has been observed at village Junagarh and minimum value of PM_{2.5} has been observed at village Machiala.

SO₂ concentrations at various ambient air quality monitoring stations have ranged from 7.5 to 16.3 µg/m³. The maximum value of SO₂ has been observed at village Junagarh and minimum value of SO₂ has been observed at village Machiala.

NO_x concentrations at various ambient air quality monitoring stations have ranged from 17.5 to 28.6 µg/m³. The maximum value of NO_x has been observed at village Junagarh and minimum value of NO_x has been observed at project site and village Machiala.



Ambient Air Quality Monitoring Locations

AAQM₁ – At Site, AAQM₂ – Village Goud Sargiguda, AAQM₃ – Village Junagarh,
 AAQM₄ – Village Bandibasul, AAQM₅ – Village Badbasul, AAQM₆ – Village Machiala

 – Locations marked as on the topographical map

Figure – 3.4

3.3 NOISE ENVIRONMENT

The physical description of sound concerns its loudness as a function of frequency. Noise, in general, is sound that is composed of many frequency components of various levels of loudness, distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the 'A' weighted scale which is measured as dB (A). This is more suitable in the audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of the human ear. The impact of noise sources in surrounding community depends upon;

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness.
- The time of day at which noise occurs, for example high noise levels at night in residential area are not acceptable because of sleep disturbance.
- The location of the noise source w.r.t. noise sensitive area, which determines the loudness and period of exposure.

The environmental impact of noise can have several effects varying from noise induced hearing loss (NIHL) to annoyance depending on loudness of noise levels. The environmental impact assessment of noise from the activity and vehicular traffic can be undertaken taking into consideration various factors like potential damage to hearing, physiological responses, annoyance and general community responses.

The study area of 10 km radius with reference to Starlight Energy Ltd. has been covered for noise environment. The three zones, viz., residential, highways and silent zones have been considered for noise monitoring. Noise monitoring has been undertaken for 24 hours at each location. The proximity to NH 201 has also been considered for the monitoring,

The main objective of noise pollution impact assessment in the study area is to assess the impact of total noise generated by the existing domestic, commercial activities and vehicular traffic in the human settlements within 10 km radius. The main objective of the study is;

- Assessment of background noise levels.
- Identification and monitoring the major noise sources of the existing activity.
- To assess the impact of noise on the workers as well as on the general population.

3.3.1 Ambient noise monitoring locations

A preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. Noise generating sources were identified with respect to the activities, viz., traffic noise, ambient noise due to residential population. The study area is not having any industrial or commercial activity which may affect the existing ambient noise quality.

The noise survey involved the determination of noise levels in decibels at 6 locations. The noise monitoring locations are indicated in *figure 3.5*.

3.3.2 Methodology of data generation

Types of sound fields

- **Free field** : Free progressive sound waves have been described as sound waves that propagate without deduction from source to the receiver. In the case of spherical waves, the inverse square law holds good so that the sound pressure level decreases by 6 dB as the distance is doubled. Such a field is known as free field.
- **Near field** : The near field is defined as that region close to the source where the inverse square law does not apply. Usually this region is located within a few wavelengths of the source and is also controlled by the dimensions of the source.
- **Far field** : This field consists of two parts, the free part and reverberation part. In the free part of the far field, the sound pressure level obeys the inverse square law. The reverberant part of the field exists for enclosed situation where the reflected sound waves are superimposed on the incident sound waves. If there are many reflected waves from all possible directions, a diffuse sound field exists.

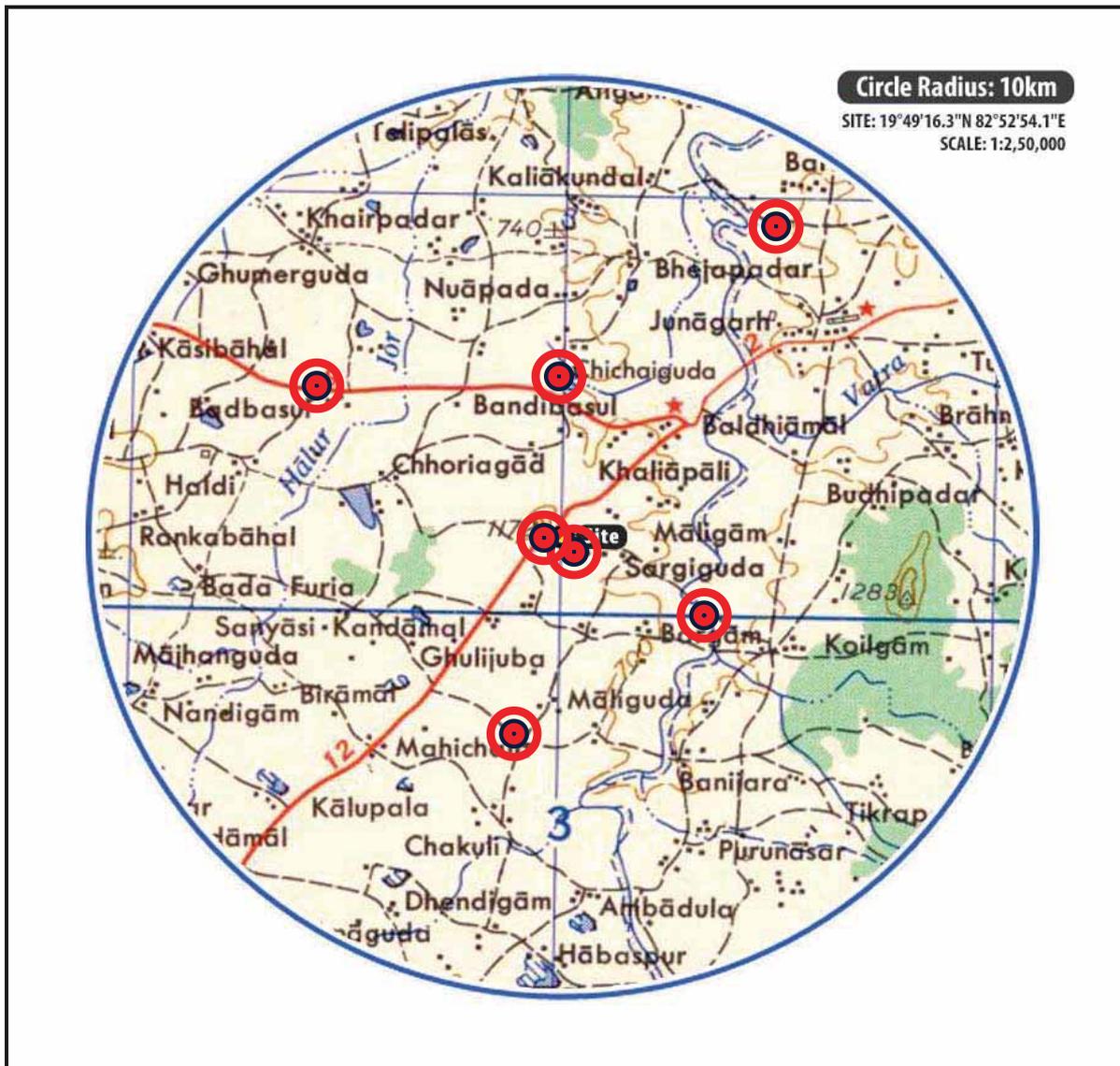
Method of Monitoring

A detailed noise survey was undertaken to study the levels of noise as the high noise may cause adverse effect on human beings and the associated environment.

Noise level was recorded at every hour for 10 minutes continuously for 24 hours at 'A' response. Then the data was tabulated to get frequency table with different intervals. The ambient noise levels measures for the study are given in *table 3.8*.

Table 3.8 : Noise monitoring data

S. No.	Noise monitoring point	Noise level dB(A) L _{eq} (Day)	Noise level dB(A) L _{eq} (Night)
1.	At Site	53.20	44.30
2.	At National Highway near site	67.80	53.50
3.	Village Goud Sargiguda	52.10	43.58
4.	Village Junagarh	53.10	41.60
5.	Village Bandibasal	51.60	42.50
6.	Village Badbasul	53.10	42.50
7.	Village Mahichala	50.10	43.50



Noise Monitoring Locations

NM₁ – At Site, NM₂ – Village Goud Sargiguda, NM₃ – Village Junagarh, NM₄ – Village Bandibasul, NM₅ – Village Badbasul, NM₆ – Village Machiala,

 – Locations marked as on the topographical map

Figure – 3.5

3.4 WATER QUALITY

Understanding the water quality is important in the preparation of environmental impact assessment (EIA) to identify critical issues with a view to identify appropriate mitigation measures for implementation. The purpose of this study is to;

- Understand the baseline characteristics
- Identify critical parameters of water characteristics and their origin
- Evaluate the extent of leaching to ground water
- Identify water polluting sources
- Predicting impact on water quality

3.4.1 Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on;

- Topographical maps to identify water bodies
- Likely areas which can represent baseline conditions
- Flow direction of surface and ground water bodies
- Location of industries/residential areas, their water intake and effluent disposal locations

Surface water : River Hati flows at a distance of 3.5 Kms from the site. Surface water sample of river Hati was collected from upstream at Village Goud Sargiguda. The downstream surface water sample was collected at Village Junagarh. The locations of surface water monitoring stations are shown in figure 3.6. The analysis results of the surface water quality are shown in table 3.9.

Ground water : Kalahandi is one of the economically backward districts in southwestern part of Orissa, as the economic condition has been shaken terribly due to continuous natural calamities such as drought etc. It has a total geographical area of 7920 sq. km. and comprises of 2 Sub-divisions and 13 C.D. blocks. The utilizable ground water resources in the district for irrigation are computed to be 49520 HAM and net annual ground water draft is 4431 HAM, leaving a balance of 45089 HAM for further ground water development which can support an irrigation potential of 131082 hectares. However, the district is plagued with frequent droughts and drought

condition in successive years leading to acute water-scarcity conditions locally. Quantification of groundwater resources of shallow aquifer (weathered zone), indicate that the present stage of groundwater development in Kalahandi district is 8.95% of the utilizable resource. There is enough scope to harness groundwater resources in over 75 percent of the areas in the district with the additional groundwater structures.

To assess the groundwater quality of the study area, six no. of groundwater samples were collected. The locations of groundwater monitoring stations are shown in figure 3.6.

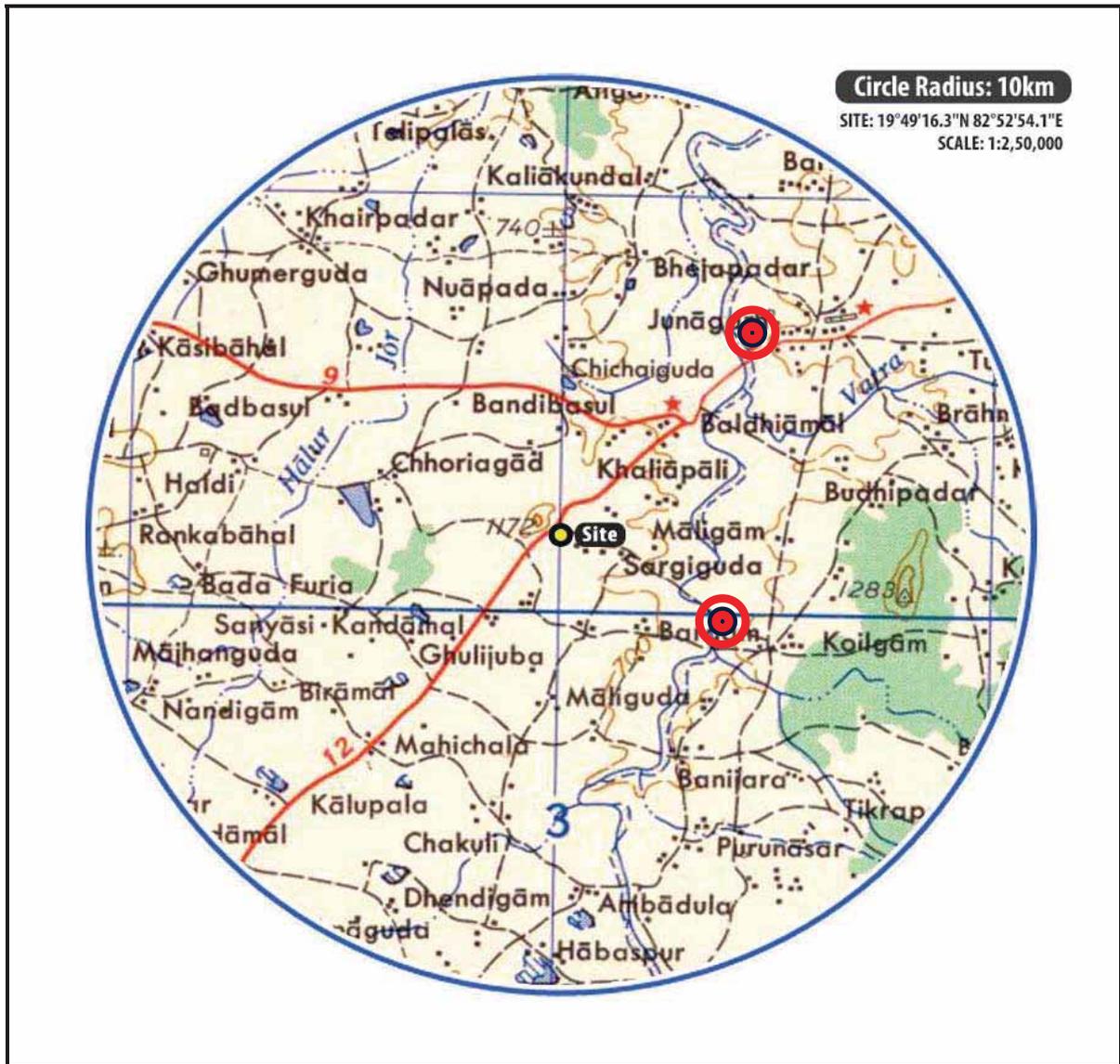
Groundwater samples were collected for the winter season. Analysis of water samples for physical, chemical and bacteriological parameters were carried out.

The samples were collected and analysed as per the procedures specified in Standard Methods for Examination of Water and Wastewater published by American Public Health Association (APHA), 20th edition.

Samples for chemical analysis were collected in polyethylene carboys. Samples for bacteriological analysis were collected in sterilised glass bottles. Parameters analysed at site were pH, temperature, turbidity and dissolved oxygen using potable water analysis kit.

The analysis results of the groundwater quality are shown in table 3.10.

The characteristics of the groundwater samples were found to be somewhat exceeding the standard limits specified for the water quality characteristics for the desirable limits as specified in IS-10500:1991.



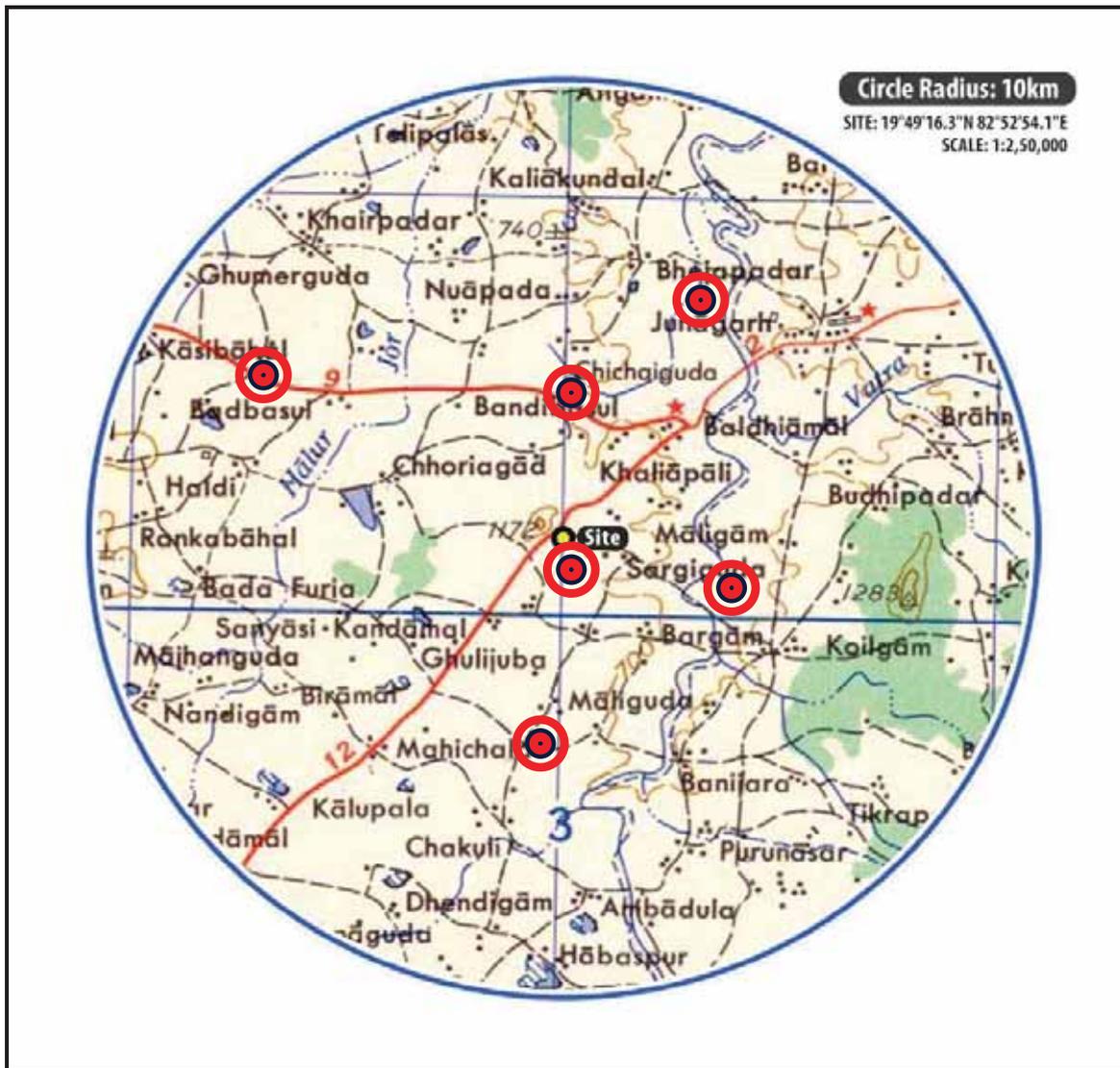
Surface Water Quality Monitoring Locations

SW₁ – Village Goud Sargiguda (Upstream)

SW₂ – Village Junagarh (Downstream)

 – Locations marked as on the topographical map

Figure – 3.6



Ground Water Quality Monitoring Locations

GW₁ – At Site, GW₂ – Village Goud Sargiguda, GW₃ – Village Junagarh, GW₄ – Village Bandibasul, GW₅ – Village Badbasul, GW₆ – Village Machiala,

 – Locations marked as on the topographical map

Figure – 3.7

Table 3.9 : SURFACE WATER ANALYSIS RESULTS

Sr. No.	Parameters	Unit	SW₁	SW₂
1.	pH	-	8.11	7.88
2.	Dissolved Oxygen	mg/l	4.6	4.8
3.	BOD ₃ at 27 °C	mg/l	6.9	7.1
4.	Total Dissolved Solids	mg/l	538	640
5.	Total Suspended Solids	mg/l	32	29
6.	Total Hardness as CaCO ₃	mg/l	309	286
7.	Electrical Conductivity	mmho/cm	639	746
8.	Chlorides as Cl ²	mg/l	119.11	186.61
9.	Sulphates as SO ₄	mg/l	35.51	75.54
10.	Total Coliform Organisms	MPN/100 ml	Absent	<2

SW₁ – Village Goud Sargiguda (Upstream)

SW₂ – Village Junagarh (Downstream)

Table 3.10 : Ground water characteristics

Parameters	Unit	GW ₁	GW ₂	GW ₃	GW ₄	GW ₅	GW ₆	Limits IS:10500
Colour	Hazen	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless	10
Turbidity	NTU	2	3	3	2	1	3	10
pH	-	7.81	7.6	7.59	7.72	7.92	7.50	6.5-8.5
Total Dissolved Solids	mg/l	305	690	360	320	250	309	500
Total Suspended Solids	mg/l	1	2	2	1	3	2	–
Oil and Grease	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	Absent
Total Hardness as CaCO ₃	mg/l	262	552	352	297	156	213	–
Total residual chlorine as Cl ₂	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.2
Ammonical Nitrogen	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	–
Chlorides as Cl ₁	mg/l	15	170	41	45	19	49	250
Sulphates as SO ₄ ⁻⁴	mg/l	12.41	85.2	14.66	17.21	6.77	8.9	200
Nitrate as NO ₃	mg/l	0.46	12.77	2.47	1.81	0.95	0.30	45
Dissolved Phosphates as P	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	–
Calcium as Ca	mg/l	58	113	81	61	20	31	75
Magnesium as Mg	mg/l	28	66	36	35	15	19	30
Sodium as Na	mg/l	124	132	120	113	123	119	–
Potassium as K	mg/l	4.2	3.9	4.7	4.4	3.5	3.8	–
Phenolic compounds as C ₆ H ₅ OH	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.001
Cyanide as CN	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.05
Iron	mg/l	0.23	0.27	0.20	0.23	0.21	0.20	0.3
COD	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	–
BOD for 3 days at 27°C	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	–
Fluoride	mg/l	0.43	0.64	0.31	0.23	0.32	0.37	1.5
Hexavalent Chromium	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.05
Selenium as Se	mg/l	Nil	Nil	Nil	Nil	Nil	Nil	0.01
MPN	per 100 ml	Absent	Absent	Absent	Absent	Absent	Absent	10
E – Coli	-	Nil						

GW₁ – At Site, GW₂ – Village Goud Sargiguda, GW₃ – Village Junagarh, GW₄ – Village Bandibasal GW₅ – Village Badbasul, GW₆ – Village Machiala,

3.5 LAND ENVIRONMENT

Land environment requires data regarding topography, zoning settlement, industry, forests, roads and traffic, etc. The collection of data was done from various secondary sources like district census handbook, revenue records, State and Central Government offices, and Survey of India topographical sheets. The purpose of land use studies is;

- to determine the present land use pattern
- to determine the temporal changes in land use pattern over a period of ten years or so
- to analyse the impact of change in land use due to the commercial complex on the study area
- to give recommendations for optimising land use pattern vis-a-vis growth in the study area and its associated impacts.

3.5.1 Land use pattern

Kalahandi is one of the most backward district of the Orissa State, spreading over an area of 7920 sq kms, which is about 7.56% of the total area of the State. Out of the 30 districts of Orissa, it occupies 7th position in area. It is situated between 19° 08' N to 20° 25' N latitude and 82° 32' east and 83° 47' east longitude. It is located in the south-western part of Orissa. The district is bounded by Bolangir on the north, Phulbani on the east, Rayagada on the south-east, Koraput on the south, Nabarangpur and Raipur on the west and Nuapada district on the northwest. There are 2 Sub-Divisions, 7 Tehsils, 13 Blocks, 1 Municipality, 2 NACs, 12 Police Stations, 273 Grampanchayats, 2068 villages and 137 uninhabited villages in Kalahandi district.

Physiographically the district may be broadly divided into two different natural divisions, the hilly tracts and the plain country. The former chiefly comprises of the ranges of hills which run from the north-east to the south-west of the district and the latter constitutes the river valleys of Tel and its tributaries, and the Jonk. About eight kilometres south-east of Bhawanipatna, commences the mountain tracts called the Dongarla which cover a vast area of about 3665 sq km on the eastern side of the district and south-wards to the Koraput border. These tracts vessel in a series of precipitous hill ranges from the plains. The hillsides are covered with dense Sal (*shorea robusta*) forest, and it is not until the open valleys at the higher elevation are

reached that cultivation is met with. The principal plateau lands are the Karlap at, Thuamul Rampur ranges and the Baphilimali hill, a fine plateau on the district border near Madhupatna; these in parts each an elevation above sea level of 1220 metres and over. In these hills of the Dangarla area the splendid stream of the Indravati takes its rise near Thuamal. It makes its way through the hill range which forms the southern boundary of Kalahandi. Not far from the place where the Indravati flows south through this barrier the Hati river rises on the northern slopes and flows due north in exactly the opposite direction.

To assess the land use pattern of the study area, land utilization within the study area was identified. To assess the land use pattern of the study area, the geographical area of all the villages covered under 10 km radius circle is taken into consideration.

Forest Land includes all lands classed as forest under legal enactment dealing with forest or administered as forests, whether state owned or private, and whether wooded or maintained as potential forest land. 32% of the total district area is under forest as per Government sources (*District at a glance*) which turns out to be around 2500 Sq. Km.

Land under non-agricultural include all lands occupied by buildings, roads and railways or under water. e.g. rivers and canal. Around 41372 Ha of land comes under this category in the district. 56961 Ha of district area covers all barren and uncultivable lands, including mountains, deserts etc. which cannot be brought under cultivation except at a high cost. 350160 Ha of the total district area comes under the net area sown under crops and orchards, counting areas sown more than once in the same year only once.

Culturable waste land includes all lands available for cultivation or not taken up for cultivation even once, but not cultivated during the current years and last five years or more in succession. 265 09 Ha of the district area comes under this category. 23702 Ha comes under Permanent pastures and other grazing land category.

3.5.2 Soil Characteristics

Soil is a natural part of the earth's surface being characterized by layers paralleled to the earth's surface resulting from modification of parent materials by physical, chemical and biological processes operating under varying conditions. The soil of

Kalahandi district is an admixture of Red, Black and Sandy loan. The district has five different types of soil broadly classified as

- a) Red Laterite
- b) Black clay
- c) Sandy Loan
- d) Clay
- e) Red Sandy loan.

The red Laterite soil which is deficient in Phosphorous and nitrogen is found all over the district, mostly at the foot hills and hills. In Bhawanipatna and Dharamgarh occurrence of heavy soil is common. It is rich in Potassium and Nitrogen but poor in Phosphorous. Sandy loan is seen in Lanjigarh and parts of Bhawanipatna Tehsils. The soil on the river banks of Tel, Udanti, Utei and Sagada are alluvial, sandy and sandy loan. The fertility of soil in Dharamgarh and Jaipatna areas is high. The percentage occurrence of the major soil types are as follows :

S. No.	Soil Type	Percentage occurrence (%)
1.	Red Soil	31.63
2.	Black Soil	15.93
3.	Clay and Sandy Loam	52.44

Assessment of Baseline Data on Soil Quality

To assess the baseline status of the soil quality in the study area, six soil samples were collected from different locations. The soil monitoring locations are shown in figure 3.8. The physical and chemical properties of the soil samples are given in table 3.11.

Baseline Status

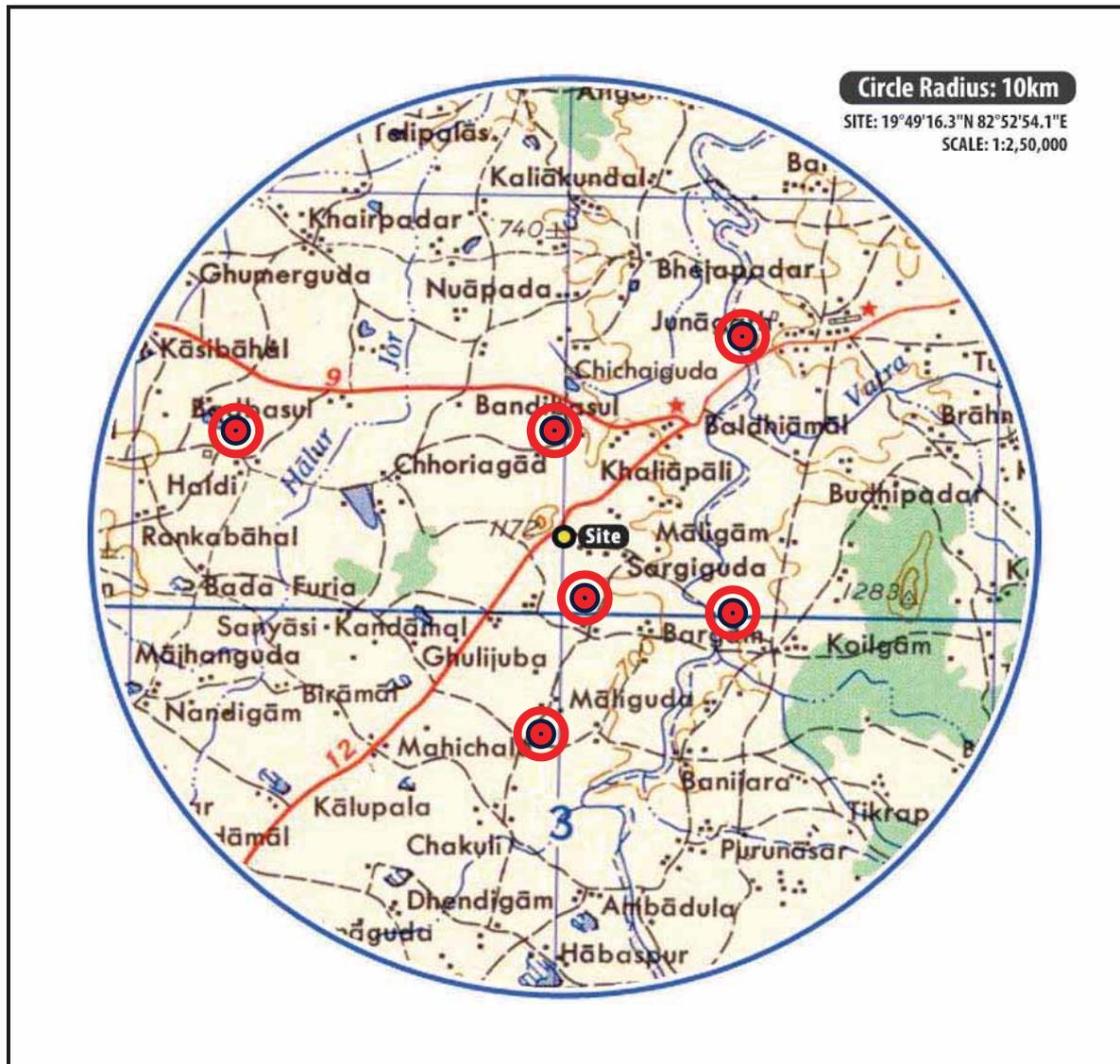
The texture of the soil in the study area ranged between loamy to sandy loam. Bulk density of soil samples varies between 1.29 to 1.46 gm/cm³. The soils of all the sites are moderately porous (porosities ranging between 47.9 to 58.4%)

pH of soil samples ranged between 7.35 to 7.80. The availability of nitrogen is of prime importance to grow plants since they are dependent on adequate supply of nitrates and ammonia. Total available nitrogen available for different soil sample ranged between 228 to 280 kg/hect. The available nitrogen value is highest for village

Machiala and lowest for village Jun agarh. The highest value of nitrogen may be due to favourable conditions which affect the release of nitrogen from the soil ecosystem.

The potassium content in soil originates from the disintegration and decomposition of rocks containing potassium bearing minerals. Available potassium concentration ranged between 218 to 264 mg/100gm.

Phosphorus has several essential functions in plant growth. The available phosphorus concentration in the study area has varied from 38 to 44 Kg/hect.



Soil Quality Monitoring Locations

SM₁ – At S ite, SM₂ – Village Goud Sargiguda, SM₃ – Village Junagarh, SM₄ – Village Bandibasul, SM₅ – Village Badbasul, SM₆ –Village Machiala

 – Locations marked as on the topographical map

Figure–3.8

Table 3.11 : Soil characteristics

Parameter	Unit	SQ ₁	SQ ₂	SQ ₃	SQ ₄	SQ ₅	SQ ₆
pH of (10% Extract)	--	7.75	7.45	7.80	7.35	7.48	7.80
Water Holding Capacity	(%)	30.23	28.67	31.20	31.04	30.02	29.12
Conductivity	(mS/cm)	0.401	0.354	0.378	0.541	0.433	0.429
Bulk Density	(gm/cm ³)	1.36	1.32	1.27	1.34	1.35	1.29
Sand	(%)	65.6	68.2	61.8	69.1	67.6	64.2
Silt	(%)	18.4	19.7	20.7	16.5	18.7	19.8
Clay	(%)	16	12.1	17.5	14.4	13.7	16.0
Cation Exchange Capacity	(meq/100gm)	25.7	24.6	22.8	21.7	20.4	22.3
Porosity	(%)	47.9	51.6	58.4	55.1	51.3	49.8
Available Nitrogen	(Kg/hect)	243	268	228	276	236	280
Phosphorus	(Kg/hect)	42	44	38	40	43	42
Potassium	(mg/100gm)	264	218	259	258	260	238
Carbonates	(mg/100gm)	Nil	Nil Nil	Nil Nil Nil			
Chlorides	(mg/100gm)	155	173	145	191	131	152
Lead	--	Nil	Nil Nil	Nil Nil Nil			
Cadmium	(mg/100gm)	1.67	2.34	1.45	2.31	2.31	1.98
Chromium	(mg/kg)	BDL	BDL BDL	BDL BDL			BDL
Zinc	(mg/100gm)	3.22	5.95	4.50	3.21	4.93	5.11

SQ₁ – At Site, SQ₂ – Village Goud Sargiguda, SQ₃ – Village Junagarh, SQ₄ – Village Bandibasul, SQ₅ – Village Badbasul, SQ₆ – Village Machiala

3.6 BIOLOGICAL ENVIRONMENT

The environment at any particular geographical location is the sum total of physical (air, water, soil etc.) and biological conditions in the context of given meteorological influences so exerted from within and outside the ecosystem. While the habitat is the natural abode of plants and animals (including human being), the ecosystem includes all the biotic communities with continuous interaction among themselves. Fundamentally, there are two types of ecosystem, viz. the aquatic and terrestrial. The ecosystem further constitutes the marine and fresh water, the two type of subsystem; while the former is confined to oceans, estuaries, lagoons, etc. and the latter consists of rivers, streams (lotic subsystems) and ponds, lake reservoirs, impoundments (lentic subsystem).

The generation/regeneration and the existence of any particular type of flora and fauna under any given environment, ecosystem or a place is long drawn process and a complex phenomenon of a continuous interaction between meteorological conditions and the location specific geo-topo-terrestrial/aquatic features, whereas, the aforesaid natural interactions/processes are interwoven and interlinked directly/indirectly with each other.

3.6.1 Flora and fauna

The ecosystem is defined by the water availability and soil type which are themselves interlinked. The outstanding features of the cropping pattern of India are the wide variety of crops and the preponderance of food grains over non-food crops. Paddy is the principal crop which alone accounts for 60% of the gross cropped area of Kalahandi district. Other major crops are Wheat, Jowar, Bajra, Maize, Ragi, and Pulses. Grazing lands are also found. A list of plant species growing in the study area are listed at table 3.12.

The presence of fauna depends on topography and vegetation in the area. The animals like Neel Gai (*Boselaphus tragocamelus*), Fox (*Vulpes bengalensis*), Hare (*Lepus nigricollis*), are found in the study area. The reptiles like snake, lizard are also found in the area. Among the birds mainly crow (*Corvus splendens*), sparrow (*Athene broma*), dove, pigeon (*Columba livia*) are found in the area.

Table 3.12 : LIST OF COMMON PLANTS IN THE STUDY AREA

S. No.	Botanical Name	Local Name
1.	<i>Mangifera indica</i>	Aam
2.	<i>Emblica officinalis</i>	Amla
3.	<i>Ficus carica</i>	Anjir
4.	<i>Albizia lebbeck</i>	Kala siras
5.	<i>Anthocephalus indicus</i>	Kadamb
6.	<i>Citrus medica</i>	Nimbu
7.	<i>Accia arabica</i>	Babool
8.	<i>Terminalia belerica</i>	Baheda
9.	<i>Ficus religiosa</i>	Peepal
10.	<i>Delbergia sissoo</i>	Shisham
11.	<i>Prosopis juliflora</i>	Vilayati babool
12.	<i>Cuscuta reflexa</i>	Amarbel
13.	<i>Dendrocalamus strictus</i>	Bans
14.	<i>Saccharum sp.</i>	Sugarcane
15.	<i>Aegle marmelos</i>	Bel
16.	<i>Pyrus communis</i>	Nashpati
17.	<i>Azadirachta indica</i>	Neem
18.	<i>Psidium guajava</i>	Amrood
19.	<i>Polyalthia longifolia</i>	Ashok

Natural fauna is a gift of nature and the different beasts and birds forms the part of wild life. Kalahandi district is rich in animals and birds including some of the rare species as shown below;

Mammals (Mammalia).- Sambhar, Nilgai, Jungle cat, Jackal, Mongoose, Palm squirrel, Hares, Rats, Mice, Rhesus macaque, Bat (small & Large), Porcupine, Hedge hog. Domestic mammals like Cow, Buffalo, Goat, Sheep, Pigs, Donkey, Horse, Dog and Cat are also present in the area.

Birds (Aves).- Asiatic dowitchers, Dalmatian pelican, Pallas' s fish-eagles, spoon-billed sandpiper, spot-billed pelican, white-bellied sea eagle, pariah kite, brahmany kites, kestrel, marsh harriers, collared pratincole, ruff, dunlin, snipes, sandpipers, larks, wagtails,

moorhens, coots, jacanas. Pond herons, night herons, shovellers, pintails, gadwall, teals, pochards, geese and coots.

Reptile (Lizard, Snakes, Turtles, etc.).- Tortoise, Wall lizard, Calotes, Varanus, Cobra, Rat snake, Krait, Python.

Pises (Fishes) - Butter catfish and Wallago attu are the most common type of fish found in the lake. 11 species of fish, 5 species of prawn and 2 crab species are commercially important. The commercially important prawn are giant tiger prawn, *Penaeus indicus* (Indian white shrimp), *Metapenaeus monoceros* (speckled shrimp), *Metapenaeus affinis* (pink prawn) and *Metapenaeus dobson* (Kadal shrimp). Mangrove crab is the most important commercial crab.

3.7 SOCIO-ECONOMIC ENVIRONMENT

Socio-economic status of the population is an indicator of development of the region. Any developmental project of any magnitude will have a bearing on the living condition and the economic bearing of the population in particular and the region as a whole. Similarly, the proposed 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 MW cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist. Kalahandi, Odisha will have its share of socio-economic influence in the study area. The section delineates the overall appraisal of the socially relevant attributes.

The data on socio-economic aspects in the study area has been carried out through the analysis of the secondary data available for the study area.

3.7.1 Methodology

The methodology adopted in the assessment of socio-economic condition is as given below;

- Evaluation of the parameters defining the socio-economic conditions of the population.
- Analysis of the identification of social attributes like population distribution, sex ratio, occupational structure, available public utilities, etc., through literatures like district census hand book.
- public opinion for the future development in the study area.
- Sociological aspects include human settlements, demographic and socio-economic aspects and infrastructural facilities available in the study area. The economic aspects include agriculture, industry and occupational structure of workers.

The socio-economic profile of the study area is given below;

- **Settlement pattern:** The study area theoretically covers an area of 314 sq Km. with the proposed distillery plant expansion considered as the centre. This area is covered under Taluka Junagarh and District Kalahandi. Altogether, there are approximately 36 villages in the study area.

- **Communications:** The means of transport and communications such as roads, railways, post, telegraphs, telephone etc. are important for the development of any area. The study area is quite advanced in this matter partly due to its proximity to National Highway 201. The area is well served by the Public Road Transport System and Railway networks.
- **Industry :** As per MSME- Development institute, Cuttack's report there are 1231 registered industrial units in the district. There are 2 large and medium scale units. The small scale units impart employment to around 23000 people in the district. Vedanta Aluminium Ltd., Lanjigarh, Kalahandi which is a large scale enterprise functioning in the district provide ample scope for promotion of few ancillary and downstream industries including service based industries. The following products have been identified as ancillary products in the district viz ;Caustic Soda, Burnt Lime, Grinding Media, Flocculants, Resins, Filter Cloth, Chlorine Plant, Fly Ash Bricks, Red Mud Tiles/Bricks, Mini Cement Plant, Alum, Iron extraction from red mud.
- **Minerals and Mining :** The district of Kalahandi has a wide availability of various minerals out of which bauxite, graphite, manganese, iron and quartz are the main availabilities. Graphite has been commercially exploited and one big industry of Alumina Refinery has been set-up in the private sector by Sterlite Industries India Ltd., by the Vedanta group at Lanjigarh where the other minerals are of poor quality and unsuitable for economic exploitation.
- **Post and Telegraph :** There is a good network of post offices, post and telegraph offices in the study area. There are around 300 post offices around the district.
- **Medical and Public Health :** The district is gaining a notable improvement in the medical and public health facilities during the last two decades. The district has 1 Allopathic hospital, 43 Primary health centers and 3 sub- centres. There is a lack of medical facilities overall in the state. But still the district is fighting odds to reconcile its stature.
- **Education :** Average literacy rate of Kalahandi in 2011 was 59.22% compared to 45.94% of 2001. If things are looked out at gender wise, male and female literacy rate were 71.90 and 46.68 % respectively. Total literate in Kalahandi District were 802,036 of which male and female were 484,177 and 317,859 respectively

as per 2011 census. According to MSME report there are around 2234 primary schools, 771 medium schools, 305 senior secondary schools and around 62 colleges in the district.

- **Demography** : According to 2011 census, Kalahandi has a population of 15,76,869. The male to female ratio of the population in the study area district is 1000:1003. The study area had a population density of 169 persons per sq. km. in 2001 which has raised to 199 persons per sq. km as per 2011 census.
- **Economic Profile** : This section deals with the economic aspects of the study area which includes occupational structure of the inhabitants. In the study area the population has been divided into three segments viz. main workers, marginal workers and non workers. Out of the total population, around 620,000 are the total workers in the district in which around 381,000 are male workers and 239,000 are female. Out of the total workers the main workers total up to 382,050.

Chapter – 4

ENVIRONMENTAL IMPACT IDENTIFICATION AND ASSESSMENT

Prediction of impacts is the most important component of an EIA study. Many scientific techniques and methodologies are available to predict impacts on physico-ecological and socio-economic environment. The prediction of impacts helps to identify the gaps and implementation of environmental management plan during and after the execution of the developmental activity to minimize the deterioration of environmental quality.

The selection of the factors require due consideration to;

- a) The extent to which the action will cause environmental effects in excess of those created by existing uses in the area affected by it
- b) The absolute quantitative environmental effects of the action itself, including the cumulative harm that results from its contribution to existing adverse conditions or uses in the affected area
- c) The extent to which the proposed action is consistent with local development plans

In the present study, the most probable impacts on various components of the surrounding environment due to the proposed project have been predicted. The methodology involves comparison with “no action” option – not carrying out action at all. The “no action” alternative represents an objective baseline against which all measurements and comparisons are made.

The impacts studied have been classified as under;

- a) **Positive and negative impacts** – an action which will result in significant environmental impacts all of which are either beneficial or adverse (undesirable).
- b) **Primary and secondary impacts** – **primary impacts** covers those which are the direct fallout of the proposed project and that generally occur at the same time or place. **Secondary impacts** are indirect or induced changes (as a result of chain of consequences) due to the project/action. Secondary impacts span the

potential effects of additional changes that are likely to occur later in time or at a different place as a result of implementation of a particular action. **Cumulative impacts** result from the incremental impact of the proposed action on a common resource when added to other past, present, and reasonable foreseeable future action.

c) **Scope of the impacts**

i) **Temporal** – this analyse the impact on basis of its bearing on time scale depending on persistence or duration of the impacts. The impact may be **immediate** (immediate consequence of the action which may or may not persist over time), **term** (takes place continuously over a period of time till action continues), or **chronic** (get manifested at a later stage due to accumulated effect over time).

ii) **Spatial** – the impact can effect **immediate work area** (within the complex of the proposed project), **in the vicinity** – outside boundary, and far and **wide area** around the project site.

iii) **Frequency** – whether the impact is **continuous** (always there during project operation), **sporadic** (the impact is irregular due to some activity or situation which is random or infrequent), or **accidental** (it may be due to some uncontrolled happening resulting into accident).

d) **Control/mitigation possibilities** – these include various options for minimizing damage to the environment, which include, **avoidance** (no action – mitigation by *not carrying out* proposed project/action), **minimization** (mitigation by *scaling-down the magnitude* of the project, *reorienting the layout* of the project, or *employing pollution prevention or cleaner production technology and procedures* that reduces factors generating the undesirable environmental impact), **restoration** (mitigation by *restoration of the environments* affected by the action), **reduction** (mitigation by taking *control, prevention, or maintenance steps* during the course of the action), **compensation** (mitigation through the *creation of environments* similar to those affected by the action).

e) **Controversial status** – impending public controversy (disagreement among the public groups or concerned/affected individuals about the purpose, need, or location of the action) or historical proneness to arouse public controversy is an

important aspect needing specific attention.

- f) **Sensitivity** – the actions encroaching sensitive environmental resources need specific consideration. Sensitive natural resources may be certain natural environments (such as, major wetland complexes – inland or coastal, floodplains of major rivers, wildlife reserves/habitats, large tracts of prime agricultural land, or regions with extensive and important cultural, or unique resources) or “sensitive receptors” in the affected area.

4.1 DETERMINANTS OF ENVIRONMENTAL IMPACTS

The project, during its life cycle, involves a large number of activities, the consequences of some of which – direct or indirect – may be of significance in underlining the potential impacts on the environment. The activities can be classified under following significant environmental aspects;

- a) Land alteration/regime modification
- b) Land transformation and construction
- c) Resource extraction and consumption/renewal
- d) Processing/industrial activity
- e) Waste treatment and emplacement
- f) Demographic changes
- g) Changes in transportation pattern
- h) Requirement of civic amenities, public services and facilities
- i) Accidents

4.1.1 Land alteration/regime modification

This covers changes in geologic profile of land as well as in existing land use.

The industry is already having more than 90 acres of land at village Village - Goud-Sargiguda, Taluka Junagarh, Dist. Kalahandi Odisha. Out of this, the promoters of the project would earmark 40 acres of land for the proposed 2 x 45 KLPD grain based distillery project. The land is sufficient to cater the needs for plant establishment and land for plantation purposes for the disposal of treated waste water. The project site adjoins NH 201. The area has mostly sandy loam soil characteristics

with levels lower than of NH 201.

The site needs to be dressed for surface leveling with average cut and fill requirements are expected to balance each other. As per present planning, more than 55000 m² will be landscaped into horticulture and plantation belts. Storm water management and harvesting arrangement will be implemented for effective use of rain water and restrict run-off contamination and surface erosion problem.

The significant concerns are;

- a) Change in land use pattern
- b) Alteration in storm water management
- c) Geologic alterations in the vicinity due to secondary development triggered by the proposed project
- d) Commercial of realty and property

4.1.2 Land transformation and construction

This includes on site activities related to site development and construction, etc. The construction activities, of significance, will include;

- a) Site preparation – fencing, boundary and clearing of site
- b) Excavation, backfilling and leveling
- c) Sub-structural (digging, trenching, foundation work, etc.) and super structural (mostly steel, concrete and masonry, works etc.) construction/erection operations and their finishing
- d) Construction of roads, drains, laying of utilities (water supply, wastewater, fuel lines, compressed air lines, etc.)
- e) Hauling and dumping/storage of construction materials and construction spoils
- f) Clean-up operations and landscaping

The construction activities will be outsourced through specialized contractors. The labour requirement will, preferably, be arranged from that locally available. Total time expected to be taken for on site construction work will be about 8-9 months. At any time, there will not be more than 200 labour/manpower on site. There will be adequate provision for temporary accommodation (including their hygiene and sanitation) of labour at the site.

The machinery and equipment required will include excavators, cranes, concrete mixers, vibratory compactors, hoists, welding sets, etc.

Also, the industry will setup a camp office for its managers, engineers, supervisors, etc., concerned with the site activities.

Energy requirement during construction phase will be about ~50 kW and will be satisfied through the DG set of the appropriate capacity.

The significant concerns are;

- a) Noise during operation of construction machinery
- b) Dust generation during construction operations
- c) Maintenance of machinery and equipment
- d) On-site vehicular movement
- e) Accident and safety issues

4.1.3 Resource extraction and consumption/renewal

The resource use will take place during construction phase as well as operation phase.

The construction material requirement will include conventional building materials – cement, sand, coarse aggregates, bricks, water and steel – which are easily available locally. Energy requirement during construction phase will be about ~50 kW and will be satisfied through the DG set of the appropriate capacity.

To meet water requirement, during construction (including that for domestic consumption (for the camp office and labour camp), less than 50 m³/day of fresh water will be needed, which will be sourced from river Hati flowing approx. 4 km s from the site.

The machinery and equipment, to be installed, will be of steel and alloys.

The industry would install 3.0 MW extraction cum condensing turbine for the cogeneration power plant. The industry plans to install a 30 TPH capacity fluidized bed boiler (FBC) for the production of 3.0 MW of cogeneration of power with steam. Biomass would be used as fuel for the boiler furnace. The promoters of the project would implement the phase 2 having identical project of 45 KLPD grain based distillery unit having 3.0 MW cogeneration power plant. Fuel @ 6.5 MT/ hour would be required for the total boiler operation of 30 TPH capacity. The fuel (Biomass

consisting of rice husk, cotton stalk, mustard stalk/ coal) is locally available in plenty throughout the year.

The raw water requirement for industrial consumption will be less than 450 m³/day for phase 1 and would be less than a total of 900 m³/day with the commencement of phase 2. (or less than 2,97,000 m³/year) which will be sourced from river Hati flowing approx. 3.5 kms from the site.

The significant concerns are;

- a) Construction phase
 - i) Harvesting/processing of building materials – at respective production sources
 - ii) Energy requirement
- b) Operation phase
 - i) Fuel requirement
 - ii) Energy conservation
 - iii) Efficient recycling of metal

4.1.4 Processing/industrial activity

The basic steps involved in the proposed activity includes conversion of grains into fermentable sugars, fermentation of the starch into alcohol and then distillation to receive alcohol as final product.

The utilities/supporting facilities will include handling of grains, milling section, cooling towers, boiler, compressed air, fuel, oils and lubricants, flue gas cleaning, ventilation of working area, wastewater, solid and hazardous wastes, etc.

The production of alcohol (at 100% capacity utilization of the proposed expansion) will be about 45 KL/day in phase 1 and a total of 90 KL/day with the commencement of phase 2 also.

The significant concerns are;

- a) Occupational health and safety issues
- b) Local ventilation of critical work areas
- c) Flue gas (including green house gases) generation
- d) Wastewater generation
- e) Worker training

4.1.5 Waste treatment and emplacement

Wastes to be generated include;

- a) **Wastewater during construction phase** – The wastewater generation during construction phase will be from domestic consumption in camp office and labour camp. The rate of generation will be about 15 m³/day, which will be treated in a conventional septic tank and disposed onto land for irrigation.
- b) **Wastewater during operation phase** – The proposed industrial activity will result in generation of about 270 m³/day of spent wash, 260 m³/day of condensates and 96 m³/day of wastewater from other streams from each of the unit during the production of alcohol @ 45 KL/day. There will be appropriate wastewater treatment systems in place. The treated wastewater will be reused for watering of green area within the complex, cooling tower makeup etc.
- c) **Flue gas emissions** – The manufacturing process will result in combustion emissions from boiler furnace. The emissions from furnace will be cleaned through an electrostatic precipitator after cooling to desired levels. The cleaned gas will have less than 100 mg/Nm³ of SPM. The emissions will be discharged into the atmosphere through a stack of appropriate height.
- d) **Solid waste** – The boiler furnace will result in ash generation @ 15 MT/day from each of the unit. The ash would be used for the production of flyash bricks.
- e) **Hazardous waste** – Hazardous waste will include used/spent oils and lubricants – ~1000 litre/year of aggregate quantity. The used oils will be stored in metallic drums inside a lined and covered room and will be, ultimately, sold to the authorized recyclers.

The significant concerns are;

- a) Disposal of treated wastewater
- b) Handling of flue gas emissions
- c) Handling and disposal of solid wastes
- d) Handling and disposal of hazardous wastes
- e) Effect on ambient air quality
- f) Housekeeping

4.1.6 Demographic changes

During operational phase, maximum manpower requirement will be about 200. Semi-skilled/un-skilled work force will be arranged mostly from that locally available. There are no plans to set-up any residential facility for workers at site. Also, the nature of project does not warrant any major ancillary industrial development in the surrounding area. Thus, there will not be any significant demographic changes induced by the proposed project.

4.1.7 Changes in transportation pattern

The project site adjoins NH 201. Present peak traffic is about 500 vehicles/hour (~1500 PCU/hour). The proposed expansion of the project will add less than 20 PCU/hour at peak level (~30% of which will be heavy commercial vehicles). Desired traffic limit is about 1500 PCU/hour. Combined traffic will be which will put negligible stress on the traffic load. Hence, stress on traffic pattern, due to the proposed project is insignificant.

4.1.8 Requirement of civic amenities, public services and facilities

The project will not require any additional civic amenities, public services and facilities.

4.1.9 Accidents

The risk of accident may be there on account of;

- a) Fire
- b) Injury due to plant and machinery operation
- c) Electrocutation

The industrial unit will have its existing occupational health and safety management system and emergency response management system extended to the proposed expansion as well. The Potential accidents and hazards will be identified and suitable preventive and safety measures (conforming to best practices in this kind of industry) will be implemented. The systems will be periodically checked/reviewed internally as well as audited externally to ensure that it is effective and up-to-date, and to overcome the limitations and drawbacks, if any.

The significant concerns are;

- a) Probability of accidental happenings
- b) Area of influence
- c) Safety and preventive measures
- d) Emergency response management

4.2 ENVIRONMENTAL PARAMETERS

The project activities, as a result of interaction with various components of the environment, are going to affect them – in a beneficial or adverse way. The components, requiring consideration, are;

- a) Atmosphere
- b) Water (surface water and ground water) resources
- c) Geology and topography
- d) Biological conditions
- e) Ecology
- f) Sound and noise
- g) Human resources
 - i) Social and cultural status
 - ii) Economic conditions
 - iii) Human interests and aesthetics

4.2.1 Atmosphere

- Will the action result in emissions into the atmosphere of significant amount of pollutants?
- How and to what extent will the action affect air quality?
- How and to what extent will it change its physical and chemical composition?
- Will it affect the local climate?
- Will it contribute to degradation/improvement in the quality?

4.2.2 Water (surface water and ground water) resources

- How and to what extent will the action affect the availability, supply, use, and quality of water?

- Will the action contribute to a significant alteration of ground or surface water?
- How and to what extent will it change its physical and chemical composition?
- How change in water quality will affect its utility?

4.2.3 Geology and topography

- How and to what extent will the action affect soil quality?
- How and to what extent will it change its physical and chemical composition?
- How change in soil quality will affect its utility?
- How and to what extent will the action affect stability (or instability) of soils and/or geology of the site?
- How will the action interfere with natural drainage pattern?
- How will the action alter erosion or run-off potential of the site?
- Are there unusual risks from natural hazards such as geologic fault, floods, volcanic activity, mudslides, etc., or other hazardous terrain features? Will the action contribute to any alteration in these?

4.2.4 Biological conditions

- Will the action result in significant alteration – the diversity, population, patterns, behavior, etc. – in vegetation or biological life (including micro-flora/fauna, wild life, etc.)?

4.2.5 Ecology

- Will the action significantly affect, beneficially or adversely, other forms of life or ecosystems of which they are part?
- How will the action cause changes in biological productivity and species diversity?
- How, and to what extent, the action will cause changes in food chain (energy/matter flow) across ecosystems?
- How will the action interact with ecologically sensitive areas (wetlands, flood plains, coastal zones, wildlife reserves/habitats, etc.), if any, in the impacted region?

4.2.6 Sound and noise

- Will the action result in creation of excessive noise, considering the proximity of the likely effects of the noise on humans or other biological life?
- Will the action result in kinds of noises and noise levels that will be disturbing or a nuisance in immediate and overlying areas?

4.2.7 Human resources

Social and cultural status

- How will the action have affect on areas of scenic or recreational value?
- How will the action affect population density and congestion?
- How will the action affect neighbourhood character and cohesion?
- Will the action cause displacement and relocation of homes, families, and businesses?
- How will the action affect public and civic amenities?
- How will the action affect human and social welfare and well being?
- How will the action affect traffic flow and congestion?

Economic conditions

- How will the action divide or disrupt existing land uses?
- How will the action alter the economic base of the area?
- How will the action affect work and employment opportunities?
- How will the action affect quality of life of the residents of the area?
- How will the action affect commercial, industrial, or general economic growth of the area?
- How will the action affect revenues and costs to local governmental agencies?
- How will the action affect development and use of different resources?
- Will the action effect resource conservation?

Human interest and aesthetics

- Will the action, in any way, affect human safety and health?
- How will the action affect quality of life?
- How will the action affect areas of unique interest or beauty?

- How will the action alter the aesthetic qualities of the area?
- How will the action alter unique areas – historical, archaeological, paleontological sites?

4.3 IMPACT IDENTIFICATION

The impacts, favourable or adverse, have been assessed in terms of their nature without actually quantifying these (at this stage). As a reference point, existing background environmental setting and “no action” scenario have been used for comparative assessment.

4.3.1 Land alteration/regime modification

• Atmosphere	No significant impact.
• Water resources	Limiting uncontrolled surface run-off and storm water management will have positive contribution to water scenario.
• Geology and topography	Alteration in natural unregulated drainage taken care of by apt channelizing storm water flow and limiting soil erosion.
• Biological conditions	No significant impact.
• Ecology	Landscaping and plantation will improve local ecology.
• Sound and noise	No significant impact.
• Human resources	
◉ <i>Social and cultural status</i>	No significant impact.
◉ <i>Economic conditions</i>	Increase in commercial worth of property in surrounding region.
◉ <i>Human interest and aesthetics</i>	Beautification of barren area.

4.3.2 Land transformation and construction

• Atmosphere	The modest construction activity will not have any visible effect on the local PM ₁₀ & 2.5, stressing beyond the AAQS.
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• Water resources	Water requirement being marginal, there will be no significant impact.
• Geology and topography	No significant impact.
• Biological conditions	No impact specific to the study area/site.
• Ecology	No impact specific to the study area/site.
• Sound and noise	There will be some noise due to construction machinery, but it will not be stressing beyond permissible limits.
• Human resources	
◦ <i>Social and cultural status</i>	No significant impact.
◦ <i>Economic conditions</i>	The activity will generate extra employment and business opportunities.
◦ <i>Human interest and aesthetics</i>	Beautification of barren area.

4.3.3 Resource extraction and consumption/renewal

• Atmosphere	No significant impact.
• Water resources	The industry would use river water to cater the needs of the industry, hence no stress laid on ground water resources.
• Geology and topography	The construction material requirement is insignificant. Effects of its harvesting on lithospheric character of respective source areas are marginal and not specific to the study area/site.
• Biological conditions	No significant impact specific to site.
• Ecology	No significant impact specific to site.
• Sound and noise	No significant impact specific to site.
• Human resources	
◦ <i>Social and cultural status</i>	No significant impact.

⊙ <i>Economic conditions</i>	The activity will generate extra job and business opportunities.
⊙ <i>Human interest and aesthetics</i>	No significant impact.

4.3.4 Processing/industrial activity

• Atmosphere	Gaseous emissions will have little local effect.
• Water resources	No significant effect on local groundwater resource as the industry would use river water to cater its need.
• Geology and topography	No significant impact.
• Biological conditions	Appropriate personal protective equipment will eliminate the potential hazards to the workers.
• Ecology	No significant impact.
• Sound and noise	Some noise from the industrial activity will be contained through appropriate noise reduction measures.
• Human resources	
⊙ <i>Social and cultural status</i>	Improved quality of life in surrounding area.
⊙ <i>Economic conditions</i>	The activity will generate extra employment and business opportunities.
⊙ <i>Human interest and aesthetics</i>	No significant effect.

4.3.5 Waste treatment and emplacement

• Atmosphere	Appropriate mitigative measures (flue gas cleaning) will eliminate potential harmful effects.
• Water resources	Reuse of treated water will improve greenery in the complex without stressing groundwater resources.
• Geology and topography	No significant impact.

• Biological conditions	Appropriate mitigative measures (flue gas cleaning) will eliminate potential harmful effects.
• Ecology	Development of green area will be beneficial to terrestrial ecology.
• Sound and noise	No significant impact.
• Human resources	
◉ <i>Social and cultural status</i>	No significant impact.
◉ <i>Economic conditions</i>	No impact specific to the study area/site.
◉ <i>Human interest and aesthetics</i>	No significant impact.

4.3.6 Demographic changes

• Atmosphere	No significant impact.
• Water resources	No significant impact.
• Geology and topography	No significant impact.
• Biological conditions	No significant impact.
• Ecology	No significant impact.
• Sound and noise	No significant impact.
• Human resources	
◉ <i>Social and cultural status</i>	Improvement in quality of life.
◉ <i>Economic conditions</i>	Improved job opportunities.
◉ <i>Human interest and aesthetics</i>	Gains for local bodies contribute to urbanized development of the area.

4.3.7 Changes in transportation pattern

• Atmosphere	Marginal addition to vehicular emissions.
• Water resources	No significant impact.
• Geology and topography	No significant impact.
• Biological conditions	No significant impact.
• Ecology	No significant impact.
• Sound and noise	No significant impact.
• Human resources	
◦ <i>Social and cultural status</i>	No significant impact.
◦ <i>Economic conditions</i>	Improved job opportunities.
◦ <i>Human interest and aesthetics</i>	No significant effect.

4.3.8 Requirement of civic amenities, public services and facilities

• Atmosphere	No significant impact.
• Water resources	No significant impact.
• Geology and topography	No significant impact.
• Biological conditions	No significant impact.
• Ecology	No significant impact.
• Sound and noise	No significant impact.
• Human resources	
◦ <i>Social and cultural status</i>	No significant impact.

⊙ <i>Economic conditions</i>	No significant impact.
⊙ <i>Human interest and aesthetics</i>	No significant effect.

4.3.9 Accidents

• Atmosphere	Any event of fire or explosions will harm the air environment of the area.
• Water resources	No significant impact.
• Geology and topography	No significant impact.
• Biological conditions	Worker exposure to hazardous working environment will be minimized through appropriate safety measures and personal protective equipment.
• Ecology	No significant impact.
• Sound and noise	No significant impact.
• Human resources	
⊙ <i>Social and cultural status</i>	No significant impact.
⊙ <i>Economic conditions</i>	Any accidental incident will harm the industrial unit and its direct/indirect dependents economically.
⊙ <i>Human interest and aesthetics</i>	No significant effect.

4.4 QUANTIFICATION OF SIGNIFICANT IMPACTS

The only significant impact in context of the proposed expansion of the project, that need to be modeled and quantified, is release of flue gas emissions into the atmosphere and their effect on ground level concentrations of different parameters – PM_{10&2.5}, SO₂, and NO_x – in the study area.

There would not be any NO_x formation in the combustion process resulting from the operation of the plant, its modeling for GLC analysis is not required.

Thus, modeling for GLC analysis of SPM and SO₂ has been done.

There are a large number of mathematical models available for the prediction of impacts on air environment. These models deal with different types of atmospheric sources, different types of air pollution sources, different topographic features and cater to different types of requirements. Some of the available mathematical models require large amount of meteorological data and computer resources to handle these data, whereas some models could be used with less amount of data. Keeping in view of the requirement and data availability, one has to identify a proper model suitable to the specific project for prediction of impacts on air environment.

The site for the proposed project site is situated on a flat terrain. There is one stack which is identified as significant elevated continuous point source. A short-term multiple point sources **Gaussian Plume Dispersion Model (PTMTP)** has been identified as the suitable model for prediction of impacts on air environment.

The basic equations of the PTMTP model is given below.

For stable conditions or unlimited mixing;

$$X_p = Q_{g1} \cdot g^2 / (2n \cdot r_y \cdot r_z \cdot u)$$

In unstable or neutral conditions and if r_z is greater than 1.6 times the mixing height (L), than;

$$X_p = Q_{g1} / [(r_y \cdot L_u \cdot (2n)^2)]$$

In all other unstable or neutral conditions, that is, if r_z is less than 1.6 times mixing height;

$$X_p = Q_{g1} \cdot g^3 / (2n \cdot r_y \cdot r_z \cdot u)$$

the expressions used are;

$$g_1 = \exp(-0.5Y^2/r_y^2)$$

$$g^2 = \{\exp[-0.5(z-H)^2/r_z^2] + \exp[-0.5(z+H)^2/r_z^2]\}$$

$$g^3 = E_o \{\exp[-0.5(z-H_2N_L)^2/R_z^2] + 0.5(z+H+2N_L)^2/R_z^2\}$$

Where,

X_p = Ground level concentration, g/m³

L = Mixing height, the top of the unstable layer (m),

Y = Crosswind direction (m),

Z = Receptor height above ground (m)

- r_y = Standard deviation of plume concentration distribution in lateral (m)
- r_x = Standard deviation of plume concentration distribution in vertical (m)
- u = Wind speed, (m/s)
- Q = Emission rate from point sources, (g/sec)
- H = Effective height of the source, (m)

4.4.1 Micrometeorology

The wind speed and wind direction data were recorded for the winter season.

The wind data was analysed to obtain predominant wind direction and average wind speed for 1 to 24 hours, and the same data was used in the prediction of impacts on air environment.

The hourly wind speed, solar insolation and total cloudness during day time and wind speed and total cloudness during night time were used to determine the hourly atmospheric stability class (Pasquill and Gifford) viz., A to F. Visual observations were made for the cloud cover during study period. Mixing heights during night time were considered to be zero as stable atmospheric conditions prevail during night. The average meteorological conditions as observed during the study period have been used for prediction of impacts.

4.4.2 Air Quality Prediction

The point multiple point (PTMTP) model was used to predict the ground level concentrations (GLC) of SPM and SO₂ due to the proposed project. Predicted GLC of the pollutant was superimposed on the existing baseline data to assess the overall impact on surrounding air quality. The GLC was predicted on 24 hourly average basis.

During the study period predominant wind direction was towards N-W direction. Maximum incremental concentrations, predicted due to the stack emissions from the proposed industrial facility within the study area, are 8.0 µg/m³ for SPM. Maximum baseline values of PM(10&2.5) obtained during the study period in NW direction was 68.6 µg/m³ and 35.8 µg/m³ respectively in village Badbasul. The PM (10&2.5) concentration remains well within the limits after the addition of incremental SPM level due to the upcoming of the project.

Maximum incremental concentrations, predicted due to the stack emissions from the proposed industrial facility within the study area, are $3.5 \mu\text{g}/\text{m}^3$ for SO_2 . Maximum baseline values of SO_2 obtained during the study period in NW direction was $15.7 \mu\text{g}/\text{m}^3$ in village Badbasul. The SO_2 concentration remains well within the limits after the addition of incremental SPM level due to the upcoming of the project.

Therefore maximum GLCs after superimposing on existing background level will be well within the limits as prescribed by the MoEF.

4.5 OVERALL IMPACT ASSESSMENT

An effort has been made to objectively assess the overall environmental impact of the proposed project.

Impending impact (beneficial or adverse) due to various project determinants on the environmental parameters have been assessed (refer *Section 4.3*) and rated on a scale of -5 to 0 to 5 . Higher negative value suggests severity of adverse effect or disadvantageous state. 0 denotes no significant effect or no significant change.

Progressive positive values represent intensity of beneficial effects or advantageous state. The assessment is comparative to “no action” scenario.

Further, in the context of project under study, each parameter has differing importance in their relative contribution to overall impact. The concept of impact weight has been introduced to rate the same. All the parameters have been assigned some numerical value, aggregate of which (for all the parameters) is 100 .

The impact value for each parameter is product of corresponding impact weight and impact rating assigned.

The summation of all impact values (for all the parameters/determinants) gives summary impact value for the project, ratifying the impending environmental impact of the project.

A positive summary impact value favours the project, whereas, a negative value asks for rejection of project from environmental perspective. The numerical value denotes intensity of overall rating.

Refer *Annexure 5* for tabulated assessment of environmental impact.

The aggregate impact value, for the proposed project, is 15. A good positive

aggregate environmental impact value suggests that the project has fair benefits and advantages. The harmful effects are mitigable and manageable. Thus the assessment favours realisation of the proposed project at the suggested site.

Chapter – 5

ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan (EMP) is meant to ensure that the adverse residual environmental impacts, if any, due to the regular operations of the project, are completely checked or, otherwise, minimised. Further, the EMP also warrant compliance with all the statutory requirements applicable to the project, from time-to-time right from the conception.

While evolving an effective and feasible EMP, due consideration has been accorded to the technological as well as the economic aspects. The EMP addresses the following facts;

- The appropriate mitigation measures
- The monitoring of the state of physical environment, internal as well as external to the industry
- Steps to augment environmental capacity building
- The house-keeping practices
- The emergency/disaster management
- The state of socio-economic issues

The plan is expected to cater to the environmental and other related issues of the project, comprehensively, and manage its environmental performance.

5.1 MITIGATION MEASURES

As a result of the project related actions, some activities have significant environmental concern. Appropriate mitigation measures have been recommended to take care of these concerns and minimize resulting damage to the environment.

Suitable management and control systems have been planned and measures have been proposed to eliminate or mitigate the adverse impacts.

5.1.1 Flue gas cleaning

The industry plans to install a 30 T PH capacity fluidized bed boiler (FBC) for steam and 3.0 MW of cogeneration of power for the proposed phase I of the distillery unit. Identically similar unit would be installed in phase II, after the commissioning of the phase I. FBC boiler furnace is the most suitable technology for the burning of biomass and coal as fuel.

The air pollution control system, for the combustion emissions from the boiler furnace, will comprise of;

- a) ducting arrangement to transport emissions to the APCD,
- b) an APCD – electro-static precipitator
- c) an ID fan, and
- d) a stack to discharge the cleaned flue gas at adequate height.

The boiler furnace emissions will be conveyed into the APCD, the electro-static precipitator (ESP), where it will get cleaned (removal of SPM) before being discharged into the atmosphere, through a stack of adequate height.

Electro-static precipitator

The ESP will have following technical specifications;

- | | | |
|------------------------------|---|---|
| 1. Design gas flow rate | – | 50000 m ³ /hour |
| 2. Temperature | – | 140-150°C |
| 3. Maximum inlet dust load | – | 22 g/Nm ³ |
| 4. Outlet emission dust load | – | <100 mg/Nm ³ |
| 5. Plate area | – | 2000 m ² |
| 6. Specific collection area | – | 111.69 m ² /m ³ s |
| 7. Velocity through ESP | – | 0.50 m/s |
| 8. Treatment time | – | ~22 s |
| 9. Migration velocity | – | ~5.0 cm/s |
| 10. Number of fields | – | 3 |
| 11. Efficiency | – | > 99.54% |

The flue gas cleaning system will achieve SPM removal efficiency of more than 99.54%, resulting in emission discharge with SPM concentration of less than 50 mg/Nm³.

Stack

The stack shall have adequate height to properly disperse SO₂ generated or 40 m, whichever is more. The stack height is calculated using the equation;

$$H = 14 (Q)^{0.3}$$

Where, H is stack height (in m), and

Q is quantity of SO₂ generated (in kg/hour).

- | | | |
|---|---|----------------|
| a) Rate of fuel combustion | = | 6500 kg/hour |
| b) Rate of combustion of S (maximum)
(@ 0.18 % Sulphur in rice husk) | = | 11.7 kg/hour |
| c) Maximum SO ₂ in the emissions | = | 23.4 kg/hour |
| d) Stack height (minimum) | = | 36.0 m |
| e) Stack diameter | = | 1.2 m |
| f) Height of sampling port above inlet | = | 12 m (minimum) |

A sampling port with platform shall be provided for monitoring purposes. A ladder arrangement shall be provided to access the sampling port.

5.1.2 Wastewater treatment and disposal

The project will result in generation of following types of effluents from the process operations during each phase of the project;

- Spent Wash from Distillation Process : The project would result in generation of spent wash from the distillation process. Spent wash @ 270 m³/day would be generated during the production of alcohol @ 45 KL/day. After decantation, 40 MT/day of wet cake would be generated and net thin slops generation would be 230 MT/day. Out of this, 50 MT /day of thin slops would be reused in the liquefaction and balance 180 MT/day of spent wash would be treated in multiple-effect evaporation system.
- Condensates from Process and MEE : The project would result in generation of process condensates (spent lees) from the distillation process and multiple effect

evaporation condensates. Spent lees @ 60 m³/day would be generated and MEE condensate @ 150 m³/day would be generated. A part of the condensates would be used in the process for slurry preparation and the remaining after treatment would be used for makeup water of cooling towers.

- c) Effluent from other processes : Besides the above mentioned streams, effluent would be generated from misc. other streams such as – Fermentor washing effluent @ 20 m³/day, cooling towers blow down @ 25 m³/day, domestic effluent @ 09 m³/day, D.M. plant reject @ 15 m³/day, Bottlewash/spillages @ 12 m³/day and boiler blowdown @ 15 m³/day. This effluent would be moderately polluted and after treatment would be used on land for irrigation purposes.

5.1.2.1 MULTIPLE EFFECT EVAPORATION (Treatment of Spent Wash)

The suggested treatment scheme Effect working on the principle of falling film & Force Circulation

- Analyzer vapors is fed to the first effect evaporator shell side and steam is fed to shell side finisher at the given pressure and temperature as the heating medium.
- Vapors from last effect are condensed in Surface Condenser. A Shell & tube type Multi-pass Surface condenser is employed for condensing the shell side vapors.
- The product at the desired concentration 35-40% is obtained at the outlet of Finisher.
- Each effect is provided with recirculation cum transfer pump.
- The condensate from surface condensers is collected in a common condensate pot. The condensate is transferred for further treatment / Recycle by using centrifugal pump.
- The Pure steam condensate are collected in receiving vessels and can be pumped to desired battery limit
- Highly efficient operating pumps have been provided for pumping the required fluid.
- The plant is having high level of automation to get consistent output at required concentration.
- The system operates under vacuum. Water-ring vacuum pumps are used to maintain a desired vacuum.

5.1.2.2 Treatment of Condensates

The spent lees and condensates from stage I and stage II of multiple effect evaporation (210 m³/day) would be collected in a collection tank. The condensates would be treated in a condensates polishing unit consisting of aeration, clarification, sand filtration and activated charcoal filtration before its final reuse in cooling water makeup. The detailed design consideration of condensate polishing unit are as follows;

Collection tank

The collection tank will be provided with an HRT of about 6 hours for 210 m³/day of effluent. So, the collection tank will have a total capacity of around 50 m³. The tank will have conventional rectangular geometry.

Aeration tank

The tank will have completely mixed flow regime. The specifications of the tank are as under;

Flow Rate	–	210 m ³ /day
1. BOD loading	–	500 mg/l
2. MCRT	–	6 days
3. F/M	–	0.2
4. MLSS	–	3500 mg/l
5. MLVSS/MLSS ratio	–	0.8
6. HRT	–	24 hours
7. Effective tank volume	–	210 m ³
8. Air requirement (for diffused aeration)	–	300 m ³ /hour
9. Nutrient ratio (BOD:N:P) required	–	100:7:1
10. Treatment efficiency (BOD ₃ removal)	–	> 95%

The tank will be provided with fine-bubble diffused aeration system. The air is supplied by the twin-lobe roots blowers of desired capacity at 0.5 kg pressure.

Secondary clarifier

The secondary settling unit is meant to separate the solids from the mixed liquor from the aeration tank. The process is very critical for the efficient operation of the ASP. The clarifier can be described as under;

- | | | |
|---------------------------|---|--|
| a) Design overflow rate | = | 16 m ³ /m ² .day |
| b) Peaking factor | = | 2.0 |
| c) Design flow (at p.f.) | = | 17.5 m ³ /hour |
| d) Settling area required | = | 26.25 m ² |

The secondary clarifier will be rectangular in geometry. The separated solids (underflow) would be either recycled back into the aeration tank or would be wasted (to adjust for the excess sludge generated) onto sludge filter beds.

Intermediate Storage Tank

An intermediate storage tank of around 2 hours HRT would be provided for feeding the treated effluent in the pressure sand filter and activated charcoal filter. The tank will have conventional rectangular geometry.

Sand Filtration

The pressure sand filter will have following specifications;

- | | | |
|-----------------------------------|---|---|
| a) <i>Working principle</i> | – | <i>down flow</i> |
| b) Maximum flow rate | – | 10 m ³ /hour |
| c) Minimum flow rate | – | 7 m ³ /hour |
| d) Maximum working pressure | – | 3 kg/cm ² |
| e) Minimum working pressure | – | 1.5 kg/cm ² |
| f) Pressure vessel type | – | vertical cylindrical |
| g) Filtration rate | – | 14 m ³ /m ² .hour |
| h) Effective diameter | – | 1200 mm |
| i) Effective height | – | 2500 mm |
| j) Filtration media type | – | Graded sand with under bed |
| k) Top layer (anthracite 1-2 mm) | – | 700 |
| l) Second layer (sand 0.4-0.8 mm) | – | 600 mm |
| m) Total bed depth | – | 1300 mm |
| n) Backwash velocity required | – | 0.8-1.2 m ³ /m ² .min |
| o) Backwash water feed rate | – | ~1 m ³ /min |

Activated Charcoal Filtration

The activated charcoal filter will have following specifications;

- | | | |
|-----------------------------|---|-------------------------|
| a) <i>Working principle</i> | – | <i>down flow</i> |
| b) Maximum flow rate | – | 10 m ³ /hour |

c) Minimum flow rate	–	7 m ³ /hour
d) Maximum working pressure	–	3 kg/cm ²
e) Minimum working pressure	–	1.5 kg/cm ²
f) Pressure vessel type	–	vertical cylindrical
g) Filtration rate	–	16 m ³ /m ² .hour
h) Effective diameter	–	1200 mm
i) Effective height	–	2500 mm
j) Filtration media type	–	charcoal with minimum 600 iodine value
k) Total bed depth	–	1300 mm
l) Backwash velocity required	–	0.8-1.2 m ³ /m ² .min
m) Backwash water feed rate	–	~1 m ³ /min

Final Treated Effluent Storage Tank

The final treated effluent storage tank will be provided with an HRT of about 4 hours. The tank will have conventional rectangular geometry. Treated effluent from this tank would be transferred to the cooling towers for their makeup requirements.

5.1.2.3 Treatment of Other Streams

Effluent generation from other misc. streams as discussed above would be less than 100 m³/day. The mixed effluent would be moderately polluted. The mixed effluent would be collected in a collection tank. Thereafter it would be treated through anaerobic biofiltration, aeration and clarification. The treated effluent would be disposed on land for irrigation purposes. The detailed design consideration of effluent treatment plant are as follows;

Collection tank

The collection tank will be provided with an HRT of about 8 hours for 100 m³/day of effluent. So, the collection tank will have a total capacity of around 40 m³. The tank will have conventional rectangular geometry.

Primary clarifier

The primary settling unit is meant to separate the solids from the untreated effluent. The process is very critical for the efficient operation of the ETP. The clarifier can be described as under;

a) Design overflow rate	=	12 m ³ /m ² .day
-------------------------	---	--

- b) Peaking factor = 2.5
 c) Design flow (at p.f.) = 11.50 m³/hour
 d) Settling area required = 23 m²

The primary clarifier will be rectangular in geometry. The separated solids (underflow) would be wasted onto sludge filter beds.

Anaerobic Biofilter

Average Flow Rate assumed	100 KLPD
Average COD Load	6000 mg/l
Peak daily COD Load	550 kg/day
COD loading assumed	0.3 kg/m ² .day
Surface area required	1850 m ²
Surface area available per m ³ with media	110
Volume of media required	20
Capacity of tank	200 m ³

Aeration tank

The tank will have completely mixed flow regime. The specifications of the tank are as under;

Flow Rate	–	100 m ³ /day
1. BOD loading	–	600 mg/l
2. MCRT	–	6 days
3. F/M	–	0.2
4. MLSS	–	3500 mg/l
5. MLVSS/MLSS ratio	–	0.8
6. HRT	–	24 hours
7. Effective tank volume	–	~ 110 m ³
8. Air requirement (for diffused aeration)	–	~ 150 m ³ /hour
9. Nutrient ratio (BOD:N:P) required	–	100:7:1
10. Treatment efficiency (BOD ₃ removal)	–	> 95%

The tank will be provided with fine-bubble diffused aeration system. The air is supplied by the twin-lobe roots blowers of desired capacity at 0.5 kg pressure.

Secondary clarifier

The secondary settling unit is meant to separate the solids from the mixed liquor from the aeration tank. The process is very critical for the efficient operation of the ASP.

The clarifier can be described as under;

a) Design overflow rate	=	16 m ³ /m ² .day
b) Peaking factor	=	2.5
c) Design flow (at p.f.)	=	17.2 m ³ /hour
e) Settling area required	=	26 m ²

The secondary clarifier will be rectangular in geometry. The separated solids (underflow) would be either recycled back into the aeration tank or would be wasted (to adjust for the excess sludge generated) onto sludge filter beds

Septic tank for domestic treatment

The septic tank will provide an effective HRT of at least 48 hours, for maximum daily flow, to biologically stabilize, partially, the organic pollution load. A two compartment septic tank will be used for the purpose. The stabilisation compartment (first compartment) will have volumetric capacity of 50 m³/day, with aspect ratio (length:width) of at least 3. Floor slope at 1:5 will be provided for sludge accumulation. The effective submerged depth of tank will not exceed 2.5 m.

Provision will be made for periodic withdrawal (pumping out) of accumulated sludge. The actual tank dimensions will be worked out to suit the process and site requirements.

5.1.2.4 Disposal of treated wastewater

The industrial unit will generate a maximum of 100 m³/day of wastewater from the proposed project which needs to be disposed off on land for irrigation purposes. The treated wastewater will be used for watering/irrigation of the green area (horticulture and plantation) within the project site. Area available for this purpose is more than 50000 m² within the industrial premises.

Nominal water application rate for watering /irrigation can be safely assumed to be about 1 cm/day. Thus, maximum green area requirement for disposal of 100 m³ of wastewater is about 10,000 m², which is much less than the area available for the purpose.

5.1.3 Solid waste management

The plant facility will generate a maximum of 15 MT/day of ash. The ash handling will be totally in an enclosed system. The ash handling system shall be designed to take care of 100% fuel burning. Ash collected from the bottom of furnace (bottom ash) and the ash collected in the air heater hoppers and ESP (air pollution control system) hoppers will be taken to an ash silo through a pneumatic conveying system. Ash silo will have the capacity of storage for 1 day of ash. The ash from the silo will be unloaded through the ash conditioner and stored on land. This ash will be finally disposed for the preparation of fly ash bricks. The industrial unit will commit about 5000 m², exclusively to be developed for ash handling.

5.1.4 Hazardous waste management

The plant facility will result in generation of about 1 kL/year of spent oils (lubricants and transformer oil), which will be stored on site and sold to authorised recyclers.

5.1.5 Sundry measures

Sundry mitigative measures proposed to alleviate harm to the local environmental concerns are as under;

	Issue	Mitigative measures
1.	Safety during construction	All labour will be provided with personal protective equipment. Working hours and working conditions, as per ILO norms, will be strictly adhered to.
2.	Construction material	The material to be procured from existing approved sources conforming to the applicable environmental provisions and should have valid consents/permissions/authorizations.
3.	Equipment and machinery	All equipment and machinery will conform to the relevant BIS norms, other statutory provisions (in terms of performance, emissions, noise, etc.)

	Issue	Mitigative measures
4.	Noise control	<p>The industry will follow “<i>buy quiet</i>” while selecting machinery and equipment with the aim of achieving employee daily noise exposures of or below an $L_{Aeq,8h}$ of 85 dB(A).</p> <p>The hierarchy of noise control – elimination, substitution, isolation, and engineering control – will be used in workplace design.</p> <p>Regular maintenance will also ensure noise control.</p>
5.	Ground water usage	The ground water scene in the area is not exploited. To minimize the additional stress to meet the project’s water requirement, appropriate storm water management will be implemented.
6.	Material transportation and handling	The vehicles should conform to Motor Vehicles Act, 1988. The covered transportation will be preferred. Due care to be taken during unloading.
7.	Material storage	<p>All materials (raw material, fuel, lubricants etc.) will be stored in covered area with lined floor. Any spillage/leakage of liquids will be immediately attended.</p> <p>The storage areas will be protected from exposure to storm water run-off.</p>
8.	Drainage	The industrial unit will have adequate storm water drains for the complex to prevent flooding of the complex as well as surrounding areas.
9.	Green belt development	Plantation around plant area, in ash storage area, areas of critical GLC of pollutants.
10.	Occupational health and safety	The workers will be provided with suitable personal protective equipment and will be compulsorily made to wear them.
11.	Accidents	<p>Adequate preventive measures to be implemented. An elaborate health and safety plan is already in place.</p> <p>Personal protective equipment will be suitably provided.</p> <p>Workers to be properly trained in on-site emergency response management.</p>
12.	Environmental conditions	Regular monitoring of air, water, noise, and soil quality, through self or an approved monitoring agency will be periodically undertaken.

5.2 Green Belt Development

The industry has the social obligation to recreate the environmental status by providing thick green cover to suppress fugitive emission and provide aesthetic beauty. Trees form the important part of the biosphere in our eco-system. A green belt or tree plantation around the proposed plant shall help to arrest the effects of particulate matter and gaseous pollutants in the area besides playing a major role in environmental conservation efforts. For effective control of air pollutants in and around the proposed industry, a suitable green belt is proposed by taking into consideration the following criteria. The green belt would;

- Mitigate gaseous emissions
- Have sufficient capability to arrest accidental release.
- Effective in wastewater reuse.
- Maintain the ecological balance.
- Control noise pollution to a considerable extent.
- Prevent soil erosion.
- Improve the Aesthetics.

Moreover, keeping in view the characteristics of soil, water quality and topography of the area the following additional aspects have also been considered –

- Tolerance to inorganic chemicals
- Large leaf area index.
- Vertical root development system.
- Locally available.
- Fast growing and perennial.
- Low water requirement.

Taking the above-mentioned criteria into consideration, the green belt covers around 33% of the total project area within the distillery project site. The green belt is consisting of shrubs, trees, avenue trees, revenue trees, crops and potted plants. All the species suggested are pollution tolerant, besides having an aesthetic appeal.

The vegetation of varied types has the potentiality to respond to the hazards of pollution. Trees also act as wind breakers and stop the particulate matter from crossing over. The plants species would be planted in such a way that they are able to control the effects of pollutants.

Aftercare and Monitoring

Investment on reclamation would be futile without adequate and timely aftercare. Aftercare includes weeding, soil working, mulching and fertilizing, and if possible, irrigation to promote better growth of the planted seedlings. The vegetated area would be protected from grazing of animals until the plants are above the level of damage. Wherever necessary, fencing would be erected on the boundaries of reclaimed areas.

5.3 RAIN WATER HARVESTING

Rain water harvesting is the technique of collection and storage of rain water at surface or in sub-surface aquifer, before it is lost as surface run-off. The augmented resource can be harvested in the time of need. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that under natural conditions of replenishment.

5.3.1 Need

- a) To overcome the inadequacy of surface water to meet our demands.
- b) To arrest decline in ground water levels.
- c) To enhance availability of ground water at specific place and time, and utilise rain water for sustainable development.
- d) To increase infiltration of the rain water in sub-soil which has decreased drastically in urban areas due to paving of open area.
- e) To improve ground water quality by dilution.

5.3.2 Advantages

- a) The cost of recharge to sub-surface reservoir is lower than that for surface reservoirs.
- b) The aquifer serves as distribution system also.
- c) No land is wasted for storage purpose and no population displacement is involved.
- d) Ground water is not directly exposed to evaporation and pollution.
- e) Storing water under ground is more environment friendly.
- f) It increases the productivity of aquifer.

- g) It reduces flood hazards.
- h) Effects rise in ground water levels.
- i) Mitigates effects of draught.
- j) Reduces soil erosion.

5.3.3 Design aspects

The important aspects to be looked into for designing a rainwater harvesting system to augment ground water resources are;

- a) Hydro-geology of the area including nature and extent of aquifer, soil cover, topography, depth to water level, and qualitative characteristics of ground water.
- b) The availability of source water, one of the prime requisite for ground water recharge, basically assessed in terms of non-committed surplus monsoon runoff.
- c) Area contributing runoff like area available, land use pattern, industrial, residential, green belt, paved areas, roof top area, etc.
- d) Hydro-meteorological characteristics like rainfall duration, general pattern, and intensity of rainfall.

5.3.4 Design considerations

- a) *Storm water runoff from the roads and pavements will not be allowed to enter rainwater harvesting structures. Separate drain arrangement will be provided for this.*
- b) Average depth of upper ground water table – 15 m.
- c) Critical rainfall intensity – 50 mm in 1 hour.
- d) Run off factors;
 - i) Roof-top area – ~0.8
 - ii) unlined area (kucha area/area under green cover) – 0.2
 - iii) paved/lined/covered area – 0.5
- e) Spatial coverage of the complex contributing to surface run-off (some of the area does not contribute to the run-off at all);
 - i) Roof-top area – ~30000 m²
 - ii) unlined area (kucha area under green cover) – ~60000 m²
 - iii) paved/lined/covered area – ~70000 m²

- f) Time of concentration – ~60 minutes
- g) Maximum storm water available – ~ 3550 m³ in 60 minutes
- h) Recharge method/technique – deep recharge well

5.3.5 The System

- a) Storm water drainage and collection system
- b) Water recharge system – trench with recharge wells

Whole of the complex area will be provided by a network of storm water drains. The drains will link water recharge system.

The drains will provide inlet to each trench of the recharge wells through a grating (screen). The inlet water will surge into an overflow trough (provided to avoid sludging of sand layer) provided all along the inner periphery. Each trench will be provided with an outlet also. This will facilitate outflow of water to other wells in case a particular recharge well gets choked.

In all, the complex will be provided with 20 recharge systems interconnected with each-other through storm drains.

In this arrangement, recharge wells, in addition to theoretical design will introduce safety factor.

The road formation will be approximately 0.45 m above ground level. The plinth levels of the buildings shall be further, at least, 0.45 m above the road level. The natural gradient will be used to flush storm water and transport it through a network of storm drains connecting recharge wells at suitable locations.

5.3.6 Salient features of the adopted recharge system

- a) In areas where large quantities of surface run-off is available, the use of trench/pits is made to store water in a filter media, and subsequently recharge to ground water through specially constructed recharge wells.
- b) Based in the lithology of the area, well assembly is designed with slotted pipes against the shallow and deeper aquifers.
- c) A lateral trench, of suitable size depending upon the availability of water, is constructed with the recharge well in the centre.

- d) The trench is backfilled with boulders, gravels, and coarse sand to act as a filter media for recharge wells.

5.3.7 Specifications

- a) Area of the trench – 5 m x 5 m
- b) Depth of inlet invert – at invert of drainage level
- c) Depth of outlet invert – 100 mm below inlet invert
- d) Filter media (from top to bottom) – coarse sand (1.5-2 mm), gravel (5-10 mm), boulder (50-100 mm).
- e) Diameter of recharge bore – 400 mm
- f) Diameter of recharge pipe – 200 mm
- g) Total aquifer depth required – 10 m
- h) Slot size of the recharge pipe – 3-5 mm

The trench filter top layer will be required to be cleaned at least once a year (preferably before monsoon).

In case of choking of a recharge well, a submersible pump will be introduced in the recharge pipe. The pumping out of the water will washout the choking of the recharge well.

The average rainfall in the area is about 1270 mm/year. Assuming 70% of the total actual rainfall as efficiency of the recharge system, more than 60000 m³ of water will be recharged in an year into the ground water.

5.4 MANAGEMENT, STAFFING AND CAPACITY DEVELOPMENT

The efficiency of a system, depends not only on the infrastructure but also on the level of commitment from the facility management and the kind of manpower and resources provided for its optimal working.

5.4.1 Staffing

The industry shall have an environmental, health and safety committee (from amongst the regular staff of the industry), headed by a co-ordinator (a senior level functionary), who will be adequately trained.

A trained and experienced full-time Manager (Safety, Health and Environment) will

be appointed to oversee and control executive authority over the concerning issues.

Trained manpower will be arranged for operation and management of pollution control systems. Capability for routine monitoring of the control systems, for their efficient operation, will be given due importance. It is planned to develop in-house capacity for automated/manual monitoring of routine stack emission parameters.

Matters pertaining to safety would be reported, in the level of decreasing hierarchy, Vice President (Plant), General Manager (Labour & Industrial Relations) and subordinates. One of them will always be available at the factory during the emergency and will arrange the following;

- a) To shift victim(s) to the hospital, if required
- b) To arrange vehicles to bring the persons/experts required to take care of incident, like doctor
- c) To get in touch with Civil Hospital/Nursing Home to get them prepared to take care of the victims
- d) To contact with other industries, if required
- e) To inform the relevant government authorities
- f) To have liaison with the government bodies

They will be assisted by the other supervisory staff of the factory who will contact other factories, Civil Hospital/Nursing Home, Police Station, etc.

The above said person shall be responsible for controlling the disaster, shifting of victims from the spot and provide the victims with first aid. The Co-ordinator, shall take care of the incident at the site and take all necessary steps to normalise the situation.

5.4.2 Training

Suitable training programs will be arranged for the manpower, which are directly responsible for the pollution control systems and emergency response planning, in their respective field/area of responsibility. The training aspects will include plant start-up, shut-down, day-to-day trouble shooting, operational control and management, monitoring requirements and techniques, etc., and more importantly, on emergency response management including first aid. Information will also be imparted on regulatory requirements applicable.

5.4.3 Budgetary allocation

The commitment has to be in terms of allocation of adequate financial resources, the constraints in which, may result in failure of the overall environmental performance as laid down in the environmental management plan. The facility management have committed to satisfy the budgetary requirements needed to achieve the desired performance levels, without any kind of compromise.

An estimated 10.0 % of the project cost, i.e., about Rs. 4.65 crores, has been earmarked for implementation of environmental management plan.

ESTIMATED OVERALL PROJECT INVESTMENT

The estimated cost of project for the phase I 45 KLPD distillery project and cogeneration of 3.0 MW of power would be as below;

S. No.	Particulars	Cost (Rs. In Lakhs)
1.	Milling, Liquefaction and Sacherification	70.00
2.	Fermentation with Chiller	250.00
3.	Plate Heat Exchangers	70.00
4.	Distillation and MEE	1200.00
5.	Cooling Towers	60.00
6.	Drier	300.00
7.	Boiler and Turbine	1200.00
9.	Civil Works	450.00
10.	Storage Tanks	100.00
11.	CPU	50.00
12.	Electrical Work	100.00
13.	MS structure	100.00
14.	DM Plant, Softner, RO	50.00
	Total	4000.00

Breakup of Capital Cost of Pollution Control Measures

S. No.	DESCRIPTION	COST (Rs. in Crores)
1	Multiple Effect Evaporator	2.50
3	Condensate Polishing Unit	0.50
4	ETP for Misc. Streams	0.20
5	Electrostatic Precipitator	1.00

6	Green Area Development	0.10
7	Development of spent wash storage lagoon, ash handling area etc.	0.20
8	Laboratory for analysis of environmental parameters	0.05
	Total	4.55

Breakup of Recurring Cost of Pollution Control Measures

S. No.	DESCRIPTION	Cost/Annum (Rs. in Crores)
1	Electricity cost (300 KWH @ Rs. 5.5/KWH)	1.30
2	Manpower Cost	0.20
3	Chemicals Cost	0.10
4	Cost of repair and maintenance	0.10
5	Cost of management of ash in scientific manner	0.30
6	Green Area Maintenance	0.05
	Total	2.05

Chapter – 6

ENVIRONMENTAL MONITORING PLAN

The environmental monitoring is meant to establish the state and quality of environment, the adequacy of environmental mitigation measures, and the performance of environmental management system in place. It helps in establishing trends in the quality of the environment (its various components), and changes in the same with respect to the baseline reference quality. It may further help in setting overall performance benchmarks. The monitoring data and results will be communicated to the appropriate authorities.

The monitoring can be done by the industry itself or through approved monitoring agency.

The monitoring requirements are as under;

	Environmental aspect	Parameters	Frequency
1.	Ambient air quality	RSPM ₁₀ , RSPM _{2.5} , SO ₂ , NO _x	Quarterly
2.	Stack emissions	SPM, SO ₂	Online daily
3.	Ground water	pH, TDS, hardness, chloride, alkalinity, sulphate, BOD, COD, microbiological quality	Monthly
4.	Raw/treated wastewater	pH, TSS, TDS, BOD, COD	Online daily
5.	Soil quality (at ash storage site)	pH, alkalinity, conductivity, water holding capacity, SAR, calcium, magnesium, sodium, potassium, nitrogen, available phosphorus, aluminum, nickel, iron	Annually
6.	Sound and noise (at all source points)	L _{eq,day} , L _{eq,night} , L _{eq}	Annually

The industry would install piezometers at suitable locations in consultations with the State Pollution Control Board for the monthly monitoring of ground water quality at various locations within the industrial premises.

The industry would install a basic laboratory within the premises of the factory for the monitoring of the basic environmental parameters required on daily basis. For this, the industry would acquire the basic equipment required for the laboratory. Besides this, as per the latest requirements of Central Pollution Control Board, the industry is also going to install online monitoring equipment at the stack and ETP for measurements of various environmental parameters.

Chapter – 7

ADDITIONAL STUDIES

7.1 OCCUPATIONAL HEALTH & SAFETY

In order to ensure good health of workers, regular health check-up of the plant workers would be carried out. Occupational health surveillance programme will be taken as a regular exercise for all the employees and their record will be maintained.

Production of Rectified Spirit and ENA and subsequent production of IMFL involve storage handling and use of several chemicals. Some of these chemicals are toxic and hazardous in nature. Information about these chemicals is therefore important for the safety of the employees and the plant. Besides, the health status of the employees is also important which may be affected due to exposure to these chemicals. The exposures may be sudden and accidental or for a long period. In both the cases there will be different health effects. Therefore safety measures dealing with these chemicals are of vital importance.

Following table presents the major chemicals stored and handled in the plant

Table - 7.1.1

IMPORTANT CHEMICALS

S. No.	Name of each substances/chemical used, handled, produced as intermediate or end products raw materials, etc.	Boiling point	Flash point	Fire rating value	Health Rating	Reactivity rating
1.	Sulphuric Acid	290 °C	-	0	3	2
2.	Hydrochloric Acid	85 °C	-	0	3	0
3.	Rectified Spirit	78.4 °C	12 °C	4	-	N.A.
4.	Country Spirit/Rum Spirit	81°C	30 °C	2	-	N.A.
5.	Fusel Oil	137.9 °C	38 °C	2	-	N.A.

Health and Safety aspects of the Chemicals

Ethyl Alcohol : Ethyl Alcohol is a flammable liquid requiring a red label by DOT. Its flash point 12 °C (closed cup). Vapour concentration between 3.3% and 19.0% by volume in air is explosive. It reacts vigorously with oxidizing materials. TLV for 8 hr. is 1000 ppm (ACGIH). Minimum identifiable concentration has been reported as 350 ppm. Exposure to concentrations of 5000 - 10000 ppm results in irritation of eyes and mucous membranes of the upper respiratory tract.

Table – 7.1.2

EFFECT OF ETHYL ALCOHOL

mg/l	ppm	Effects in human
10-20	5300 – 10,640	Some transient coughing and smarting of eyes and nose, not tolerable
30	15,960	Continuous lacrimation and marked coughing; could be tolerated with discomfort.
40	21,280	Just tolerable for short period
> 40	>21,280	Intolerable

There is no evidence that inhalation of ethyl alcohol vapour can cause drunkenness or cause cirrhosis.

Hydrochloric Acid : Hydrochloric Acid is also known as muratic acid, chlorohydric acid, hydrogen chloride. It is a colourless gas or colourless fuming liquid, strongly corrosive. Its Mol.wt is 36.47, melting point -114.3°C, Boiling Point - 84.8°C, Vapour Pressure: 4.0 atm @ 17.8°. Acute Toxicity Data: Oral LD60 (rabbit) = 900 mg/kg; inhal LC50 (rat) = 3124 ppm for 1hr; inhal LC10 (human) = 1300 ppm for 1/2 hr. Toxicity Statement (THR): Irritation to skin, eyes, mucous and via oral and inhale routes. Hydrochloric acid is an irritant to the mucous membrane of the eyes and respiratory tract, and a conc. of 35 ppm causes irritation of the throat after short exposure. Conc. of 50-100 ppm is tolerable for 1 hr. More severe exposures result in pulmonary edema, and often-laryngeal spasm. Conc. of 1,000-2,000 ppm is dangerous, even for brief exposures. Mists of hydrochloric acid are considered less harmful than the anhydrous hydrogen chloride, since the droplets have no dehydrating

action. In general, hydrochloric causes little trouble in industry, other than from accidental splashes and burns. It is used as a general-purpose food additive. It is a common air contaminant. Violent reactions with acetic anhydride, 2-amino ethanol, NH_4OH , Ca_3P_2 , chlorosulphonic acid, ethylene diamine, ethylene imine, oleum, HClO_4 , B-propiolactone, propylene oxide, ($\text{AgClO}_4 + \text{CCl}_4$), NaOH , H_2SO_4 , U_3P_4 , vinyl acetate. Also CaC_2 , CsC_2H , Cs_2C_2 , Li_6Si , Mg_3B_2 , HgSO_4 , RbC_2H , Rb_2C_2 , Na .

Disaster Hazard: Dangerous; reacts with water or steam to produce toxic and corrosive fumes.

Sulphuric Acid : Sulphuric Acid is also known as oil of vitriol, dipping acid. It is a colourless, oily liquid. Formula H_2SO_4 . Mol. Wt. is 98.08. Melting Point 330° Boiling Point 10.49°C . Acute Toxicity Data - Oral LD₅₀ (rat) is 2140 mg/kg. [3] Toxicity Statement: MOD via oral route. Extremely irritating, corrosive and toxic to tissue. Contact with the body results in rapid destruction of tissue, causing severe burns. No systemic effects due to continual ingestion of small amounts of this material have been noted. There are systemic effects secondary to tissue damage caused by contact with it. However, repeated contact with dilute solutions can cause dermatitis, and repeated or prolonged inhalation of a mist of sulphuric acid can cause an inflammation to the upper respiratory tract leading to chronic bronchitis. Sensitivity to sulphuric acid or mists or vapours varies with individuals. Normally 0.125-0.50 ppm may be mildly annoying and 1.5-2.5 ppm can be definitely unpleasant. 10-20 ppm is unbearable.

In order to prevent the workers of the industrial unit for any kind of accident, following Personnel Protective Equipments has been provided to them;

Goggles : The workers will be asked to use goggles who work on washing of bottles, filling, cap sealing of bottles for protection of their eyes in case bottles are broken.

Rubber Gumboots : These will be provided to person who handles sulphuric acid. Full suit having hand-gloves, goggles, helmet and aprons will be provided.

Face Shield Helmet : The person deputed for welding work will be provided with face shield helmet.

Medical Facilities : The Factory will be provided with the following medical facilities to handle any emergency:

1. Well equipped First Aid Boxes would be provided in each Section of the factory.
2. The First Aid Boxes would be distinctively marked with a Red Cross on green background and contain the following equipment/accessories:
 - a) Small sterilized dressings.
 - b) Medium size sterilized dressings
 - c) Large size sterilized dressings
 - d) Large size sterilized burn dressings
 - e) Packets sterilized cotton
 - f) Snake bite Lancet
 - g) Pair of scissors
 - h) Bottle of Potassium Permanganate
 - i) Bottle containing 2% of alcoholic solution of iodine.
 - j) Bottle of Sol. Volatile having the dose and mode of administration indicated on the label
 - k) One copy of first aid leaf-let
 - l) Bandages
 - n) Adhesive plaster
 - o) Triangular bandage
 - p) Packets of safety pins
 - q) Supply of suitable splints
 - r) One tournequet

In case of need, factory would be having dispensary to give effective medical facility to workers. In dispensary, sufficient stock of medicines would be made available to provide to workers in case of any major emergent situation. A vehicle would be always made available to shift the sick/injured person to District Hospital.

7.2 DISASTER AND EMERGENCY RESPONSE MANAGEMENT

Disaster, in this context, means a sudden, accidental event that causes many deaths and injuries. Most disasters also result in significant property damage. Common natural causes of disasters include earthquakes, floods, hurricanes and typhoons, and

tornadoes. Tsunamis (popularly, but incorrectly, known as tidal waves), volcanic eruptions, wildfires, and landslides and avalanches rank among the other natural forces that sometimes create disasters.

Not all disasters are produced by the forces of nature. The “man-made” disasters can be traced to explosions, fires, uncontrolled release of hazardous substances/chemicals, acts of war and terrorism, etc., unintentionally or intentionally, triggered by humans.

The disaster management approach entails a National Disaster Framework (a roadmap) covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response, and human resource development.

Major hazards can be generally associated with the potential of fire, flood, or earthquake. Hazard control system is meant to ensure the avoidance of the hazards, or in case of any mis-happening minimum possible impact on residents and surrounding environment. Disaster, in this situation, may include incidences of flood, earthquake, fire, or disruptive incidents of human extremism. While the incidences of natural disaster are remote, these may result in significant loss of life and property.

Disaster, in this situation, may include incidences of flood, earthquake, fire, or disruptive incidents of human extremism. While the incidences of natural disaster are remote, these may result in significant loss of life and property. The project is fire sensitive and accordingly all the suitable arrangements would be made to contain the incident without any damage, if it happens at any time. Adequate, fire fighting arrangement at micro level will be provided by the management.

Most of the situations are likely to be in the category of *Level 1 Emergency* (a local incident with a likely impact only to immediate surroundings of local site, where the impact radius may not be more than 15 m, such as, local fire, etc.) or *Level 3 Emergency* (an incident with likely impact area extending beyond the boundary limits of the project area, such as, floods, earthquakes, etc.).

On site emergency management will meet the exigency created due to all Level 1 emergencies. Level 3 emergencies need off-site management plan.

The construction specifications adopted by the promoters significantly incorporate fire-retarding properties. Adequate, fire fighting arrangement at micro level will be

provided by the promoter. In case of mishap, suitable provisions for emergency evacuation will be incorporated.

Regarding earthquakes, the structures of the project will be got designed to include earthquake resistant features. These will be appropriately incorporated while erection of the structures.

To contain the retrospective effects, only government authorities and agencies, at local and state level govt to be adequately prepared in its mechanism to contain or minimize the losses arising thereof.

7.2.1 Risk Assessment

Starlight Energy Ltd. would be storing around 500 KL of alcohol in the storage tanks at site for each phase. If the alcohol is released into the atmosphere, they may cause damage due to resulting fires or vapour clouds. Analysis has been done for the potential impact if the whole of the alcohol storage is released into atmosphere. The analysis was done with the use of computer software – EFFECT indicating the intensity of heat radiation, duration of fire ball, diameter of cloud and impact area. The results of the assessment are as below;

- Alcohol Storage Tanks – 1000 KL (~ 900000 kgs.) (Both Phases)
- Intensity of Heat Radiation – 31.4 KW/m²
- Duration of Fire Ball – 30.1 seconds
- Diameter of cloud – 558.1 meters

Impact Area due to the heat radiation is as below;

S. No.	Distance (meters)	Max. Thermal Load (KW/m ²)
1.	306.9	18.4
2.	334.9	14.5
3.	362.8	11.9
4.	390.7	10.0
5.	418.6	8.6
6.	558.1	4.5

Impact on surrounding environment due to heat radiation is as below;

S. No.	Max. Thermal Load (KW/m ²)	Damage
1.	37.5	100 % lethality, heavy damage to equipments
2.	25	50 % lethality, nonpiloted ignition
3.	14	Damage to normal buildings
4.	12.5	1 % lethality, piloted ignition
5.	6	Burns
6.	4.5	Non lethal, 1 st degree burns

From the above data, it is clear that if whole of the alcohol storage is released into atmosphere, then the impact area would be upto 560 meters. Accordingly, the company has to take preventive measures for the potential risks associated with the storage of alcohol.

7.2.2 Planning for disaster

The management system, at industry level, needs to include;

- a) Prevention and control at the onset
- b) Setting up an authority, a core group, and control structure
- c) Training and capacity building
- d) Emergency planning for actions on site
- e) Emergency planning for actions off site
- f) Preparing a checklist of periodic requirements
- g) Resource allocation

7.2.3 Prevention and control

Identification of hazards is the starting point for a system of prevention and control. The causes and sources need to be delineated. The probability and extent (magnitude) of their likelihood will also be estimated.

With this background information, every effort will be made to have a safest possible system, under the given constraints. The identified hazards need to be taken care of

by;

- a) Incorporating safety and precautionary features at design, execution, and commissioning stages of development
- b) Identifying and setting early warning indicators
- c) Carrying out preventive measures periodically
- d) Identification and regular monitoring of the potentially accident/hazard prone domains

Additionally, selection/design of vessels, machinery, equipments, pipelines, etc., must take care of the following;

- a) Strict adherence to applicable standards and codes regarding performance and safety
- b) Selection of appropriate MOC
- c) Adequate indicators, proper instrumentation and control system with warning and safety triggering mechanisms

7.2.4 Response planning and management

The overall objectives of and emergency plan are;

- a) To localise the emergency, and, if possible, eliminate it
- b) To minimise the effects of the disaster on people and property

Emergency plans are separate for on-site and off-site matters, but that should be consistent to each other.

On-site emergency plan includes the following issues;

- a) Formulation of the plan and of emergency services
- b) Alarm and communication mechanisms
- c) Appointment of personnel and definition of duties
- d) Emergency control centres
- e) Voluntary organisations
- f) Chemical/material information
- g) Action on site
- h) Rehearsing emergency procedures

i) Plan appraisal and updating

An off-site emergency plan will include the detailed information on following aspects;

- a) Organisation – details of command structure, warning systems, implementation procedures, emergency control centres, details of the key officers.
- b) Communications – identification of personnel involved, communication centre, call signs, networks, list of telephone numbers, etc.
- c) Specialised emergency equipment
- d) Specialised knowledge
- e) Meteorological information
- f) GIS based database
- g) Humanitarian arrangements
- h) Public information
- i) Assessment

7.2.5 Fire protection system

The following systems of fire protection are proposed to be provided for the plant:

- a) Fire alarm system
- b) Fire containment
- c) Hydrant system for the entire plant
- d) High velocity water spray (HVWS) system
- e) Carbon dioxide flooding system
- f) Portable fire extinguishers.

7.2.5.1 Fire alarm system

A fire alarm system would be installed to provide visual and audible alarm in the plant for fire detection at the incipient stage. This system would comprise manual call points located at strategic locations in areas which are normally manned, and automatic smoke and heat *detectors* located at important points such as the cable vault, the control room, switchgear room etc., to detect fire at an early stage, and provide visual and audible alarm.

7.2.5.2 Fire containment

Strategic areas in the plant would be separated by adequately rated firewalls. All openings for switchgears and cable entry would be sealed by fireproof seals to prevent spread of fire from one area to another.

7.2.5.3 Reserve water storage for fire demand

Reserve storage of 500 m³ would be provided in the treated effluent storage tank with a suitable partition to cater to the water requirements of the fire protection system.

7.2.5.4 Hydrant system

The hydrant system comprises the following:

- a) Four pumps, two motor driven and two diesel engine driven, each of 10 m³/hour, capacity would be provided to keep both the hydrant and H₂O VWS system mains pressurized. These pumps will take the suction from the water storage tank.
- b) External as well as internal fire hydrants in all areas of the industry.

7.2.5.5 High velocity water spray system

The HVWS system would be provided for the fuel storage area. Since the parameters for the HVWS system will be identical to that of the hydrant system, the diesel engine driven pump described in the hydrant system serve as a common standby for both HVWS system and hydrant system. The HVWS system consists of a number of high velocity water projectors. Smoke and heat detectors have been used strategically.

7.2.5.6 Portable fire extinguishers

Wall/column mounted type portable fire extinguishers in various areas of the plant including the control room, administration building, canteen, stores, workshop, etc. would be provided. These portable fire extinguishers are basically of carbon dioxide and dry power type.

7.2.6 Lightning protection system

A lightning protection system would be provided as per IS:2309 and Indian Electricity Rules. The protections consist of roof conductors, air terminals and down-comers, and would be provided for high-rise (of more than 10 m height) structures.

7.2.7 Safety earthing system

A safety earthing system consisting of a buried mild steel conductor earthing grid would be provided for the plant transformer yard, switchyard and other outlying areas. These would be connected to the earth grids in various buildings. The buried earthing grid would be further connected to earthing grid and further connected to earthing electrodes buried under ground and located at representative points.

7.2.8 Communication system

Adequate provision of inter-communication telephones, public address system, and walkie-talkie sets along with cellular phone based communication would be made to ensure that communication works fail safe during emergency response planning.

7.2.9 Training and information

While technical measures are essential for the safety, the role of people in management of disasters can not be ignored. The people can have a negative as well as a positive influence on the safety.

It is important to train not only the persons directly involved by the virtue of official authority or institutional affiliations (including NGOs), but also the general public by appropriately disseminating information on;

- a) Possible disaster prone situations and extent of impact
- b) Experience in similar situations elsewhere
- c) Expected response and measures
- d) Role of various constitutional authorities

7.3 OFF-SITE EMERGENCY MANAGEMENT

The Off-Site disaster management plan is as per the requirement of Schedule 12 of MSIHC Rules, 2000. Organizations involved, their responsibilities and liaison arrangements between them are discussed in following paragraphs.

7.3.1 City fire services

It is to combat fire and carry out other emergency operations as per the need. In case of fire, the fire brigade is the best help from outside. Even in a disaster not involving fire, the fire brigade could be of good help, inside the plant and outside, in view of

their specialized equipments and expertise in rescue and relief.

Responsibilities;

- To reach the accident spot as soon as possible with all necessary equipments to extinguish the fire
- To provide all other necessary help depending on nature of emergency

7.3.2 Police

Police is required to manage and control the mob, violence, sabotage or outbreak, if any, cordoning of the area and help in fire fighting and other emergency operations. In case of emergency the police department has a number of functions to perform.

Responsibilities;

- Maintain law and order situation around the premises
- To control the traffic to facilitate the victims to reach hospitals as early as possible
- To restrict entry of any unauthorized persons
- To set up communication to assist in disaster management operation
- To take control of surrounding transport facilities and assist in disaster management operation by shifting injured persons and casualties to nearby hospitals
- Shifting injured persons and casualties to nearby hospitals
- To assist in fire fighting and other emergency operations

7.3.3 Hospital

Hospitals are required to provide first aid, treatment, and also to arrange for removal of victims/casualties. Prompt and efficient medical aid is important in an emergency situation. The first center, inside the industrial premises, can not cope up with all the treatment requirements. The right approach to this problem is to have arrangements with nearby hospitals so that in case of an emergency, services and facilities available with the nearby hospitals can be utilized.

Responsibilities;

- Depute doctors and nurses to site with ambulance

- To provide immediate medical relief to casualties
- Augmentation of equipments, drugs and doctors
- To provide first aid on the spot to casualties
- To take all out efforts on war-footing to save maximum lives
- To continue treatment to casualties till all of them are attended and properly shifted to medical centers

7.3.4 District administration

Civil administration is meant to provide overall supervision of all off-site emergency operations including order to evacuate off-site population. Local administration means those who are responsible for administration of the geographical area where the industrial facility is located.

Responsibilities;

- To protect the citizens
- To assess the situation for overall control
- To monitor the functioning and need of various agencies in rescue operation at site
- To requisite and make available the services and facilities available in the area like additional fire tenders, hospitals, doctors, transport, police, fire brigade, requisition of army and so on
- To coordinate the activities outside the industrial facility in view of their authority and experience in coordinating rescue and relief operations.

7.3.5 Regional transport office

RTO services may be needed to clear all approach roads to and from accident area for free flow of vehicular traffic, which is engaged in combating the emergency, and demarcate parking area for vehicles to evacuate population.

7.3.6 Controller of Explosives and Factory Inspectorate

These authorities are meant to provide expert advice and help in coordinating emergency operations with government agencies.

The inspector of factories is expected to be friend and a guide to industrial

establishments. His involvement is a matter of course since he would be officially connected with inquiries after the disaster.

Responsibilities;

- To coordinate with local government body e.g., civil administration, civil hospital, police department, etc., as well as surrounding voluntary organizations
- To act as off-site emergency controlling authority
- To inform public for precautionary measures

7.3.7 Voluntary organisations

Voluntary organizations should help in relief and humanitarian services to victims in case of any emergency.

Responsibilities;

- To assist in rescue operations and first aid to the victims.
- To arrange transport, refreshment and shelter
- To take necessary assistance from social organizations like Red Cross Society, Scouts, NCC, Rotary, Lions clubs, etc.,

7.3.8 Other industrial installation in the vicinity

Industrial installations present near the site should help to combat the emergency with the available equipment/infrastructure present in their locations.

Responsibilities;

- To provide the strongest possible support and resources to the plant managers so that the best accident prevention and emergency preparedness procedures are in place in the industrial facility
- To encourage their facility managers to commit themselves fully to the awareness and preparedness for emergencies at local level process.

Chapter – 8

PROJECT BENEFITS

M/s Starlight Energy Ltd. are planning to set up 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 MW cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist. Kalahandi, Odisha. The company would be installing the project in two phases. In phase 1, 45 KLPD capacity grain based distillery unit, 3.0 MW cogeneration power plant and 8000 cases/day of IMFL/IMIL bottling unit would be installed. After the commissioning of the phase I, the company would start the installation of the identical similar unit in phase 2. The project would be having many benefits to the state. Some of them are as discussed below;

1. As already stated in chapter 2, lot of broken rice and maize is available in the state. Presently, the same is used within the state and the surplus is sent to outside the state for the production of alcohol and for cattle feed use. When the same would be consumed within the state, the sellers of broken rice and maize would get better price for it.
3. The project would give direct employment to more than 30 technical persons, and around 70 full time skilled labour in each of the phases. Besides this, there would be contractual labour also. With the coming of the project, it can be assessed that at least more than 150 persons would be helped for getting the employment in each of the phase.
4. The industry is putting up the boiler based on rice husk and biomass. The local and nearby villagers can supply the biomass to the plant for boiler. This can become a big source of income for the nearby villagers.
5. The operation of industry would generate opportunities for the transportation of raw materials, products etc. The local people with transportation facilities would be benefitted with the project.

6. The management of the company would invest funds towards Corporate Social Responsibility as per the Company's Act, 2013. The investment in CSR would benefit the local area as the total funds would be utilized for the public welfare only.

Some of the CSR activities that would be followed are as below;

a)	Purchase of Ambulance (stationed at project site for general public)	-	Rs. 10,00,000.00
b)	Adoption of primary school for free education	-	Rs. 15,00,000.00
c)	Funding of Environmental Awareness programs (Local schools of Kalahandi District)	-	Rs. 10,00,000.00
d)	Distribution of free medicines from project site (to needy persons of the nearby area)	-	Rs. 20,00,000.00
e)	Plantation of 20000 saplings in Kalahandi district	-	Rs. 10,00,000.00
f)	Opening of a primary healthcare unit for local and nearby population.	-	Rs. 20,00,000.00
g)	Contribution towards Swachh Bharat Abhiyan by helping local NGO's set up toilets in the surrounding villages.	-	Rs. 10,00,000.00
h)	Setting up Vocational Training Institute (ITI)	-	Rs. 20,00,000.00
	Total	-	Rs. 1,15,00,000.00

Chapter – 9

SUMMARY AND CONSLUSIONS

Name of Project	New Project - 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 MW cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit
Name of Project Proponent	M/s Starlight Energy Ltd., Village Goud Sargiguda, Taluk a Junagarh, Dist. Kalahandi, Odisha.

S. No.	Salient Features	
1.	Location of project Village : Tehsil : District : State : Co-ordinates of all four corners: Average height of area above MSL (m)	Goud Sargiguda Junagarh Kalahandi Odisha 9°49'15.00" N and 82° 52'55.9" E 232.2 meters
2.	Capacity & Unit Configurations:	Phase I : 45 KLPD of ENA/alcohol/RS production, 5 MW of Power Cogeneration and 8000 cases of liquor Phase II : 45 KLPD of ENA/alcohol/RS production, 5 MW of Power Cogeneration and 8000 cases of liquor
	Number of Days operation in a year	330
	Products to be manufactured	ENA/RS/Alcohol – 2 x 45 KLPD Bottling of liquour – 2 x 8000 cases Cogeneration of power – 2 x 3 MW
	By Products	DDGS – 2 x 25 MT/day CO ₂ – 2 x 40 MT/day Fusel Oil – 2 x 1 KL/day

	Raw Material Consumption	Broken Rice/Maize etc. – 2 x 115 MT/day Chemicals (each phase) - enzymes (@ 100 kg/day), sodium hydroxide (@ 50 kg/day), urea (@ 225 kg/day), anti-foam agent (@ 25 kg/day), yeast (@ 100 kg/day)
	Fuel Consumption	Rice Husk/Coal – 160 MT/day for each phase
3.	Land requirement/available	16.18 hectares/40 acres/161840meters
4.	Status of Land acquisition	Already in possession, the land is not a part of the notified industrial area.
5.	Land-Use of project site	Land is for industrial use.
6.	Fuel to be used	Biomass/Coal
7.	Quantity of Fuel Required per Annum	52800 MT/annum for each phase
8.	Source of Water	River Water (River Hati) Ground Water in case river water is not available
	Quantity of raw water to be used	450 m ³ /day (maximum in each phase)
9.	Quantity of industrial effluent generation and domestic wastewater generation.	Each Phase Condensates @ 260 m ³ /day Trade Effluent @ 87 m ³ /day Domestic Effluent @ 9 m ³ /day
10.	Effluent treatment process proposed	For Trade Effluent – Anaerobic followed by aerobic treatment. Further polishing in MSF and ACF. For domestic Effluent – Septic Tank
11.	Disposal of treated effluent	The condensates to be reused in process for slurry preparation and cooling tower makeup water use. Trade effluent of Misc. streams to be used for plantation within industrial premises

12.	Details of process emissions	Process emissions from boiler furnace of 30 TPH capacity
13.	Proposed air pollution control device alongwith stack height	ESP, stack height – 50 meters
14.	Details hazardous waste generation	Used Oil @ 1 KL/day
15.	Management of hazardous waste (Treatment & Disposal)	To be sold to authorized recyclers of used oil
16.	Quantity of Fly Ash to be Generated	5000 MT/annum in each phase
17.	Greenbelt area proposed	55000 m ² /5.5 hectares
18.	Cost of the Project, Rs (in Crores)	Rs. 40.00 Crores (Phase I) Rs. 52.00 Crores (Phase II)
19.	Cost of project earmarked for pollution control measures	Rs. 4.55 Crores
20.	Cost of project earmarked for CSR activities	Rs. 1.15 Crores

CONSLUSIONS : M/s Starlight Energy Ltd. are planning to set up 2 x 45 KLPD capacity grain based distillery plant, 2 x 3.0 MW cogeneration power plant and 2 x 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist. Kalahandi, Odisha. The company would be installing the project in two phases. In phase 1, 45 KLPD capacity grain based distillery unit, 3.0 MW cogeneration power plant and 8000 cases/day of IMFL/IMIL bottling unit would be installed. After the commissioning of the phase I, the company would start the installation of the identical similar unit in phase 2. There are no national parks, wildlife sanctuaries, biosphere reserves, heritage sites etc. located within 10 Km from the proposed plant boundary. No litigation/Court case is pending pertaining to the project. Company has committed to implement all the pollution control measures to protect the surrounding environment. The project can definitely improve the regional, state and national economy. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

F.No.J-11011/298/2014-IA-II(I)
Government of India
Ministry of Environment, Forest and Climate Change
(IA Division)

Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi - 3
Dated: 23rd May, 2018

To,

M/s Starlight Energy Pvt Ltd
Village Goud Sargiguda, Taluka Junagarh,
District Kalahandi - 769001_(Odisha)

Sub: Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x8000 cases/ day) in District Kalahandi (Odisha) by M/s Starlight Energy Pvt Ltd – Amendment/Extension of validity of ToR - reg.

Sir,

This has reference to your online proposal no. IA/OR/IND2/69696/2014 dated 21st September, 2017 on the above mentioned subject.

2. The Ministry had earlier granted terms of reference (ToR) vide letter dated 23rd January, 2015 for the project 'Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL Bottling (2x8000 cases/day)' by M/s Starlight Energy Pvt Ltd at Survey Nos.244, 249 to 251, 253 to 262, 295 to 298, 300 to 302, 314, 317, 319, 322, 327, 331, 334, 337, 339, 340 in Village Goud Sargiguda, Taluka Junagarh, District Kalahandi (Odisha).
3. The present proposal is for amendment in the said ToR in respect of survey nos due to change in land allocation system, and also extension of validity of the ToR.
4. The proposal was considered by the sectoral Expert Appraisal Committee (Industry-2) in its 32nd meeting held on 20-22 December, 2017. The EAC, noted that the proposed amendment in respect of survey number from SABIK to HAL system is due to change in policy of the State Government, and does not qualify for amendment. The EAC, however, recommended for extension of validity of ToR for a period of one year i.e. up to 23rd January, 2019.
5. Based on the proposal submitted by the project proponent and recommendations of EAC (Industry-2), the Ministry of Environment, Forest and Climate Change hereby accords extension of the validity of ToR for a period of one year i.e. up to 23rd January, 2019.
6. All other terms and conditions stipulated in the ToR letter dated 23rd January, 2015 shall remain the same.


(S K Srivastava)
Scientist E

Copy to:

The Member Secretary, Orissa Pollution Control Board, Parivesh Bhawan, A/118, Nilakantha Nagar, Unit-VIII, Bhubaneswar -751012 (Odisha)

J-11011/298/2014-IA II (I)
Government of India
Ministry of Environment, Forest and Climate Change
(IA Division)

Indira Paryavaran Bhawan
Jor Bagh Road, New Delhi - 3
Dated: 6th October, 2017

To,

M/s Starlight Energy Pvt Ltd
Village Goud Sargiguda, Taluka Junagarh
District **Kalahandi** - 769001 (Odisha)

Sub: Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x8000 cases/day) in District Kalahandi (Odisha) by M/s Starlight Energy Pvt Ltd – Correction in ToR - reg.

Sir,

This is in reference to your proposal No. IA/OR/IND2/64190/2014 dated 25th April, 2017 for correction in the ToR for the above project.

2. The Terms of Reference (ToR) for the project 'Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x800 day) by M/s Starlight Energy Pvt Ltd at Survey No.244, 249 to 251, 253 to 262, 295 to 298, 300 to 302, 314, 317, 319, 322, 327, 331, 334, 337, 339, 340 at Village Goud Sargiguda, Taluka Junagarh, District Kalahandi (Odisha) was issued by the Ministry vide letter No J-11011/298/2014-IA-II(I) dated 23rd January, 2015.

3. The project proponent has sought correction in the said ToR in its subject and the text, as under:

S.No.	As per ToR	Correction sought
1.	'IMFL/IMIL bottling (2x800 day)'	'IMFL/IMIL bottling (2x8000 cases/ day)'

4. The proposal was placed before Expert Appraisal Committee (Industry-2) in its 24th meeting held during 14-16 June, 2017. The Committee recommended for the correction in the said ToR dated 23rd January, 2015 as per para 3 above.

5. Based on the recommendations of the EAC, the Ministry hereby accords approval for corrections in the said ToR on the above lines. Accordingly, the term 'IMFL/IMIL bottling (2x800 day)', wherever mentioned in the ToR, shall be read as 'IMFL/IMIL bottling (2x8000 cases/ day)'.

6. All other terms and conditions stipulated in the ToR dated 23rd January, 2015 shall remain unchanged.


6/10/2017
(S. K. Srivastava)
Scientist E

Copy to:

1. The Additional Principal Chief Conservator of Forests (C), MoEF&CC, RO(EZ), A/3, Chandersekharpur, **Bhubaneswar** - 751023
2. The Member Secretary, Odisha Pollution Control Board, Paribesh Bhawan, A/118, Nilakantha Nagar, Unit - VIII, **Bhubaneswar**, Odisha 751012
3. Guard File/ Monitoring File/ Website/ Record File


9/10

J-11011/298/2014-IA II (I)
Government of India
Ministry of Environment, Forests and Climate Change
(I.A. Division)

Indira Paryavaran Bhawan
Aliganj, Jorbagh Road,
New Delhi -110003

E-mail : lk.bokolia@nic.in
Telefax: 011-24695401
Dated: 23rd January, 2015

To,
Shri Suneel Choudhary
Director
M/s Starlight Energy Ltd.
Village Goud Sargiguda Taluka Junagarh
District Kalahandi Odisha

Email.: nil Fax.: nil

Subject: Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x800 day) at Survey No.244, 249 to 251, 253 to 262, 295 to 298, 300 to 302, 314, 317, 319, 322, 327, 331, 334, 337, 339, 340 at Village Goud Sargiguda, Taluka Junagarh, District Kalahandi, Odisha by M/s Starlight Energy Ltd

Ref. No.: Your Letter no SEPL/2014/1921 dated 16 September 2014

Sir,

Kindly refer your letter no. SEPL/2014/1921 dated 16 September 2014 alongwith project documents including Form-I, Pre-feasibility Report and draft 'Terms of Reference' as per the EIA Notification, 2006. It is noted that proposal is Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x800 day) at Survey No.244, 249 to 251, 253 to 262, 295 to 298, 300 to 302, 314, 317, 319, 322, 327, 331, 334, 337, 339, 340 at Village Goud Sargiguda, Taluka Junagarh, District Kalahandi, Odisha by M/s Starlight Energy Ltd

2.0 Draft Terms of Reference (TOR) have been discussed and finalized during the 28th Reconstituted Expert Appraisal Committee (Industry) held during 1st – 2nd December, 2014 for preparation of EIA/EMP report. Following are the 'TORs':

A. Standard TOR:

1. Executive summary of the project.
2. Detailed break-up of the land area alongwith latest photograph of the area.
3. Present land use based on satellite imagery and details of land availability for the project alongwith supporting document.
4. Details of site and information related to environmental setting within 10 km radius of the project site.

5. A copy of lease deed or allotment letter, if land is already acquired.
6. Information regarding eco-sensitive areas such as national park/wildlife sanctuary/ biosphere reserves within 10 km radius of project area.
7. List of existing distillery units in the study area alongwith their capacity and sourcing of raw material.
8. Details of proposed products alongwith manufacturing capacity.
9. Number of working days of the distillery unit.
10. Total cost of the project alongwith total capital cost and recurring cost/annum for environmental pollution control measures.
11. Details of raw materials, its source & availability of all raw materials including cereal grains requirement.
12. Sources and quantity of fuel (rice husk/coal etc.) for the boiler. Measures to take care of SO₂ emission. Stack height should be based on maximum sulphur content in the coal. A copy of Memorandum of Understanding (MoU) signed with the coal suppliers should be submitted.
13. Storage facility for raw materials, prepared alcohol, fuel and fly ash.
14. Action plan to control ambient air quality as per NAAQES Standards for PM₁₀, PM_{2.5}, SO₂ and NO_x as per GSR 826(E) dated 16th November, 2009.
15. One season site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall and AAQ data (except monsoon) for PM₁₀, SO₂, NO_x and HC (methane & non methane) should be collected. The monitoring stations should take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring should also be included.
16. Mathematical modeling for calculating the dispersion of air pollutants and ground level concentration along with emissions from the boiler.
17. An action plan to control and monitor secondary fugitive emissions from all the sources.
18. Details of the use of steam from the boiler.
19. Ground water quality around proposed spent wash storage lagoon and the project area.
20. Details of water requirement, water balance chart for grain based Distillery and co-generation plant. Measures for conservation water by recycling and reuse to minimize the fresh water requirement.
21. Fresh water requirement should be restricted upto 10 Kl/Kl of alcohol for grain based distillery
22. Permission of withdrawal of water from competent authority.
23. Proposed effluent treatment system for grain based distillery (spent wash and spent lees) alongwith utility wastewater including CPP and scheme for achieving zero discharge.
24. Spent wash generation should not exceed 6 Kl/Kl of alcohol production. Details of the spent wash treatment for grain based distillery based distillery.
25. Capacity for spent wash holding tank and action plan to control ground water pollution.
26. Dryer shall be installed to dry DWGS.
27. Layout for storage of rice husk/biomass.
28. Details of solid waste management including management of boiler ash.
29. Green belt development as per the CPCB guidelines.

30. List of flora and fauna in the study area.
31. Noise levels monitoring at five locations within the study area.
32. Detailed Environment management Plan (EMP) with specific reference to details of air pollution control system, water & wastewater management, monitoring frequency, responsibility and time bound implementation plan for mitigation measure should be provided.
33. EMP should also include the concept of waste-minimization, recycle/reuse/ recover techniques, Energy conservation, and natural resource conservation.
34. Risk assessment for storage and handling of alcohol and mitigation measure due to fire and explosion and handling areas.
35. Alcohol storage and handling area fire fighting facility as per norms.
36. Provision of Foam System for fire fighting to control fire from the alcohol storage tank.
37. Action plan for rainwater harvesting measures at plant site should be included to harvest rainwater from the roof tops and storm water drains to recharge the ground water.
38. Details of occupational health programme.
 - i) To which chemicals, workers are exposed directly or indirectly.
 - ii) Whether these chemicals are within Threshold Limit Values (TLV)/ Permissible Exposure Levels as per ACGIH recommendation.
 - iii) What measures company have taken to keep these chemicals within PEL/TLV.
 - iv) How the workers are evaluated concerning their exposure to chemicals during pre-placement and periodical medical monitoring.
 - v) What are onsite and offsite emergency plan during chemical disaster.
 - vi) Liver function tests (LFT) during pre-placement and periodical examination.
39. Details of occupational health surveillance programme.
40. Details of socio-economic welfare activities.
41. Traffic study of the area for the proposed projects in respect of existing traffic, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
42. Action plan for post-project environmental monitoring.

43. Corporate Environmental Responsibility

- a) Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
- b) Does the Environmental Policy prescribe for standard operating process/procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA report.
- c) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Details of this system may be given.
- d) Does the company have a system of reporting of non compliance / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism should be detailed in the EIA report.

44. Any litigation pending against the project and /or any direction /order passed by any Court of Law against the project, if so, details thereof.
45. Public hearing issues raised and commitments made by the project proponent on the same should be included separately in EIA/EMP Report in the form of tabular chart with financial budget for complying with the commitments made.
46. A tabular chart with index for point-wise compliance of above TORs. Any litigation pending against the project and /or any direction /order passed by any Court of Law against the project, if so, details thereof.

B. Additional TOR

1. Public hearing to be conducted and issues raised and commitments made by the project proponent on the same should be included in EIA/EMP Report in the form of tabular chart with financial budget for complying with the commitments made.

The following general points shall be noted:

- i. All documents shall be properly indexed, page numbered.
- ii. Period/date of data collection shall be clearly indicated.
- iii. Authenticated English translation of all material provided in Regional languages.
- iv. The letter/application for EC shall quote the MOEF file No. and also attach a copy of the letter.
- v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.
- vi. The final EIA-EMP report submitted to the Ministry must incorporate the issues in this letter. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report.
- vii. Certificate of Accreditation issued by the QCI to the environmental consultant shall be included.

3.0 These 'TORs' should be considered for the preparation of EIA / EMP for Grain based Distillery (2x45 KLPD) and Cogeneration Power Plant (2x3 MW) and IMFL/IMIL bottling (2x800 day) at Survey No.244, 249 to 251, 253 to 262, 295 to 298, 300 to 302, 314, 317, 319, 322, 327, 331, 334, 337, 339, 340 at Village Goud Sargiguda, Taluka Junagarh, District Kalahandi, Odisha by M/s Starlight Energy. Ltd in addition to all the relevant information as per the 'General Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. The EIA/EMP as per TORs should be submitted to the **Chairman, Orissa Pollution Control Board**, for public consultation. The **SPCB** shall conduct the public hearing/public consultation as per the provisions of EIA notification, 2006.

4.0 You are requested to kindly submit the final EIA/EMP prepared as per TORs and incorporating all the issues raised during Public Hearing / Public Consultation to the Ministry for considering the proposal for environmental clearance **within 3 years as per the MoEF O.M. No. J-11013/41/2006-IA.II (I) dated 8th October, 2014.**

5.0 The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India / National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/Laboratories including their status of approvals etc.

(Lalit Bokolia)
Additional Director

- Copy to :
1. The Chairman, Orissa Pollution Control Board, Parivesh Bhavan, A/118, Neelkanthhanagar, Unit-8, Bhubaneswar-751 012, Orissa
 2. Chief Conservator of Forests (Eastern), Ministry of Environment & Forests, Regional Office, A/

(Lalit Bokolia)
Additional Director

Compliance of the Terms of Reference for conduction of Environmental Impact Assessment Study of the proposed a 2 x 45 KLPD capacity grain based distillery unit having 2 x 3.0 MW cogeneration power plant along with around 8000 cases/day of IMFL/IMIL bottling unit at Village Goud Sargiguda, Taluka Junagarh, Dist. Kalahandi, Odisha, by Starlight Energy Ltd.

S. No.	Approved TOR's	Compliance
1.	Executive summary of the project	Executive Summary of the project is attached as annexure.
2.	Detailed break up of the land area along with latest photographs of the area.	Detailed breakup of the land area is given in article 2.1 of chapter 2. Latest photographs of the project are attached as annexure.
3.	Present landuse based on satellite imagery and details of land availability for the project along with supporting document.	Present land use based on satellite imagery is shown in figure 3.2 of Chapter 3.
4.	Details of site and information related to environmental setting within 10 Km radius of the project site.	The details of site and information relating to environmental setting are given in chapter 3 of the EIA report.
5.	A copy of lease deed or allotment letter, if land is already aquired.	Copy of land papers are attached as annexure.
6.	Information regarding eco-sensitive areas such as national park/wildlife sanctuary/biosphere reserves within 10 Km radius of the project area.	There is no eco-sensitive area such as national park / wild life sanctuary / biosphere reserves / reserve forests within 10 km radius of project area.
7.	List of existing distillery units in the study area along with their capacity and sourcing of raw materials	There is no distillery unit within 50 kms radius of the proposed plant site.
8.	Details of the proposed product along with their manufacturing capacity.	The company would be installing the project in two phases. In phase 1, 45 KLPD capacity grain based distillery unit, 3.0 MW cogeneration power plant and 8000 cases/day of IMFL/IMIL bottling unit would be installed. After the commissioning of the phase I, the company would start the installation of the identical similar unit in phase 2. The specific product mix will include ethanol, ENA, Bottling of country liquor/IMFL and Power cogeneration in the respective phases.
9.	Number of working days of the distillery unit.	330 working days

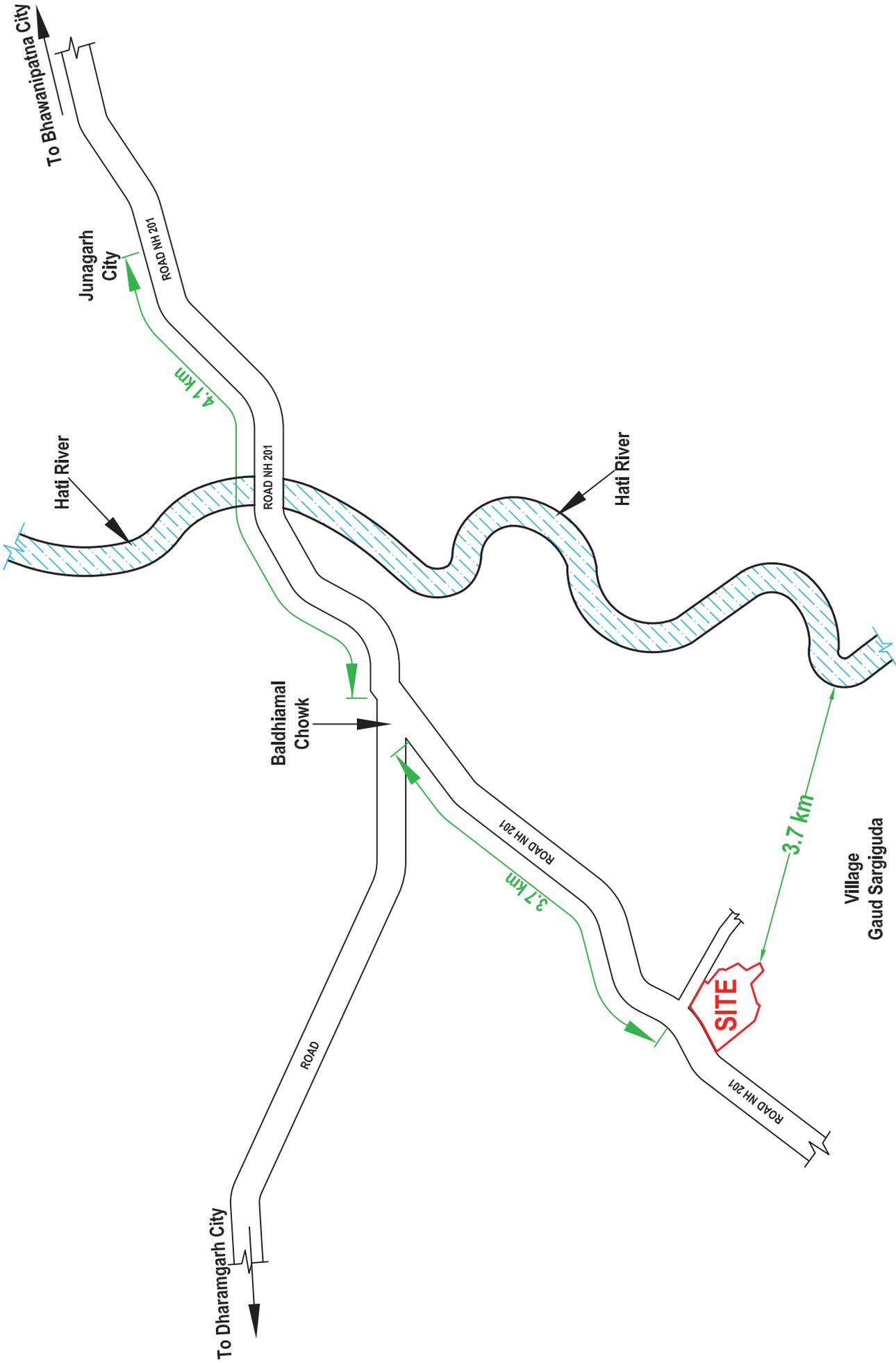
10.	Total cost of the project along with total capital cost and recurring cost/annum for environmental pollution control measures.	Total Cost Phase 1 – Rs. 40.00 Crores Total Cost Phase 2 – Rs. 52.00 Crores Capital cost on environmental pollution control measures – Rs. 4.55 Crores Recurring cost of pollution control measures – Rs. 2.05 crores
11.	Details of the raw material, its source & availability of all raw materials including cereal grains requirement.	Details of the raw material, its source & availability of all raw materials including cereal grains requirement are given in article 2.2.3 of chapter 2.
12.	Sources and quantity of fuel (rice husk/coal etc.) for the boiler. Measures to take care of SO ₂ emissions. Stack height should be based on maximum sulphur content in the coal. A copy of Memorandum of Understanding (MoU) signed with the coal suppliers should be submitted.	Industry would install one boiler of 30 TPH capacity having for 3.0 MW co- generation in phase 1. An identical unit shall be installed for phase 2 of the project. Biomass and coal would be used as fuel @ 6.5 TPH with coal percentage not exceeding 15%. Stack of minimum height of 36 meters will be installed.
13.	Storage facility for raw materials, prepared alcohol, fuel and fly ash.	Storage facility for raw materials, prepared alcohol, fuel and fly ash are given in the layout plan attached as annexure.
14.	Action plan to control ambient air quality as per NAAQES standards for PM ₁₀ , PM _{2.5} , SO ₂ , and NO _x as per GSR 826(E) dated 16th November, 2009.	Action plan for control ambient air quality has been given in chapter 4 and 5 of the EIA report.
15.	One season site specific micro - meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall and AAQ data (Except monsoon) for PM ₁₀ , SO ₂ , NO _x and HC (Methane and Non methane) should be collected. The monitoring stations should take into account the pre- dominant wind direction, population zone and sensitive receptors including reserved forests. Data for water and noise monitoring should also be included.	One season site-specific micro-meteorological data, AAQ data (winter season) for PM ₁₀ , PM _{2.5} , SO ₂ and NO _x , water and noise monitoring data is given in chapter 3 of the EIA report.
16.	Mathematical modeling for calculating the dispersion of air pollutants and ground level conc. along with emissions from the boiler.	Mathematical modeling for calculating the dispersion of air pollutants and ground level conc. along with emissions from the boiler are given in article 4.4.2 of chapter 4.

17.	An action plan to control and monitor secondary fugitive emissions from all the sources.	An action plan to control and monitor secondary fugitive emissions from all the sources has been given in article 5.1 of the EIA report.
18.	Details of the use of steam for the boiler.	Steam balance is enclosed as annexure.
19.	Ground water quality around the proposed spent wash storage lagoon and the project area.	Ground water quality within the project area is enclosed as table 3.10 of chapter 3.
20.	Details of the water requirement, water balance chart for grain based distillery and Co - generation plant. Measures for conservation water by recycling and reuse to minimise the fresh water requirement.	Detailed water balance for the distillery along with reuse is enclosed as figure 2 of chapter 2. Overall water requirements are given in article 2.8.1.8 of chapter 2.
21.	Fresh water requirement should be restricted upto 10 KL/KL of alcohol for grain based distillery.	Water requirement of the project has been restricted to less than 10 KL/KL.
22.	Permission of withdrawl of water from the competent authority.	Industry has applied for the permission from the irrigation department to use river water for industrial purposes. Copy of the docs. submission enclosed as annexure.
23.	Proposed effluent treatment system for grain based distillery (Spent Wash and Spent Lees) alongwith utility wastewater including CPP and scheme for achieving zero discharge.	Details of Multiple Effect Evaporator for the treatment of spent wash are given in article 5.1.2 of chapter 5. Further the details of CPU and ETP for treatment of Misc. Streams is given in article 5.1.2 of chapter 5.
24.	Spent wash generation should not exceed 6 KL/KL of alcohol production. Details of the spent wash treatment for grain based distillery operations.	Spent wash generation is less than 6 KL/KL of alcohol production.
25.	Capacity for spent ash holding tank and action plan to control ground water pollution.	Industry plans to construct a spent wash holding tank of around 5 days capacity and the subsurface of the holding tank would be provided with 400 micron HDPE lining and impervious surface to control any leaching.
26.	Dryer shall be installed to dry DWGS.	The industry would install drier for the drying of DWGS for the proposed project.
27.	Layout for storage of Rice husk/Biomass.	Layout for storage of husk/biomass in given in layout plan.

28.	Details of Solid waste management including management of Boiler ash.	The details of boiler ash management are given in article 5.1.3 of chapter 5.
29.	Green belt development as per the CPCB guidelines.	The details of green belt development are given in article 5.2 of chapter 5.
30.	List of Flora and Fauna in the study area.	List of flora and fauna in the study area is given in article 3.6 of chapter 3.
31.	Noise level monitoring at five locations within the study area.	Noise Level monitoring at 6 locations within study area is given in table 3.8 of chapter 3.
32.	Detailed Environment Management Plan (EMP) with specific reference to details of air pollution control system, water and waste water management, monitoring frequency, responsibility and time bound implementation plan for mitigation measures should be provided.	Detailed Environmental management plan (EMP) with specific reference to detail of air pollution control system, water and waste water management, monitoring frequency etc. is given as Chapter 5 of the EIA report.
33.	EMP should also include the concept of waste minimization, recycle/reuse/recover techniques, energy conservation, and natural resource conservation.	Concept of waste minimization, recycle/ reuse/ recover techniques, energy conservation, and natural resource conservation details are given in Chapter 5 of the EIA report.
34.	Risk assessment for storage and handling of alcohol and mitigation measures due to fire and explosion and handling areas.	Details of risk assessment for storage and handling of alcohol and mitigation measure due to fire and explosion and handling areas are given in article 7.2.1 of Chapter 7.
35.	Alcohol storage and handling areas fire fighting facility as per norms.	Alcohol storage and handling area fire fighting facility as per OISD 117 norms would be provided. Details given in article 7.2.5 of chapter 7.
36.	Provisions of the Foam system for fire fighting to control fire from the alcohol storage tank.	Provision of foam system for fire fighting to control fire from the alcohol storage tank would be provided. Details given in article 7.2.5 of chapter 7.
37.	Action plan for rain water harvesting measures at plant site should be included to harvest rainwater from the roof tops and storm water drains to recharge the ground water.	Details of rain water harvesting system area given in article 5.3 of Chapter 5.

38.	<p>Details of Occupational health programme:</p> <ol style="list-style-type: none"> i. To which chemicals, workers are exposed directly or indirectly. ii. Whether these chemicals are within Threshold Limit Values (TLV)/ Permissible Exposure Levels as per ACGIH recommendations. iii. What measures company have taken to keep these chemicals within PEL/TLV. iv. How the workers are evaluated concerning their exposure to chemicals during pre-placement and periodical medical monitoring. v. What are onsite and offsite emergency plan during chemical disaster. vi. Liver function tests (LFT) during pre-placement and periodical examinations. 	<p>Details of occupational health surveillance are given in article 7.1 of chapter 7.</p>
39.	<p>Details of Occupational health surveillance programme.</p>	<p>Details of occupational health surveillance are given in article 7.1 of chapter 7.</p>
40.	<p>Details of socio-economic welfare activities.</p>	<p>Details of socio-economic welfare activities as proposed by the industry are given in chapter 8.</p>
41.	<p>Traffic study of the area and the proposed projects in respect to existing traffic, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangements etc.</p>	<p>Parking arrangement of the vehicles would be made within the industrial premises. The site falls near the highway and there is no problem for the traffic movement.</p>
42.	<p>Action plan for post project environmental setting.</p>	<p>Details of post project monitoring of various environmental parameters is given in article 5.2 of chapter 5.</p>
43.	<p>Corporate Environmental Responsibility Does the company have a well laid down Environmental Policy approved by its board of directors? if so, it may be detailed in the EIA report.</p>	<p>Details of the administrative system followed in the company are attached as annexure.</p>

	<p>Does the environmental policy prescribe for standard operating process/procedures to bring into focus any infringement/ deviation / violation of the environmental or forest norms/ conditions? if so, it may be detailed in the EIA report.</p> <p>What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions. Details of this system may be given.</p> <p>Does the company have a system of reporting of non compliance / violations of the environmental norms to the board of Directors of the company and / or shareholders at large? This reporting mechanism should be detailed in EIA report.</p>	
44.	Any litigation pending against the project and/or any direction/ order passed by any court of Law against the project if so, details thereof.	There is no litigation pending against the project and / or any direction/ order passed by any Court of Law against the project.
45.	Public hearing issues raised and commitments made by the project proponent on the same should be included separately in EIA/EMP report in the form of tabular chart with financial budget for complying with commitments made.	-
46.	A tabular chart with index for point-wise compliance of above TORs. Any litigation pending against the project and/or any direction/ order passed by any Court of Law against the project, if so, details thereof.	Compliance of the TOR in tabular form has been made.



Issue Record As Built Good For Construction For Tender For DPR Preliminary Design Design Development		Approved for Issue <input type="checkbox"/>
DRAWING TITLE Location Plan		REV:
DRAWING NUMBER AEC/2014/SLI001		SCALE:
DATE: 26/07/2014		
TECHNICAL CONSULTANTS Ace Engineers and Consultants 2nd floor, opp. SBOV, Bhujiguda Road, Pallela email: jain_jy@igyaero.com, mobile: 985 1087586		
PROJECT DEVELOPER & ADVISORY Starlight Infra Pvt. Ltd., Village Goud Sargiguda Tehsil Junagarh, District Kalahandi, Odisha		
By Designer	Yashpal Jain Consultant	Yashpal Jain Issued By
Dhama Singh Drawn by	Yashpal Jain Consultant	

- LAND USAGE DETAILS**
- ① DISTILLERY PLANT = 40.0 ACRES
 - ② RICE MILL = 25.0 ACRES
 - ③ POWER PLANT = 10.0 ACRES
 - ④ IMFL BOTTLING PLANT = 5.0 ACRES
 - ⑤ EFFLUENT TREATMENT PLANT = 25.0 ACRES
 - ⑥ FLY ASH BRICK = 5.0 ACRES
 - ⑦ HOUSING COLONY = 20.0 ACRES
 - ⑧ GREEN PLANTATION = 40.0 ACRES
 - ⑨ RAIN WATER HARVESTING SYSTEM = 25.0 ACRES
 - ⑩ INTERNAL ROAD = 5.0 ACRES

AREA DETAILS
 VILL - GOUD SARGGLUDA
 P.S. - JUNAGARH
 TAHSIL - JUNAGARH
 DIST. - KALAHANDI
 ODISHA

TOTAL AREA = ACRES 300.0



- LEGENDS:-**
- 1-RICE MILL
 - 2-PARBOIL SECTION
 - 3-RICE GODOWN
 - 4-CHEMICAL LAB.
 - 5-PADDOY GODOWN
 - 6-ROLLER
 - 7-TURBINE HALL
 - 8-E.S.P
 - 9-CHIMNEY
 - 10-COOLING TOWER
 - 11-D.M PLANT
 - 12-WATER TANK
 - 13-RAW WATER TANK
 - 14-E.T.P
 - 15-GUARD POND
 - 16-FUEL YARD
 - 17-COAL YARD
 - 18-STORES
 - 19-GUEST HOUSE
 - 20-OFFICE
 - 21-WEIGH BRIDGE
 - 22-SUB STATION
 - 23-ADMIN. BLDG.
 - 24-SECURITY & TIME OFFICE
 - 25-SHED
 - 26-ASH SILO & CONTROL ROOM
 - 27-TEMPLE
 - 28-ENTRANCE
 - 29-EMERGENCY GATE
 - 30-AREA FOR GREENERY
 - 31-WASTE MANAGEMENT AREA
 - 32-DISTILLERY GRAIN STORAGE
 - 33-GRAIN SILO
 - 34-DISTILLERY MILLING SECTION
 - 35-FERMENTATION & LIQUIFICATION SECTION
 - 36-DISTILLATION & EVAPORATION SECTION
 - 37-HOUSING COLONY
 - 38-RAIN WATER HARVESTING
 - 39-IMFL BOTTLING PLANT
 - 40-EFFLUENT TREATMENT PLANT
 - 41-FLY ASH BRICK PLANT

CLIENT	LAY OUT PLAN OF M/S. STARLIGHT ENERGY LTD. ATVILL - GOUD SARGGLUDA, THANA - JUNAGARH, TAHSIL - JUNAGARH, DIST. KALAHANDI
PROJECT	PROPOSED LAY OUT PLAN FOR RICE MILL, PARBOIL SECTION, DISTILLERY UNIT, IMFL BOTTLING PLANT, FLY ASH BRICK DISTILLERY, EFF. TREATMENT PLANT
SCALE	1:1000
DATE	07/03/2016
CONSULTANT	AMRVA ARCHITECTS & ENGINEERS

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 Rs. 0050000 -5.1.2008
 561294 00085
 INDIA ORISSA S.R. DHARMAGARH

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Signature
S.R. DHARMAGARH

SUB REGISTRAR
DHARAMGARH



Official Liquidator
Orissa High Court, Cuttack

05/1/08



For Starlight Enterprises Pvt Ltd

Signature
DIRECTOR

Admissible Under Rule
25 duly stamped under
the Indian Stamp
(Orissa Amendment Act 2001
Schedule 1-A No 23

FEE'S PAID

A (I)	2,00,000.00
A 19 (a)	120.00
A 19 (b)	4.00
(S)	2.00
TOTAL	2,00,126.00

Signature
R.D.

CONVEYANCE DEED

X

This conveyance deed is made on this 5th day of January
 Two thousand & eight BETWEEN Mr. D. K. Singh, THE
 OFFICIAL LIQUIDATOR, ORISSA HIGH COURT, AT
 CUTTACK being the liquidator of M/s. Western Orissa Sugar
 Limited (In Liquidation) having its Office at Chalachitra
 Bhawan, 2nd Floor, Buxi Bazar, Cuttack-753001 within the town
 of Cuttack herein after referred to as the "VENDOR" (Which
 expression shall unless excluded by or repugnant to the subject
 or context be deemed to include his successor-in-office,

aged 44 years 05/1/08

05/1/08 Debender Kumar Singh
 Official Liquidator
 Orissa High Court, Cuttack



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executors, administrators, representatives, and assigns) of the FIRST PART.

AND

M/s Starlight Enterprises Private Limited, a Company incorporated/registered under the Indian Companies Act, 1956 with its registered office At: In front of Pawansut Rice Mill, N.H: 200, P.O: H.Katapali, P.S: Jharsuguda, Dist: Jharsuguda, represented by its Director and Authorised Representative, Dinesh Kumar Agarwal, aged about 29 years, Son of Sri Babulal Agarwal, a permanent resident of Dinanath Lane, Main Road, P.S: Plant Site, Rourkela, Dist: Sundargarh, the purchasers of the assets and properties in this indenture, here-in-after called the VENDEE of the SECOND PART.

Type of Deed:

SALE DEED

Sale Consideration Amount:

Rs. 1,00,00,000/- (Rupees One Crore only).

Cess, Rent & Status:

Cess: Rs.750.00

Rent: Rs.1,00,000.00

Status: Sthitiban.

11/5/08 05/1/08
आचार्यजीय अनापक
परीक्षा उच्च न्यायालय, कटक
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Orissa High Court, Cuttack



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Description of Land:

All that piece and parcel of the land total measuring to Ac.91.48 Dec. situated at Mouza- Goud Sargiguda, P.S- Junagarh, Tahasil- Junagarh, Dist- Kalahandi, along with main factory buildings with structures and other associated buildings etc. lying thereon, more fully described in the SCHEDULE hereunder written and delineated in the annexed Trace map/ Plan coloured in Red .

DESCRIPTION:

WHEREAS, the said "M/s. Western Orissa Sugar Limited (In Liquidation)" hereinafter referred to as the "Company in Liquidation" is absolutely seized and possessed of and has otherwise well and sufficient right, title and interest over the freehold land measuring Ac.91.48 Dec. upon purchasing it by different registered deeds of conveyance from different Vendors and for the consideration mentioned therein, registered in the office of Registering Officer, Dharmagarh. The Company in liquidation holds the said property to its own exclusive use.

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Orissa High Court, Cuttack

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AND WHEREAS, the Company in Liquidation, as the sole and absolute owner of the Scheduled land installed a factory inter-alia, for the purpose of carrying on business of manufacturing sugar etc. in terms of objects described in Memorandum of Association of the Company in Liquidation.

AND WHEREAS, the Company in liquidation held the said property morefully described in SCHEDULE hereunder written, to the use of themselves exclusively

thereby running their business and other related activities until it was directed to be wound up by order dated 11.11.2005 passed by the Hon'ble Orissa High Court in COPET No.23 of 2003 and the Official Liquidator attached to this Hon'ble High Court by virtue of his office became the liquidator thereof and took into his custody or under his control the entire assets and properties and effects etc. of the company including the property described in the Schedule.

AND WHEREAS, by an order dated 15.09.2006 passed by the Hon'ble Orissa High Court, the Vendor herein was directed to issue advertisement for sale of the assets and properties of the company in liquidation i.e. the subject matter of these presents, strictly "ON AS IS WHERE IS

15/9/06
 05/1/08
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 उड़ीसा उच्च न्यायालय, कटक
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 Orissa High Court, Cuttack



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AND WHATEVER THERE IS" basis. On issue of such advertisement/ Sale Notice, the Vendee hereinabove made an offer for the purchase of property more fully described in Schedule hereunder written and emerged as the highest bidder by offering the price of Rs.1,00,00,000/- (Rupees One crore only). Later the Vendee has deposited the entire sale consideration amount with the Vendor.

AND WHEREAS, the matter relating to the confirmation of sale of the assets and properties was heard by the Hon'ble Orissa High Court at Cuttack and by Order dated 09.03.2007 passed in Misc. Case No.11 of 2007, the sale of the properties morefully described in the Schedule hereunder was confirmed in favour of the Vendee. By the said order dated 09.03.2007, the Vendor was directed to take up necessary steps for completing the process of sale by execution of documents etc.

AND WHEREAS the Vendor has handed over possession of assets and properties of M/s. Western Orissa Sugar Limited (In Liquidation) situated at Village- Goud Sargiguda, P.S.- Junagarh, Tahasil- Junagarh, Dist- Kalahandi, morefully described in the Schedule below, strictly on "AS IS WHERE IS AND WHATEVER THERE IS BASIS" on 26.03.2007.

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AND WHEREAS, the Vendor has for himself as Official Liquidator and for and on behalf of the Company in Liquidation is competent to convey the title of the scheduled property of the Company in Liquidation to the Vendees, this Sale Deed is hereby executed in consequent to the order dated 09.03.2007 as stated hereinabove.

NOW THIS DEED OF CONVEYANCE/ SALE WITNESSES ;

That in pursuance of the said Order dated 09.03.2007 passed by the Hon'ble Orissa High Court and on receipt of entire consideration amount of Rs.1,00,00,000/- (Rupees One Crore only), the Vendor herein conveys, sales, transfers and assigns to the use of Vendees and their heirs, executors, administrators and assigns ALL THAT LAND measuring to Ac.91.48 Dec. more fully described in the SCHEDULE hereunder written and shown in Red in Trace Map along with Main factory building with structures, sheds and other associated buildings etc. lying thereon on "As is where is and whatever there is basis", AND ALL THE RIGHT, TITLE, INTEREST, PROPERTY claim and demand whatsoever of the Vendor into or upon the said scheduled

S.R. Dharmgarh
05/1/08

आधिकारिक सचिव
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Official Liquidator
Orissa High Court, Cuttack



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S.R. Dharmgarh

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property are hereby conveyed into the Vendees, their heirs, executors, administrators and assigns absolutely and for ever.

AND FURTHER THAT THE VENDOR and all persons claiming any estate or interest whatsoever in the said property or any part thereof under, the Vendor shall and will from time to time and at all times hereafter at the request and at the cost

of the Vendee, its heirs, executors, administrators, representatives and assigns, execute or cause to be done all such acts, deeds and things what so ever for further, better and more perfectly assuring the said property and every part thereof unto and to the use of the Vendee and its heirs, executors, administrators, representatives and assigns according to the true intent and meaning of these presents as shall or may be reasonably required.

AND FURTHER MORE THAT the Vendor covenants with the Vendee that whatever documents which are in possession of the Vendor will be produced by the Vendor to the Vendee as and when required for inspection and also to furnish certified copies thereof to the Vendee at the request and costs of the Vendee.

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आसक्ति समारक
बहीला उच्च न्यायालय, कटक
Official Liquidator
Orissa High Court, Cuttack

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AND THAT the Vendee will pay regularly the rent to all Government and Semi Government bodies and or authorities relating thereto from the execution of these presents onwards.

IN WITNESS WHEREOF THE VENDOR as aforesaid has caused the common seal to be affixed hereto and has hereunder set and subscribed their hand and has signed this Sale Deed on the Day, Month and Year written first above.

The said property has not been obtained from the Government within last ten years by way of lease for cultivation. The said property also does not bear any part of Wakf Board's /Endowment Commission's Property. It is neither the Property of any Religious Institution or Public Deity or Public Property.

AND THAT THE VENDOR does hereby conveys in his Official Capacity and under the direction of the Hon'ble High Court; as such, the question of declaration that he does not belong to SC or ST community does not arise and/or is irrelevant.

VENDOR
ଫାକ୍ଟରୀ ସମାବକ
ଓଡ଼ିଶା ଉଚ୍ଚ ମ୍ୟାଗାଲ୍ୟ, କଟକ
Official Liquidator
Orissa High Court, Cuttack.



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AND THAT SINCE THE VENDEE is a body Corporate, the declaration that it does not belong to SC or ST community does not arise and/or is irrelevant.

VENDEE

SCHEDULE

All that piece and parcel of the land total measuring to Ac.91.48 Dec. i.e. Freehold Land situated at Village- Goud Sargiguda, P.S.- Junagarh, Tahasil- Junagarh, District: Kalahandi as detailed below:- *under S.R.O. Dharmagarh, Distt-Kalahandi.*

Sl.No.	Sabik Khata	Sabik Plot	Area
1	65/77	48/731	Ac. 0.15 Dec.
2	65/77	49/734	Ac. 1.05 Dec.
3	63/146	35/691/876	Ac. 0.48 Dec.
4	63/146	36/875	Ac. 0.10 Dec.
5	22	18	Ac. 1.00 Dec.
6	22	20	Ac. 0.27 Dec.
7	22	18	Ac. 1.30 Dec.
8	22	16	Ac. 0.92 Dec.
9	22	18	Ac. 1.25 Dec.

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Official Liquidator
Orissa High Court, Cuttack

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10	22	19	Ac. 0.70 Dec.
11	22	12	Ac. 0.26 Dec.
12	22	14	Ac. 0.57 Dec.
13	63/159	36/893	Ac. 0.96 Dec.
14	65/104	31/821	Ac. 0.60 Dec.
15	65/104	33/824	Ac. 0.30 Dec.
16	65/104	32/823	Ac. 0.10 Dec.
17	65/104	28/822	Ac. 0.53 Dec.
18	65/104	36/825	Ac. 0.10 Dec.
19	65/104	30	Ac. 0.06 Dec.
20	63/174	-	Ac. 0.18 Dec.
21	63/141	55	Ac. 0.56 Dec.
22	65/71	52/722	Ac. 0.50 Dec.
23	65/71	52/722	Ac. 0.80 Dec.
24	65/71	43/720	Ac. 0.06 Dec.
25	65/71	45	Ac. 0.91 Dec.
26	65/71	47	Ac. 0.69 Dec.
27	65/71	48/721	Ac. 0.10 Dec.
28	65/93	43/711	Ac. 0.45 Dec.
29	65/93	46	Ac. 0.25 Dec.
30	65/93	45/712	Ac. 0.19 Dec.
31	65/93	44	Ac. 2.28 Dec.
32	18	52	Ac. 0.20 Dec.
33	18	531	Ac. 0.19 Dec.

11/5/08 05/1/08

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34	18	43	Ac. 0.04 Dec.
35	18	36	Ac. 0.31 Dec.
36	18	35/691	Ac. 0.73 Dec.
37	18	175	Ac. 0.56 Dec.
38	18	53	Ac. 1.55 Dec.
39	18	49	Ac. 0.05 Dec.
40	66/35	28	Ac. 0.05 Dec.
41	66/35	29	Ac. 1.20 Dec.
42	66/35	33	Ac. 0.06 Dec.
43	63/193	177	Ac. 1.62 Dec.
44	63/193	176	Ac. 0.10 Dec.
45	63/193	53/723	Ac. 0.32 Dec.
46	63/172	53/913	Ac. 0.90 Dec.
47	63/172	53/914	Ac. 0.18 Dec.
48	63/172	56	Ac. 1.42 Dec.
49	65/105	55	Ac. 1.09 Dec.
50	65/105	54	Ac. 0.20 Dec.
51	65/105	53/737	Ac. 0.22 Dec.
52	65/105	172/737	Ac. 0.10 Dec.
53	65/105	57/728	Ac. 0.26 Dec.
54	65/29	36/843	Ac. 0.18 Dec.
55	63/177	179	Ac. 1.41 Dec.
56	65/44	21	Ac. 1.52 Dec.
57	63/163	188/904	Ac. 0.04 Dec.

[Handwritten Signature] 05/1/08

आधिकारिक सनाथक
 बहीशा उरुन म्वागालय, कलहण
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58	63/163	189/905	Ac. 1.38 Dec.
59	63/163	190/906	Ac. 0.08 Dec.
60	63/163	193	Ac. 0.75 Dec.
61	63/163	195/903	Ac. 2.25 Dec.
62	63/163	195/907	Ac. 1.50 Dec.
63	63/163	195/910	Ac. 0.13 Dec.
64	63/186	188/890/922	Ac. 0.24 Dec.
65	63/186	189/891	Ac. 0.58 Dec.
66	63/186	195/892	Ac. 0.18 Dec.
67	63/191	188/890	Ac. 2.34 Dec.
68	65/34	36	Ac. 0.56 Dec.
69	65/34	24	Ac. 0.97 Dec.
70	65/34	36	Ac. 0.70 Dec.
71	65/34	58	Ac. 0.80 Dec.
72	65/34	179	Ac. 0.19 Dec.
73	65/34	58	Ac. 0.71 Dec.
74	65/34	59	Ac. 0.09 Dec.
75	65/34	58	Ac. 0.56 Dec.
76	65/34	57	Ac. 0.99 Dec.
77	65/34	36	Ac. 2.80 Dec.
78	65/34	36	Ac. 2.72 Dec.
79	65/34	35/691	Ac. 0.40 Dec.
80	65/34	28	Ac. 0.46 Dec.
81	65/34	32	Ac. 0.66 Dec.

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82	65/34	31	Ac. 0.85 Dec.
83	65/34	33	Ac. 0.96 Dec.
84	65/34	84	Ac. 0.14 Dec.
85	65/34	56	Ac. 0.22 Dec.
86	63/192	42	Ac. 1.10 Dec.
87	63/192	187	Ac. 0.36 Dec.
88	63/173	191	Ac. 0.50 Dec.
89	63/173	190/902	Ac. 1.35 Dec.
90	63/173	195/901/916	Ac. 1.15 Dec.
91	65/14	175/748	Ac. 0.10 Dec.
92	65/14	169/724	Ac. 0.70 Dec.
93	65/14	174/749	Ac. 0.80 Dec.
94	63/132	12	Ac. 0.01 Dec.
95	63/132	14	Ac. 0.21 Dec.
96	77/167	65	Ac. 0.16 Dec.
97	77/167	13	Ac. 0.29 Dec.
98	65/168	187	Ac. 0.36 Dec.
99	65/168	188	Ac. 0.64 Dec.
100	65/168	188/909	Ac. 0.50 Dec.
101	65/168	189	Ac. 0.25 Dec.
102	65/168	190	Ac. 3.25 Dec.
103	63/111	197/830	Ac. 0.50 Dec.
104	63/111	198	Ac. 0.28 Dec.
105	63/112	197/831	Ac. 0.78 Dec.

11/5/2008
 शासकिय सहायक
 बड़ीया उच्च न्यायालय, कटक
 Official Liquidator
 Orissa High Court, Cuttack

भारत NONJUDICIAL STAMP

 Rs. 0050000
 561294
 ORISSA
 INDIA

ଓଡ଼ିଶା
 ओडिशा
 -5.1.2008
 00085
 S.P. DHARAMGARH

110545460541

S.P. Dharmgarh
 SUB REGISTRAR
 DHARAMGARH

-14-

106	63/162	195/901	Ac. 0.13 Dec.
107	24	195	Ac. 1.82 Dec.
108	63/110	200/1/829	Ac. 0.80 Dec.
109	63/110	197/1	Ac. 0.78 Dec.
110	63/61	195/895	Ac. 2.00 Dec.
111	14	196	Ac. 1.35 Dec.
112	14	196	Ac. 1.34 Dec.
113	63/183	25	Ac. 0.44 Dec.
114	63/183	26	Ac. 0.83 Dec.
115	63/183	27	Ac. 0.55 Dec.
116	65/46	37	Ac. 1.40 Dec.
117	65/46	38	Ac. 0.17 Dec.
118	29	206	Ac. 0.70 Dec.
119	29	206	Ac. 2.00 Dec.
120	25	160/703	Ac. 0.82 Dec.
121	25	159/704	Ac. 0.50 Dec.
122	65/72	66	Ac. 0.61 Dec.
123	65/72	68	Ac. 0.67 Dec.
124	65/72	69	Ac. 1.64 Dec.
125	63/130	49/850	Ac. 2.10 Dec.
126	63/125	48	Ac. 0.76 Dec.
127	65/56	205	Ac. 0.40 Dec.

Total: Ac. 91.48 Dec.

ns. 5/2 05/1/08
 कार्यालय सनायक
 ଓଡ଼ିଶା ଉଚ୍ଚ ନ୍ୟାୟାଳୟ, କଟକ
 Official Liquidator
 Orissa High Court, Cuttack

भारत NON JUDICIAL STAMP
INDIA



Rs. 0050000

561294
ORISSA

ଓଡ଼ିଶା
ओडिशा

-5.1.2008

00085
S.R. DHARMAGARH

110545470557

SUB REGISTRAR
DHARAMGARH

-15-

Along with main factory building with structures, sheds and other associated buildings etc. lying thereon. The immovable property of Ac.91.48 Dec. has been further delineated in the Trace Map/ Plan hereto annexed and thereon coloured in Red. The entire properties are in one compact area and bounded by:

East: Road, thereafter Mouza Mathura ;

West: Mouza Sanyasi Kundamal ;

North: Gochar, thereafter N.H. 201;

South: Mouza Goud Tulsipali .

15/1/08

आसक्तिव समावह
ଓଡ଼ିଶା उच्च न्यायालय, कटक
Official Liquidator
Orissa High Court, Cuttack

SUB REGISTRAR
DHARAMGARH

- 16 -

IN WITNESS WHEREOF the Vendor & Vendee hereby sign
this deed of Sale on the 5th day of January, 2008 after going
through the contents of this deed.

Witnesses:

1. *Sahoo*
05/01/2008
Prafulla Kumar Sahoo
S/o. Chakradhar Sahoo
Off. the Official Liquidator
Orissa High Court, Cuttack

05/01/08
आधिकारिक समाचारक
उड़ीशा उच्च न्यायालय, कटक
Official Liquidator
Orissa High Court, Cuttack

Vendor

For Starlight Enterprises Pvt. Ltd

Senapati
05/01/2008
DIRECTOR

Vendee

2. *Bag*
5/1/08
(Parna Lachan Bag)
S/o Late Mohan Bir Bag
At - Gountiapara
PO - Bohawanipatara.
PS.
Dist. Kalahandi

Drafted & typed on the instruction of the
parties. Readover & explained the contents
of the deed to the parties. They admitted the
same to be true & correct & signed in my presence.

Schedule I Form No.39 (Revised)

ଖଟିଆନ

ମୌଜା : ଗୌଡ଼ପରିଗୁଡ଼ା
 ଥାନା : ଜୁନାଗଡ଼
 ଥାନା ନମ୍ବର : 147

ଚହସିଲ : ଜୁନାଗଡ଼
 ଚହସିଲ ନମ୍ବର :
 ଡିଲ୍ଲା : କଳାହାଣ୍ଡି

ଜମିଦାରଙ୍କ ନାମ ଓ ଖେଡ଼ା ଚ ବା ଖଟିଆନ ନମ୍ବର	ଓଡ଼ିଶା ସରକାର ଖେଡ଼ା ଚ ନମ୍ବର-୧
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୧। ଖଟିଆନର କ୍ରମିକ ନମ୍ବର KHATA	25
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୨। ପ୍ରକାଶ ନାମ, ପିତାଙ୍କ ନାମ, ଜାତି ଓ ବାସସ୍ଥାନ	ଏମ. ଏସ. ସାରଳାଜିତ୍ ଏନଜିଲିମିଟେଡ୍ M.S- STAR LIGHT ENERGY LTD
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୩। ପ୍ରଭୃତି	ଛୁଟିବାର
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	ଜଳକର	ଖଜଣା	ସେସ	ନିସ୍କାର ସେସ ଓ ଅନ୍ୟାନ୍ୟ ସେସ	ମୋଟ	୪। କ୍ରମବର୍ତ୍ତନଶୀଳ ଖଜଣାର ବିବରଣୀ
୦16422		4135.50	3014.38		7150	

୬। ବିଶେଷ ଅନୁସଙ୍ଗ, ଯଦି କିଛି ଥାଏ	ନାହିଁ
--------------------------------	-------

BLANK SPACE FOR STAMPING



ଖାଦିଆନର କ୍ରମିକ ନଂ:		25	ମୌଜା : ଗୋତସରିଗୁଡ଼ା		ଜିଲ୍ଲା : ଜଳାହାଣ୍ଡି	
PLOT No ପ୍ଲଟ ନମ୍ବର ଓ ଚକର ନାମ	କିସମ	କିସମର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ଚୌହଦା	ରକବା			ମତବ୍ୟ
			ଏ.	ଡି.	ହେ.	
7	8	9	10	11	12	
212 ପଦରଭାଗ	ମାଳ ଅଣକଳସେଚିତ	ଉ : ନିଜ ଦ : ପ୍ରଧାନନ ନାଏକ	0.27			
X 244	ଘରବାର	ଚିନିକଳ ଘର	1.33			
248 ପଦରଭାଗ	ଆଟ	ଉ : ରାସ୍ତା ଦ : ନିଜ	0.38			
X 249	ଘରବାର	ଘର	0.04			
X 250	ଘରବାର	ଘର	0.04			
X 251	ଘରବାର	ବାରୀ	0.08			
252 ପଦରଭାଗ	ବେଣ୍ଟା ଅଣକଳସେଚିତ	ଉ : ରାସ୍ତା ଦ : ନିଜ	0.34			
X 253	ଘରବାର	ଘର	0.05			
X 254	ଘରବାର	ଘର	0.05			
X 255	ଘରବାର	ଘର	0.03			
X 256	ଘରବାର	ଘର	0.04			
X 257	ଘରବାର	ଘର	0.04			
X 258	ଘରବାର	ଘର	0.01			
X 259	ଘରବାର	ଘର	0.02			
X 260	ଘରବାର	ବାରୀ	0.03			
X 261	ଘରବାର	ଘର	0.02			
X 262	ଘରବାର	ଘର	0.06			
263 ପଦରଭାଗ	ବେଣ୍ଟା ଅଣକଳସେଚିତ	ଉ : ନିଜ ଦ : କଟା	1.20			
278 ପଦରଭାଗ	ବେଣ୍ଟା ଅଣକଳସେଚିତ	ଉ : ନିଜ ଦ : କଟା	0.12			
280 ପଦରଭାଗ	ବେଣ୍ଟା ଅଣକଳସେଚିତ	ଉ : ରାସ୍ତା ଦ : କଟା	0.13			
X 295	ଘରବାର	ଚିନି କାରଖାନା	0.10			
X 296	ଘରବାର	ଚିନି କାରଖାନା	2.77			
X 297	ଘରବାର	ଚିନି କାରଖାନା	0.83			
X 298	ଘରବାର	ଚିନି କାରଖାନା	0.46			

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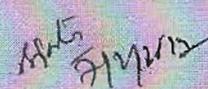
Adl. Tahasil dar
Jumunah

ଖତିଆନର କ୍ରମିକ ନଂ:		25	ମୌଜା : ଗୌଡ଼ପରିଗୁଡ଼ା		ଜିଲ୍ଲା : କଳାହାଣ୍ଡି	
PLDT No ପୁର ନମ୍ବର ଓ ରକର ନାମ	କ୍ଷେତ୍ର	କ୍ଷେତ୍ରର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ଚୌହୁଦା	ରକରା			ମଟର
			ଏ.	ଡି.	ଫୁ.	
7	8	9	10	11	12	
X 300	ଘରବାରି	ଚିନି କାରଖାନା	0.35			
X 301	ଘରବାରି	ଚିନି କାରଖାନା	0.58			
X 302	ଘରବାରି	ଚିନି କାରଖାନା	2.65			
X 314	ଘରବାରି	ଚିନି କାରଖାନା	0.99			
X 317	ଘରବାରି	ଚିନି କାରଖାନା	3.12			
X 319	ଘରବାରି	ଚିନି କାରଖାନା	0.76			
X 322	ଘରବାରି	ଚିନି କାରଖାନା	2.10			
← 327	ଘରବାରି	ଚିନି କାରଖାନା	0.86			
X 331	ଘରବାରି	ଚିନି କାରଖାନା	0.10			
X 334	ଘରବାରି	ଚିନି କାରଖାନା	0.70			
X 337	ଘରବାରି	ଚିନି କାରଖାନା	0.22			
X 339	ଘରବାରି	ଚିନି କାରଖାନା	0.63			
X 340	ଘରବାରି	ଚିନି କାରଖାନା	0.28			
342	ଘରବାରି	ଚିନି କାରଖାନା	1.29			
347	ଘରବାରି	ଚିନି କାରଖାନା	0.10			
348	ଘରବାରି	ଚିନି କାରଖାନା	1.75			
374 ଡଙ୍ଗରବାହାଳି	ଆଟ	ଉ : ପ୍ରମୋଦିନି ପଣ୍ଡା ଦ : ଉମାକାନ୍ତ ନାଏକ	0.64			
376 ଡଙ୍ଗରବାହାଳି	ଆଟ	ଉ : ନିଜ ଦ : ନିଜ	0.12			
377 ଡଙ୍ଗରବାହାଳି	ବେଣ୍ଟା ଅଣକଳସେଚିତ	ଉ : ଖାରି ମାଳି ଓଗେର ଦ : ଖାରି ମାଳି ଓଗେର	0.34			
385 ଡଙ୍ଗରବାହାଳି	ମାଳ ଅଣକଳସେଚିତ	ଉ : ଖାରି ମାଳି ଓଗେର ଦ : ଖାରି ମାଳି ଓଗେର	0.50			
386 ଡଙ୍ଗରବାହାଳି	ଆଟ	ଉ : ନିଜ ଦ : ନିଜ	2.80			

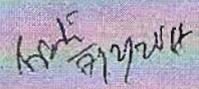
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Addl. Tahasildar
Jumegarh

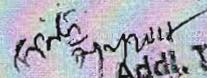
ଖଣ୍ଡିଆନର କ୍ରମିକ ନଂ:		25	ମୌଜା : ଗୌତମଗୁଡ଼ା		ଜିଲ୍ଲା : କଳାହାଣ୍ଡି	
PLOT No ପ୍ଲଟ ନମ୍ବର ଓ ତଳର ନାମ	କିସମ	କିସମର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ବୌଦ୍ଧତା	ରଜବା			ମଟବ୍ୟ
			ଏ.	ଡି.	ହେ.	
7	8	9	10	11	12	
389 ଡଙ୍ଗରବାହାଳି	ଆଟ	ଉ : ନିଜ ଦ : ମୌଜା ସନ୍ଧ୍ୟାସାକୁଷ୍ଠାମାନ ସରହଦ	4.50			
390 ଡଙ୍ଗରବାହାଳି	ବେଣ୍ଟା ଅଣଜଳସେଚିତ	ଉ : ଗ୍ରାମ୍ୟ ଜଙ୍ଗଲ ଦ : ନିଜ	0.75			
394 ଡଙ୍ଗରବାହାଳି	ମାଳ ଅଣଜଳସେଚିତ	ଉ : ଗ୍ରାମ୍ୟ ଜଙ୍ଗଲ ଦ : ଗୁଣନିଧି ନାଏକ	0.13			
418 ସହିଭଟା	ଆଟ	ଉ : ଭେଟା ନାଏକ ଦ : ନିଜ	0.70			
419 ସହିଭଟା	ଆଟ	ଉ : ନିଜ ଦ : ମଦନାବରା ନାଗ	0.78			
420 ସହିବାହାଳି	ଆଟ	ଉ : ନିଜ ଦ : ନାଳ	0.78			
450 ସହିମୁଣ୍ଡା	ବାହାଳ ଅଣଜଳସେଚିତ	ଉ : ନାଳ ଦ : ମୌଜା ସନ୍ଧ୍ୟାସାକୁଷ୍ଠାମାନ ସରହଦ	0.80			
329	ଘରବାରି		0.18			
313 ଡଙ୍ଗରଭଟା	ଆଟ		1.25			
383 ଡଙ୍ଗରବାହାଳି	ମାଳ ଅଣଜଳସେଚିତ		2.95			
378 ଡଙ୍ଗରଭଟା	ବେଣ୍ଟା ଅଣଜଳସେଚିତ		0.41			
388 ଡଙ୍ଗରବାହାଳି	ଆଟ		0.30			
384 ଡଙ୍ଗରବାହାଳି	ମାଳ ଅଣଜଳସେଚିତ		0.18			
315	ଘରବାରି		0.97			
318	ଘରବାରି		0.79			
349	ଘରବାରି		0.80			
350	ଘରବାରି		0.60			
323	ଘରବାରି		1.57			
232 ବେଣ୍ଟିଭାଗ	ବେଣ୍ଟା ଅଣଜଳସେଚିତ		0.51			
281 ବେଣ୍ଟିଭାଗ	ବେଣ୍ଟା ଅଣଜଳସେଚିତ		0.15			


 Addl. Tahasildar
 Junagarh

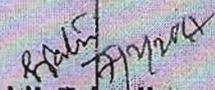
ପଠିଆନର କ୍ରମିକ ନଂ:		25	ଶୈଳୀ : ଗୌଡ଼ସର୍ଗିଗୁଡ଼ା		ଜିଲ୍ଲା : କଳାହାଣ୍ଡି	
PLOT No ପ୍ଲଟ ନମ୍ବର ଓ ଚକର ନାମ	କିସମ	କିସମର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ଶୈଳୀ	ରକବା			ମତ୍ତବ୍ୟ
			ଏ.	ଡି.	ଫୁ.	
7	8	9	10			12
413 ଆମ୍ବୁନର ଘର	ଆଟ		0.40			
414 ଆମ୍ବୁଗଛ ଭଟ୍ଟା	ଆଟ		1.75			
416 ଆମ୍ବୁଗଛ ଭଟ୍ଟା	ମାଳ ଅଣଜଳସେଚିତ		0.54			
316	ଘରବାର୍ଡି		0.04			
351	ଘରବାର୍ଡି		0.20			
377/1362 ରନ୍ଧିବାହାଲି	ଆଟ		0.08			
377/1363 କରକିବାହାଲି	ଆଟ		0.16			
335	ଘରବାର୍ଡି		1.46			
338	ଘରବାର୍ଡି		1.08			
352	ବିଜେଣ୍ଡଳି		0.20			
353	ଘରବାର୍ଡି		1.15			
375 ଡଙ୍ଗରବାହାଲି	ଆଟ		0.14			
243	ଘରବାର୍ଡି		2.87			
341	ଘରବାର୍ଡି		0.99			
328	ଘରବାର୍ଡି		0.31			
332	ଘରବାର୍ଡି		0.73			
336	ଘରବାର୍ଡି		1.60			
321	ଘରବାର୍ଡି		1.30			
393 ଡଙ୍ଗର ବାହାଲି	ଆଟ		2.05			
293	ଘରବାର୍ଡି		0.97			
294	ଘରବାର୍ଡି		1.26			


 Addl. Tehasildar
 Junagadh

ଖଟିଆନର କ୍ରମିକ.ଂ:		25	ମୌଜା : ଗୌଡ଼ସର୍ଗିଗୁଡ଼ା		ଜିଲ୍ଲା : କଳାହାଣ୍ଡି	
PLOT No ସ୍ୱତନ୍ତ୍ର ନମ୍ବର ଓ ତହସିଲ ନାମ	କିସମ	କିସମର ବିଷୟବିଷୟ ବିବରଣୀ ଓ କୌଣସି	ରକବା			ମତବ୍ୟ
			ଏ.	ଡି.	ଫୁ.	
7	8	9	10		11	12
324	ଘରବାରି		2.80			
325	ଘରବାରି		0.55			
326	ଘରବାରି		0.39			
343	ଘରବାରି		0.74			
354	ଘରବାରି		0.18			
297/1360	ଘରବାରି		0.20			
343/1361	ଘରବାରି		1.36			
330	ଘରବାରି		0.18			
230 ବନ୍ଧୁତରା	ଆଟ		0.09			
231 ବନ୍ଧୁତରା	ବେଣ୍ଟି ଅଣକଳସେଚିତ		0.83			
179 ମୁଣ୍ଡିମୁଣ୍ଡା	ବାହାଲ		1.58			
426 ତୁମେରମୁଣ୍ଡା	ଆଟ		1.80			
427	ରାଣ୍ଡା		0.16			
433 ତୁମେରମୁଣ୍ଡା	ମାଳ		0.62			
299	ଘରବାରି		1.82			
408 ତଳରବାହାଳି	ଆଟ		0.40			
157 ପୁଣ୍ଡାମୁଣ୍ଡା	ଆଟ		0.29			
361 ଭାଉଆମୁଣ୍ଡା	ବାହାଲ ଅଣକଳସେଚିତ		0.90			
371 ଭଉଆମୁଣ୍ଡା	ଆଟ		0.70			
380 ତଳରବାହାଳି	ବେଣ୍ଟି		1.53			
392 ତଳରବାହାଳି	ଆଟ		1.04			
733	ଘରବାରି	ଚିନିକାରଖାନା	1.00			
243/1348	ଘରବାରି	ଚିନିକାରଖାନା	0.27			


 Addl. Tahasildar
 Junagarh

ଖାତିଆନର କ୍ରମିକ ନଂ:		25	ମୌଜା : ଗୌଡ଼ସରିଗଡ଼ା	ଜିଲ୍ଲା : କଳାହାଣ୍ଡି		
PLOT No ପ୍ଲଟ ନମ୍ବର ଓ ଚକର ନାମ	କିସମ	କିସମର ବିସ୍ତାରିତ ବିବରଣୀ ଓ ଗୌହତା	ରଜବା			ମିତ୍ରତ୍ୟ
			ଏ.	ଡି.	ଘେ.	
7	8	9	10		11	12
241	ଘରବାରି	ଡିନିକାରଖାନା	1.55			
406/1494	ବେର୍ଷା ଅଣଜଳ ସେଚିଟ		1.30			
409	ଆଟ		1.49			
113 ପୁଟ			91.48			
<p>ମ୍ୟୁ.କେ.ନଂ 63/08 ତା 1.02.08 ଆ.ମତେ. ଏହି ଖାତାର ସମଗ୍ର ଜମି ଉକ୍ତି ହେତୁ ଖାତାଦାର ନାମ ଖାରଜ କରି ଖ. ସୂତ୍ରେ ଦିନେଶ କୁମାର ଅଗ୍ରୱାଲ ତାଲିକାରେ ଏମ. ଏସ. ସ୍ଵାରଲାଭର ଏକ ପ୍ରାକ୍ତନେସ ପ୍ରାକ୍ତନେସ ଲିମିଟେଡ଼ ନାମରେ ଖାତା ଦରଜ କରାଗଲା ।</p> <p style="text-align: center;">ସା/- ଚନ୍ଦ୍ରସିଲଦାର, ଜୁନାଗଡ଼</p>						
<p>ମ୍ୟୁ.କେ.ନଂ 63/08 ତା 1.02.08 ଆ.ମତେ. ଖ. ସୁ. ଖା.ନଂ 2 ଏ.3.17, ଖା.ନଂ 8 ଏ.0.08, ଖା.ନଂ 22 ଏ.5.09 ଖା.ନଂ 27 ଏ.3.16, ଖା.ନଂ 30 ଏ.1.57, ଖା.ନଂ 34 ଏ.0.20, ଖା.ନଂ 35 ଏ.0.67, ଖା.ନଂ 41 ଏ.2.69 ଖା.ନଂ 45 ଏ.0.45, ଖା.ନଂ 53 ଏ.0.24, ଖା.ନଂ 57 ଏ.2.05, ଖା.ନଂ 68 ଏ.8.45, ଖା.ନଂ 69 ଏ.0.18 ଖା.ନଂ 73 ଏ.0.92, ଖା.ନଂ 82 ଏ.1.58, ଖା.ନଂ 93 ଏ.2.58, ଖା.ନଂ 98 ଏ.0.25, ଖା.ନଂ 132 ଏ.0.27, ଖା.ନଂ 138 ଏ.2.54 ଖା.ନଂ 141 ଏ.1.49, ଖା.ନଂ 155 ଏ.2.87, ଖା.ନଂ 159 ଏ.0.99, ଖା.ନଂ 160 ଏ.3.20, ଖା.ନଂ 162 ଏ.1.30 ଖା.ନଂ 168 ଏ.0.17, ଖା.ନଂ 191 ଏ.0.35, ଖା.ନଂ 220 ଏ.1.82, ଖା.ନଂ 236 ଏ.0.40, ଖା.ନଂ 258 ଏ.0.29 ଖା.ନଂ 260 ଏ.1.60, ଖା.ନଂ 284 ଏ.2.57 ଓ ଖା.ନଂ 287 ଏ.0.55 ମୋଟ ଏ. 53.63 ଖାରଜ ହୋଇ ଖ. ସୁ. ଖା.ନଂ. 25 ରେ ଯୋଗ କରାଗଲା ।</p> <p style="text-align: center;">ସା/- ଚନ୍ଦ୍ରସିଲଦାର, ଜୁନାଗଡ଼</p>						
<p>ମି.କେ.ନଂ 2/16 ତା 26.07.16 ଆ.ମତେ. ପୁ.ନଂ. 159 ଏ. 1.93, 160 ଏ. 1.00, 161/1354 ଏ. 0.24 ପୁ.ନଂ. 425 ଏ. 0.20, 223 ଏ. 0.08, 224 ଏ. 0.17, 155 ଏ. 0.27, 360 ଏ.0.56, 357 ଏ.0.17 ପୁ.ନଂ. 428 ଏ. 0.35, 415 ଏ. 0.55 କ.ଟ. 60.00 ସେ.ଟ. 20.00 ଖାରଜ ହୋଇ ଯଥାକ୍ରମେ ଖା.ନଂ. 2, 34, 98, 132, 160, 168, 191, 287 ରେ ଯୋଗ କରାଗଲା ଏବଂ ପୁ. ନଂ. 233 ଏ. 1.00, 243/1348 ଏ.0.27, 241 ଏ.1.55 କ.ଟ. 196.50 ସେ.ଟ. 147.38 ଖାରଜ ହୋଇ ଯଥାକ୍ରମେ ଖା.ନଂ. 153, 182 ରୁ ଆସି ଉକ୍ତ ଖାତାରେ ଯୋଗ କରାଗଲା ।</p> <p style="text-align: center;">ସା/- ଚନ୍ଦ୍ରସିଲଦାର, ଜୁନାଗଡ଼</p>						
<p>ମି.କେ.ନଂ 2/16 ତା 5.08.16 ଆ.ମତେ. ଖାତାଦାରଙ୍କ ନାମ ଖାରଜ କରି ଏମ. ଏସ. ସ୍ଵାରଲାଭର ଏନର୍ଜିଲିମିଟେଡ଼ କ ନାମ ଦରଜ କରାଗଲା ।</p> <p style="text-align: center;">ସା/- ଚନ୍ଦ୍ରସିଲଦାର, ଜୁନାଗଡ଼</p>						
<p>ମି.କେ.ନଂ 2/16 ତା 3.02.17 ଆ.ମତେ. ପୁ.ନଂ. 406 ଏ.1.30 କ.ଟ. 14.00 ସେ.ଟ. 10.00 ଖାରଜ ହୋଇ ଖା.ନଂ. 46 ରୁ ଆସିଲା ଏବଂ ପୁ. ନଂ. 409 ଏ. 1.49 କ.ଟ. 14.90 ସେ.ଟ. 11.18 ଖାରଜ ହୋଇ ଖା.ନଂ. 238 ରୁ ଆସିଲା ଏବଂ ଉକ୍ତ ଖାତାରେ ଯୋଗ କରାଗଲା ।</p>						


Addl. Tahasildar
Junagarh

Corrected by Lohit kumar Bagarty, Court Amin

ଚନ୍ଦ୍ରସିଲଦାର ଜୁନାଗଡ଼ (ସ୍ଵାକ୍ଷର)



STARLIGHT ENERGY LIMITED

Ref: SEL/2015-16/DOWR

Date: 07.10. 2015

To
The Commissioner Cum Principal Secretary,
Department of Water Resources,
Rajiv Bhawan,
Bhubaneswar, Odisha.

Sub: Application in "J" form for water agreement in the name of M/s Starlight Energy Ltd..

Ref: Application in "J" form dated 01.05.2012 by M/s Starlight Infra Pvt Ltd.

Sir,

In inviting a kind reference to the subject cited above, it is to intimate you that our sister concern, M/s SIPL had already applied for drawl of 670 Cum/day of water from Hati nadi vide our application through "J" form dated 01.05.2012 with all relevant documents, along with Bank draft bearing No.001008, dated 01/05/2012, of Rs.1000/- (Rupees one thousand only) as "processing fee" and another Bank draft bearing No.001010, dated 01/05/2012 of Rs.37,000 /- (Rupees thirty seven thousand) only towards "security deposit" for the quantity of water applied in the name **Starlight Infra Pvt Ltd** (SIPL) for our proposed Biomass plant at Goud Sargiguda in Junagarh Block of Kalahandi district. However, due to certain exigency and change in management the project is now planned to be implemented in the name of **M/s Starlight Energy Limited** (SEL) in place of SIPL.

Furthermore, we would like to bring to your kind information that we are proposing to add an integrated grain based distillery unit of 2 x 45 KLPD along with an IMFL/IMIL Bottling Unit of 7700 cases/day alongside the biomass and rice mill project at the same location in two equal phases. The second phase shall commence after successful implementation of the first phase, i.e 1.1.2016. A brief report is hereby enclosed for the entire project as planned for your kind and needful information and consideration please.

Contd.....page 2



STARLIGHT ENERGY LIMITED

Ref: SEL/2015-16/DWR

Date: 07.10.2015

-2-

The water requirement shall stand revised to 680 cum/day from 600 cum/day as applied earlier for the phase -I of the project.

Therefore, it is to request you that the security deposit already submitted with earlier application of M/s SIPL may please be adjusted towards this revised application & the Bank draft bearing No.185214, dated 24/09/2015, of Rs.1000/- (Rupees one thousand only) as "processing fee" and the balance amount of security deposit Rs 4700.00(Rupees four thousand seven hundred) only is being submitted along with this application vide bank draft No 1852216 dated 24.09.2015 for which water allocation is required.

Also, we are kindly enclosing a NOC from M/s SIPL for grant and sanction of water in the name of M/s SEL for the ground water and surface water as applied by SIPL.

Your early and needful action is kindly solicited in the above matter.

Thanking You

Yours faithfully,

For Starlight Energy Limited
STARLIGHT ENERGY LIMITED

Dulal Choudhury
(Authorized Signatory)
DIRECTOR

Received
DD No. - 185216 - 4700/- (Security)
DD No. - 185214 - 1000/- (Processing)

R/m
13/10/15
Under Secretary to Govt.
Deptt. of Water Resources

Encl:

1. Location Map 6 Copies (4 copies in loose and 1 copy each with the FSR)
2. Water management plan 2 Copies
3. Xerox copy of Consent to Operate (SPCB)
4. Bank Draft-2Nos
5. Land document.



INDUSTRIAL PROMOTION AND INVESTMENT CORPORATION OF ODISHA LIMITED

(A Government of Odisha Undertaking)
(An ISO 9001-2008 Certified State Level Nodal Agency)
IPICOL HOUSE, JANPATH, BHUBANESWAR - 751 022, ODISHA (INDIA)
Phone: 0674-2542601-03, 2542605-06 (EPABX), Fax: 91-674-2543766
Website : www.ipicolodisha.com / www.teamodisha.org
E-mail: ipicol@sanchamnet.in / info@teamodisha.org
CIN: U65993OR1973SGC000585, Toll Free No.: 18003457111

No.SJ/SLSWCA-217(2)/ 375

Dt. 25/01/2016.

To
The Director,
M/s. Starlight Energy Ltd.,
C/O-Utkal Automotive (P) Ltd.,
Ring Road, Near Konark Cinema,
Roukela-769 001.

Sub: Proceedings of the 59th SLSWCA meeting held on 13/01/2016.

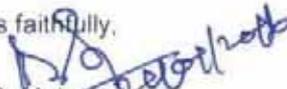
Dear Sir,

The State Level Single Window Clearance Authority (SLSWCA) in its meeting held on 13/01/2016 has considered the proposal of your company to set up a 2X45KLPD Integrated Grain based Distillery unit with 2X7700cases/day of IMFL/IMIL bottling plant along with 6X8MT/hour Parboiled Rice Mill with 2X3MW Co generation biomass power project at vill-Goud Sargiguda in the district of Kalahandi with a total investment of Rs.137 crores and approved "in principle" the proposal subject to the following conditions:

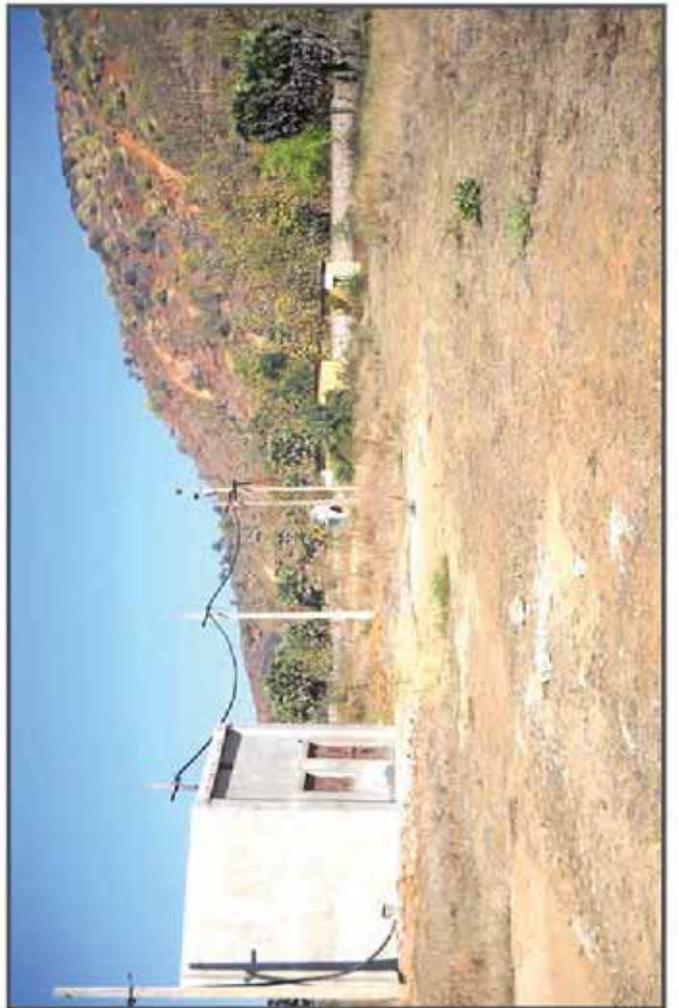
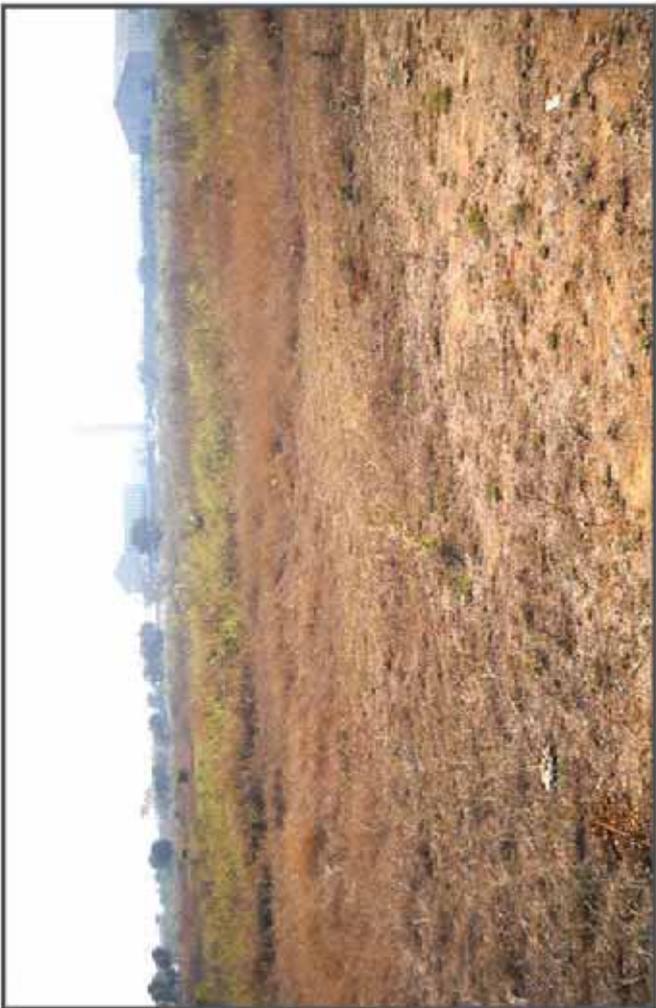
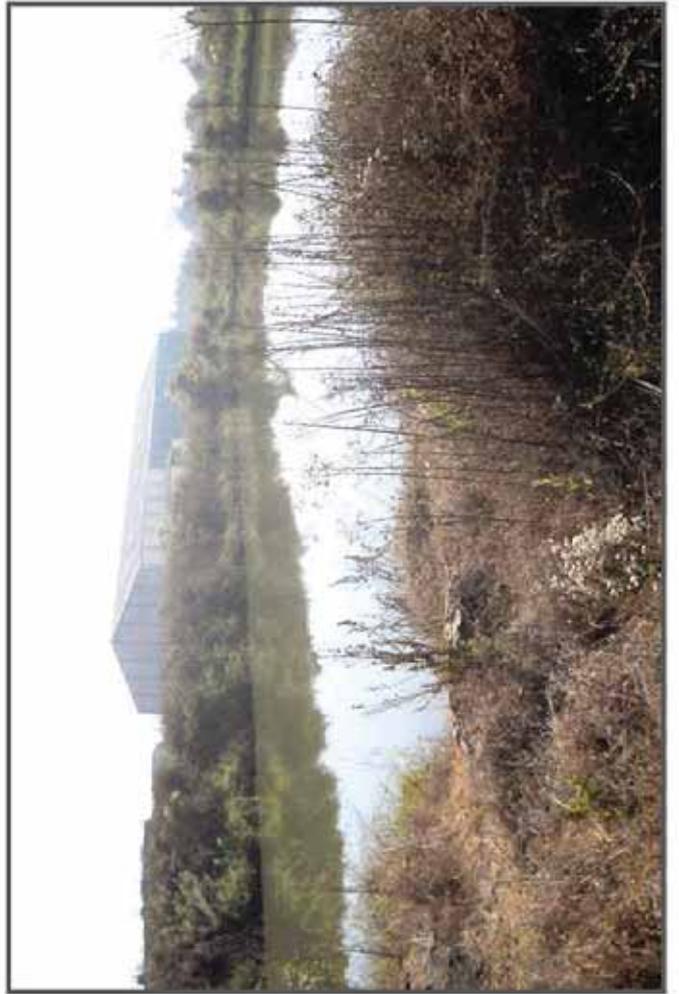
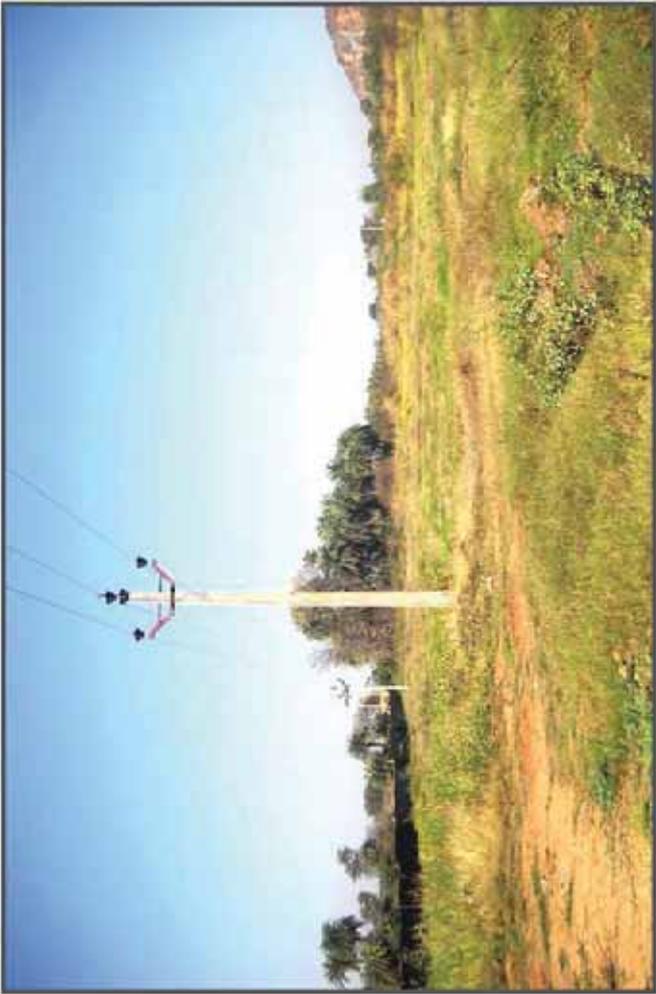
- a. No raw material linkages/assurances from the State Government for the project shall be provided.
- b. The company has to submit detail land use plan to IPICOL. Allotment of land to the project is subject to assessment by IPICOL (considering the bench mark report wherever available) or as required by the company, whichever is lower and will be as per the applicable procedure of IDCO.
- c. The project should not be located on mineral bearing area or command area of any irrigation project.
- d. The allotment of required quantity of water is subject to assessment by IPICOL or as required by the company, whichever is lower and as per DOWR norms.
- e. The company should obtain state excise clearance from the competent Authority.
- f. The use of power from the captive source is subject to the governing rules as applicable to the industry.
- g. The company has to obtain all statutory clearances as may be required & abide by the conditions/ stipulations made by Statutory Bodies of Govt. of India & Govt. of Odisha.
- h. The company shall strictly comply with the State Employment norms, R & R Policy and other policies of Govt. as applicable from time to time.
- i. The company shall take-up CSR activities in the locality in consultation with the District Collector. Besides the company shall comply with the extant rules & policies of Govt as applicable from time to time.
- j. The project shall not be located within 500 meters from any NH or SH or river bank.
- k. The company should make adequate provisions for parking of the transport vehicles required for their operations to ensure that project related vehicles are not parked within 200 meters from any NH/SH.
- l. The promoter(s) of the company shall not divest/dilute either directly or indirectly their share holding to less than 51% till 3 years from the date of completion of construction & commencement of commercial operation without the prior approval of the Govt.
- m. The company will submit its action plan for implementation of the proposed project to IPICOL & IDCO.
- n. Use of flyash bricks is mandatory for all the construction that the company may take up.

Kindly acknowledge the receipt of the letter.

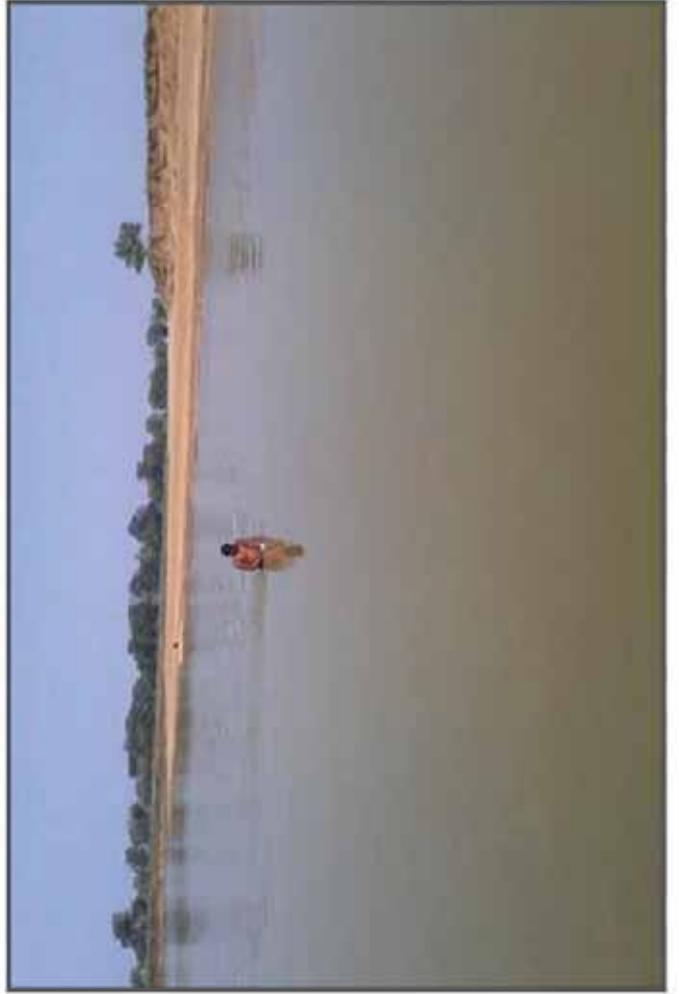
Thanking you,

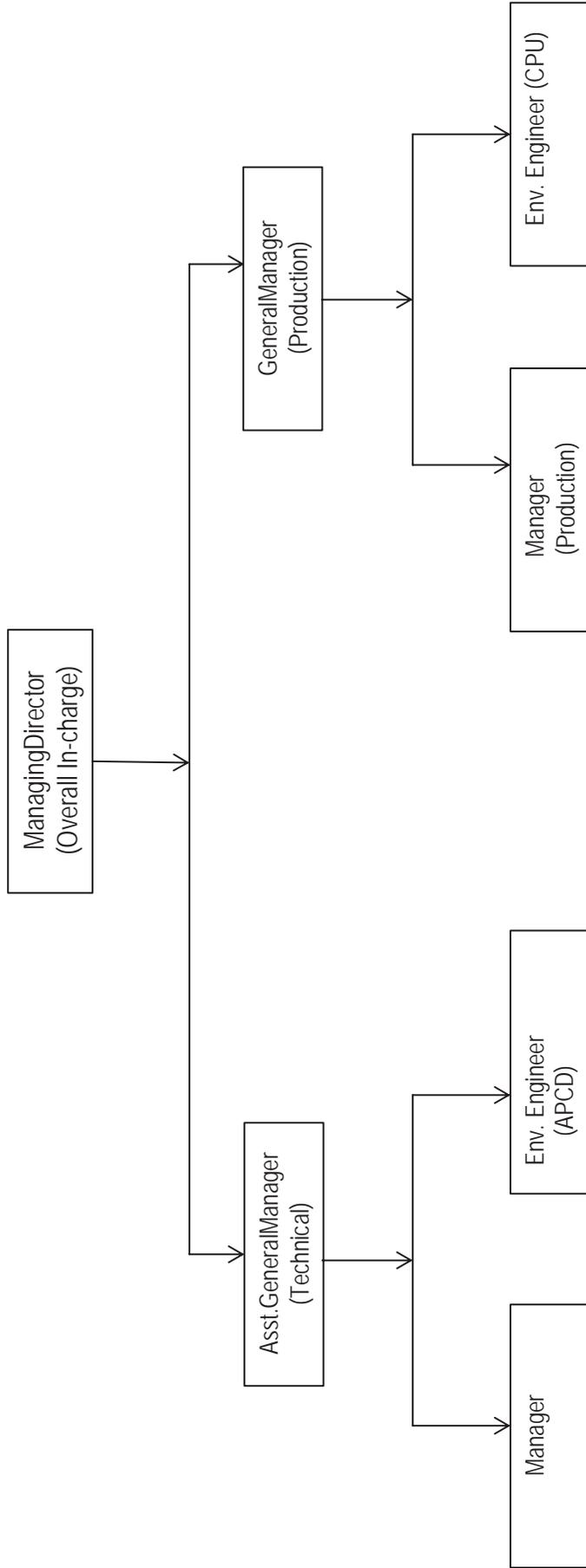
Yours faithfully,

(K.C. Mohanty)
General Manager, SLNA











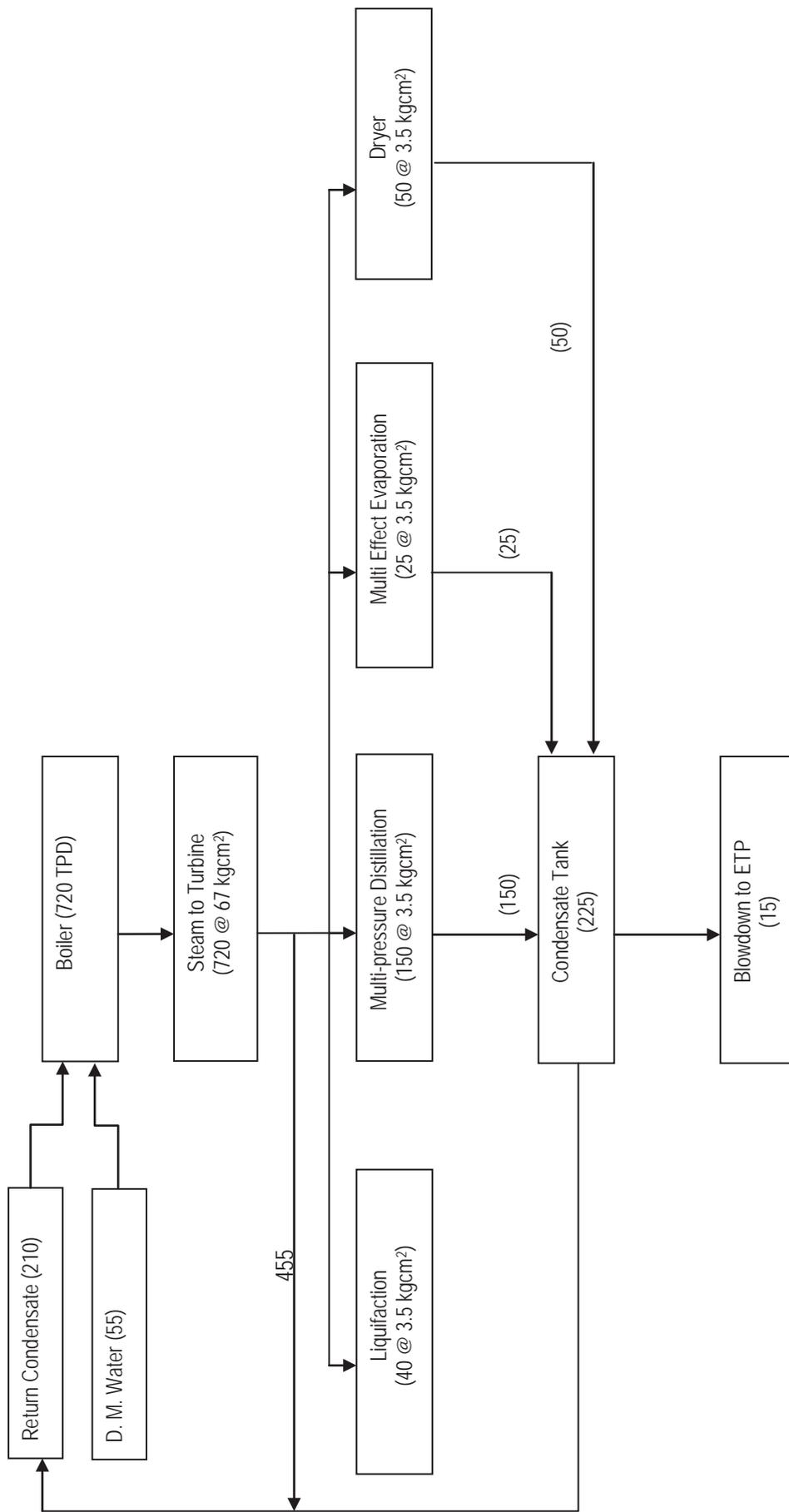
Roles and Responsibilities:

Managing Director of Starlight Energy Ltd. is the overall in-charge for the Environmental Management Cell. His role is to verify the implementation of the Environmental Management Systems in the industry time to time.

Assistant General Manager– Technical is responsible for the efficient operation of ESP, blow downs from the utilities such as cooling towers , DM plant reject, APCD Ash Management etc.

General Manager Production is responsible for the operation of the CPU, water management in the process, green area development and maintenance etc.

The other subordinate staff are working under the Assistant General Manager– Technical and General Manager Production as per their instructions.



Idealised Steam Balance (Each Phase)

All values are in MT/day

MATERIAL SAFETY DATA SHEET

1. CHEMICAL IDENTITY

Chemical Name *ETHYL ALCOHOL* : Chemical Classification *Alcohol*
Synonyms *Ethanol, Alcohol, Spirit of wine* : Trade Name

Formula: C_2H_5OH : C.A.S.No. *64-17-5* :U.N.No. *1170*

Regulated Identification : Shipping Name : *Ethanol* : Hazchem Code *2 E*
: Codes/Label : *Flammable Liquid, Class 3*
: Hazardous Waste ID No : *5*

HAZARDOUS INGREDIENTS : C.A.S.No : HAZARDOUS INGREDIENTS : C.A.S.No

1. *Ethyl Alcohol* *64-17-5* *3*
2 *4*

2. PHYSICAL/CHEMICAL DATA

Boiling Pt/Range *78.32 °C* : Physical State *Liquid* : Appearance *Colourless*
: Vapour Pressure : Odour *Alcohol odour*
Melting/Freezing Pt *-117 °C* : @ *35 °C* *40 mm Hg at 19 °C*
Vapour Density *1.59* : Solubility : Others *Miscible with chloroform, ether*
(Air = 1) : in water at *30 °C* *Soluble* :
Specific Gravity *0.7893 at* : pH *Neutral*
(Water = 1) *20 °C (Liq.)*

2.FIRE/EEXPLOSION HAZARD DATA

Flammability *Yes* : LEL *3 %* Flash Point $^{\circ}C$ *17.8* (*OC*)
TDG Flammability *3* :UEL *19 %* Flash Point $^{\circ}C$ *12.8* (*CC*)

Auto ignition $^{\circ}C$: *422.7*
Explosion sensitivity to impact : *Stable*
Explosion sensitivity to static Electricity : *Data not available*
Hazardous Combustion Products : *None*
Hazardous Polymerization : *Will not occur*

Combustible Liquid *Yes* : Explosive Material *No* Corrosive Material *No*
Flammable Material *Yes* : Oxidiser *No* Others
Pyrophoric Material *No* : Organic Peroxide *No*

4.REACTIVITY DATA

Chemical Stability : *Stable*
Incompatibility : *Acetyl chloride, BrF₅, Ca(Ocl)₂, ClO₃, CrO₃, Cr(OCl)₂, (Cyanuric Acid+H₂O)*
With other material : *H₂O₂, HNO₃, (H₂O₂+H₂SO₄), Perchlorates*

Reactivity : *Reacts violently with acetyl bromide (evolves Hydrogen bromide), Dichloromethane + Sulfuric acid + Nitrate or Nitrite, Disulfuryl, Tetraachlorisilane + Water & strong oxidants*
Hazardous : *Forms explosive products on reaction with ammonia + silver nitrate (forms silver nitrate & :silver fulminate)*

5.LD₅₀ (oral-rat)	7060 mg/kg	: STEL	Not listed	ppm	Not listed	mg/m ³
Permissible Exposure limit	1000 ppm	1900 mg/m ³	: Odour Threshold	Not	ppm	Not
TLV(ACGIH)	1000 ppm	1900 mg/m ³		available		available

NEPA Hazard	: Health	: Flammability	: Reactivity	: Special
Signals	: 0	: 3	: 0	:

6. PREVENTIVE MEASURES

Personal	: Avoid contact with liquid or Vapour
Protective Equipments	: Provide safety goggles, all purpose canisters, protective overclothing & shoe
Handling & storage	: Store in a cool, well ventilated, dry area, away from heat, sparks, flame & oxidiseres
Precautions	:

7. EMERGENCY/FIRST AID MEASURESE

FIRE	: Fire Extinguishing	: Alcohol foam, CO ₂ , dry chemical powder
	: Media	

:	Special Procedure	: keep the containers cool by spraying with water if exposed in fire or heat
:	Unusual Hazards	: Flashback along Vapour trail may occur

EXPOSURE	: First Aid Measures	: If eyes are affected wash with plenty of water for 15 min. If skin is affected, remove the contaminated clothes and wash the affected area with plenty of water and soap. If inhaled, remove the victim to fresh air area. Seek medical help immediately.
	Antidotes/Dosages	: Not available

SPILLS

:	Steps To Be Taken	: Shut off leaks if without risk. Drench with water.
:	Waste Disposal Method	: Seal all waste in Vapour tight plastic bags for eventual disposal

8. ADDITIONAL INFORMATION/REFERENCES

Ethanol is rapidly oxidized in the body to CO₂ and water. Though Ethanol possesses narcotic properties concentration Sufficient to produce this effect are not reached in industry. Concentration below 100 ppm usually produces no intoxication.

9. MANUFACTURERS/SUPPLIERS DATA

NAME OF FIRM	: Starlight Energy Ltd. (Distillery Unit).	Contact person	: i
MAILING ADDRESS	: Dist Kalahandi in	emergency	
TELEPHONES/FAX	:	Local Bodies involved	standard packing Term card Details /Ref

10. DISCLAIMER

Information contained in material data sheet is belayed to be reliable no representation , guarantee or warranties of any kind are made as to its accuracy, suitability for a particular application or results to be obtained from them. It is up to the manufacturer/seller to ensure that the information contained in the material safety data sheet is relevant to the product manufactured/handled or sold by him as the case may be. The I.C.M.A. makes no warranties expressed or implied in respect of the adequacy of this documents for any particular purpose.