M/S. ESVEEGEE BREWERIS (P) LIMITED

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & EMP REPORT

FOR

Grain Based Distillery (ENA/RS 60 KLPD) and Expansion (ENA/RS 60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD) with Cogeneration Power Plant (3.5 MW)

AT

Plot no. 321/362, 323/363, 323, 324, 325, 339, 340/381, 392 / 449, 449 / 451 & 449 / 455, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim.

PROJECT PROPONENT:

M/s. Esveegee Breweries (P) Limited.

PREPARED BY:

en-VISION ENVIRO ENGINEERS PVT. LTD.

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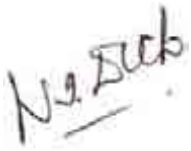
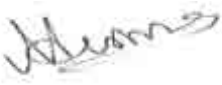
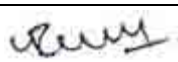
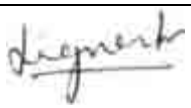
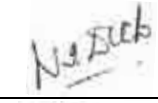
Provisional Accreditation by
Quality Council of India under NABET

MAY, 2013
1410007_12010053_0507

PROJECT TITLE	M/s. Esveegee Breweries (P) Ltd.		
CORRESPONDENSE ADDERESS	Mr. Rajesh Kumar Jalan (Director) Antaraa Tower,Danish Road, Panbazar, Guwahati-781001 (Assam)		
PROJECT NO.:	12010053	**DATE:**	07/05/2013
CATEGORY OF THE PROJECT AS PER EIA NOTIFICATION, DATED 14TH SEPTEMBER, 2006 AND AS AMENDED TILL DATE			
A, 5(g), Distilleries, (ii) All Cane juice/non-molasses based distilleries ³30 KLD			
DETAILS REQUIRED AS PER NABET, QCI GUIDELINES			
NABET SECTOR NO.	22		

FUNCTIONAL AREA EXPERTS INVOLVED IN PREPARATION OF REPORT:

AREA	NAME	SIGNATURE
EIA CO-ORDINATOR	Mr. Nihar Doctor	
METEOROLOGY, AIR QUALITY MODELING & PREDICTION		
SOLID & HAZARDOUS WASTE MANAGEMENT		
WATER POLLUTION MONITORING, PREVENTION, & CONTROL		
AIR POLLUTION MONITORING, PREVENTION & CONTROL	Dr. Manojkumar Mishra	
NOISE		
LAND USE	Dr. Y. Ramamohan	
ECOLOGY & BIODIVERSITY	Dr. Manoj Eldath	
SOCIO-ECONOMOICS	Dr. Rahul Deshmukh	
HYDROLOGY, GROUND WATER & WATER CONSERVATION	Mr. Ravikant Sharma	
GEOLOGY		
RISK ASSESSMENT & HAZARD MANAGEMENT	Mr. D. H. Patel	
	NAME & DESIGNATION	**SIGNATURE**
PREPARED BY	Mr. Jignesh Patel	
CHECKED BY EIA CO-ORDINATOR	Mr. Nihar Doctor	
AUTHENTICATED BY	Mr. R. K. Dubey (General Manager)	

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EXECUTIVE SUMMARY

OF

DRAFT EIA & EMP REPORT

PREPARED FOR

EXISTING GRAIN BASED DISTILLERY (ENA/RS 60 KLPD) AND EXPANSION (ENA/RS 60 KLPD TO 120 KLPD) AND ABSOLUTE ALCOHOL (30 KLPD) ALONG WITH COGENERATION POWER PLANT (3.5 MW)

AT

PLOT NO. 321/362,323/363,323,324,325, 339,340/381,392/449,449/451 & 449/455, VILLAGE MANPUR, TEHSIL NAMCHI, DISTRICT SOUTH SIKKIM, SIKKIM

OF

M/S. ESVEEGEE BREWERIES (P) LIMITED

ANTARAA TOWER, DANISH ROAD,
PANBAZAR,
GUWAHATI- 781001
ASSAM

CONTEXT

1 INTRODUCTION

M/s. Esveegee Breweries (P) Limited, is a Private Limited Company having its corporate office at Antaraa Tower, Danish Road, Panbazar, Guwahati, Assam-781001. M/s. Esveegee Breweries (P) Limited has already set up Grain based Distillery to manufacture Extra Neutral Alcohol (ENA)/Rectified Spirit (RS) 60 KLPD at Plot no. 321/362,323/363,323,324,325, 339,340/381,392/449,449/451 & 449/455, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim and now proposes expansion to manufacture ENA/RS 60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD with Cogeneration Power Plant (3.5 MW). The project is categorized as A under 5(g), (ii) (All Cane juice/non-molasses based distilleries >30 KLD) as per EIA Notification, dated 14th, September, 2006 & its amendment in 2009. The EIA Study has been carried out by M/s. En-vision Enviro Engineers Pvt. Ltd., Surat, Gujarat which is based on the three months field data collected at site during 9th January to 8th April 2013 and the same data has been used in assessment of impacts.

2 PROJECT DESCRIPTION

2.1 PROJECT DETAILS

Name of the company	M/s. Esveegee Breweries (P). Ltd.
Capacity of the project	Existing & Proposed expansion of Grain Based Distillery (120 KLPD ENA/RS) with Co-generation Power Plant (3.5 MW)
Total project cost	Existing: Rs. 44.90 Crores, Proposed expansion: Rs. 79.50 Crores
Cost for EPCM	Existing: Rs. 5.5 Crores, Proposed expansion: Rs. 9.0 Crores
Cost for CSR activity	Rs. 4 crore shall be utilized over a period of 5 years as 5% of project cost. After words Rs. 5.0 Lacs shall be utilized per annum as Recurring expenditure.

2.2 PROJECT REQUIREMENT

Land requirement	Existing land area is 12 acres (4.80 ha). No new land will be acquired.
Water requirement & its source	Total 1134 KLPD water will be required after proposed expansion of existing project and will be sourced from surface water of Rangit River and/or ground water through.
Electricity requirement & its source	3.5 MW and shall be sourced from Proposed 3.5 MW Cogeneration Power Plant.
Manpower requirements	In existing 60 personnel are working additionally 30 no. of personnel will be employed. First preference will be given to local people as far as possible.
Fuel requirement & its source	Coal: 110 TPD for CPP and will be Source from Meghalaya. HSD: 120 lit/hr for D. G. Set, from nearest sources.
D.G. set for emergency use	Two D. G. Sets of 860 KVA Capacity for emergency purposes

2.3 RAW MATERIAL REQUIREMENT

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION (MT/DAY)		SOURCE & THEIR DISTANCE (KM)
		EXISTING	AFTER EXPANSION	
1.	Grains (Corn / Bajra / Wheat)	150 MT	300 MT	Assam, Bihar, West Bengal, Uttar Pradesh.
2.	Alpha Amylase	30 Kg	60 Kg	Directly from the Chemical Companies

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION (MT/DAY)		SOURCE & THEIR DISTANCE (KM)
		EXISTING	AFTER EXPANSION	
3.	Amyloglu Cosidase	30 Kg	60 Kg	Directly from the Chemical Companies
4.	Sulphuric Acid	150 Kg	300 Kg	West Bengal
5.	Nutrients Ammonia	150 Kg	300 Kg	West Bengal
6.	Antifoam	0.6 kg per KL 36 kg	0.6 kg per KL 36 kg	West Bengal
7.	Yeast	As per requirement	As per requirement	Authorized Dealers (West Bengal)
8.	Biocides	30 kg	60 kg	West Bengal

2.4 WASTE WATER GENERATION

There is no discharge of wastewater from the project. The effluent generated from the ENA production process is segregated as process effluent (spent wash and spent lees) and effluent from utilities like Boiler, Vacuum pump, washings. The company proposes to follow & set up a "Zero Effluent Discharge" scheme. The condensates from evaporation shall be recycled and reused in Process & Make up water streams. Spent wash shall be decanted for separation of Suspended Solids and Multi-Effect Evaporation arrangement. Condensate shall be reused and spent lees shall be recycled back to Distillation.

Wastewater from Boiler (Blow down) as well as miscellaneous Water shall be used in internal Green Belt development and ash quenching purposed. Domestic wastewater generated shall be discharged into septic tanks and disposed off using soak pits.

2.5 AIR EMISSION & AIR POLLUTION CONTROL MEASURES

NO. OF STACK	STACK ATTACHED TO	NAME & QUANTITY OF FUEL	POLLUTION CONTROL EQUIPMENT	HEIGHT & DIAMETER (MTR)	POLLUTANT AS PER SPCB LIMIT
1.	Boiler – 40 TPH	Coal 110 TPD	Bag Filter/ESP	Ht. 82.5 m & dia. - 1.0 m	PM – 150 mg/Nm^3 SO_2 – 100 ppm NOx – 50 ppm
2.	D. G. Set of 860 KVA (Standby facility)	Diesel 120 Lit./Hr	Industrial Grade Resistive Mufflers and RCC room with proper ventilation	Ht. - 9 m & dia. - 0.4 m	PM – 150 mg/Nm^3 SO_2 – 100 ppm NOx – 50 ppm

2.6 DETAILS OF SOLID WASTE GENERATION & ITS DISPOSAL METHOD

SR. NO.	PARTICULAR	QUANTITY (PER DAY)		METHOD OF STORAGE & DISPOSAL
		EXISTING	TOTAL(EXISITNG & PROPOSED)	
1.	Grain residue (DDGS/DWGS)	30 MT / 60 MT	60 MT / 130 MT	Use as cattle feed
2.	Fly ash	8.5 MT (Depending upon the type of fuel used)	17 MT (Depending upon the type of fuel used)	Shall be trapped, stored in open underground shed and utilized for brick manufacturing or sold to nearby Cement plant.
3.	Used/Spent Oil	-	0.96 lit	Reused in the plan for libration or sell to MoEF authorized reprocessors.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

The baseline environmental quality of Air, Water, Soil, Noise, Socioeconomic Status and Ecology has been assessed in the months of 9th January to 8th April, 2013 in a study area of 10 km radial distance from the project site.

3.2 ENVIRONMENTAL SETTING OF THE AREA

Site coordinates	Latitude : 27° 5'47.07"N Longitude : 88°21'32.42"E
Nearest Village	Manpur at around 2.7 Km in NE
Nearest Town	Jorethang at around 8.66 km WNW
Nearest City	Namchi at around 7.6 Km in N
Nearest Dist Headquarter	Namchi at around 7.6 Km in N
Nearest National Highway	NH – 31a Around 7.5 Km in SE NH – 44 Around 10.8 Km in SW
Nearest Railway Station	Darjeeling at around 12 km in SW
Nearest Airport	Darjeeling at around 11.5 km in SW
Nearest River	Rangit River adjacent the project site in S & W
Seismicity	Seismic Zone-IV

3.3 BASE LINE DATA

The baseline environmental data is collected during 9th January to 8th April, 2013 from the study area of 10 km radial distance from the project site.

3.3.1 MICRO-METEOROLOGY

The maximum and minimum temperatures observed in this area are 28.2°C in July and 8.4°C in January with average relative humidity of 08.30 hrs and 17.30 hrs. Relative Humidity was generally high during the period from June to September. The predominant wind direction is South-EastWest and North-East with 17.30 hrs of calm condition.

3.3.2 AMBIENT AIR QUALITY

The ambient air samples were collected from eight locations and analyzed for PM_{10}, $PM_{2.5}$, SO_2, NOx & HC (Methane & Non-methane). As per the monitoring PM_{10}, $PM_{2.5}$, SO_2, NOx & HC as Methane & HC as Non-methane levels were in the range of 12-91 $\mu g/m^3$, 5-32 $\mu g/m^3$, <4-6 $\mu g/m^3$, 9-25 $\mu g/m^3$ respectively. While for HC as Methane was found between range of <0.1-3 ppm & HC as Non-methane below <0.1 ppm. The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to rural / residential norms of National Ambient Air Quality standards of Central Pollution Control Board (CPCB), with present level of activities.

3.3.3 SURFACE WATER QUALITY MONITORING

Total 5 nos. of surface water samples have been collected from the study area. All the surface water samples were collected and analyzed for physical, chemical and microbiological characteristics as per CPCB guidelines and approved methods.

3.3.5 GROUND WATER QUALITY MONITORING

Three nos. of ground water samples in the study area have been collected from ground water sources. The water samples were collected and analyzed for physical, chemical and microbiological characteristics as per CPCB guidelines and approved methods.

3.3.6 BACKGROUND NOISE LEVEL

Background noise levels were measured at 8 locations. The day time noise levels at all the locations ranged between 37.7-54.1 dBA. The night time noise levels at all the locations ranged between 36.2-42.5 dBA in residential areas.

3.3.7 TRANSPORTATION NOISE LEVEL

Transportation noise levels were measured at 3 locations. The noise levels at all the locations in day time from edge of the road ranged between 60.6-63.7 dBA. The noise levels at all the locations night time m from edge of the road ranged between 44.7-55.5 dBA.

3.3.8 SOIL QUALITY

Total of 6 nos. of samples have been collected from the study area and tested in the laboratory. Mostly texture of the soil is clay followed by loamy sand, clay loam and sandy clay loam soil. Regular cultivation practices increase the bulk density of soil, thus inducing compaction. This results in reduction in water percolation rate and penetration of root through soils. The bulk density of soils in the region is in the range of 1.43-1.54 g/cm^3, which is considered as moderate. The porosity and water holding capacity of soils are in the range of38.3-42.8% and 37.4-48.9%. Total Organic carbon in soil samples vary in the range of 0.87-1.49 which is low to medium and phosphate as P_2O_5 varies from 0.46-1.17%. However, Magnesium showed in range 3.11-7.28 mg/kg.

3.3.9 LAND USE PATTERN

Land use within 10 km radius of the study area has been determined with the help of satellite imagery, and broadly consists of settlements, Industrial land, Tank/River, land with scrub, land without scrub, mining area and predominant land use is Dense Mixed Jungle.

3.3.10 BIOLOGICAL ENVIRONMENT

The study area is characterized by mostly hilly terrains and steep valleys covered with good forest in the entire study area. The Rangit and Teesta rivers makes national boundary in south with Darjeeling district of West Bengal state. The elevation in the study area varies from 250 feet to 2500 feet. The Kitam Bird Sanctuary is present in the study area.

FLORAL DIVERSITY OF THE STUDY AREA

The most dominating family in Sikkim Sate is Lauraceae followed by Euphorbiaceae while the most dominating genus is Ficus with 30 species followed by Sorbus and Rhododendron with 15 species each. The tropical and sub-tropical forests observed in the study area mainly along the Teesta and Rangit rivers and their tributaries. The composition of the tree species in the study area are characterized by mixed nature. These tree species show profuse growth, reaching up to a height of 30 m.

CULTIVATED PLANTS IN THE STUDY AREA

The agriculture lands are very limited in this region due to the rugged mountainous terrains with wide variations in slopes and altitude. Agriculture is mainly maize. Annual crops are grown in three seasons

A- Pre-kharif - Maize.
B- Kharif - Rice, urd, soybean, finger millet, rice bean, beans, ginger and few solanaceous vegetables.
C- Rabi - Wheat, mustard, sarson, rai sag, potato, pea, cabbage, cauliflower, radish and carrot.

Tea gardens were observed at many places in Darjeeling districts especially at Peshok region

FAUNAL BIODIVERSITY OF THE STUDY AREA

For the documentation of the faunal biodiversity of the study area with respect to birds, reptiles, amphibians, and butterfly species, a detailed survey had been conducted. Faunal species recorded in the study area includes 13 types of mammals, 56 types of birds, 9 types of Reptiles and 23 types of butterflies belonging to 4 families.

3.3.11 SOCIO-ECONOMIC STUDY

The study area consists of two States viz. Sikkim and West Bengal while three districts viz. South Sikkim, West Sikkim and Darjeeling and 6 tehsils. The total population of the study area was 2,65,065 out of which 1,35,931 were male and 1,29,134 were female. There were 49,362 no. of households in the study area. The total literates of the study area are 1,91,626. The total illiterates of the study area are 73,439. It is also observed that the rural population predominates over the urban population.

4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IMPACT ASSESSMENT

An effort has been made to identify various environmental, social and ecological impacts due to proposed existing and expansion project during construction and operation phases considering present environmental scenario as baseline. The corresponding mitigation measures to take care of the adverse impacts are also discussed in following sections.

4.2 IMPACTS DURING CONSTRUCTION PHASE & ITS MITIGATION MEASURES

During Construction Phase, the Fugitive Dust Emission due to civil work and vehicular movement is not expected to spread too far as water spraying will be carried out to suppress the dust emission at the site and as well as on road. The increase in noise levels due to the movement of vehicles will be taken care of by regulating the movement of vehicles and the impact on the human beings will be taken care of by providing the working people with ear plugs / ear muffs. During monsoon, there is a chance of runoff of the debris / mud that will be generated during construction only. This is very much temporary in nature. To reduce the suspended solids, the storm water run offs will be diverted to storm water drains through catch pits. During Construction**,** drainage pattern and water supply system of overland water flow will be somewhat changed due to the site preparation activities. Potential impacts may be on surface water quality during this phase could arise from dust emissions (from vehicles and disturbance of soil). Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the particles to settle down, prior to discharge. During construction period, the project is likely to generate substantial employment and income.

4.3 IMPACT DURING OPERATION PHASE & MITIGATION MEASURES

4.3.1 AIR ENVIRONMENT

Major air emissions are anticipated by the gaseous emissions from a single or small group of stacks is a local phenomenon. Fugitive dust emission will be due to raw materials handling, loading and unloading of raw materials, conveying and feeding point at furnace, vehicular movements, etc. The ISCST3 scientific model has been used to predict the proposed air quality on the environment.

The maximum 24 hourly average GLC's for PM, SO_2 and NOx, are observed to be 4.8 $\mu g/m^3$, 8.4 $\mu g/m^3$, 3.0 $\mu g/m^3$ respectively at a distance of 1000 m towards east direction, which when added to the baseline data comes within the CPCB norms. The GLC predicted at all receptor locations are well within the limit prescribed in NAAQS.

Mitigation measures:

- Effective stack height with proper air pollution control equipment shall be provided to stack.
- Regular maintenance of APCE shall be done and recorded.
- Green belt shall be developed on 33% are of the total plant area.
- Lime stone as absorbent will be blended with coal to take care SO_2 emission due to high Sulphur content in coal.

4.3.2 NOISE ENVIRONMENT

The noise pollution management will be taken up in the following manner;

- By selecting low noise generating equipment, which would have below 85 dBA noise level at 1 m distance. This is taken care at the equipment design stage.
- By isolating the noise unit from the working personnel's continuous exposure by providing acoustic aids for plant personnel.
- By administrative & safety measures, providing noise level monitoring, remedial measures, providing noise safety appliances to the working personnel.

By these measures, it is anticipated that noise levels in the plant will be maintained below 85 dBA.

4.3.3 WATER ENVIRONMENT

Total water requirement will be fulfilled from ground water and/or surface water sources. This area is falls in safe category of water availability in CGWA. The company envisages zero discharge system for the proposed expansion of existing project. Wastewater will be reused in the process as well as internal greenbelt development activity which will reduce the water requirement so there will be no significant impact on water.

4.3.4 SOLID WASTE MANAGEMENT

Main solid waste generation during operation phase will be Grain residue (DDGS/DWGS 60/130 MT/day) and fly ash (17 MT/day). These materials will be properly stored and will be disposed as per Guidelines. Grain Residue will be sent for cattle feeding and fly ash shall be trapped and utilized for brick manufacturing or sold to nearby Cement plant.

4.3.5 GREEN BELT DEVELOPMENT

About 15,870 sq. m. area shall be developed as green belt at plant boundary, road side, around offices & buildings and Stretch of open land. In Green belt area about 1,000 trees per acre of land shall be planted

5 ENVIRONMENTAL MONITORING PROGRAMME

5.1 ENVIRONMENTAL MONITORING

A regular monitoring of environmental parameters like air, water, noise and soil as well as performance of pollution control facilities and safety measures in the plant are important for proper environmental management of any project. Therefore, the environment and safety cell will handle monitoring of air and water pollutants as well as the solid wastes generation as per the requirements of State Pollution Control Board and Central Pollution Control Board.

5.2 MONITORING SCHEDULE

Proposed schedule of environmental monitoring for the proposed expansion is given in following table:

SR. NO.	AREA OF MONITORING	SAMPLING LOCATIONS	PARAMETERS TO BE ANALYSED	FREQUENCY OF SAMPLING
AIR POLLUTION MONITORING				
1.	Stack Emission	Each utility stack	PM, SO_2, NOx & CO	Once in a month
2.	Ambient Air Quality	Three samples	$PM_{2.5}$, PM_{10}, SO_2, NOx and CO	Once in six month
3.	Work Zone Environment	Production area & Storage area	HC, VOC	Once in six month
WATER POLLUTION MONITORING				
4.	Liquid effluent	outlet at Effluent treatment plant	As per consent of PCB	Once in a month
5.	Ground and surface water	Two sampling locations	As per IS Standards	Once in a year
SOIL POLLUTION MONITORING				
6.	Soil	Two sampling locations of Impact Area	As per consent of PCB	Once in year
NOISE POLLUTION MONITORING				
7.	Noise	Noise generating units	Sound Pressure Levels (Leq)	Once in a six month
		Four sampling locations within Plant	Sound Pressure Levels (Leq)	Once in a month
8.	Occupational Health Monitoring	Pre employment Check up	Vision, Audiometry, Spirometry, Chest Skiagram, Urine, RBCs, etc.	Once after appointment
		Periodical Check up	Spirometry, Urine, RBCs, LFT, Anemia, etc.	<30 yrs. Once in five years 31-40 yrs. Once in four years 41-50 yrs. Once in two years Above >50 yrs. once every year
		Post employment check up	Vision, Audiometry, Spirometry, Chest Skiagram, Urine, RBCs, etc.	Once before relief

6 ADDITIONAL STUDIES

6.1 RISK ASSESSMENT

The management is very much aware of their obligation to protect all persons at work and others in the neighbourhood who may be affected by an unfortunate and unforeseen incidence occurring at the works. Any hazard either to employees or others arising from activities at the plant site shall, as far as possible, be handled by the personnel of the company and prevented from spreading any further. In the case of eventuality the Disaster Management plan adopted by the proponents is sufficient and may be able to control the situation.

7 PROJECT BENEFITS

7.1 PHYSICAL INFRASTRUCTURE

As the proposed M/s. Esveegee Breweries (P) Limited project is an existing and expansion, all the major physical infrastructure development is already developed, which has improved the existing infrastructure scenario.

7.2 EMPLOYMENT POTENTIAL

For this project activities skilled and unskilled manpower will be needed. This will temporarily increase the employment opportunity. Secondary jobs are also bound to be generated to provide day-to-day needs and services to the work force. This will also temporarily increase the demand for essential daily utilities in the local market.

7.3 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Funds to the extent of Rs. 4.0 Crore shall be earmarked for CSR activities, this fund shall be utilized over a period of 5 years which is a 5% of the total project cost. After words Rs. 5.0 Lacs shall be utilized per annum as Recurring expenditure for CSR.

FOLLOWING ACTIVITY SHALL BE UNDER TAKEN A PART OF CSR.

- Education development
- Health care
- Sustainable livelihood
- Agriculture Initiative
- Community activities or others

8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 ENVIRONMENTAL MANAGEMENT PLAN (ADMINISTRATIVE ASPECTS)

Environmental monitoring of different parameters will be done regularly and the activity will be coordinated by the Environmental Management Cell (EMC). Mitigation of environmental impacts has to be implemented according to the suggestions and will be monitored regularly to prevent any lapse. The EMC will be under the overall supervision of the Manager (Environment). The cell will report on a regular basis to the Unit Head. The EMC will prepare a formal report on environmental management and mitigation at six month intervals. The company will undertake various training programme for improving the performance of the working personnel. Special training will be arranged in regular intervals to combat emergency scenarios that may occur during the plant operation.

9 CONCLUSION

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. Industrial growth is an indication of socio economic development. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

CHAPTER – 1

INTRODUCTION

1.1 PURPOSE OF EIA

An EIA is a systematic process that predicts and evaluates the potential impacts a proposed project may have on aspects of the physical, biological, socio-economic and human environment. Mitigation measures are then developed and incorporated into the project to eliminate, minimize or reduce adverse impacts and, where practicable, to enhance benefits. This introductory chapter presents an overview of the project, provides details of the EIA team and outlines the approach taken to undertake the EIA. In addition the structure of the remainder of the report is outlined. Executive

This Environmental Impact Assessment study is carried out as a part of the process to obtain Environmental Clearance for the existing and proposed expansion project of M/s. Esveegee Breweries (P) Limited. The project is categorized as A under 5(g), (ii) (All Cane juice/non-molasses based distilleries >30 KLD) as per EIA Notification, dated 14 September, 2006 & its amendment in 2009.

1.2 IDENTIFICATION OF PROJECT PROPONENT

M/s. Esveegee Breweries (P) Limited is a Private Limited Company incorporated on 17th day of April 2008 and promoted by Mr. Vijay kumar Gupta (CMD) and Smt. Sulochana V Gupta (Director) with its Registered Office at Ambuja Tower, post: Navjivan, Navrangpura, Ahmedabad-38001 and Factory/Works at Manpur, South Sikkim, Sikkim. The Company is incepted with the object of carrying on the business of Distillers, Bottlers, and Canners, etc. and the company had obtained Consent to establish (NOC) from state pollution control board, Sikkim vide letter no. 126/SPCB dated 16/04/2010 for the Grain based distillery. Then consent to operate (CCA) was obtained vide letter no. 208/SPCB 67 dated 07/04/2011 valid up to 31st March, 2012.

The company was taken over by a group of professionals on dated 22/6/2011.

Now, the Main Promoters of the Company are:-

1. Mr. Rajesh Kumar Jalan, Director
2. Mr. Jitendre Newatia, Director
3. Mr. Binod Kumar Chhawchharia, Director

1.2.1 BRIEF INTRODUCTION OF THE PROMOTERS

The Brief bio-data of the promoters are given below:

1. MR. RAJESH JALAN:

Mr. Rajesh Jalan is graduate by qualification. He is one of the prominent businessman of Assam and is financially very sound. He is proprietor of **Gayatri Distillers & Bottling Industries**, which is a IMFL manufacturing unit at Tinsukia, Assam is also having bonded warehouse. He is presently director/partner in following concerns:

1. Changlang Oil Traders, a petrol pump,
2. Green Gold Tea Industries, a tea manufacturing unit
3. Maruti Nandan Bonded Warehouse,
4. M/s. M. P. Jalan, a petrol pump,
5. Rangkattu Tea Company Private Limited, a Tea Estate
6. M/s. Master India Breweries, Beer Manufacturing.

All the units are running successfully and earning good profits. Mr. Jalan is hard working, sincere in his efforts and reputed businessman.

2. MR. JITENDAR NEWETIA:

Mr. Jitendra Newetia is commerce graduate from Guawahati University. He has experience of around 18 years in various activities like IMFL trading and manufacturing, bonded warehouse keeper, sandal wood manufacturing. He is presently director in following company:

1. Karnak Distillery Private Limited.
2. G.J. Fragrance Limited.
3. Express Real Estate Private Limited
4. Megha Assam Private Limted

Mr. Newetia is actively engaged in operation of the company and due to his sincere efforts and business experience all the units are running successfully and earning good profits. Mr. Newatia is hard working, reputed businessman and also having good business connection and network throughout the North East region.

3. MR. BINOD KUMAR CHHAWCHHARIA:

Mr. Binod Kumar Chhawchharia is a successful businessman having a wide experience in the field of leasing, financing and manufacturing line. He is also having experience in food grain and milling business. Mr. Chhawchharia is the first entrepreneur to set-up a IMFL unit in the name of Karnak Distilleries Private Limited at Panikhaiti, Guwahti and the unit was first to launch its own brand of IMFL also. Mostly they are doing job work for national payers. He is the proprietor of M/s. Navajyoti Modern Atta Mills, which is earning a steady profit since its inception. Besides his other proprietary concern M/s. Megha Investment deals in financing & leasing business, it is also a profit making venture. In addition to this, he is a partner in M/s. Soya Puff Industries, Kalaphar Guwahati, which is a family business affair in partnership with his wife. Presently he is holding directorship in M/s. SBP Commercial Pvt Ltd.

1.3 BRIEF DESCRIPTION OF THE PROJECT

M/s. Esveegee Breweries (P) Limited has set up Grain based Distillery to manufacture Extra Neutral Alcohol (ENA)/Rectified Spirit (RS) 60 KLPD and proposes expansion to manufacture ENA/RS 60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD with Cogeneration Power Plant (3.5 MW). Unit is located at Plot no. 321/362, 323/363, 323, 324, 325, 339, 340/381, 392/449, 449/451 & 449/455, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim.

The new management was under the impression that the old management has taken all the necessary permissions to establish/operate the unit and after that only merely getting NOC from the State Pollution Control Board will allow us to start the industry. In December, 2011 the board of directors came to know from regional office of MoEF, Shillong that they are running the unit without taking the prior mandatory Environmental Clearance from competent authority as per the provision to EIA Notification.

As the company has violated Environmental Protection Act, 1986, a court case is filed by State Pollution Control Board of Sikkim against managing director of the company as per the provision of EPA act. A copy of summons is enclosed as annexure-XV.

1.4 SCOPE OF THE STUDY

The scope of work of EIA/EMP studies of the expansion project of M/s. Esveegee Breweries (P) Limited includes detailed characterization of various environmental components such as micro-meteorology, air, noise, water, land, biological and socio economy within 10 km radius from the project site. The main objectives of the study are:-

- To identify and quantify significant impacts due to various operations of the existing and proposed project on various environmental components through prediction of impacts.
- To evaluate the beneficial and adverse impacts of the plant.
- To evaluate and implement the Environmental Management Plan (EMP) detailing control measures and its efficiency to minimize the pollution levels within the permissible norms.
- To assess the probable risks, likely to occur in unit and suggest appropriate measures to avoid the same.

- To design an occupational health & safety plan for the employees.
- To design post project monitoring plan for regulating the environmental quality within the limits and help in sustainable development of the area.

1.5 REGULATORY FRAME WORK (COMPLIANCE TO TOR)

Environmental clearance application along with Form-I & Pre-Feasibility Report to Ministry of Environment and Forest was submitted and subsequently TOR meeting was held and TOR for EIA study was received.

The EIA/EMP Report has been prepared in line with **Terms of Reference (TOR)** suggested by Environmental Appraisal Committee (Industry) vide **MoEF letter No. F. No. J-11011/32/2012-IA II (I), Dated 21st March, 2013,** attached an annexure-I and its compliance is given in table-1.1.

TABLE - 1.1 COMPLIANCE OF TERMS OF REFERENCE

S.N.	TERMS OF REFERENCE	COMPLIANCE
1.	Executive summary of the project.	Refer page no S-1 to S-7 of EIA Report.
2.	Detailed break-up of the land area along with latest photograph of the area.	Refer section 2.6.1 & table-2.5 on page no. 2-11 of chapter-2. And refer photographs on page no. 2-4 of chapter-2.
3.	Present land use based on satellite imagery and details of land availability for the project along with supporting document.	Refer section 3.10.1 on page no. 23 of chapter-3 and refer section 2.6.1 on page no. 2-11 of chapter-2 and refer annexure-II on page no. A-5.
4.	Details of site and information related to environmental setting within 10 km radius of the project site.	Refer section 2.4 on page no. 2-2 of chapter-2.
5.	A copy of lease deed or allotment letter, if land is already acquired.	Refer section 2.6.1 on page no. 2-11 and refer annexure-II on page no. A-5.
6.	Information regarding eco-sensitive areas such as national park / wildlife sanctuary / biosphere reserves within 10 km radius of project area.	Refer section 2.4.2.2 on page no. 2-2 of chapter-2.
7.	List of existing distillery units in the study area along with their capacity and sourcing of raw material.	There is no other distillery located within study area.
8.	Details of proposed products along with manufacturing capacity.	Refer section 2.5.3 on page no. 2-9.
9.	Number of working days of the distillery unit.	Numbers of working days of the distillery unit is 330 Days/ Annum or refer 2.5.3 on page no. 2-9.
10.	Total cost of the project along with total capital cost and recurring cost/annum for environmental pollution control measures.	Refer section 2.3 on page no. 2-1 of chapter-2 and refer section 8.7 on page no. 8-9 of chapter-8.
11.	Details of raw materials, its source & availability of all raw materials including cereal grains requirement.	Refer section 2.5.3.1.1 on page no. 2-9 of chapter-2.
12.	Sources and quantity of fuel (coal etc.) for the boiler. Measures to take care of SO_2 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.	For fuel details refer section 2.6.4 on page no. 2-12 of chapter-2, for SO2 emission measures refer section 4.3.2 on page no. 4-6 of chapter-4 and stack height refer section 2.6.9.1 on page

S.N.	TERMS OF REFERENCE	COMPLIANCE
		no. 2-16 of chapter-2. Coal will be sourced from private mine owners located in Meghalaya.
13.	Storage facility for raw materials, prepared alcohol, fuel and fly ash.	For storage details of raw material refer section 2.5.3.1.2 on page no. 2-10 of chapter-2, for prepared alcohol refer section 6.6 on page no. 6-2 of chapter-6, for fuel refer section 2.6.4 on page no. 2-12 of chapter-2 and for fly ash 2.6.11 on page no. 2-17 of chapter-2.
14.	Action plan to control ambient air quality as per NAAQES Standards for PM_{10}, $PM_{2.5}$, SO_2 and NOx as per GSR 826(E) dated 16th November, 2009.	Refer section 2.6.9.2 on page no. 2-16 of chapter-2.
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, NOx 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.	Refer section 3.3.1.6 on page no. 3-4, refer section 3.5 on page no. 3-6, refer section 3.6 on page no. 3-10 and refer section 3.8 on page no. 3-17 of chapter-3.
16.	Mathematical modeling for calculating the dispersion of air pollutants and ground level concentration along with emissions from the boiler.	Refer section 4.3.2 on page no. 4-6 of chapter-4.
17.	An action plan to control and monitor secondary fugitive emissions from all the sources.	Refer section 8.3.2.2 on page no 8-3 of chapter-8.
18.	Details of the use of steam from the boiler.	Refer section 2.6.5 on page no. 2-12 of chapter-2.
19.	Ground water quality around proposed spent wash storage lagoon and the project area.	Refer section 3.6.2 on page no. 3-10 of chapter-3.
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.	Refer section 2.6.8 on page no. 2-13 of chapter-2.
21.	Fresh water requirement should be restricted upto 10 Kl/Kl of alcohol for grain based distillery.	Refer section 2.6.8.2 and table 2.8 on page no. 2-13 of chapter-2.
22.	Permission of withdrawal of water from ground water Board.	Refer section 2.6.8.1 on page no. 2-13 of chapter-2.
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.	Refer section 2.6.8.4 on page no.2-14 of chapter-2.
24.	Spent wash generation should not exceed 6 KL/KL of alcohol production. Details of the spent wash treatment for grain based distillery.	Refer section 2.6.8.2 on page no.2-13 of chapter-2.
25.	Capacity for spent wash holding tank and action plan to	Refer section 8.3.2.3 on page no. 8-4

S.N.	TERMS OF REFERENCE	COMPLIANCE
	control ground water pollution.	of chapter-8.
26.	Dryer shall be installed to dry DWGS.	Refer section 2.6.8.4 on page no.2-14 of chapter-2.
27.	Layout for storage of rice husk/biomass.	No rice husk/biomass propose to used as a fuel.
28.	Details of solid waste management including management of boiler ash.	Refer section 2.6.11 on page no. 2-17 of chapter-2.
29.	Green belt development as per the CPCB guidelines.	Refer section 8.3.2.7.1 on page no. 8-5 of chapter-8.
30.	List of flora and fauna in the study area.	Refer section 3.12 on page no. 3-31 of chapter-3.
31.	Noise levels monitoring at five locations within the study area.	Refer section 3.8 on page no. 3-17 of chapter-3.
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.	Refer section 8.3 on page no. 8-1 of chapter-8. Refer section 5.2 on page no. 5-1 of chapter-5 and refer section 8.4 on page no. 8-7 of chapter-8.
33.	EMP should also include the concept of waste-minimization, recycle/reuse/ recover techniques, Energy conservation, and natural resource conservation.	Refer section 8.3.2.10 on page no. 8-7 of chapter-8.
34.	Risk assessment for storage and handling of alcohol and mitigation measure due to fire and explosion and handling areas.	Refer section 6.12 on page no. 6-11 of chapter-6.
35.	Alcohol storage and handling area fire fighting facility as per norms.	Refer section 6.10 on page no. 6-8 of chapter-6.
36.	Provision of Foam System for fire fighting to control fire from the alcohol storage tank.	Refer section 6.10 on page no. 6-8 of chapter-6.
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.	Refer section 8.3.2.3 on page no. 8-4 of chapter-8.
38.	Details of occupational health programme.	
	i). To which chemicals, workers are exposed directly or indirectly.	Refer section 6.7.1.1 on page no. 6-3 of chapter-6.
	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.	Refer section 6.7.1.1 on page no. 6-3 of chapter-6.
	v). What are onsite and offsite emergency plan during chemical disaster.	Refer section 6.13 on page no. 6-24 of chapter-6.
	vi). Liver function tests (LFT) during pre-placement and periodical examination.	Refer table-5.1 on page no. 5-1 of chapter-5.

S.N.	TERMS OF REFERENCE	COMPLIANCE
	vii). Details of occupational health surveillance programme.	
39.	Details of socio-economic welfare activities.	Refer section 7.5 on page no. 7-1 of chapter-7.
40.	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.	For traffic study of the area refer section 3.13 on page no. 3-35 of chapter-3, for additional traffic refer section 2.5.3.1.2 on page no. 2-10 of chapter-2 and for parking arrangement refer section 2.6.1 on page no. 2-11 of chapter-2.
41.	Action plan for post-project environmental monitoring.	Refer section 5.2 on page no.5-1 of chapter-5.
42.	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.	Refer Section 8.5 on page no. 8-9 of chapter-8 and annexure-XII on page no. A-48.
	(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.	Yes, refer section 8.4 on page no. 8-7 and section 8.5 on page no. 8-9 of chapter-8.
	(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.	Refer Section 8.4 on page no. 8-7 of chapter-8.
	(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.	Refer Section 8.4 on page no. 8-7 of chapter-8.
43	Any litigation pending against the project and /or any direction /order passed by any Court of Law against the project, if so, details thereof.	Refer section 1.3 on page no. 1-2 of chapter-1.
44	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.	Will be incorporated after conducting public hearing.
45	A tabular chart with index for point-wise compliance of above TORs	Refer section 1.5 on page no. 1-3 of chapter-1.
i	All documents should be properly indexed, page numbered.	Complied
ii	Period/date of data collection should be clearly indicated.	Complied
iii	Authenticated English translation of all material provided in Regional languages.	Complied
iv	The letter/application for EC should quote the MOEF file No. and also attach a copy of the letter.	Will be compiled at the time of EC application.

S.N.	TERMS OF REFERENCE	COMPLIANCE
v	The copy of the letter received from the Ministry should be also attached as an annexure to the final EIA-EMP Report.	Attached as annexure-I on page no. A-1.
vi	The final EIA-EMP report submitted to the Ministry must incorporate the issues in this letter and that raised in Public Hearing/consultation alongwith duly filled in Industry Sector questionnaire. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report where the above issues and the issues raised in the Public hearing have been incorporated.	Will be complied after conducting public hearing.
vii	Certificate of Accreditation issued by the QCI to the environmental consultant shall be included.	Refer chapter-10.

1.6 STRUCTURE OF THE REPORT

The objective of the EIA study is a preparation of Environment Impact Assessment (EIA) and Environmental Management Plan (EMP) report based on the guidelines of the Ministry of Environment and Forests (MoEF) and CPCB. The contents of the study are arranged as follows:

- Chapter 1 is an Introduction to the Industry, Purposes of the report, Project, Information of project proponent and regulatory frame work.
- Chapter 2 presents a Description of Project and Infrastructure facilities including all industrial and environmental aspects during operation phase activities as well as manufacturing process details of proposed product. This chapter also gives information about location, material storage and handling, water and wastewater quantitative details, air pollution and control system, Hazardous Waste generation, storage facility and disposal and utilities for proposed production capacity of plant. It also provides information about proposed Environmental Management Facilities available at the project site.
- Chapter 3 covers Baseline Environmental Status including meteorological details, Identification of baseline status of Environmental components of the surrounding area covering air, water and land environment, study of land use pattern, Biological & Socio-Economic Environment giving details about District south Sikkim and the study area in terms of land use pattern, biological environment, and socio-economic environment.
- Chapter 4 deals with Identification and Prediction of Impact, which provides quantification of significant impacts of the proposed expansion activities of plant on various environmental components. Evaluation of the proposed pollution control facilities has been presented.
- Chapter 5 describes Environment Monitoring Plan to be adopted.
- Chapter 6 gives the information of public hearing and Risk analysis and Disaster management plan that is adopted by the company
- Chapter 7 gives the benefits of the proposed projects.
- Chapter 8 describes Environment Management Plan (EMP) to be adopted for mitigation of anticipated adverse impacts if any and to ensure acceptable impacts.
- Chapter 9 gives the summary and conclusion of the project.
- Chapter 10 gives the information of consultants.

CHAPTER – 2

PROJECT DESCRIPTION AND INFRASTRUCTURAL FACILITIES

2.1 PROJECT DESCRIPTION

M/s. Esveegee Breweries (P) Limited has already set up Grain based Distillery to manufacture Extra Neutral Alcohol (ENA)/Rectified Spirit (RS) 60 KLPD at Plot no. 321/362, 323/363, 323, 324, 325, 339, 340/381, 392/449, 449/451 & 449/455 Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim and now proposes expansion to manufacture ENA/RS 60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD with Cogeneration Power Plant (3.5 MW).

2.2 PROJECT NEED

Ethanol has been used by humans since prehistory as the intoxicating ingredient of alcoholic beverages. Dried residues on 9,000-year-old pottery found in China imply Neolithic people consumed alcoholic beverages. Drinking prevailed in India in all ages of history-"vedic" and "post-vedic". In India, production of "country liquor", which is also known as "arrack" has been prevailing since 800 B.C.

The use of alcohol as drink is an age-old story in India and it appears that the technique for fermentation and distillation was available even in the Vedic times. It was then called "Somarasa" and was used not only for its invigorating effect but also in worship. To date, not only has the consumption of alcohol been continued but it is an integral part of the Ayurvedic system of medicine.

The First distillery in the country was set up at Cawnpore (Kanpur) in 1805 by Carew & Co. Ltd., for manufacturing of Rum for the army. The technique of fermentation, distillation and blending of alcoholic beverages was developed in our country on the lines of practices adopted overseas particularly in Europe.

The distillery industry today consists broadly of two parts, potable liquor and the industrial alcohol. The potable distillery producing Indian Made Foreign Liquor and Country Liquor has a steady but limited demand with a growth rate of about 7-10 per cent per annum. Over the years the potable liquor industry has shown remarkable results in the production of quality spirits. Indian Liquor industry is today exporting a sizable quantity of India Liquor products to other countries. India has one of the larger liquor consuming crowds in the world. The country's per capita consumption is just about 0.6 litres per annum, which is among the lowest in the world. This leaves tremendous scope for growth in the industry.

In the view of the increasing demand and supply, M/s. Esveegee Breweries (P) Limited has proposed expansion of its grain based distillery plant.

2.3 PROJECT COST

Cost of the project would be approx **Rs. 7,950.00 lacs**. Break up of existing & proposed expansion cost is given in following table-2.1.

TABLE - 2.1 BREAK UP OF THE EXISITNG & PROPOSED PROJECT COST

SR. NO.	ITEM	EXISTING (RS. IN LACS)	PROPOSED (RS. IN LACS)	TOTAL (RS. IN LACS)
1	Land & Site Development	40.50	25.32	65.82
2	Building and Civil Construction	865.59	1630.25	2495.84
3	Plant & Machinery	2455.68	4799.43	7255.11
4	Environmental protection Cost	550.00	900.00	1450.00
5	Miscellaneous Fixed Assets	11.16	24.35	35.51
6	Miscellaneous Equipment	3.81	15.25	19.06
7	Preliminary Expenses	13.44	0.00	13.44
8	Contingencies		105.40	105.40
9	Margin for Working Capital	550.00	450.00	1000.00
	TOTAL	**4490.18**	**7950.00**	**12440.18**

2.4 PROJECT SETTING

2.4.1 LOCATION

The project site is located at Manpur, District South Sikkim, Sikkim adjacent to the interstate boundary of Sikkim-West Bangal. Geographical co-ordinates of the project site is Latitude 27°5'47.07"N and Longitude 88°21'32.42"E.

Unit is surrounded by Bari Rangit River and, then Mountain from south and west side, by one small industry i.e. M/s. RPC Polymers (P) Ltd. from East side and by Manpur Basti from North side. Photographs of the project site and surrounding areas are shown on page no. 2-4, while Google images are shown in figure-2.3. Gangtok, Capital of the Sikkim state is situated at a distance of approx. 35.0 km. Nearest national highway-31a is situated at around 7.58 Kilometers in South-East Direction and airport Bagdogra is at around 65 km in South direction. The total area covered by the plant is 12 Acres approx. Location map and detailed layout map of the proposed plant is shown in figure-2.1 and figure-2.4 respectively.

2.4.2 ADMINISTRATIVE BOUNDARY AND KEY INFRASTRUCTURE FEATURES

2.4.2.1 METHOD OF DATA PREPARATION

Administrative boundary and key infrastructure features have been extracted from Survey of India (SoI), topographical maps of 1:50,000 scale. The features have been updated using satellite data and have been, verified with ancillary information derived maps. The locations of the settlement, have been extracted from Census of India (CoI) maps and verified by using SoI topographical maps and, satellite data and have been over-layer for the ease of spatial reference.

2.4.2.2 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE

The distance of nearest Villages, Railway line, National highway, State highways, Rivers, School, Temple, etc. from the project site are presented in following table-2.2 below. There is a Bird sanctuary is present in the study area but no defense installation, national park are within 10 km radius of the project site.

TABLE - 2.2 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE

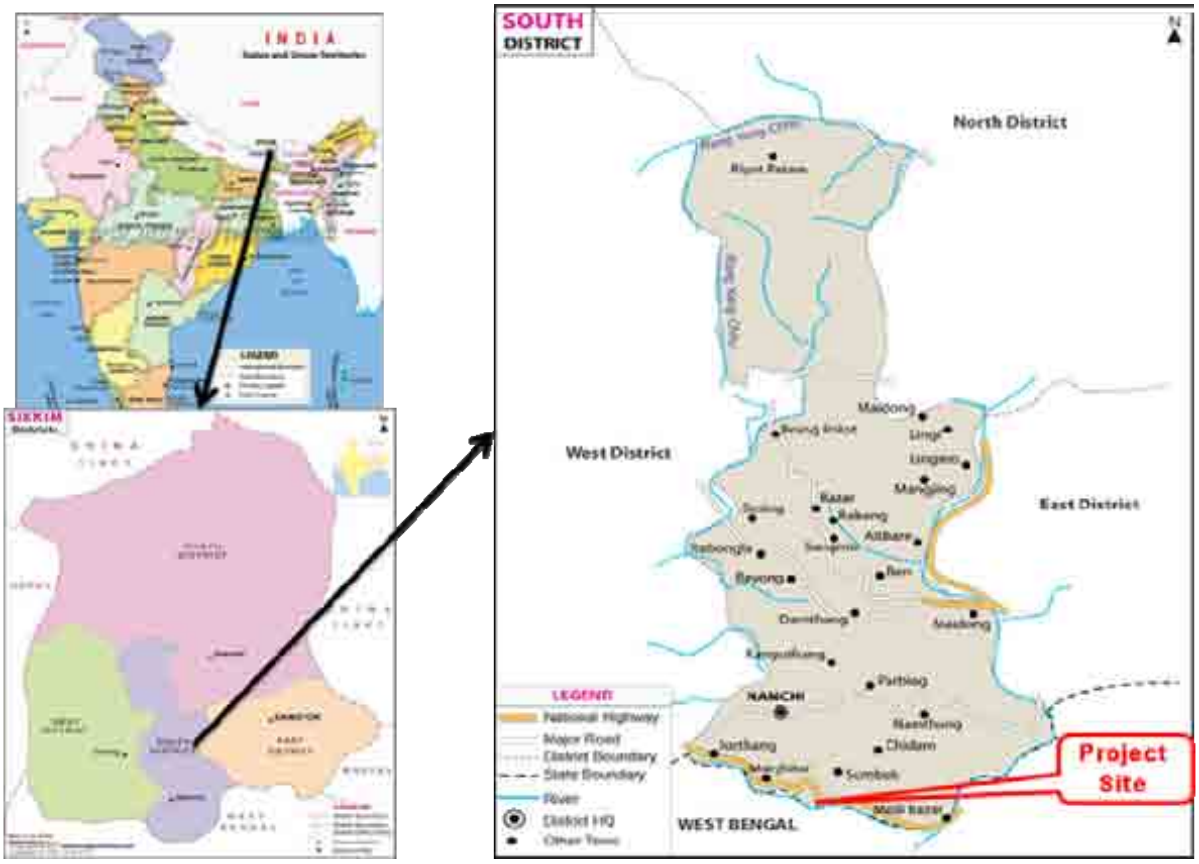
SR.NO.	NEAREST INFRASTRUCTURE FEATURE	DISTANCE FROM PROJECT SITE
1.	Village Kartickey	3.27 Kilometers North-East Direction
2.	Village Sumbuk	2.80 Kilometers North-East Direction
3.	Village Kitam	3.11 Kilometers North-West Direction
4.	Village Kambal Tea Garden	2.70 Kilometers South-West Direction
5.	Village Lapchu Tea Garden	2.79 Kilometers South Direction
6.	Village Kamarey	3.10 Kilometers North-East Direction
7.	NH-31a (National Highway)	7.58 Kilometers South-East Direction
8.	NH-44 (National Highway)	10.84 Kilometers South-West Direction
9.	SH-12 (State Highway)	5.38 Kilometers South Direction
10.	Eden Hospital	10.98 Kilometers South-West Direction
11.	Namchi Jawaharlal Nehru Hospital	7.65 Kilometers North Direction
12.	Runglee Primary School	7.71 Kilometers South Direction
13.	Angel English School	5.07 Kilometers North-East Direction
14.	Government Secondary School Melli Gumpa	7.13 Kilometers East Direction
15.	Namchi Government College	7.83 Kilometers North East Direction
16.	Senior Secondary School	7.40 Kilometers North Direction
17.	Dara School	9.22 Kilometers South West Direction

SR.NO.	NEAREST INFRASTRUCTURE FEATURE	DISTANCE FROM PROJECT SITE
18.	Railway Line	11.09 Kilometers South-West Direction
19.	Bari Rangit Nadi	0.20 Kilometers South Direction
20.	Tista River	7.70 Kilometers East Direction
21.	Rangbang Nadi	8.80 Kilometers North West Direction
22.	Temple	5.60 Kilometers North East Direction
23.	Kitam Bird Sanctuary	Around 2 Kilometers North North West Direction

2.4.3 MAP OF KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

Maps depicting boundary up to tehsil level, showing National and State highways, major and medium roads are presented in figure-2.2. The maps also show the water bodies and major landmarks for better understanding of project area. The maps mark the area within 10 km radius around the project area.

FIGURE - 2.1 DETAILED MAP OF RI BHOI DISTRICT SHOWING PROJECT LOCATION



PHOTOGRAPHS OF PROJECT SITE

Photograph showing main gate and distillery unit

Photograph showing boiler house and open space

Photograph showing plant

Photograph showing North West Direction

Photograph showing South Direction

Photograph showing North Direction

FIGURE - 2.2 ADMINISTRATIVE BOUNDARY AND KEY INFRASTRUCTURE FEATURE MAP

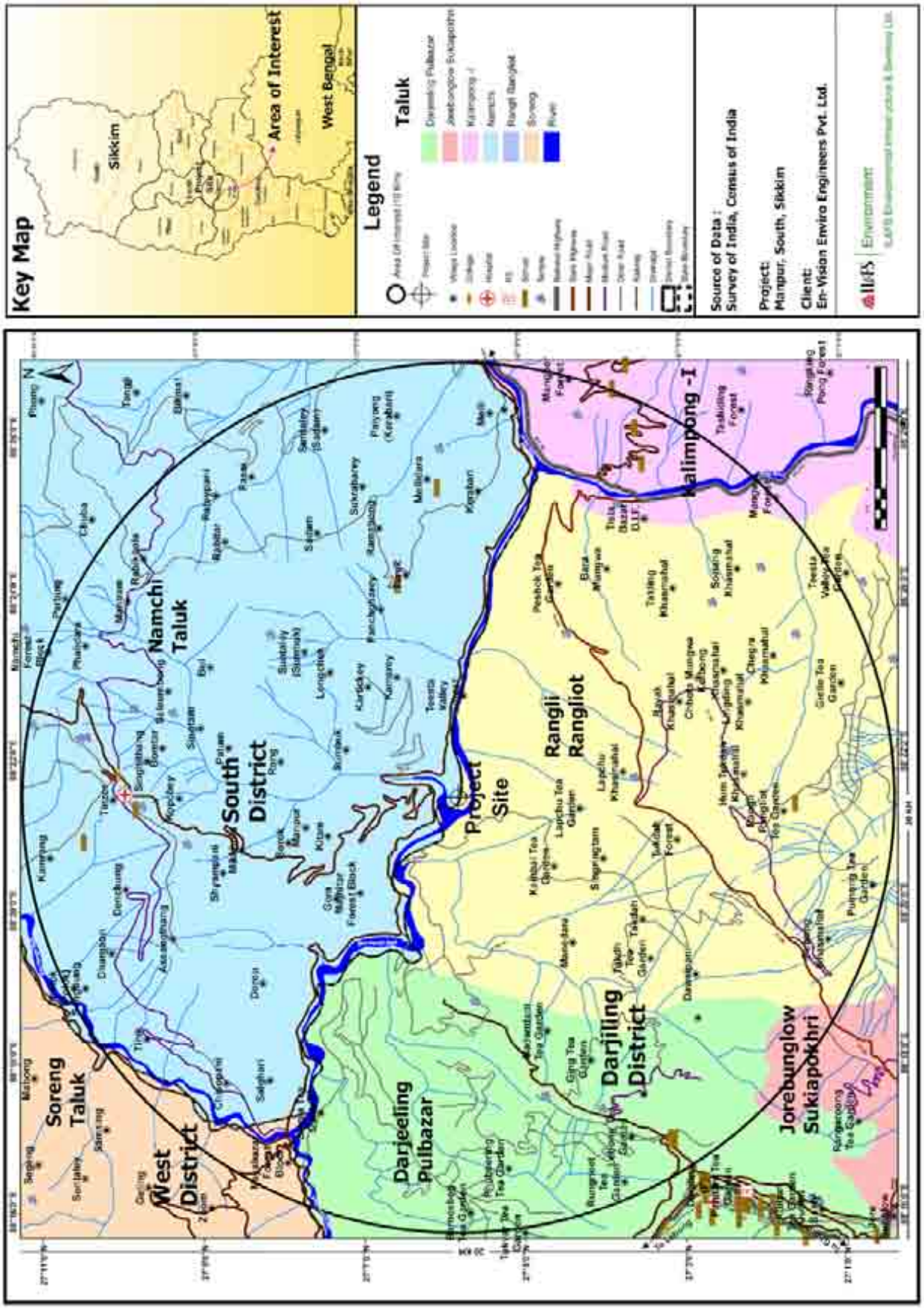


FIGURE - 2.3A GOOGLE IMAGE OF PROJECT SITE (LONG VIEW)

FIGURE - 2.3B GOOGLE IMAGE OF PROJECT SITE (SHORT VIEW)

FIGURE - 2.4 LAYOUT OF THE PLANT

TOTAL LAND =12.0 ACRE

GENERAL NOTES:

ESVEE.GEE BEVERAGES PVT. LTD.

SR.No.	DESCRIPTION	SIZES	AREA SQ.MT.
1	GRAIN STORE	36.0 x 20.0	720.00
2	GRAIN HANDLING SYSTEM	06.0 x 20.0	120.00
3	GRAIN SILO	13.0mt dia x 2	266.00
4	GRAIN MILLING	24.0 x 9.0	216.00
5	LIQUIFACTION & SACCHARIFICATION	12.0 x 15.0	180.00
5B	FUTURE LIQUIFACTION & SACCHARIFICATION	12.0 x 15.0	180.00
5C	COLLING TOWER FOR LIQ. & SACCH	6.0 x 6.0	036.00
6	FERMENTATION SECTION	24.0 x 40.0	960.00
6A	FUTURE FERMENTATION SEC.	40.0 x 21.0	840.00
6B	COLLING TOWER FOR FERMENTATION SEC.	6.0 x 6.0	036.00
7	EVAPORATION / DEGANTATION SECTION	25.0 x 14.0	350.00
7A	EVAPORATION / DECANTATION SEC. FUTURE	25.0 x 14.0	350.00
7B	WET HUSK & LIFTING AREA	10.0 x 15.0	150.00
7C	DDGS STORAGE	12.0 x 18.0	216.00
8	DISTILLATION SECTION	18.0 x 18.0	324.00
8A	FUTURE DISTILLATION SECTION	18.0 x 18.0	324.00
8B	COLLING TOWER FOR FOR DISTILLATION SEC.	6.0 x 6.0	036.00
9	ADMIN. BUILDING	12.0 x 18.0	216.00
10	WEIGH BRIDGE	04.0 x 10.0	40.00
11	ALCOHOL STORAGE WITH BONDED STORE	50.0 x 18.0	900.00
12	SECURITY OFFICE	6.0 x 6.0	036.00
13	EXCISE OFFICE	6.0 x 6.0	036.00
14	TEMPLE	5.0 x 6.0	030.00
15	PROPOSED BOILER WITH COGEN PLANT	36.0 x 24.0	864.00
16	PROPOSED 60 KLPD ENA /66 PLANT	36.0 x 88.0	3168.00
17	PROPOSED ABSOLUTE ALCOHOL PLANT	6.0 x 18.0	108.00
18	CANTEEN BUILDING	6.0 x 18.0	108.00
19	LT / HT ROOM	8.0 x 15.0	120.00
20	BOILER HOUSE	15.0 x 36.0	540.00
21	FUEL STORAGE	17.0 x 36.0	612.00
22	TOILET BLOCK -1/2	3.0x9.0x2nos.	054.00
23	WATER TREATMENT PLANT	12.0 x 12.0	144.00
24	RAW WATER POND	12.0 x 12.0	144.00
25	STORE	9.0 x 10.50	94.50
26	WORKSHOP	9.0 x 10.50	94.50
27	GREEN BELT		

PROJECT : EXISTING & PROPOSED PLAN FOR ESSVEEGEE DISTILLERY AT MANPUR SOUTH SIKKIM

DRAWING TITLE : SITE PLAN - 5

2.5 MAIN PHASES OF THE PROJECT

2.5.1 PRE CONSTRUCTION ACTIVITIES

The project site is already well developed and well connected with state and national highway and hence sufficient road communication is available, so there is no need to construct any approach road or site access. No significant pre-construction activates are anticipated.

2.5.2 CONSTRUCTION ACTIVITIES

Construction activities will take place within the open space of open plot. Construction of essential utilities shall be carried out. Erection of various machineries shall start simultaneously and is expected to be completed along side of construction activities which will consist of total 18 months after the construction is over. Construction materials, like steel, cement, crushed stones, sand, rubble, etc. shall be required for the project, will be procured from the local market of the region.

2.5.3 PRODUCTION ACTIVITIES

List of existing and proposed products are given in following table-2.3. Number of working days of the distillery unit is 330 days in a year.

TABLE - 2.3 LIST OF PROPOSED PRODUCTS & PRODUCTION CAPACITIES

SR. NO.	PRODUCT	PRODUCTION CAPACITY IN KLD		
		EXISTING	PROPOSED	TOTAL
1.	Extra Neutral Alcohol/Rectified Spirit	60 KLPD	60 KLPD	120 KLPD
2.	Absolute Alcohol	-	30 KLPD	30 KLPD
3.	Co-Generation Plant Power	--	3.5 MW	3.5 MW

2.5.3.1 RAW MATERIALS

2.5.3.1.1 RAW MATERIAL CONSUMPTION

Major raw materials used for manufacturing Grain Flour with 62% w/w (Average) Starch content. Alcohol concentration is used in Fermented wash 10% v/v (Average). Details of the raw materials, their source, mode of transportation and consumption for production are given in following table-2.4.

TABLE - 2.4 RAW MATERIAL REQUIREMENT & THEIR SOURCE

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION PER DAY		SOURCE
		EXISITNG	AFTER EXPANSION	
1.	Grains (Corn / Bajra / Wheat)	150 MT	300 MT	Assam, Bihar, West Bengal, Uttar Pradesh.
2.	Alpha Amylase	30 Kg	60 Kg	Directly from the Chemical Companies
3.	Amyloglu Cosidase	30 Kg	60 Kg	Directly from the Chemical Companies
4.	Sulphuric Acid	150 Kg	300 Kg	West Bengal
5.	Nutrients Ammonia	150 Kg	300 Kg	West Bengal
6.	Antifoam	0.6 kg per KL 36 kg	0.6 kg per KL 36 kg	West Bengal
7.	Yeast	As per requirement	As per requirement	Authorized Dealers (West Bengal)
8.	Biocides	30 Kg	60 Kg	West Bengal

Details on availability of raw materials:

Grains: Indian Distilleries use almost exclusively Grains/Cane Molasses. The Grains/Cane Molasses is available in the free market at a competitive rate all over India. However the biggest concentrations of grains suppliers are found in Meghalaya, Assam, Uttar Pradesh, Karnataka, Tamil Nadu & Maharashtra, West Bengal and Bihar. The promoters have since established contact with some of the important grains suppliers.
Yeast: Yeast is required to be imported from abroad, which are available in plenty at a competitive rate from multi-sources.

2.5.3.1.2 RAW MATERIAL STORAGE AND TRANSPORTATION

Grain Storage:
Grains procured from various sources are unloaded into warehouse. From warehouse grains are transferred into large Storage Silos after Pre-Cleaning. Storage Silos are specially designed to keep the Grains in good condition for longer durations and also avoid its deterioration and theft, etc. It is being proposed to have 30 – 45 days of Grain Storage facility in the Distillery.

Alcohol (ENA & TA) daily receivers & bulk storage:
The Extra Neutral Alcohol/rectified Sprit & Absolute Alcohol is first taken to daily receiver storage tanks, which is based on the State Excise Laws, storage for three days considering the weekly holidays of two days. Thereafter, the alcohol is transferred to bulk storage tanks after taking the daily receiver Dip. This is transferred using flameproof pumps. Final dispatch of alcohol is metered and again is carried out using special flameproof pumps. The bulk spirit storage is proposed to be set up for 30 days. Details of alcohol storage tanks are given in section 6.6 on page no. 6-2 of chapter-6.

Scheme of mode of transportation:

The raw materials will be purchased from the external sources as mentioned above. All the raw material, waste and finished goods required for construction and operation phase shall be transported by Road/Rail. Total 85 trucks per day will be transported due to the proposed activity. The raw materials, waste & finished goods will be covered during transported through trucks to the site.

2.5.3.2 MANUFACTURING PROCESS

ENA production involves the extraction and Saccharification of starches and their conversion into alcohol by fermentation process.
To achieve the best results it has to be channeled through the following process:

a) Grain Milling.
b) Slurry Preparation & Liquefaction
c) Saccharification & Fermentation
d) Multi Pressure Distillation:.

Grain Milling:
Sifted and cleaned Grains will be milled to flour using dry milling process in Hammer Mills.

Slurry Preparation & Liquefaction:
Here, Grain flour will be mixed with water for slurry preparation. The slurry so formed will be cooked in a steam jet cooker and the cooked mash will be transferred to flash tank. This process will loosen up the mash to enzyme attack. The gelatinized mash will be liquefied in the final Liquefaction tank with the help of liquefying enzyme. This process initiates the formation of sugar

Saccharification & Fermentation:
The liquefied starch slurry will be transferred into the fermentation tank where active yeast together with Amyloglyoczydase and other nutrients will be added. Yeast will initiate fermentation rapidly and CO_2 will be released during the process. The Alcohol shall be stripped from the CO_2 by CO_2 scrubber.

Multi Pressure Distillation:
The alcohol will be distilled in Multi pressure distillation system. Distillation is achieved by utilizing Analyser, Degassifier, Pre-Rectifier Column Stripper, Rectifier cum exhaust, Extractive distillation column, Recovery column and Simmering column. The ENA & Technical alcohol formed shall be stored in storage tank.

2.6 INFRASTRUCTURE FACILITIES

2.6.1 LAND

Existing unit has covered around 12.0 acres (4.8074 ha) of land, land details is enclosed as annexure-II. For the proposed expansion no new land will be acquired. Detailed Land use breakup of the land is given in following table-2.5 and plant layout shown in figure-2.4.

TABLE - 2.5 LAND BREAK-UP OF THE PLANT

S.NO.	LAND USE	SIZES	AREA SQ.MT.
1.	Grain Store	36.0 x 20.0	720.00
2.	Grain Handling System	06.0 x 20.0	120.00
3.	Grain Silo	13.0 mt diax2	266.00
4.	Grain Milling	24.0 x 9.0	216.00
5.	Liquifaction & Saccharification	12.0x15.0	180.00
5B.	Future Liquifaction & Saccharification	12.0x15.0	180.00
5C.	Cooling Tower For Liq. & Sacch	6.0 x 6.0	036.00
6.	Fermentation Section	24.0 x 40.0	960.00
6A.	Future Fermentation Sec.	40.0x21.0	840.00
6B.	Cooling Tower For Fermentation Sec.	6.0 x 6.0	036.00
7.	Evaporation / Decantation Section	25.0x14.0	350.00
7A.	Evaporation / Decantation Sec. Future	25.0x14.0	350.00
7B.	Wet Husk & Lifting Area	10.0x19.0	190.00
7C.	DDGS Storage	12.0x18.0	216.00
8.	Distillation Section	18.0x18.0	324.00
8A.	Future Distillation Section	18.0x18.0	324.00
8B.	Colling Tower For Distillation Sec.	6.0 x 6.0	036.00
9.	Admin. Building	12.0x18.0	216.00
10.	Weigh Bridge	04.0x10.0	40.00
11.	Alcohol Storage With Bonded Store	50.0 x 18.0	900.00
12.	Security Office	6.0 x 6.0	036.00
13.	Excise Office	6.0 x 6.0	036.00
14.	Temple	5.0 x 6.0	030.00
15.	Proposed Boiler With Co-Gen Plant	36.0 x 24.0	864.00
16.	Proposed 60 KLPD ENA /RS Plant	36.0 x 88.0	3168.00
17.	Proposed Absolute Alcohol Plant	6.0x18.0	108.00
18.	Canteen Building	6.0 x 18.0	108.00
19.	LT/HT Room	8.0x15.0	120.00
20.	Boiler House	15.0x36.0	540.00
21.	Fuel Storage	17.0x36.0	612.00
22.	Toilet Block-1/2	3.0x9.0x2nos.	054.00
23.	Water Treatment Plant	12.0x12.0	144.00
24.	Raw Water Pond	12.0x12.0	144.00
25.	Store	9.0x10.50	94.50
26.	Workshop	9.0x10.50	94.50
27.	Green belt	-	15870.00
28.	Other (Internal Road, Open area, Parking, etc.)	-	19551.00
	TOTAL		**48074.00**

Enough width of the internal roads is provided, so that sufficient truck parking space is available. Moreover, open space in the project site will also utilized for parking.

2.6.2 TRANSPORTATION FACILITIES

As project site is well connected through roads, transportation of all the raw materials as well as fuel is done through road only.

2.6.3 POWER REQUIREMENTS

Existing power requirement of the project is 1600 KW. Total estimated power requirement for the existing & proposed project is 3.5 MW. The company proposes to set up a co-generation power plant to meet its steam and electrical energy requirement. Two D. G. Set of 860 KVA capacity shall be used during emergency.

2.6.4 FUEL REQUIREMENTS

Fuel requirement, their source and distance and mode of transportation are given following table-2.6.

TABLE - 2.6 FUEL REQUIREMENT

SR. NO.	NAME OF THE FUEL	CONSUPTION			SOURCE & THEIR DISTANCE (KM)	MODE OF TRANSPOR-TATION
		EXISITNG	PROPOSED	TOTAL		
1.	Coal	55 TPD	55 TPD	110 TPD	Private mines owner of Meghalaya	By Road
2.	HSD for stand by D. G. set	120 LPH	-	120 LPH	Nearby sources	By Road

Details of Storage of fuels: Coal will be stored in covered shed having 650 sq.m. designated area and HSD will be stored in 500 lit HDPE drum near D.G. Room.

2.6.5 STEAM REQUIREMENT

Total steam requirement for the existing and proposed expansion is 35.7 TPH, which will be generated through proposed 40 TPH boiler. Break up of steam consumption is given in following table-2.7.

TABLE - 2.7 STEAM CONSUMPTION DETAILS

SR. NO.	STEAM REQUIREMENTS	ETEAM REQUIREMENT IN TPH		
		EXISTING	PROPOSED	TOTAL
1.	Cooking & Liquefaction	2.50	3.00	5.50
2.	Multi-Pressure Distillation	8.50	8.50	17.00
3.	Evaporation (Integrated)	2.50	2.20	4.70
4.	DWGS Drier (DDGS)	3.00	3.00	6.00
5.	Boiler De-aeration (Estimate)	0.00	1.50	1.50
6.	Misc. Requirements.	0.50	0.50	1.00
	Total Distillery Steam Requirement	**17.00**	**18.70**	**35.70**

2.6.6 BOILER DETAILS

In existing scenario company has 20 TPH Boiler, which will be kept as a standby after installation of new 40 TPH Atmospheric Fluidized Bed Combustion (AFBC) Boiler for the purpose of steam generation for process requirement & power generation.

- Boiler : Atmospheric Fluidized Bed Combustion
- Type of Fuel used : Coal
- Capacity of Boiler : 40 TPH
- Pollution Control Equipment Measures : Bag Filter/ESP

2.6.7 MANPOWER REQUIREMENTS

In existing distillery unit around 60 nos. of employee are working, while for the proposed expansion additional 30 nos. of personnel will be employed. During employment first preference will be given to local people.

2.6.8 WATER AND WASTE WATER MANAGEMENT

2.6.8.1 SOURCE OF WATER

Entire water will be sourced from river Rangit and/or ground water through Deep Bore Well. Permission for the drawl of water from Rangit River (1400 KLPD) is obtained, which is attached as an annexure-III, while permission of ground water abstraction will be obtained from Central Ground Water Authority (CGWA).

2.6.8.2 WATER CONSUMPTION

Distillery is a water intensive industry and water is required at various level of alcohol production as well as in utilities such as boiler and cooling towers and miscellaneous. Total fresh water requirement of the proposed expansion will be 1132 KLPD. Waste water generated shall be recycled and reused in the process and other activities like green belt development ash quenching, etc. thereby reducing load on fresh water demand. Details of water requirement, are given in following table-2.8.

TABLE - 2.8 WATER BALANCE (INPUT & OUTPUT): RECYCLE & NET CONSUMPTION

TOTAL WATER INPUTS	KLPD	TOTAL WATER OUTPUTS	KLPD
Process Water in Liqn & Fermentation	573.00	Steam condensate	674.00
DM Water for RS Dilution	960.00	Spent lees PR	120.00
DM Water for Boiler feed	880.00	Spent Lees Rectifier	960.00
Soft water for analyser flash tank	180.00	Spent wash (grain slops)	728.00
Soft water for vacuum pump & others	60.00	Soft water for vacuum pump & others	60.00
Soft water makeup for cooling tower	818.00	CT evaporation & drift losses	818.00
Misc. washing water	20.00	Losses in boiler (drift & blowdown)	119.00
Other domestic usage	20.00	Misc. washings water	20.00
Bottle Washings	40.00	Domestic consumption	20.00
Blending	30.00	Water in product	30.00
-	-	Bottle washing	40.00
TOTAL	**3589.00**	**TOTAL**	**3589.00**
RECYLCE & UTILIZATION STREAMS			**KLPD**
Less Recycle for RS dilution			867.00
Steam condensate recycle for boiler			717.00
Spent lees (rect) - cooling tower makeup			153.00
Thin slops recycle to liqn process			211.00
Process condensate to process & CT			333.00
Condensate from dryer			114.00
Vacuum pump recirculation			60.00
TOTAL RECYCLING / RE-UTILISATIONS OF WATER			**2455.00**
TOTAL FRESH WATER INPUT			**1134.00**

2.6.8.3 WASTE WATER GENERATION

The manufacturing of ENA generates effluent from the following sources:

1. Process wastewater (Spent Wash/ Slops): After separation of Suspended Solids for use as Cattle Feed, it is partly recycled & partly evaporated. Thus this stream is not subject to any discharge. The condensate from evaporator is recycled back to process.
2. Process wastewater (Spent Lees): This Stream of Spent Lees is recycled for RS dilution in Distillation and balance part is cooled & neutralized. It is then recycled for Slurry Preparation in Liquefaction and partly used for Cooling Tower Water Makeup. This stream is also not subject to any discharge.

3. Blow down from Boiler is proposed to be used on Internal Green Belt Development.
4. Vacuum Pump Sealing Water: This is completely under closed loop Recirculation.
5. Domestic waste water will be disposed through Soak Pit & Septic Tank.
6. Bottle Washings: As the unit proposes to use Pre-Washed Bottles, only rinsing is expected to be done. Hence, this water will be recycled back for cooling tower makeup after suitable treatment.
7. Misc. Floor Washings, etc. is expected to evaporate on the floors during washings and partly utilized on Green Belt Development.

2.6.8.4 WASTE WATER MANAGEMENT

The effluent generated from the ENA production process is segregated as process effluent [spent wash (slops) and Spent Lees] and effluent from utilities like Boiler, Vacuum pumps, Washings. The company proposes to follow & set up a "**Zero Effluent Discharge"** scheme. The condensates from evaporation shall be recycled and reused in Process & Make up water streams.
Spent wash shall be decanted for separation of Suspended Solids and Multi-Effect Evaporation arrangement. Condensate shall be reused and spent lees shall be recycled back to Distillation.'
Wastewater from Boiler (Blowdown) as well as miscellaneous Washings Water shall be reused in in-house Gardening and Green Belt development.
Domestic wastewater generated shall be discharged into septic tanks and disposed off using soak pits.

Treatment Philosophy :

Decantation:

Decanter centrifuge are used to separate Solid matter from Spent Wash stream. The Decanter consists of a bowl rotating at high speed and a screen conveyer running at different speed. The effluent/slops are fed into the Decanter. Segregation of solids from the slurry is actuated by centrifugal force. The segregated solids known as Wet cake (30-35% w/w solids) are removed from bottom of decanter and are directly loaded on the trolleys. The supernatant called thin slops coming out of Decanter are collected in a tank and transferred for part recycle & further for Evaporation.

Multiple Effect Evaporation :

The Thin Slop from Decantation section is first taken into a feed tank and then fed to the Evaporation system through Pre-heater in 1st effect mixed feed mode and it flows from first to second to third to fifth to fourth effects.

The concentrated Syrup with 35 % w/w total solids is taken out from the Second effect. The low-pressure steam shall be supplied to the First effect shell side. Vapours generated in the First effect are used as a heating medium in the second effect & vapours generated in the second effect are used as a heating medium in the 3rd effect vapours generated in third effect are used as heating medium in forth effect. Vapours generated in fourth effect are used as heating medium in fifth effect.

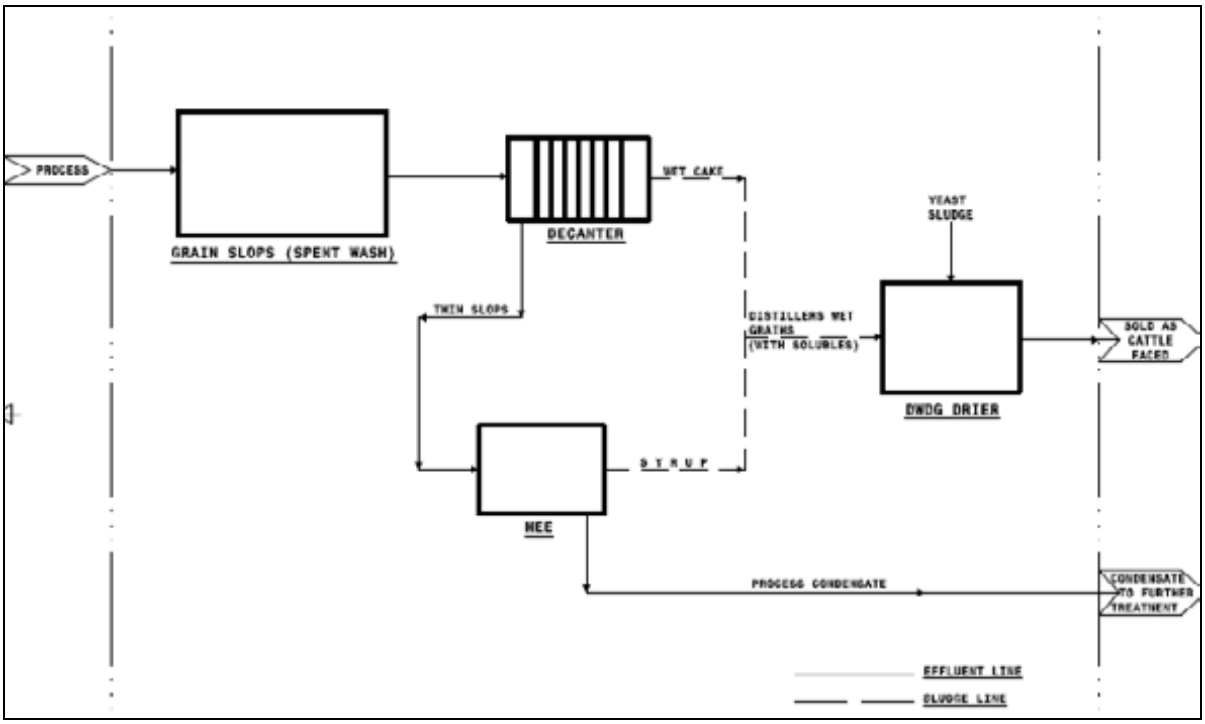
The Thin slop feed shall be concentrated from the initial concentration of 5 - 6%w/w TS to 35 %w/w TS as it travels through the multi-stage evaporation.

Steam Tube Dryers :

The concentrated syrup shall be mixed with Wet Cake from decanter forming Distillers' Wet Grains with Solubles (DWGS) and then dried through Steam Tube Drier & sold as Cattle Feed/Poultry Feed which contains a very good amount of proteins, carbohydrate & other nutrients.

The used steam shall be condensed using surface condenser. The condensate from Second, Third, fourth, Fifth effect and surface condensers condensate is collected in a condensate tank. Schematic flow diagram of spent wash treatment is shown in following figure-2.5.

FIGURE-2.5 SCHEMATIC FLOW DIAGRAM OF SPENT WASH TREATMENT



CONDENSATE TREATMENT

The condensate from the process shall be treated and reused back in to the alcohol manufacturing process as process water or cooling water make-up thereby reducing the requirement of fresh water. Expected characteristics of condensate are given in following table-2.9.

TABLE - 2.9 CONDENSATE CHARACTERISTIC

SR. NO.	PARTICULARS	CONCENTRATION
1.	Temperature	32 ^{0}C
2.	Volatile Acids (VA)	1000 - 1500 mg/L
3.	Chemical Oxygen Demand (COD)	1500 mg/L
4.	Biochemical Oxygen Demand (BOD)	700 - 1000 mg/L
5.	pH	3.5- 4.5

Treatment Philosophy:

Collection Cum Neutralization Tank:

The process condensate shall be collected in the collection tank. Caustic (Sodium Hydroxide) is added for neutralization. Continuous mixing with the help of agitator is provided in the tank.

Filtration:

The neutralized condensate passes through micron cartridge filter for the removal of residual suspended solids. The filtrate (permeate) shall be collected in the treated water tank to be reused in process.

DOMESTIC WASTEWATER

The domestic waster (~ 10-20 KL/Day) shall be disposed in septic tank and discharged off through soak pits.

2.6.9 AIR EMISSION AND ITS MANAGEMENT

2.6.9.1 POINT SOURCE EMISSION AND ITS CONTROL MEASURES

Air in and over the plant area and beyond its boundaries gets polluted with gases, fumes and dust particles emanating from the point source. Point sources are the stacks attached to Boiler and D.G. Sets, which emits PM, SOx and NOx, Details of existing and proposed stacks with pollution control measures are given in following table-2.10.

TABLE-2.10 DETAILS OF STACK ATTACHED TO UTILITIES

NO. OF STACK	STACK ATTACHED TO	NAME & QUANTITY OF FUEL	POLLUTION CONTROL EQUIPMENT	HEIGHT & DIAMETER (MTR)	POLLUTANT AS PER SPCB LIMIT
1.	Boiler – 40 TPH	Coal 110 TPD	Bag Filter/ESP	Ht. 82.5 m & dia. - 1.0 m	PM – 150 mg/Nm^3 SO_2 – 100 ppm NOx – 50 ppm
2.	D. G. Set of 860 KVA (Standby facility)	Diesel 120 Lit./Hr	Industrial Grade Resistive Mufflers and RCC room with proper ventilation	Ht. - 9 m & dia. - 0.2 m	PM – 150 mg/Nm^3 SO_2 – 100 ppm NOx – 50 ppm

Note: 1)Capacity of existing boiler is 20 TPH in which Wet Scrubber and Trima Cyclone is installed as pollution control equipment and will be kept as stand by after installation of 40 TPH new boiler.
2)Height of the proposed boiler stack is calculated considering 4% of Sulphur content.

2.6.9.2 FUGITIVE EMISSIONS AND ITS CONTROL MEASURES

Details of fugitive emission sources, associates pollutants and control measures are given in following table-11.

TABLE-2.11 FUGITIVE EMISSION AND ITS CONTROL MEASURES

NO.	SOURCE OF FUGITIVE EMISSION	POLLUTANTS	CONTROL MEASURES
1.	Raw material storage	Dust	Grain will be stored in close silo
2.	Coal storage area	Dust	Stored in covered shed
3.	Internal Road	PM	Wetting of road to control dust

2.6.9.3 STACK MONITORING ANALYSIS

Stack Monitoring of existing stack was carried out during study. Results of stack analysis are presented in following table-2.12.

TABLE-2.12 STACK MONITORING RESULTS

S.N.	STACK ATTACHED TO	TEMP ^oC	AVE. FLUE GAS VELOCITY	PARAMETERS		
				SPM	SO_2	NO_2
1	Boiler	140	17	115	48	7
			SPCB LIMIT	**150**	**100**	**50**

2.6.10 NOISE POLLUTION AND CONTROL SYSTEM

In the existing scenario, the noise levels are primarily generated due to industrial activities like mechanical movement and material handling in unit. Noise shall be generated from loading unloading, motors, I. D. Blower, vehicular movement, generators, etc. General noise levels within plant are expected to remain below 85 dB (A). In order to mitigate the noise levels during the operational phase, green belt is developed around the periphery of the plant. However, where noise levels may exceed the permissible limit, acoustic enclosure shall be provided.

2.6.11 SOLID AND HAZARDOUS WASTE GENERATION & ITS MANAGEMENT

Details of solid waste generation and its management for the existing and proposed project are given in the following table-2.13.

TABLE-2.13 DETAILS OF SOLID WASTE GENERATION AND ITS DISPOSAL METHOD

SR. NO.	PARTICULAR	QUANTITY (PER DAY)		METHOD OF STORAGE & DISPOSAL
		EXISTING	TOTAL(EXISITNG & PROPOSED)	
1.	Grain residue (DDGS/DWGS)	30-60 MT	60-130 MT	Use as cattle feed
2.	Fly ash	6.6 MT	13.2 MT	Shall be trapped, stored in open underground shed and utilized for brick manufacturing or sold to nearby Cement plant.
3.	Used/Spent Oil	-	0.96 lit	Reused in the plant for libration or sell to MoEF authorized reprocessors.

Note: DDGS= Distilled Dried Grain soluble, DWGS= Distilled Wet Grain Soluble.

CHAPTER – 3

BASELINE ENVIRONMENTAL STATUS AND DESCRIPTION OF ENVIRONMENT

The baseline status of environmental quality in the vicinity of project site serves as the basis for identification, prediction and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment, viz. air, noise, water, land, eco-biodiversity and socio-economic. The baseline environmental quality has been assessed during the period of 9th January, 2013 to 8th April, 2013 in a study area of 10 km radial distance from the project site. Location map of the project site with study area is given in figure-3.1.

Knowledge of baseline environmental status of the study area is useful for Impact Assessment Process of assessing and predicting the environmental consequences of the significant actions. Significant action depicts direct adverse changes caused by the action and its effect on the health of the biota including flora, fauna and human being, socio-economic conditions, current use of land and resources, physical and cultural heritage properties and biophysical surroundings. Baseline data generation of the following environmental attributes is essential in EIA studies.

i. Meteorology
ii. Ambient Air Quality
iii. Ambient Noise Quality
iv. Surface and Ground water Quality
v. Soil Quality & Geological Features
vi. Land use pattern
vii. Biological Information
viii. Socio-economic status survey

3.1 ESTABLISHMENT OF IMPACT ZONE

Deciding whether an existing and proposed action is likely to cause significant adverse environmental effects is central to the concept and practice of EIA. Before proceeding for baseline data collection, it is important to know the boundary limits and framework, so that the data collected can be effectively utilized for impact assessment. In this context, delineate of impact zone plays an important role. Generally the impact zone for industrial actions is classified into three parts; Core Zone, buffer Zone and Unaffected Zone, as illustrated below. The area of impact zone invariably changes from project to project and depends on the nature and magnitude of activities.

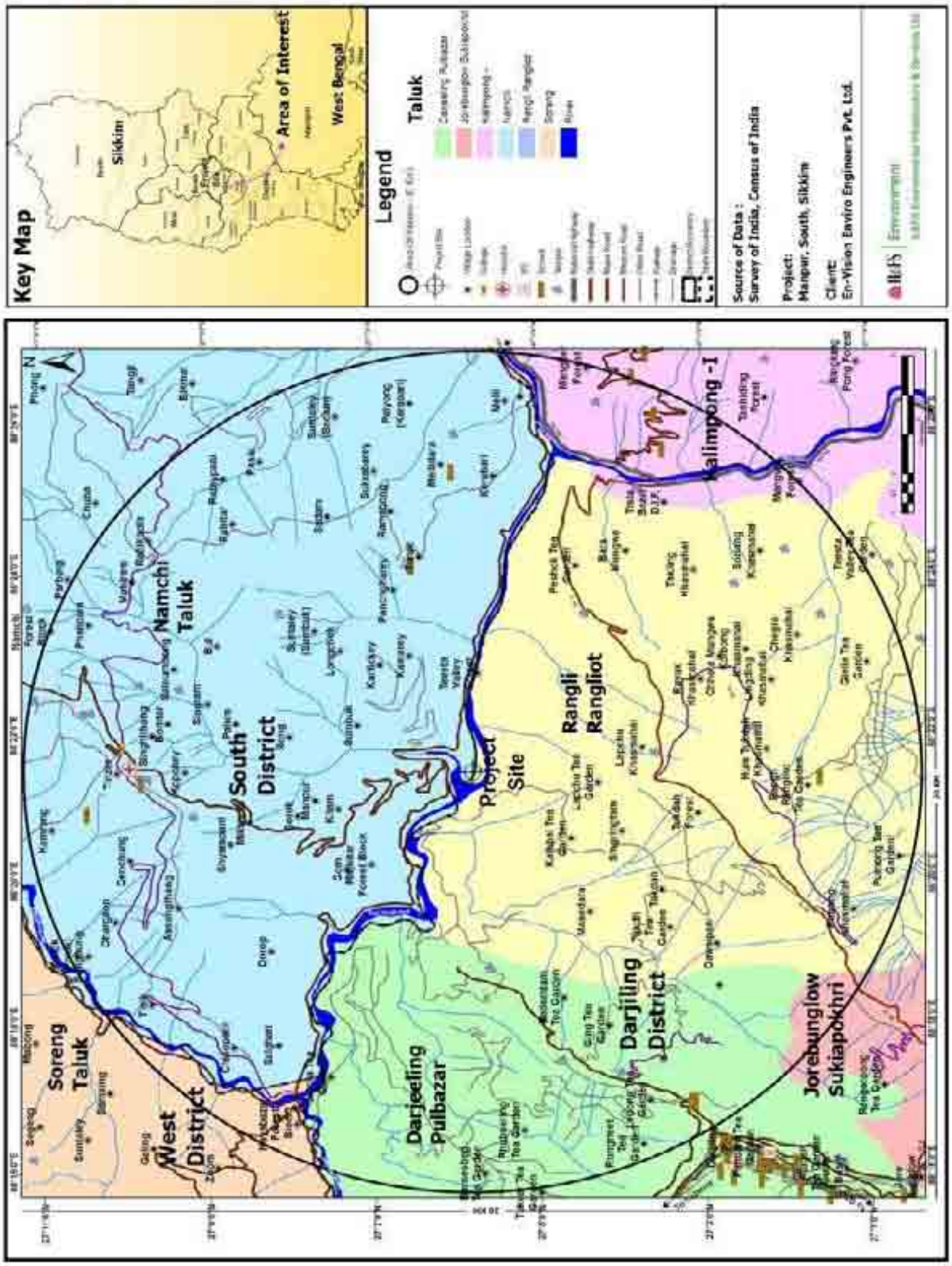
Core Zone (Host and Proximate Area where the proposed activities is completed) - This area is closest to the activity where the background quality of environmental and human health is always at high risk. This involves risks due to steady state, transient and accidental release of pollutants, noise, increased traffic congestion and social stress. The immediate vicinity of the plant that is around 3 km radius is factual core zone in this case.

Buffer zone (Moderately affected area)- Being a little away from the activity, the discharge pollutants need time lag to be transported to this area and gets attenuated/diluted to a considerable extent. However, the associated risk shall be real during brake-down, failure or upset conditions, and simultaneously with adverse meteorological and hydrological factors. Distance from 3 km to 10 km around the project site in the factual buffer zone in this case. This is based on the mathematical modeling study and air pollution dispersion pattern.

Unaffected Zone- This area shall not be at risk of serious damage to life, health and property. Here the impact becomes small enough to become imperceptible and/or inconsequent and/or insignificant and normal life activities shall prevail without any disturbances due to the activity. Distance away from the 10 km buffer zone is the factually unaffected zone in this case.

While collecting the baseline status of physical and biological environmental of the study area, the concept of impact zone has been considered. The Impact zone selection is based on preliminary screening and modeling studies. For demography and socio-economics, block wise data has been collected and used for the assessment of impacts.

FIGURE - 3.1 LOCATION MAP OF THE PROJECT SITE WITH STUDY AREA



3.2 CLIMATE

The four climatic seasons viz. pre-monsoon, monsoon, post-monsoon and winter could be considered as comprising of the following months:

Pre-monsoon : March, April and May
Monsoon : June, July, August and September
Post-monsoon : October and November
Winter : December, January and February

The summers are pleasant in most part of Sikkim with the average maximum temperature never crossing 28 ^{o} C. During this time many tourists visit the state to get away from the heat waves that affect most part of the country's plains. Especially the capital town of Gangtok sees an influx of tourists. The spring time is experienced during the months of March to May and it is the **best season to visit Sikkim**, and during this time the weather quite sunny and warm. Like the autumn months, this period is too quite popular among the tourists and visitors throng different parts of Sikkim during these months.

Monsoon starts around June and continues till around September. During this time Sikkim experiences heavy rainfall across the state. The weather is quite humid during the monsoons due to the continuous rainfall that most part of the state receives. Autumn (Post-monsoon) in Sikkim stretches through September to October and this is considered as a tourist season across the state. During this time the weather is not as less humid and quite pleasant.

Winter here starts around the month of November and continues till around early March, although the temperature drops significantly during the months of December to February. The winters in Sikkim are characterized by foggy chilly mornings and cold nights, and erratic season showers. Temperature dips to below 0 ^{o} C during winter.

3.3 METEOROLOGY

Air borne pollutants are dispersed by atmospheric motion. Knowledge of these motions, which range is scale from turbulent diffusion to long-range transport by weather systems. It is essential to simulate such dispersion and quality of impacts of air pollution on the environment. The purpose of EIA is to determine whether average concentrations are likely to encounter at fixed locations (Known as the receptor), due to the given sources (locations and rates of emission known), under idealized atmospheric conditions. It is imperative that one should work with idealized condition and all analysis pertaining to air turbulence and ambient air or noise pollution should be done with meteorological conditions, which can be best expected to occur. The detail of measurement technique, instruments, specification of measurement standards and accuracy of instruments were adopted from the Indian Standard (IS:8829-1978) "Guidelines for micrometeorological technique in Air Pollution Studies" Care was taken to install the anemometer within a distance of six times the height of nearest vertical terrain elements (house, trees etc.) and height of 10m from the average ground level of the fetched area.

3.3.1 MICRO-METEOROLOGY OF THE AREA

The months 9th January, February, March and 8th April are considered as study period. The minimum and maximum temperature was observed 8.4 ^{O}C and 26.3 ^{O}C respectively during January to July. Generally, winds blows from the directions between south-east and north-west in most of the seasons. The wind rose diagram prepared from data collected at site is shown in figure-3.2.

Kalimpong station is the meteorological observatory, to which the meteorological data (Temperature, Relative Humidity, Rainfall, Wind speed and Wind direction) were collected from the "Climatological Tables of Observatories in India 1961-1990" issued by "The Director General of Meteorology, New Delhi" which is shown as annexure-XVI. The data in respect of the above Parameters have been briefly discussed in the following paragraphs.

3.3.1.1 TEMPERATURE DETAILS

Temperature varies from season to season. Highest mean temperature in the month, recorded in July, was 28.2 °C. From December to February, both day and night temperatures begin to decrease rapidly. January is generally the coldest month, with mean morning temperatures of 11.9 °C. Mean daily minimum temperature of about 8.4 °C is recorded in January. During the post-monsoon season, day temperatures remain between 17.8 to 20.6ºC. In winters, i.e. December to February, day temperatures remain between 14.3 to 16 ºC.

3.3.1.2 RELATIVE HUMIDITY (RH)

Most humid conditions are found in the monsoon season. Thereafter, it decreases gradually during post-monsoon, winter and summer season in that order. Mornings are more humid than evenings and humidity ranges from a high of 76 to 79% in monsoon to a low of 73 to 76% in summer. During post-monsoon season, humidity remains between 78-79 %.

3.3.1.3 RAINFALL

Average annual rainfall for the Kalimpong station was observed 2232.5 mm. Allocation of rainfall by season was 30.9 mm in winter (December, January, February), 258.4 mm in summer (March, April, May), 1811.6 mm in monsoons (June, July, August, September) and 131.6 mm in post-monsoons (October to November).

3.3.1.4 CLOUD COVER

Generally, monsoon starts from June month so the area remains cloudy between the months June to September, which is the active period of the monsoon season. Generally cloud cover ranges from 4 to 4.7 Oktas during the monsoon season.

3.3.1.5 PREDOMINANT WIND DIRECTION

Pre dominant wind direction is shown as following table-3.1.

TABLE-3.1 PREDOMINANT WIND DIRECTION

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FIRST HIGHEST												
Morning	NW	NW	NW	NW	NW	NW	SW	NW	NW	NW	NW	NW
Evening	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
SECOND HIGHEST												
Morning	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Evening	SW	SW	NW	NW	NW	NW	NW	NW	NE	NW	NW	S
THIRD HIGHEST												
Morning	SW	SW	N	W	W	W	W	W	N	N	W	W
Evening	NW	NW	S	NE	NE	S	S	SW	CALM	CALM	S	NW

As per Indian Meteorological Department (IMD), Long Term Climatological Tables, 1961-1990 the predominant wind direction during the study period in winter season is observed to be from SE and NW direction. The monthly average of wind speed values for Kalimpong station was recorded 8.30 hrs and 17.30 hrs.

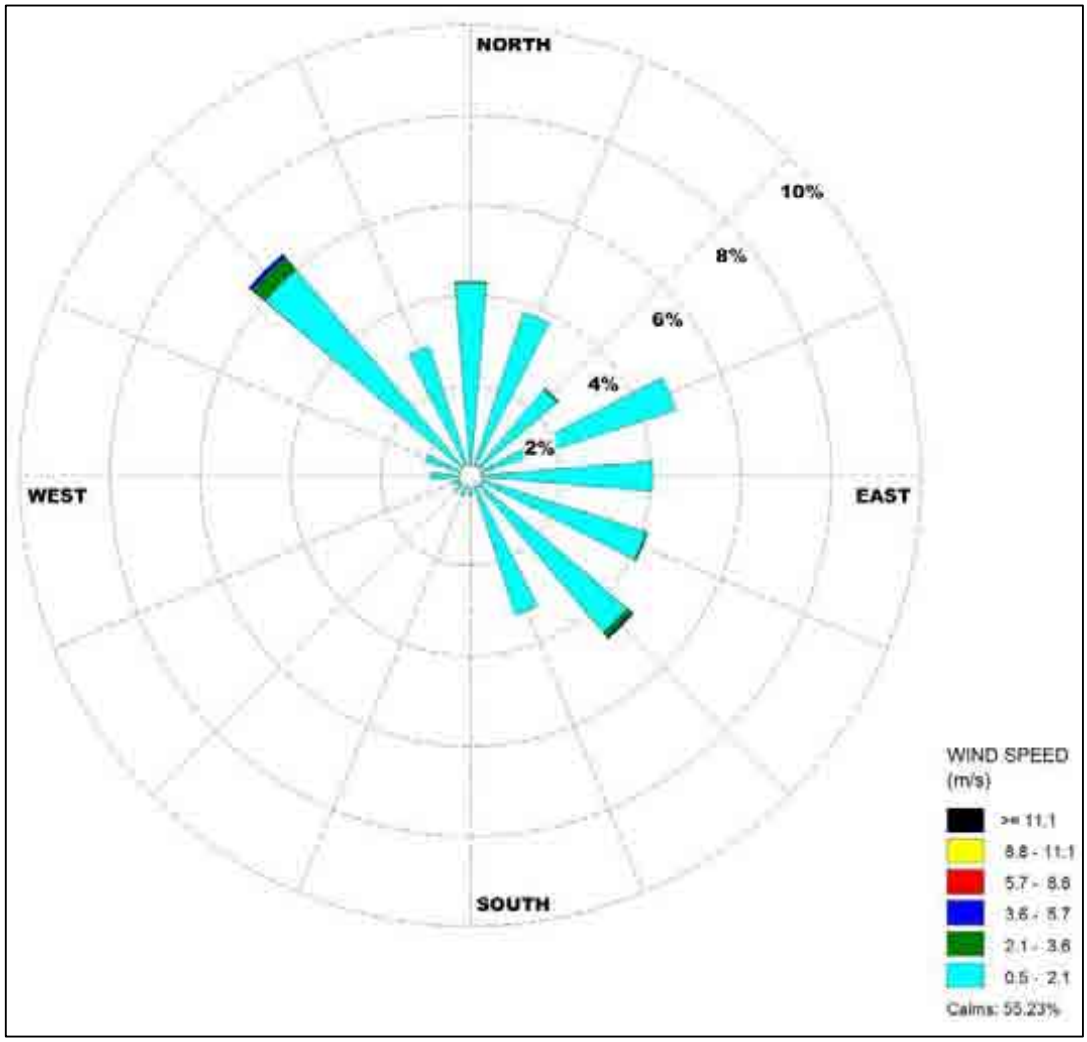
3.3.1.6 SITE SPECIFIC MICRO-METEOROLOGICAL DATA

Meteorological station was installed at the project site to record micrometeorological parameters on hourly basis during study period to understand the wind pattern, temperature variation, relative humidity variation, etc. Site-specific mean meteorological data is given in table-3.2 and the wind rose diagram processed by ISCST3 software from data collected at site is shown in figure-3.2.

TABLE - 3.2 SITE SPECIFIC METEOROLOGICAL DATA (9TH JAN TO 8TH APRIL-2013)

METEOROLOGICAL PARAMETER	MONTHS		
	1st MONTH	2nd MONTH	3rd MONTH
Temperature (^{0}C)			
Min.	5.0	5.4	8.2
Max.	24.0	24.4	26.8
Avg.	14.89	15.5	17.8
Relative Humidity (%)			
Min.	38.0	33.0	46.0
Max.	89.0	90.0	91.0
Avg.	72.0	74.1	73.8
Wind Speed (m/s)			
Min.	0.0	0.0	0.0
Max.	3.0	3.10	4.0
Avg.	0.37	0.58	0.7
Rainfall (mm)	0.0	0.0	0.0
Predominant direction	From North west to south East		

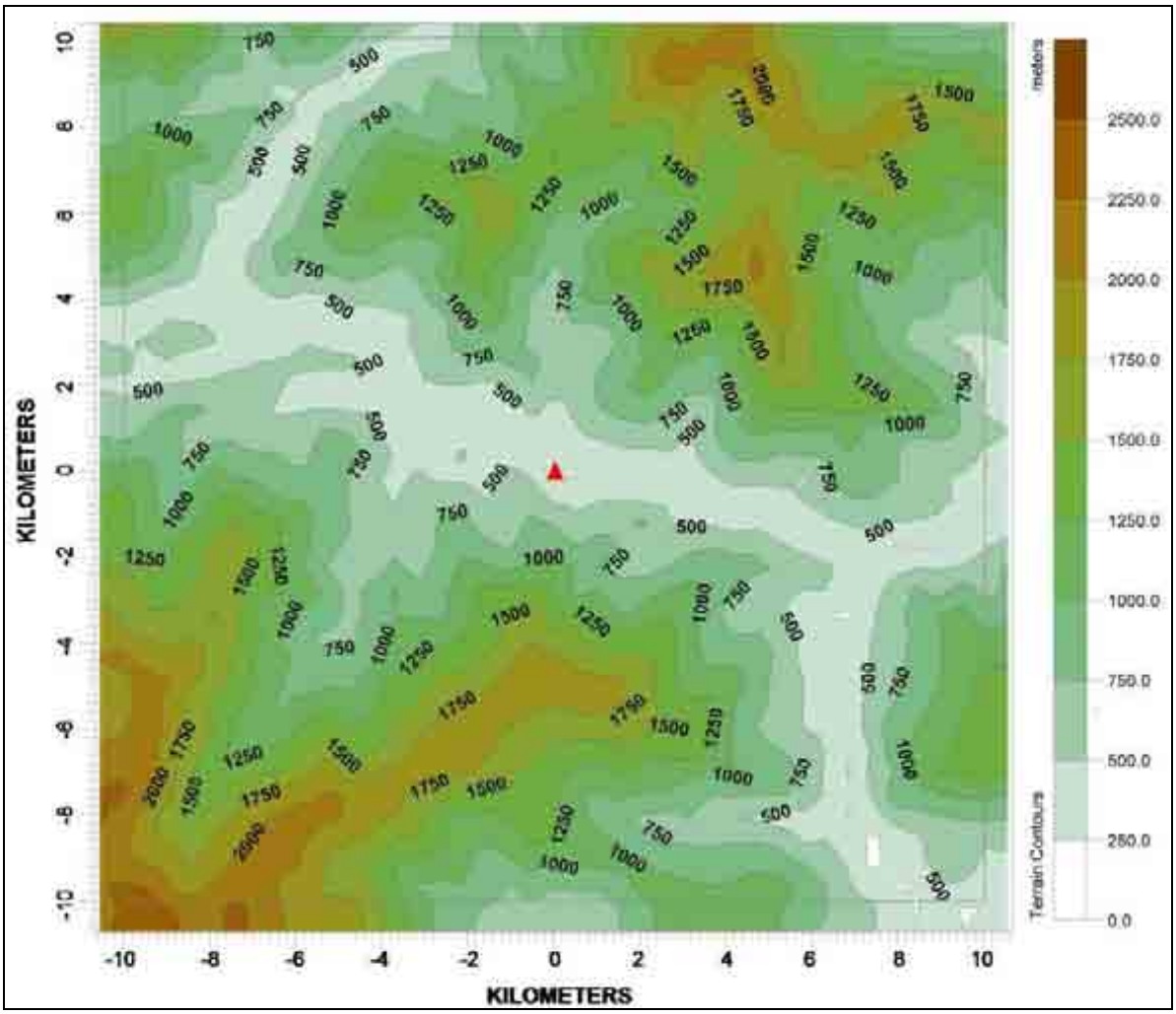
FIGURE - 3.2 WIND ROSE DIAGRAM



3.4 TOPOGRAPHY OF THE AREA

The general topography of the study area varies from low-lying plains to highland having hilly. To study topography of the area Digital terrain Model was prepared using Shuttle Radar Topography Mission (SRTM) elevation data. Digital Terrain Model is defined as three dimensional model of earth's surface, provided in a digital form. This gives a quantitative model of landform. Often the terms of DTM are used for model for containing discrete data on elevation. It is a computer simulation model to show relief, based on three dimensional data. The digital terrain map is illustrated in figure-3.3.

FIGURE - 3.3 DIGITAL TERRAIN MODEL



3.5 AIR ENVIRONMENT

3.5.1 DESIGN OF NETWORK FOR AMBIENT AIR QUALITY MONITORING LOCATIONS

The air quality status in the impact zone was assessed through a network of ambient air quality monitoring locations. The tropical climatic conditions mainly control the transport and dispersion of air pollutant during various seasons.

The baseline studies for air environment include identification of specific air pollutants prior to implementation of the project. The Environmental Impact Assessment (EIA) study requires monitoring of baseline air quality during one season. Accordingly, air quality monitoring was carried out during 9th January, 2013 to 8th April, 2013. The baseline status of the air environment was assessed through a systematic air quality surveillance programme, which was planned based on the following criteria:

- Topography / terrain of the study area
- Regional synoptic scale climatologically normal

- Densely populated areas within the region
- Location of surrounding industries
- Representation of regional background
- Representation of valid cross-sectional distribution in downwind direction

3.5.2 RECONNAISSANCE

Reconnaissance was undertaken to establish the baseline status of air environment in the study region. Eight Ambient Air Quality Monitoring (AAQM) locations were selected based on guidelines of network sitting criteria. All AAQM locations were selected within the study area of 10 km radial distance from the proposed project site.

3.5.3 METHODOLOGY FOR AMBIENT AIR QUALITY MONITORING

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) of June 1998 and National Ambient Air Quality Standards (NAAQS) of CPCB of December 2009. Ambient Air Quality Monitoring (AAQM) was carried out at nine locations during 9th January, 2013 to 8th April, 2013 for parameters such as Particulate Matter (PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx) and Hydro Carbon (Methane & Non-methane). Sampling locations were selected from the study area of 10 km radial distance around the plant site. The monitoring was carried out 24 hours a day twice a week per location in the study area except the project site, where continuous monitoring was carried out. Twenty Six numbers of observations were taken at each monitoring location except the project site. The locations of the different stations with respect to its distance and direction from project site are shown in table-3.3 and figure-3.4 respectively.

The values for mentioned concentrations of various pollutants at all the monitoring locations were processed for different statistical parameters like arithmetic mean, minimum concentration, and maximum concentration and percentile values. The existing baseline levels of PM_{10}, $PM_{2.5}$, SO_2, NOx and Hydro Carbon (Methane & Non-methane) are expressed in terms of various statistical parameters as given in tables-3.4. Prevailing air environment quality standards are enclosed as an annexure-IV.

TABLE - 3.3 DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

SR. NO.	NAME OF VILLAGE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W.R.T. PROJECT SITE	TYPE OF AREA
1.	Project Site (A1)	-	-	Industrial
2.	Manpur (A2)	2.4 km	NE	Residential
3.	Kitam (A3)	2.9 km	NNW	Residential
4.	Jorethang (A4)	3.8 km	WNW	Residential
5.	Peshok (A5)	4.3 km	SE	Residential
6.	Simbong (A6)	1.7 km	SE	Residential
7.	Shikari Dhuva (A7)	2.9 km	SW	Residential
8.	Youdha (A8)	4.1 km	E	Residential

FIGURE - 3.4 LOCATION OF AMBIENT AIR QUALITY MONITORING STATIONS

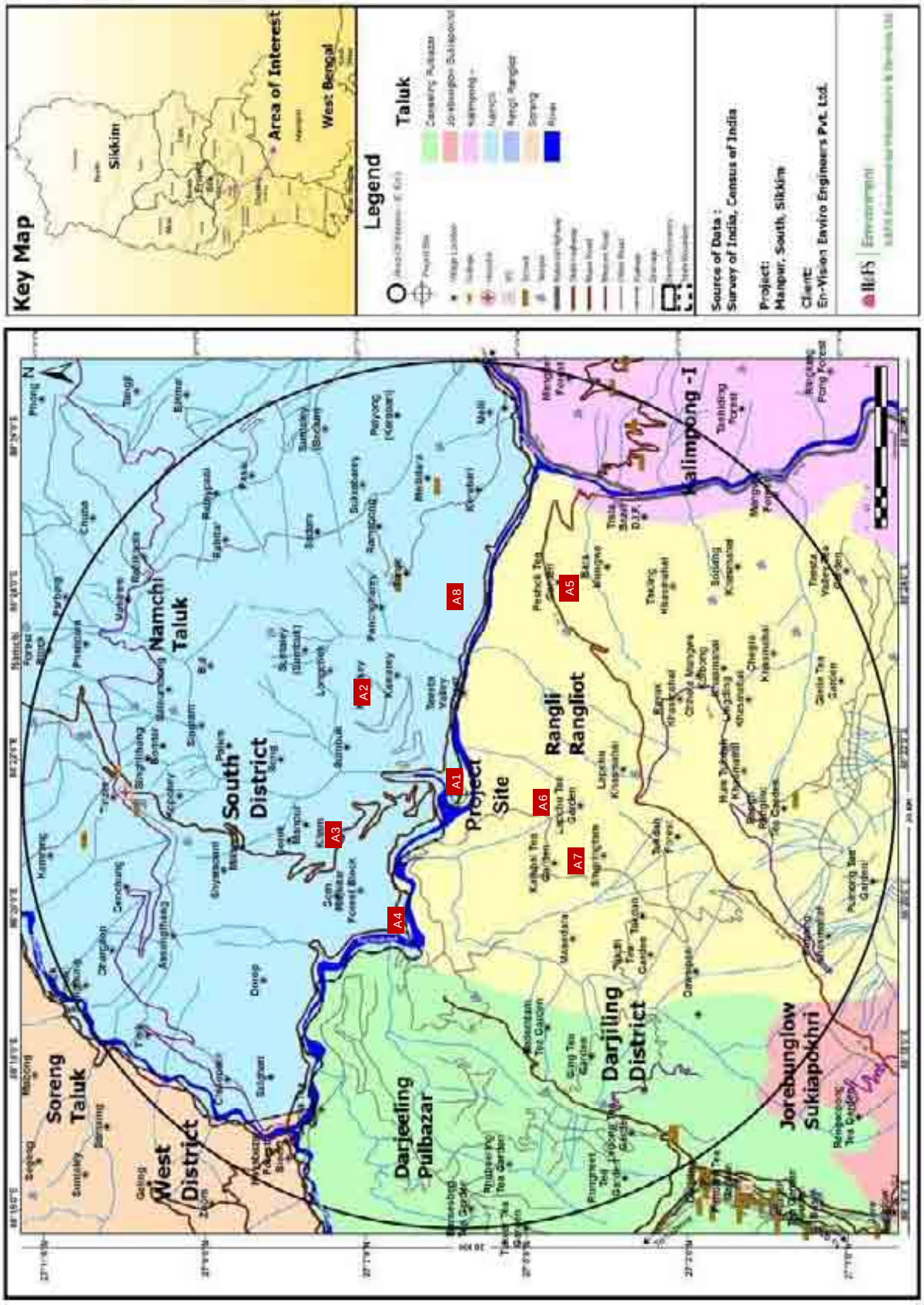


TABLE - 3.4 AMBIENT AIR QUALITY STATUS

SR. NO.	SAMPLING LOCATION	-	PARAMETERS					
			PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	HC as Methane (ppm)	HC as Non Methane (ppm)
1.	Project Site (A1)	Min.	52	18	4	9	1	< 0.1
		Max.	91	32	6	18	3	
		Ave.	69.33	23.42	4.92	13.14	1.29	
		98th Per.	86.86	30.62	6	17.6	2.54	
2.	Village Manpur (A2)	Min.	56	16	< 4	9	< 0.1	< 0.1
		Max.	80	27		10		
		Ave.	63.83	19.6		9.08		
		98th Per.	76.32	25.62		9.78		
3.	Village Kitam (A3)	Min.	52	16	4	10	< 0.1	< 0.1
		Max.	96	32	4	20		
		Ave.	61.33	19.83	4	14.83		
		98th Per.	84.96	28.32	4	20		
4.	Village Jorethang (A4)	Min.	12	5	< 4	9	< 0.1	< 0.1
		Max.	63	18		9		
		Ave.	44.50	13.96		9		
		98th Per.	62.08	17.54		9		
5.	Village Peshok (5)	Min.	56	16	4	9	< 0.1	< 0.1
		Max.	88	30	4	25		
		Ave.	66.29	21.00	4	13.54		
		98th Per.	82.94	28.16	4	21.32		
6.	Village Simbong (A6)	Min.	55	14	< 4	9	< 0.1	< 0.1
		Max.	28	28		14		
		Ave.	66.54	19.50		11.22		
		98th Per.	78.62	27.08		14		
7.	Village Shakhari Dhuva (A7)	Min.	43	14	4	9	< 0.1	< 0.1
		Max.	64	21	4	10		
		Ave.	55.92	17.58	4	9.11		
		98th Per.	63.54	21	4	9.84		
8.	Village Youdha (A8)	Min.	60	20	< 4	9	< 0.1	< 0.1
		Max.	79	26		9		
		Ave.	68.96	22.92		9		
		98th Per.	78.54	26		9		

3.5.4 RESULT AND DISCUSSION

The existing baseline levels within the study area with respect to PM_{10}, $PM_{2.5}$, SO_2, NOx, HC (as methane and non methane) expressed in terms of various statistical parameters are presented in tables-3.4 and detail results given in annexure-XI.

During baseline monitoring, the arithmetic mean values of PM_{10} varied between 12-91 $\mu g/m^3$ while the 98th percentile values of PM_{10} ranged between 62.08-86.86 $\mu g/m^3$. The arithmetic mean values of $PM_{2.5}$ varied between 5-32 $\mu g/m^3$ during the study period and the 98th percentile values of $PM_{2.5}$ were observed between 17.54-28.32 $\mu g/m^3$.

The arithmetic mean values for SO_2 was <4-6 $\mu g/m^3$ and the 98th percentile of SO_2 was <4-6 $\mu g/m^3$. The arithmetic mean values of NOx varied between 9-25 $\mu g/m^3$ while the 98th percentile of NOx ranged from 9-21.32 $\mu g/m^3$.

The values of HC as methane were varied between < 0.1-3 ppm while the values of HC as non methane were < 0.1 ppm. It is observed that, HC as methane was present only at the project site while at other all locations the value of HC as methane and non methane were found within the below detectable limit.
From the above mentioned studies it is observed that PM_{10}, $PM_{2.5}$, SO_2, NOx and HC concentrations were found well below the stipulated standards of CPCB.

3.6 WATER ENVIRONMENT

3.6.1 METHODOLOGY FOR WATER QUALITY MONITORING

Physico-chemical parameters have been analyzed to ascertain the baseline status of existing surface water and ground water bodies. Samples were collected once during the study period 9th January to 8th April. The details of surface and ground water sampling locations are given in table-3.5 and sampling locations of water quality monitoring are shown in figure-3.5. The Indian standard specification for drinking water is enclosed as an annexure-V and CPCB standards classification of inland surface water is enclosed as an annexure-VI. The physico-chemical characteristics of the collected water samples are presented in the tables-3.6-3.7.

3.6.2 PHYSICO-CHEMICAL CHARACTERISTICS GROUND WATER

Groundwater samples from different villages in the project area were collected and analyzed during 9th January to 8th April. The physico-chemical characteristics of the groundwater are presented in the Tables 3.6. The pH varied in the range of 7.02-7.19, Turbidity 0.3-0.9 NTU, Total Hardness 137-198 mg/l, Total Alkalinity 120-125 mg/l, Dissolved Solids 179.5-315 mg/l, Conductivity 314-498 µS/cm, Chloride 11-13 mg/l, Sulphate 2-4 mg/l. The Nitrate in the form of nutrient was present in the range of 1.1-2.0 mg/l. Heavy metals concentrations were observed to be below Indian standard/specification for drinking water IS 10500-1992.

3.6.3 PHYSICO-CHEMICAL CHARACTERISTICS SURFACE WATER

The Physico-chemical characteristics of surface water during study period are summarized in tables-3.7. The pH varied from 7.5-7.9, the turbidity varied from 1.6-7.1 NTU, the total dissolved solids varied from 51-196 mg/l, Conductivity varied from 74.7-258 µS/cm, The total alkalinity varied from 36 to 114 mg/l, the total hardness varied from 38.16-116.38 mg/l, calcium varied from 9.15-26.0 mg/l, chloride varied from 3-8 mg/l, the sulphate varied from 1-3 mg/l.

The results indicated that the nutrient values in the form of nitrate varied from 1.35-4.05 mg/l. The values for demands parameters like DO and BOD varied from 5.0-6.9 mg/l and <1. The levels of heavy metals viz. Nickel, Chromium, Cadmium, Copper, Lead, Iron, Manganese, Zinc and Cobalt were found within permissible limits.

TABLE - 3.5 DETAILS OF GROUND AND SURFACE WATER MONITORING LACATIONS

SR. NO.	SAMPLING LOCATIONS	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W. R.T. PROJECT SITE
1.	Near coal yard within project site (GW1)	-	-
2.	Near boile within project site (GW2)	-	-
3.	Near DM plant within Project site (GW3)	-	-
4.	Village Kartike (SW1)	3.2 km	NE
5.	Rangit River up-stream (SW2)	0.10 km	S
6.	Rangit River down-stream (SW3)	0.10 km	E
7.	Jhar, Village Manpur (SW4)	2.4 km	NE
8.	Tista River Near Triveni (SW5)	7.5 km	E

GW= Ground water, SW= Surface water

FIGURE - 3.5 LOCATIONS OF WATER SAMPLING STATIONS

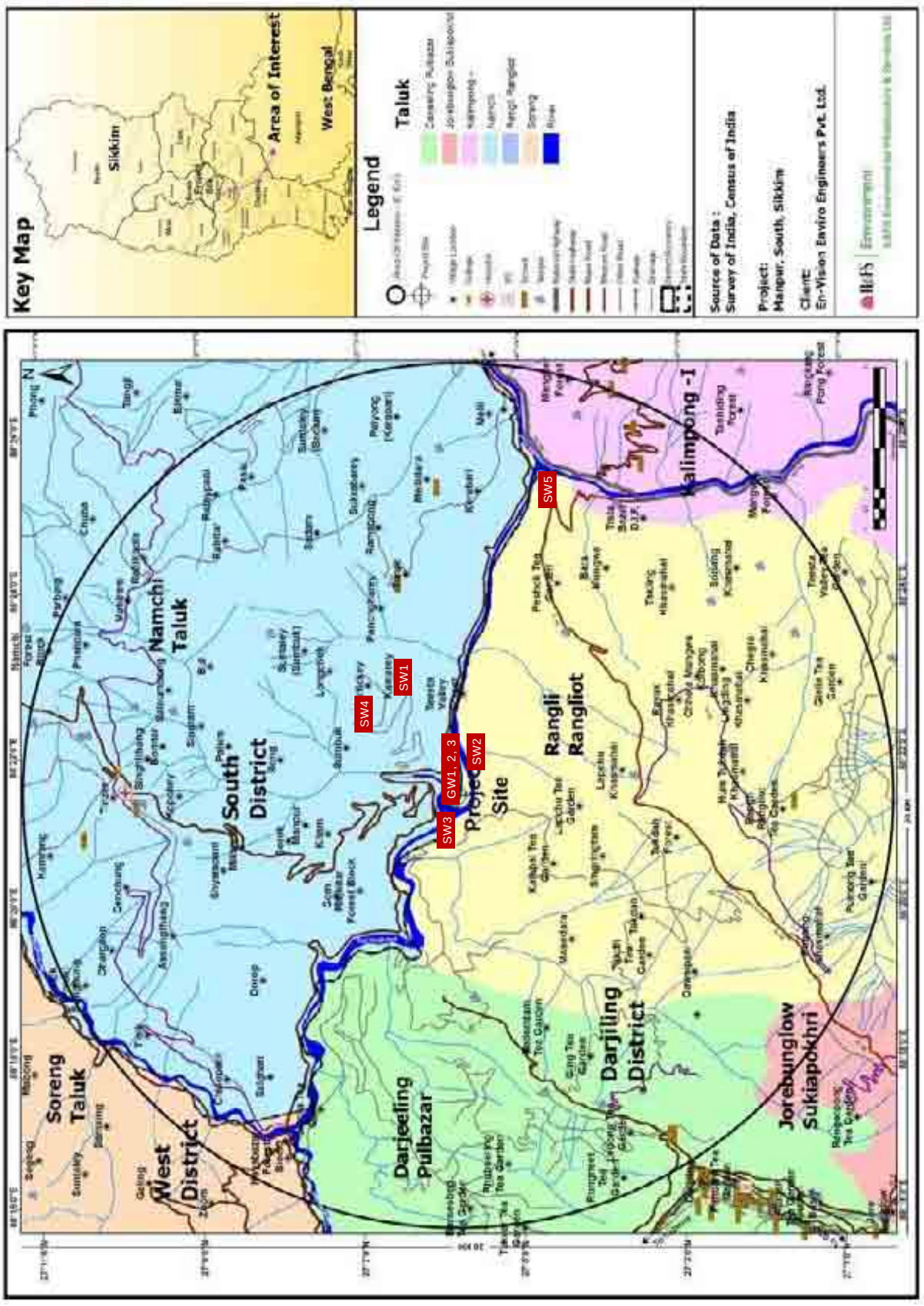


TABLE - 3.6 BASELINES GROUND WATER QUALITY

SR. NO.	SAMPLING	SAMPLING LOCATIONS			
		UNIT	NEAR COAL YARD WITHIN PROJECT SITE (GW1)	NEAR BOILER WITHIN PROJECT SITE (GW2)	NEAR DM PLANT (GW3)
1.	pH Value	-	7.02	7.19	7.08
2.	Turbidity	NTU	0.9	0.3	0.7
3.	Total Dissolved Solids	mg/l	315	179	205
4.	Electrical Conductivity	µs/cm	498	314	326
5.	Total Hardness (as $CaCO_3$)	mg/l	198	145	137
6.	Calcium Hardness (as $CaCO_3$)	mg/l	131	80	80
7.	Magnesium Hardness (as $MgCO_3$)	mg/l	97	64	57
8.	Calcium (as Ca)	mg/l	52	32	32
9.	Magnesium (as Mg)	mg/l	23	15	13
10.	Total Alkalinity (as $CaCO_3$)	mg/l	125	125	120
11.	Chlorides (as Cl)	mg/l	11	12	13
12.	Sulphate (as SO_4)	mg/l	4	2	2
13.	Total Nitrate (as NO_3)	mg/l	1.1	1.3	2.0
14.	Total Nitrogen (as N)	mg/l	< 0.5	< 0.5	< 0.5
15.	Total Phosphate (as PO_4)	mg/l	<0.01	<0.01	< 0.01
16.	Ammonical Nitrogen (as N)	mg/l	< 0.01	< 0.01	< 0.01
17.	Copper (as Cu)	mg/l	< 0.01	< 0.01	< 0.01
18.	Manganese (as Mn)	mg/l	< 0.01	< 0.01	< 0.01
19.	Iron (as Fe)	mg/l	<0.3	<0.3	<0.3
20.	Fluoride (as F)	mg/l	0.7	1	0.8
21.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	< 0.002
22.	Phenolic Compounds (as C6H5OH)	mg/l	< 0.001	< 0.001	< 0.001
23.	Boron (as B)	mg/l	< 0.05	< 0.05	< 0.05
24.	Zinc (as Zn)	mg/l	< 5	< 5	< 5
25.	Aluminium (as Al)	mg/l	<0.03	<0.03	<0.03
26.	Cadmium (as Cd)	mg/l	< 0.002	< 0.002	< 0.002
27.	Lead (as Pb)	mg/l	< 0.01	< 0.01	< 0.01
28.	Nickel (as Ni)	mg/l	< 0.02	< 0.02	< 0.02
29.	Mercury (as Hg)	mg/l	< 0.001	< 0.001	< 0.001
30.	Arsenic (as As)	mg/l	< 0.001	< 0.001	< 0.001
31.	Selenium (as Se)	mg/l	< 0.01	< 0.01	< 0.01
32.	Sodium (as Na)	mg/l	41	26	23
33.	Potassium (as K)	mg/l	14.8	10.6	12.3

SR. NO.	SAMPLING	SAMPLING LOCATIONS			
		UNIT	NEAR COAL YARD WITHIN PROJECT SITE (GW1)	NEAR BOILER WITHIN PROJECT SITE (GW2)	NEAR DM PLANT (GW3)
34.	Chemical Oxygen Demand	mg/l	< 4	< 4	< 4
35.	BOD 3days at 27oC	mg/l	< 1	< 1	< 1
36.	Dissolved Oxygen	mg/l	5.8	6.1	6.8
37.	Total Coliform Organisms	Nos/100 ml	Absent	Absent	Absent
38.	Faecal Coliform Organisms	Nos/100 ml	Absent	Absent	Absent

TABLE - 3.7 BASELINE SURFACE WATER QUALITIES

SR. NO.	PARAMETER	UNIT	SAMPLING LOCATION				
			VIILAGE KARTIKE (SW1)	RANGIT RIVER UP-STREAM (SW2)	RANGIT RIVER DOWN-STREAM (SW3)	JHAR, VILLAGE MANPUR (GW4)	TISTA RIVER NR. TRIVENI (SW5)
1.	pH Value	-	7.65	7.84	7.63	7.92	7.51
2.	Temperature	^{o}C	18.7	19.0	19.2	18.9	18.3
3.	Turbidity	NTU	4.0	2.6	2.9	7.1	1.6
4.	Total Dissolved Solids	mg/l	89	51	68.5	196	79
5.	Electrical Conductivity	µs/cm	122.2	74.7	101.1	258	109
6.	Total Hardness (as $CaCO_3$)	mg/l	59	41	38	116	44
7.	Calcium Hardness (as $CaCO_3$)	mg/l	28	23	23	65	25
8.	Magnesium Hardness (as $MgCO_3$)	mg/l	30	19	15	51	19
9.	Calcium (as Ca)	mg/l	11	9	9	26	9
10.	Magnesium (as Mg)	mg/l	7	4	3	12	4
11.	Total Alkalinity (as $CaCO_3$)	mg/l	56	38	36	114	40
12.	Chlorides (as Cl)	mg/l	4	5	3	8	4
13.	Sulphate (as SO_4)	mg/l	3	3	2	1	2
14.	Total Nitrate (as NO_3)	mg/l	2.21	1.35	4.05	1.81	2.64
15.	Total Nitrogen (as N)	mg/l	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
16.	Total Phosphate (as PO_4)	mg/l	< 0.01	0.1153	0.0489	1.3894	< 0.01
17.	Ammonical Nitrogen (as N)	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
18.	Copper (as Cu)	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.0102
19.	Manganese (as Mn)	mg/l	0.01	0.01	0.01	0.01	0.01
20.	Iron (as Fe)	mg/l	0.1	0.1	0.2	0.1	0.1
21.	Fluoride (as F)	mg/l	0.8	0.9	0.6	1.0	0.8
22.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
23.	Phenolic Compounds (as C6H5OH)	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24.	Boron (as B)	mg/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

SR. NO.	PARAMETER	UNIT	SAMPLING LOCATION				
			VIILAGE KARTIKE (SW1)	RANGIT RIVER UP-STREAM (SW2)	RANGIT RIVER DOWN-STREAM (SW3)	JHAR, VILLAGE MANPUR (GW4)	TISTA RIVER NR. TRIVENI (SW5)
25.	Zinc (as Zn)	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
26.	Aluminium (as Al)	mg/l	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
27.	Cadmium (as Cd)	mg/l	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
28.	Lead (as Pb)	mg/l	< 0.01	0.0461	0.0299	0.0457	0.0547
29.	Nickel (as Ni)	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
30.	Mercury (as Hg)	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
31.	Arsenic (as As)	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
32.	Selenium (as Se)	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
33.	Sodium (as Na)	mg/l	8	4	4	5	3
34.	Potassium (as K)	mg/l	0.8	1.2	2.2	0.8	0.6
35.	Chemical Oxygen Demand	mg/l	< 4	< 4	< 4	< 4	< 4
36.	BOD 3days at 27oC	mg/l	< 1	< 1	< 1	< 1	< 1
37.	Dissolved Oxygen	mg/l	6.9	6.1	6.1	5.0	6.0
38.	Total Coliform Organisms	Nos/ 100 ml	Absent	Absent	Absent	Absent	10
39.	Faecal Coliform Organisms	Nos/ 100 ml	Absent	Absent	Absent	Absent	Absent

3.7 GEOMORPHOLOGICAL, GEOLOGICAL, HYDRO-GEOLOGICAL STATUS

Detailed geo-hydrogeological study of study area comprise of 10 Km. radius is carried out and briefly discussed.

3.7.1 GEOMORPHOLOGY & DRAINAGE

Geomorphology: The South District of Sikkim is mountainous forming part of Eastern Himalayas. It is characterized by Himalayan topography with a series of crisscross ridges and ravines. The altitude varies from 230 to 7,000 m above MSL.

Drainage: The drainage of the district is controlled by the perennial Tista and Rangit rivers alongwith their tributaries. Tista the main river passes through the area which originates from the central crystalline zone defined by high mountain ranges which is covered by glaciers. The Tista and its tributaries drain different parts of the area. The rivers are perennial in natures which are fed by both snowmelt water and rain water. Rangit, another river originates from West Sikkim. During its southerly course it receives Melli Chhu, Namlong Khola, Rathang Chhu, Kalig Chhu, Rayong Khola, etc. The southerly flowing Tista is joined by Rangpchap Chhu at the extreme north of the South Sikkim. The type of drainage is trellis and dendritic. Most of the *Kholas* have originated from the higher altitudes and flow down by cutting deep gorges in lower altitude where they ultimately join with the main river Tista.

3.7.2 SOIL

The soils of the district in general have derived from parent rocks such as Sandstone, Phyllite, Schist, gneisses and colluvial materials. Soils are generally acidic to very acidic in reaction having soil pH between 5.00 and 6.0.

3.7.3 GEOLOGY

The geological formation of the studied and surrounding area belongs to undifferentiated proterozoic formations: sedimentary and metamorphic rocks (As per GSI 1993, 1995, 1999 classification) the area rocks & Generalised Startigraphy indicates-

Proterozoic – Undifferentiated proterozoic formations of Himalaya; gneissic complex of Chootanagpur and Meghalaya with mid proterozoic reactivation.

Proterozoic – Proterozoic granitoids of Peninsular India and Himalaya.

Proterozoic II-III:- (undifferentiated) Salkala group, Buniyar group, Daling group, Tengo and Potin formation and equivalents of Himalaya.

Proterozoic – Undifferentiated proterozoic formations Kunchenjengha gneissic, Darjiling gneiss and paro group of east Himalaya; Sela group equivalent formation and Tiding formation of NE Himalaya. Nega metamorphic of NE India.

Geotechnical: As per Geotechnical classification GSI 1995 (as per plate unit VI 8L) the studied South Sikkim area belong to:-

Morphologic/Morphotectonic units — Himalayan and Naga lushai mountain belts/foredeep zone of structural rediges and valleys.

Engineering Geologic provinces — Metamorphic and igneous rocks of lesser Himalaya/Arakan yoma axial zone.

Lithology — undifferentiated metamorphic

Permeability — Low

Bearing Capacity — Moderately high

Foundation Characteristic — Good

As per Geotechnical classification GSI 1995 (as per plate -unit-VI 9n) the studied south Sikkim area belong to :-

Morphologic/Morphotectonic units — Himalayan and Naga lushai mountain belts/foredeep zone of structural rediges and valleys.

Engineering Geologic provinces — Greater/trans/lohit formation Himalayan mountains of central crystallines, tethyan sedimentries, Ladakh granotoids complex and other meta sedimentries.

Lithology — Gnesiss, Khondolite, Rhyolite

Permeability — Low

Bearing Capacity — High

Compressive Strength — 1000-2000kg/cm^2

Foundation Characteristic — very good

3.7.3.1 SEISMICITY AND EARTHQUAKES

From the project site North of Darjiling is located in SSW direction where some fault plane have been reported by GSI 1993 classification with fault trends NE-SW. Moreover study area is located in Zone 4 as per the Bureau of Indian Standards (BIS) 2012 seismic zone map for India, which is shown in figure-3.6. Zone 4 is represents areas where there is high damage risk by destructive earthquakes. Entire Sikkim state is also falls in zone IV.

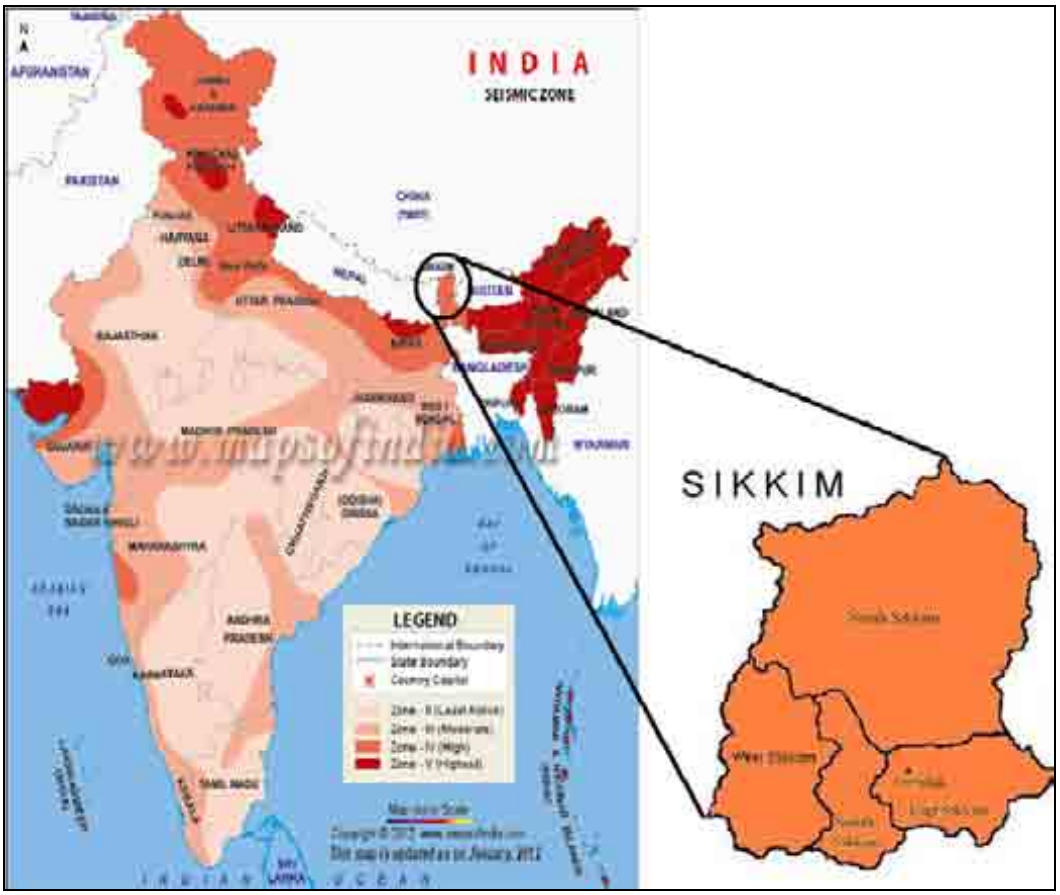
3.7.4 HYDROGEOLOGY

Major water bearing information: Fractured zones in various lithological units, weathered zones in phyllite, schist, gnessics, and quartzite.

The repository of ground water in the south district of Sikkim is the fracture and joint plains. The presence of innumerable perennial springs with varies discharge is also suggestive of occurrence of ground water in various rock formations and weathered zones in the phyllite, schist, gnessics and quartizite.

Due to higher relief and steeper gradient of the area, ground water comes out as seepages and springs, wherever the land surface intersects local ground water body. The area is characterized by high rainfall, with the result that the primary source of ground water is from natural precipitation. Direct infiltrations and rainfall through joints, fracture, weathered zones of the rocky and through soil covers is the principal mode of recharge of the springs. Due to higher slope most of the precipitation in the area flows off as surface-run off through streams, *kholas* and through intermittent springs. The movement of groundwater is mainly controlled by structural set up of the area and by the physiography.

FIGURE - 3.6 SEISMIC ZONE MAP OF SIKKIM



3.7.5 GROUND WATER EXPLORATION IN SOUTH DISTRICT OF SIKKIM:

Central Ground Water Board had undertaken exploratory drilling programme in South and East Sikkim to identify the potential fracture zones and to assess the quantum of ground water to be extracted from the successful borehole. Exploration was initiated during 1984. Total 27 nos. of exploratory borehole and 7 nos. of observation wells were drilled in South district, Sikkim in different geological formations such as Gondwanas, Daling formation and Buxa formation. Among all the exploratory wells, five numbers of exploratory wells encountered in Gondwana and Daling formation recorded encouraging yield. The discharges were recorded 5 to 8 LPS or 300 LPM to 480 LPM. The yield from other exploratory well were observed low i.e., 0.25 to 1.4 LPS. The low discharge well can be used for hand pump. The drawdown of the successful exploratory well varies from 5 to 10 meters. The potential fractures encountered at the depth range of 27.00 meter, 38 m to 91 m bgl. From aquifer performance data in four boreholes tested so far Transmissivity is seem to vary from 5.32 m^2/day to 316.43 m^2/day for the Gondwana rocks and 16.14 m^2/day to 199.9 m^2/day for the Daling rocks. Moreover the Storativity figure of 5.1328 x 10^{-4} for the Gondwana rocks at Kazitar show that groundwater occurs under confined condition and is coming from deep seated fracture zones.

3.7.6 WATER SUPPLY SYSTEM IN SOUTH DISTRICT:

The South district of Sikkim water supply system solely depends upon “Surface Water Sources”. The basic water supply system consists of –

a) Tapping of water sources located at higher reaches.
b) Transporting the raw water through gravity from the sources to the lower reaches finally distributed to consumer points through zonal distribution system.
c) The people of the villages situated on the hill slopes, depend mainly on the springs and or nearly perennial *kholas* for their drinking water supply. The rural works department of the State Government has implemented schemes for water supply. The spring water collected in storage tank from where it is supplied to various villages situated at the same or lower altitudes by gravity

3.7.7 GROUND WATER RELATED ISSUES AND PROBLEMS IN SOUTH DISTRICT OF SIKKIM.

- The occurrence of Iron (Fe) in ground water is more than permissible limit (100 mg/l) has been observed in Namchi, South Sikkim.
- The springs traditionally meet the water demand of local populace. As far as practicable, the spring source must be cleaned, storage tanks of adequate capacity be built up. Wastage of water be minimized and some treatment (both chemical and bacteriological) be done before use for drinking. Sometimes filtration lacunae may cause water borne diseases in the areas.

3.8 NOISE ENVIRONMENT

The objective of noise pollution survey around the project site was to identify existing noise sources and to measure background noise levels. The study was carried out in the following steps:

i. Reconnaissance

ii. Identification of noise sources and measurement of noise levels

iii. Measurement of noise levels due to transportation

IV. Community noise levels

3.8.1 RECONNAISSANCE

The details of locations of background noise monitoring station are given in table-3.8 and presented in figure-3.7 while the results of noise monitoring are given in table-3.9 and for transportation noise level is given in the table-3.10.

3.8.2 EQUIVALENT SOUND LEVELS OR EQUIVALENT CONTINUOUS EQUAL ENERGY LEVEL (L_{eq})

There is large number of noise scales and rating methods based on some sort of average of weighted average quantities derived from the detailed noise characteristics. Equivalent sound levels or Equivalent continuous equal energy level (L_{eq}) is a statistical value of sound pressure level that can be equated to any fluctuating noise level and forms a useful measure of noise exposure and forms basis of several of the noise indices used presently.

L_{eq} is defined as the constant noise level, which over a given time, expands the same amount of energy, as is expanded by the fluctuating level over the same time. This value is expressed by the equation:

$$L_{eq} = 10 \log \sum_{i=1}^{i=n} (10)^{Li/10} \times ti$$

Where, n = Total number of sound samples,

Li = The noise level of any i^{th} sample

ti = Time duration of i^{th} sample,

Expressed as fraction of total sample time

Leq has gained wide spread acceptance as a scale for the measurement of long term noise exposure. Hourly equipment noise levels in the identified impact zone are monitored for day and time separately using sound level meter. All the values are reported in Leq and in case of equipment noise, Sound pressure level are monitored 1.5 m away from the machine and assessed with respect to standard prescribed in factory Act.

3.8.3 METHODOLOGY FOR NOISE MONITORING

Noise standards have been designated for different types of area i.e. residential, commercial, industrial and silence zones, as per 'The Noise Pollution (Regulation and Control) Rules, 2000, Notified by Ministry of Environment and Forests, New Delhi, February 14, 2000. Different standards have been stipulated for day time (6 am to 10 pm) and night time (10 pm to 6 am).

The locations are away from the major roads and major noise sources so as to measure ambient noise levels. One day monitoring was carried out at all the locations. The frequency of monitoring was set at an interval of 15 seconds over a period of 10 minutes per hour for 24-hours. The observed Equivalent sound levels (Leq) values in dBA are given in table-3.9 for each monitoring location in distinguished form of day time (6 am to 10 pm) and night time (10 pm to 6 am).

All measurements were carried out when the ambient conditions were unlikely to adversely affect the results.

TABLE - 3.8 DETAILS OF LOCATION OF BACKGROUND NOISE MONITORING STATIONS

SR. NO.	NAME OF VILLAGE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE	BEARING W.R.T. PROJECT SITE
1.	Project Site (N1)	-	-
2.	Lapchu (N2)	3 km	S
3.	Kitam (N3)	2.9 km	NNW
4.	Jorethang (N4)	3.8 km	WNW
5.	Peshok (N5)	4.3 km	SE
6.	Simbong (N6)	1.7 km	S
7.	Shikari Dhuva (N7)	2.9 km	SW
8.	Kartike (N8)	3.2 km	NE
9.	Melli Nayabazar Road (TN1)	0.50 km	N
10.	Peshok Road (TN2)	4.3 km	SE
11.	NH-31a (TN3)	7.5 km	SE

FIGURE - 3.7 LOCATIONS OF NOISE SAMPLING STATIONS

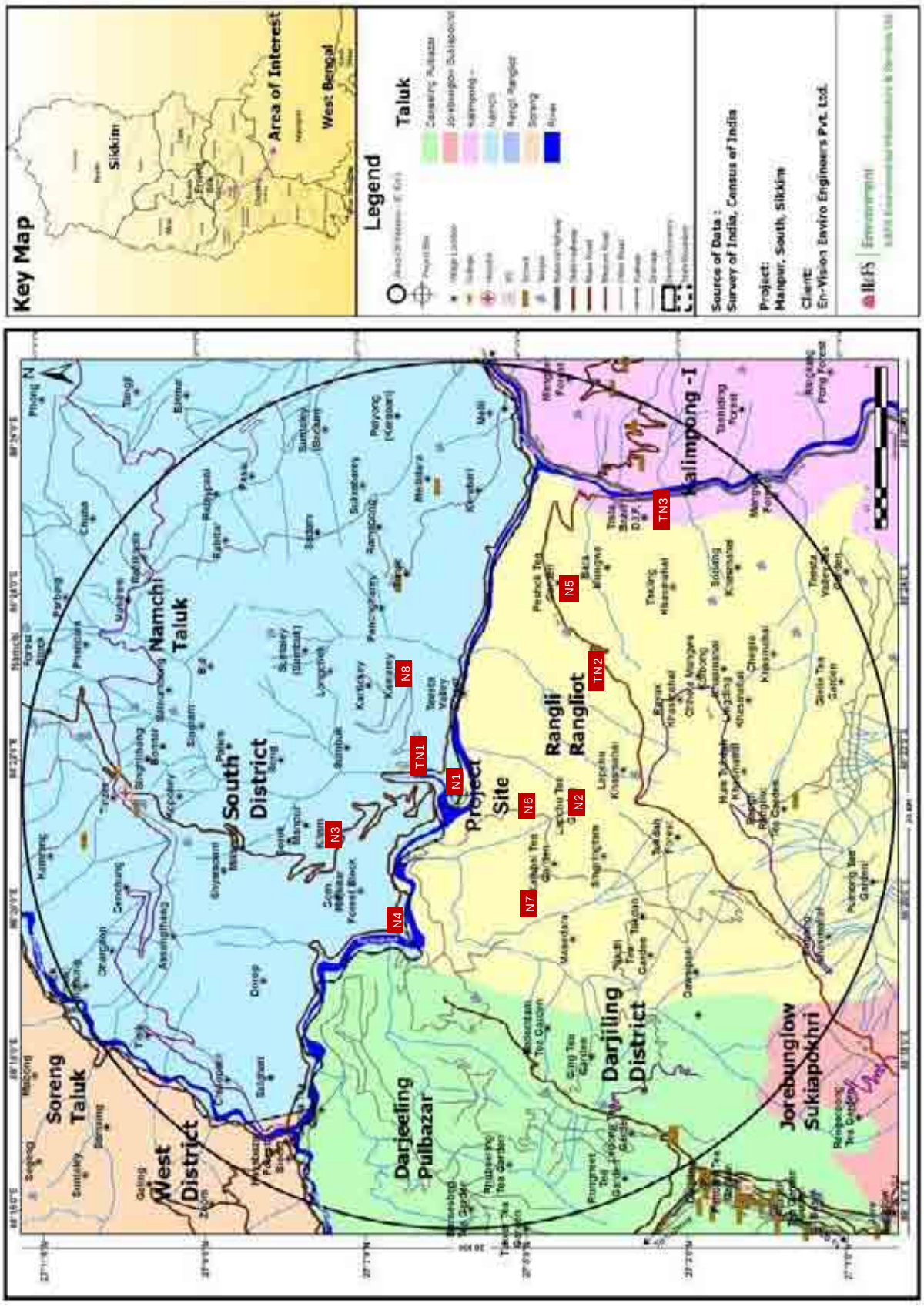


TABLE - 3.9 BACKGROUND NOISE LEVELS

SR. NO.	LOCATION	CATEGORY OF AREA	Noise Level (Leq) in dBA (Day time) (0600 to 2200 hrs.)	Noise Level (Leq) in dBA (Night time) (2100 to 0600 hrs.)
1.	Project Site (N1)	Industrial	57.2	55.3
2.	Lapchu (N2)	Residential	53.8	42.5
3.	Kitam (N3)	Residential	52.4	40.1
4.	Jorethang (N4)	Residential	54.1	38.8
5.	Peshok (N5)	Residential	52.4	41.3
6.	Simbong (N6)	Residential	37.7	36.5
7.	Shikari Dhuva (N7)	Residential	50.4	37.1
8.	Kartike (N8)	Residential	42.4	36.2

TABLE - 3.10 TRASPORTATION NOISE LEVELS

SR. NO.	LOCATION	CATEGORY OF AREA	Noise Level (Leq) in dBA (Day time) (0600 to 2200 hrs.)	Noise Level (Leq) in dBA (Night time) (2100 to 0600 hrs.)
1.	Melli Nayabazar Road (TN1)	Residential	60.7	44.7
2.	Peshik Road (TN2)	Residential	60.6	47.6
3.	NH-31a (TN3)	Residential	63.1	55.5

3.8.4 BASELINE NOISE LEVELS

The noise level measured in study area at different locations is given in table-3.8. The proposed expansion of existing project, at the project site the noise level was found 57.2 [55.3] dBA in daytime [night time]. The noise levels varied in the residential area of the study area during day time [night time] in the range of 37.7-54.1 [36.2-42.5] dBA. The noise sources identified in industrial zone were vehicular traffic, industrial and commercial activities. CPCB recommendation for community noise exposure in different category of area i.e. residential, commercial, industrial and silence zone is enclosed as annexure-VII, while Damage risk criteria for hearing loss given by occupational safety & health administration (OSHA) is enclosed as annexure-VIII. The observed noise levels were below the stipulated standards of CPCB.

3.8.5 TRNSPORTATION NOISE LEVELS

Transportation noise levels were measured in the study area during the study period at different locations which are shown in the table-3.8. The transportation noise levels were found 60.6-63.1 dBA in day time while in the night time 44.7-55.5 dBA.

3.8.6 COMMUNITY NOISE LEVELS

The communities close to the project site are not exposed to major noise sources. The commercial activities and transport apart from natural sources contribute to community noise levels. The noise levels close to project site were low and within the stipulated standards of CPCB for the respective designated areas.

3.9 SOIL ENVIRONMENT

3.9.1 METHODOLOGY FOR SOIL MONITORING

Soil samples were collected from six different locations within the study (1-3 ft from soil surface) area during study period. The locations selected for collection of soil samples are presented in table-3.11 and shown in figure-3.8. The analysis results of soil samples collected from the study area given in table-3.12.

3.9.2 PHYSICO-CHEMICALS CHARACTERISTICS OF SOIL

Physical characteristics of soil samples are delineated through specific parameters, viz., particle size distribution, texture, bulk density, porosity and water holding capacity. The particle size distribution in terms of percentage of sand, silt and clay is furnished in table-3.12. The predominant texture of soil in study area was clay followed by loamy sand, clay loam and sandy clay loam.

This results in reduction in water percolation rate and penetration of root through soils. The bulk density of soils in the region was in the range of 1.43-1.54 g/cm^3, which is considered as moderate.

Soil porosity is a measure of air filled pore spaces and gives information about movement of gases, inherent moisture, and development of root system and strength of soil. Variations in soil porosity and water holding capacity are presented in table-3.12. The porosity and water holding capacity of soils were in the range of 38.3-42.8% and 37.4-48.9%.

Total Organic carbon in soil samples vary in the range of 0.87-1.49 which is low to medium and phosphate as P_2O_5 varies from 0.46-1.17%. However, Magnesium showed in range 3.11-7.28 mg/kg.

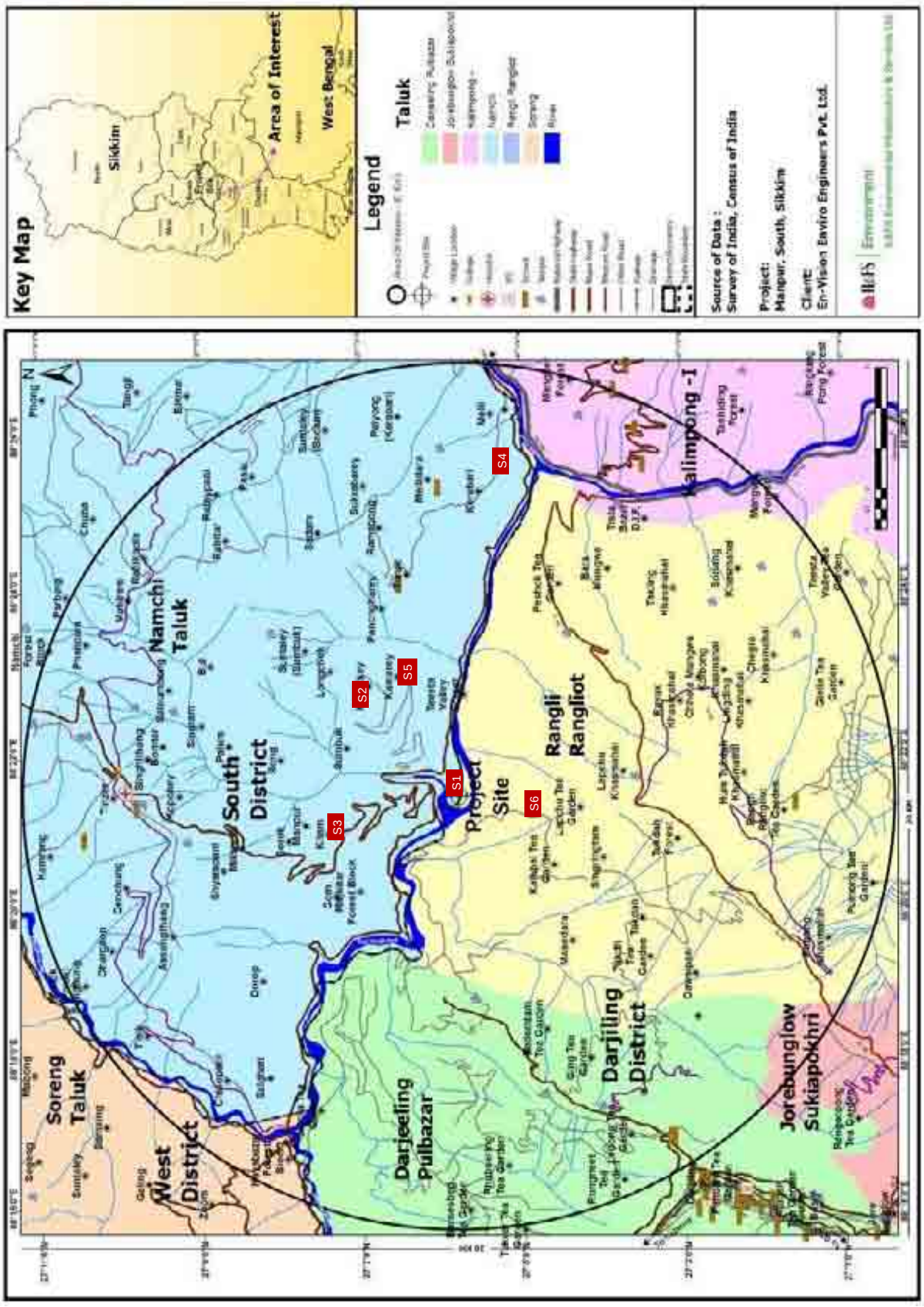
TABLE - 3.11 DETAILS OF SOIL QUALITY SAMPLING LOCATIONS

SR. NO.	SAMPLING LOCATION	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	BEARING W.R.T. PROJECT SITE
1.	Project Site (S1)	-	-
2.	Village Manpur (S2)	2.4 km	NE
3.	Village Kitam (S3)	2.9 km	NNW
4.	Near Rolu Temple (S4)	7.8 km	E
5.	Village Kartike (S5)	3.2 km	NE
6.	Simbong (S6)	2.8 km	SE

TABLE - 3.12 PHYSICO-CHEMICALS CHARACTERISTICS OF SOIL

SL. NO.	PARAMETERS	UNIT	PROJECT SITE (S1)	VILLAGE MANPUR (S2)	VILLAGE KITAM (S3)	NEAR ROLU TEMPLE (S4)	VILLAGE KARTIKE (S5)	SIMBONG (S6)
1.	Textural Class	-	Silty loam	Loam	Loam	Loam	Clay loam	Loam
2.	Sand	%	60.2	64.6	62.7	71.6	63.2	69.2
3.	Silt	%	27.6	20.0	21.0	16.0	13.2	11.2
4.	Clay	%	12.2	15.4	16.3	12.4	23.6	19.6
5.	Moisture	%	1.86	2.30	2.10	4.40	5.85	1.60
6.	Porosity	%	40.9	38.3	40.5	41.6	42.8	39.7
7.	Water Holding Capacity	%	38.8	43.5	48.9	46.5	40.5	37.4
8.	Bulk Density	gm/cc	1.46	1.53	1.46	1.46	1.43	1.54
9.	Cation Exchange Capacity	cmol (p^+) Kg^{-1}	9.8	9.04	17.49	5.77	8.9	10.7
10.	Permeability	cm/hr	1.27	0.99	1.0	0.98	1.20	1.28
11.	pH (1:2 Suspension)	-	7.85	6.86	6.09	6.02	7.27	6.65
12.	Electrical Conductivity	µS/cm	532	250	112.3	141.2	181	143
13.	Available Nitrogen (as N)	Kg/ha	14.0	12.6	14.0	12.6	23.8	19.6
14.	Available Potassium (as K_2O)	Kg/ha	142.8	129.6	130.8	241.2	129.6	139.2
15.	Total Organic Carbon	%	1.20	1.49	1.22	1.33	0.97	0.87
16.	Available Phosphorous (as P_2O_5)	Kg/ha	0.92	0.82	0.61	1.17	0.51	0.46
17.	Iron (as Fe)	Kg/ha	2.64	7.84	8.35	47.28	4.71	3.09
18.	Manganese (as Mn)	Kg/ha	1.19	8.51	11.86	2.06	1.37	1.64
19.	Calcium (as Ca)	Kg/ha	13.66	8.53	10.23	11.96	17.09	15.30
20.	Magnesium (as Mg)	Kg/ha	7.25	3.11	5.19	6.22	8.30	7.28

FIGURE - 3.8 LOCATIONS OF SOIL SAMPLING STATIONS



3.10 LAND USE PATTERN

Land use, reflects the human beings activities on land, whereas the word land cover indicates the vegetation, agricultural and artificial manmade structures covering the land surfaces. Identification and periodic surveillance of land uses and vegetation covers, in the vicinity of any developmental activity is one of the most important components for an environmental impact assessment, which would help determine the impact of the project development activity on the land use pattern.

3.10.1 LAND USE PATTERN BASED ON SATELLITE IMAGERY

3.10.1.1 METHOD OF DATA PREPARATION

The land use / land cover has been presented in the form of a map prepared by using IRS P6 LISS-IV MX and procured from the National Remote Sensing Agency (NRSA), Hyderabad.

The land use / land cover map was prepared by adopting the interpretation techniques of the image in conjunction with collateral data such as Survey of India topographical maps and census records. Image classification can be done by using visual interpretation techniques and digital classification using any of the image processing software. For the present study, ERDAS 9.1 version software was used for preprocessing, rectification, enhancements and classifying the satellite data for preparation of land use land cover map for assessing and monitoring the temporal changes in land use land cover and land developmental activities.

The imagery was interpreted and ground checked for corrections. The final map was prepared after field check. Flow chart showing the methodology adopted is given in the different land use / land cover categories in the study area has been carried out based on the NRSC land use / land cover classification system.

3.10.1.2 AREA UNDER DIFFERENT LANDUSE

The land use classification within a distance of 10 kilometers from the project location and the areas falling under the respective classifications are as given in the following table-3.13 and satellite imagery and land use land cover map of the study area is shown in figure-3.9 and 3.10 respectively.

TABLE - 3.13 AREAS STATISTICS OF LANDUSE/LAND COVER MAP

S.NO.	LAND USE	AREA (SQ. KM)	%
1.	**BUILT UP LAND**		
	a. Settlements	8.164	2.6
	b. Industrial Land	1.57	0.5
2.	**WATERBODIES**		
	a. Tank / River etc.	17.898	5.7
3.	**OTHER**		
	a. Dense Mixed Jungle	280.716	89.4
4.	**WASTELANDS**		
	a. Land with scrub	1.884	0.6
	b. Land without scrub	1.57	0.5
	c. Mining Area	2.198	0.7
	TOTAL	**314.00**	**100**

FIGURE - 3.9 SATELLITE IMAGERY OF THE STUDY AREA (RABI SEASON)

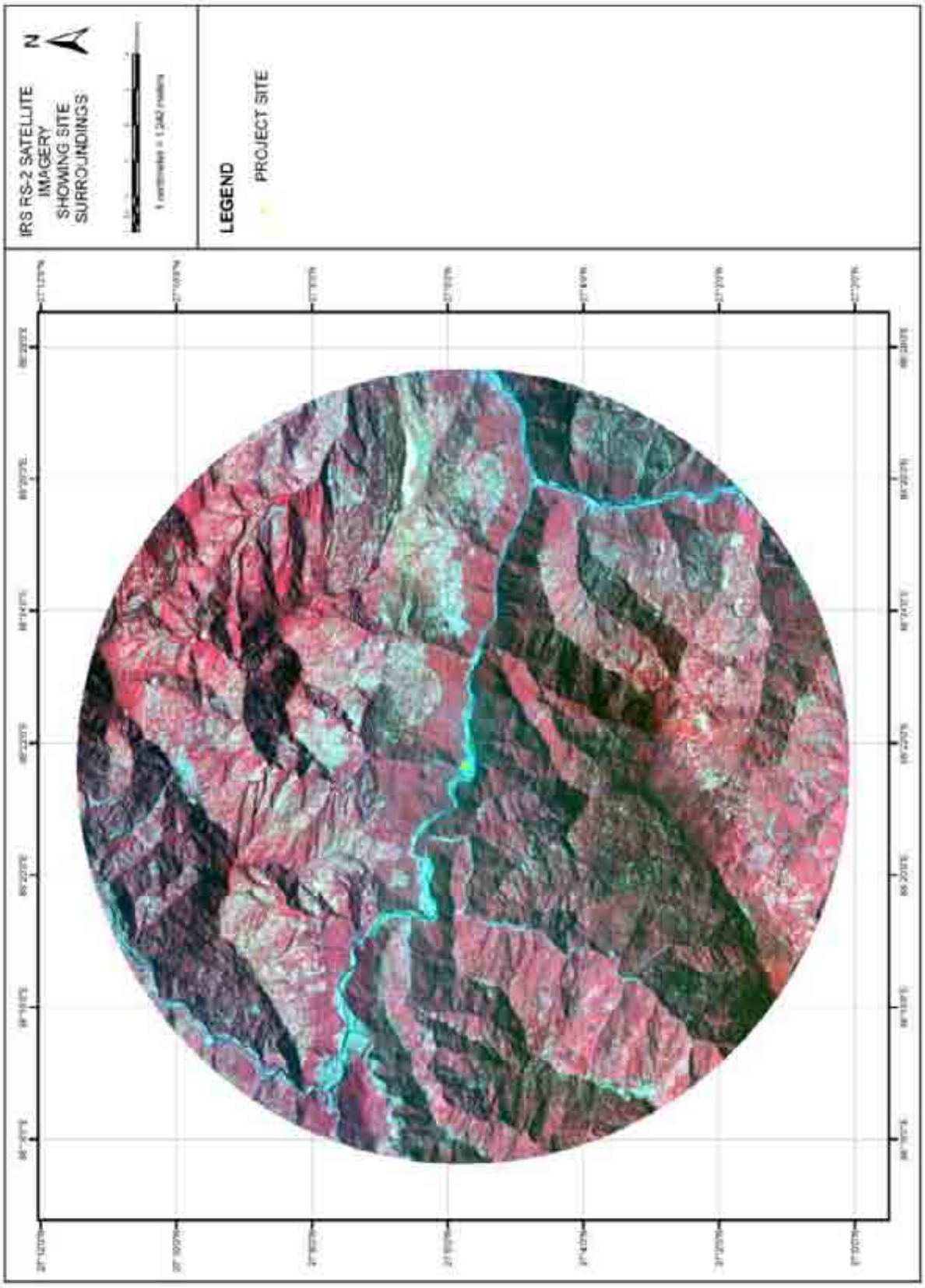
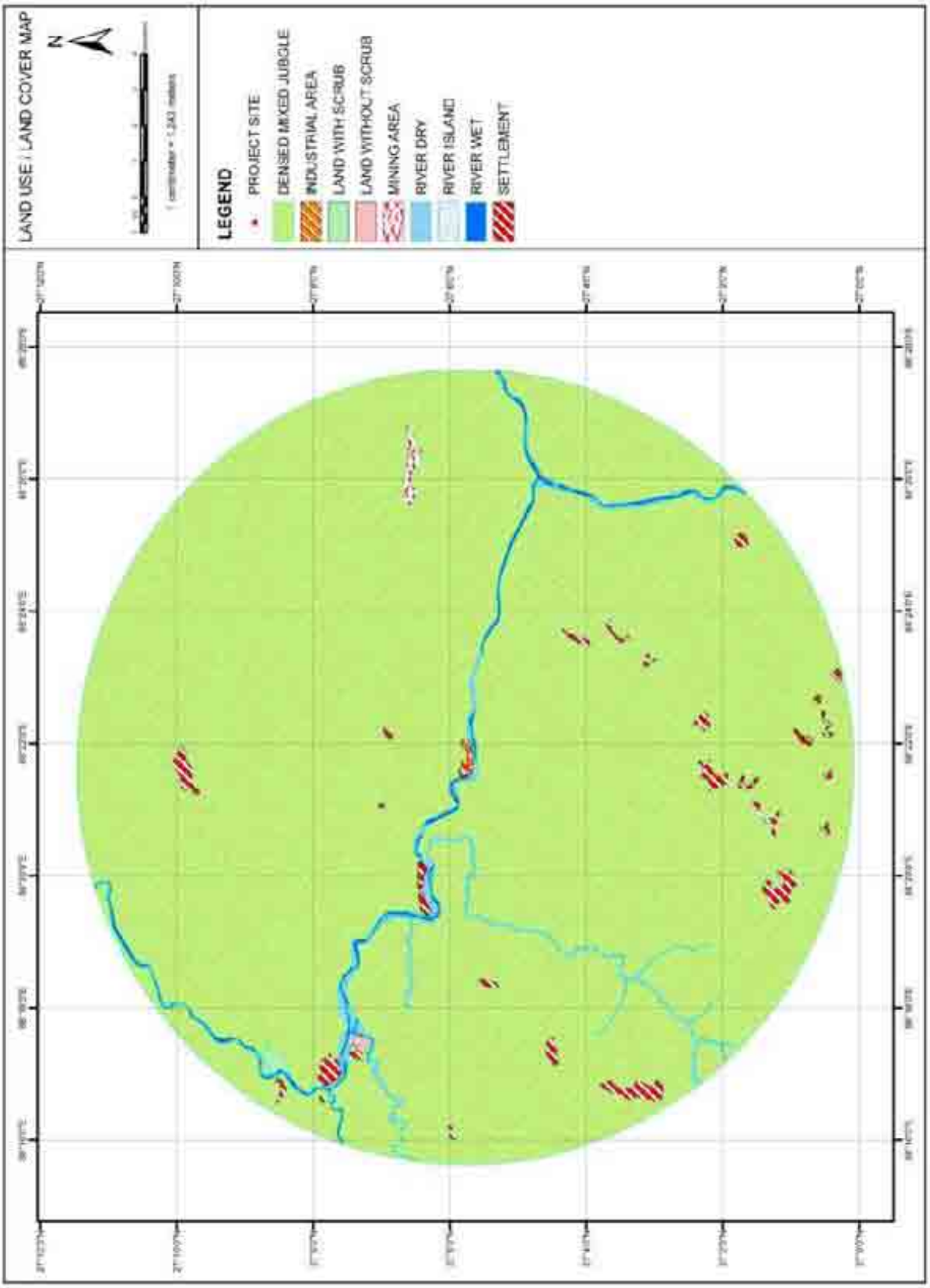


FIGURE - 3.10 LANDUSE AND LANDCOVER MAP WITH VILLAGE LOCATION



3.11 SOCIO - ECONOMIC ENVIRONMENT

An assessment of socio - economic environment forms an integral part of an EIA study. Therefore, baseline information for the same was collected during the study period. The baseline socio - economic data collected for the study region, has been identified for the four major indicators viz. demography, civic amenities, economy and social culture. The baseline status of the above indicators is compiled in forthcoming sections.

3.11.1 DEMOGRAPHIC DETAILS

Major developmental activities in industrial sector are required for economical development as well as creation of employment opportunities (direct & indirect) and to meet the basic/modern needs of the society, which ultimately results in overall improvement of quality of life through upliftment of social, economical, health, education nutrition status in project region, state as well as the country. The industrial projects are also expected to generate/discharge different types of pollutants in the surrounding environment. They may cause natural resource degradation, ecological and human health risks, unless the development is planned properly and implemented in an environmentally sustainable manner through implementation of pollution prevention, mitigation and control measures. In this manner all developmental projects have direct as well as indirect relationship with socioeconomic aspect, which also include public acceptability for new developmental projects. Thus the study of socio-economic component incorporating various facets related to prevailing social & cultural conditions and economic status of the project region is an important part of EIA study.

The aesthetic component of environmental study refers to the scenic value if any in the study area, tourist attraction, details about forest, wildlife, historic and cultural monuments. The study of these parameters helps in identification, prediction and evaluation of likely impacts on socioeconomics and parameters of human interest due to proposed project.

3.11.2 RECONNAISSANCE

Area within 10 km radius from M/s. Esveegee Breweries Pvt. Ltd. is designated as study area, which includes 15 villages of South Sikkim district.

3.11.3 BASELINE STATUS

To assess impact on Socio-Economic environment, it is essential to collect the following data:

- Population surrounding the project site, those likely to be target receptor of impact.
- Standard of the living at the site i.e. the infrastructure available to the local population such as water supply & sanitation, electricity, roads, education, medical treatment etc.

The latest available data has been complied to delineate the baseline socio-economic profile in the study area. The database thus generated in the study included.

- Demographic structure
- Infrastructure base in project area
- Economic attributes
- Health status
- Cultural attributes
- Awareness and opinion of people about the proposed project

The sample villages identified for socio-economic survey in study area are, while they are listed in table-3.14.

TABLE-3.14 LIST OF THE SURVEY AREA

SR. NO.	VILLAGES NAME	SR. NO.	VILLAGES NAME	SR. NO.	VILLAGES NAME
1	Chumbong	8	Kopchey	15	Mellidara
2	Samsing	9	Bomtar	16	Rungneet tea garden
3	Salghari	10	Manpur	17	Pandam tea garden
4	Tinik	11	Sorok	18	Dawai pani
5	Dhargaon	12	Rong	19	Lapchu khas mahal
6	Shyampani	13	Sumbuk	20	Mangber forest
7	Denchung	14	Kerabari		

Source: *Field Survey*

3.11.4 DEMOGRAPHIC STRUCTURE

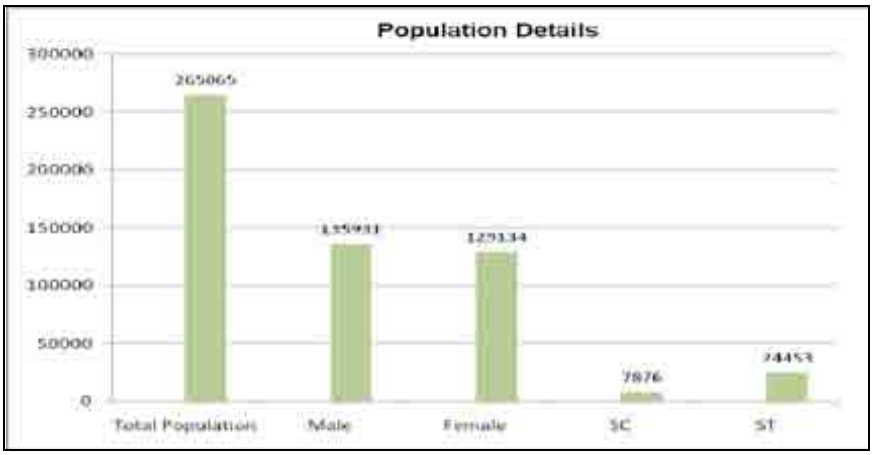
Demographic structure of the study area are given in annexure-IX while the summarized information presented in table-3.15 which highlights information on area in hectors, household, total population, schedule caste and schedule tribe population and literacy.

TABLE-3.15 DEMOGRAPHIC SUMMERY

DEMOGRAPHIC PARAMETERS	DETAILS
No. of State	2
No. of District	3
No. of Teshils	6
Total No. of Households	**49362**
Total Population	**265065**
Density of Population (Persons Per sq. km)	15 person per sq km
Sex ratio (N0. of female\ 1000 males)	949
Scheduled castes (%)	15823(5.96%)
Scheduled Tribes (%)	24453(9.22%)
Literate (%)	191626(72.29%)

Source: *Primary Census Abstract 2001,West & South Sikkim District, Darjiling District*

FIGURE-11 POPULATION DETAILS WITH SC AND ST IN THE STUDY AREA WEST & SOUTH SIKKIM DISTRICT, DARJILING DISTRICT



The above figure shows that the sex ratio is not too much differ so it is depicted that male and female ratio is not different while Schedule Tribe population is much higher than Schedule Castes population.

FIGURE-12 SEX RATIO IN THE STUDY AREA, WEST & SOUTH SIKKIM DISTRICT, DARJILING DISTRICT

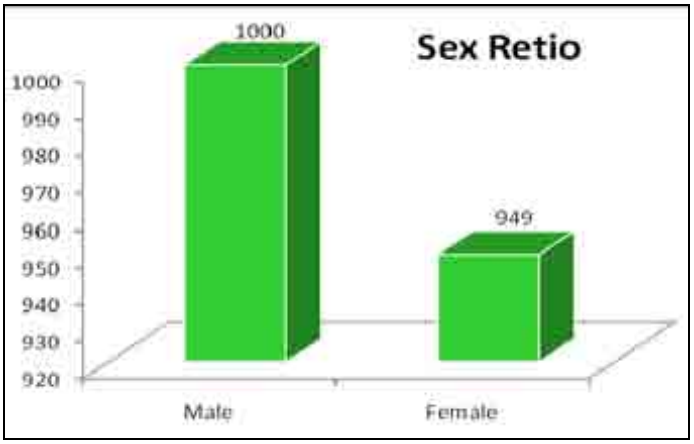
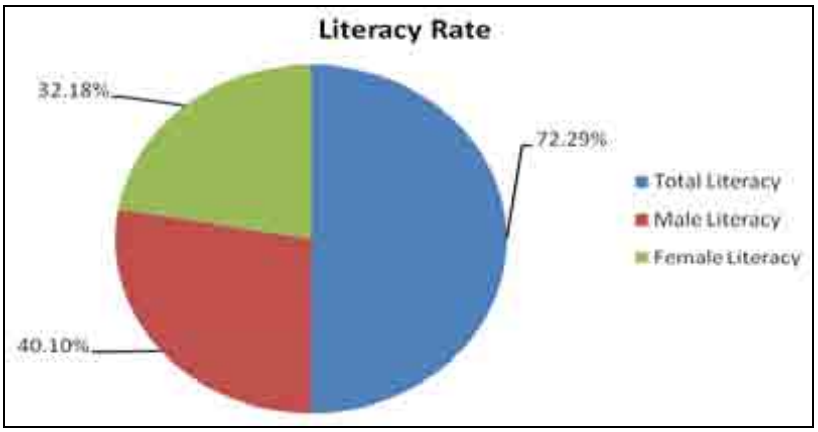


FIGURE-13 LITERACY RATE GENDER WISE IN THE STUDY AREA, WEST & SOUTH SIKKIM DISTRICT, DARJILING DISTRICT



The salient features of the study area are as follows:

- Total population of the region as per 2001 census is 2,65,065 out of which 1,35,931 are male 1,29,134 are female
- Total number of households in region is 49,362
- Sex ratio (number of male per thousand female) in the region is 949 this shows that male population is higher in the region as compared with the female
- Literacy rate in the study area is 1,91,626 (72.29%).
- Rural portion covers 42,009 hectares of land with population density 15 persons per square kilometer

3.11.5 INFRASTRUCTURE RESOURCE BASE

The infrastructure resources base of the region with reference to education, medical facility, Drinking Water Supply, post and telegraph, transportation, approach road, bank and recreational based on census data 2001 and presented in annexure-X. The infrastructure resources details have been abstracted from village directory CD 2001 of Sikkim and West Bengal state are describe below:

Education: Education facilities exist in village as stated below:

- Primary School-88
- Middle School-42
- Higher Secondary School-19
- Senior Secondary School-3
- College-3
- Adult literacy centre-8
- Other-5

Medical Facility: Medical facilities exist in villages as stated below:

- Primary health centers -1
- Primary Health Sub-centers -19
- Community Health Worker –5
- Allopathic Hospital – 5
- Allopathic Dispensary –14
- Registered Private Medical Practitioner-5
- Maternity & Child Welfare – 2
- T.B center –1
- Maternity Home -1
- Health Centre -2
- Ayurvedic Dispensary-2

- **Drinking Water Supply** Mode of drinking water supply are mainly spring and trough tap. Other source of drinking facilities is tank water
- **Transportation and Communication:** Most of the villages having post office and telephone connection are the form of communication facility available in the region. Bus services are available almost of the villages and approach routes are either paved road, mud road or foot path
- **Power Supply:** Power supply is available in most of the villages for Domestic use and some of other purposes (8 villages), all purpose (4 villages).

3.11.6 ECONOMIC ATTRIBUTES

Main Workers: Those who have worked for at least 183 days
Marginal Workers: Those who worked less than 183 days
Work: Work may define as participation in any economically productive activity such participation may be physical or mental in nature. Work involves not actual work but also effective supervision and direction of work. It also includes unpaid work on farm or in family enterprise.
The workers coming under the main and marginal workers category are: Cultivators, agricultural labours, live stock, forestry, fishing, hunting, and plantations, orchards and allied activities, mining and quarrying, manufacturing, processing, servicing and repairs in household industry, construction trade and commerce, transport, storage and communication and other services.

3.11.7 HEALTH STATUS

Health of the people is not only a desirable goal, but it is also an essential investment in human resources. As per the National Health Policy (1983), Primary Health Care has been accepted as main instrument for achieving this goal of development and strengthening rural health infrastructure through a three-tier system, viz., Primary Health Center (PHCs), Sub Centers and Community Health Center, which have been established.
Lack of building, shortage of manpower and inadequate provision of drug supplies are hampering the operationalization of these units. The standards to be met according to National Health Policy are given in table-3.16.

TABLE-3.16 RURAL HEALTH CARE SYSTEM IN INDIA

HEALTH FACILITY	POPULATION		VILLAGES COVERED	AVERAGE RURAL AREA (IN SQ.KM. COVERED)	INFRASTRUCTURE	PERSONNEL
	HILLY AREAS	PLAIN AREAS				
Sub Center	3000	5000	4	21.35	1 Sub centre	1 ANM (Auxiliary Nurse Midwives), 1 MHW ((Medical Health Worker)
Primary Health Center	20,000	30,000	27	134.20	4- 6 beds	1 Medical officer, 14 Para Medical Staff
Community Health Center	80,000	1,20,000	191	931.95	30 bedded	4 Medical officer, 21 Para Medical Staff, 14 Other Staff

Source: *National Health Policy, Year 2005-06*

During discussion with the Medical Officer of Community Health Center, Namchi, South Sikkim district it has been revealed that the major diseases prevailing in the region are Malaria. Diarrhea and Dysentery are other diseases common in the region.

3.11.8 CULTURAL AND AESTHETIC ATTRIBUTES

No cultural and aesthetically place is coming within the study area, so there will be no impacts on such important places.

3.11.9 SOCIO ECONOMIC SURVEY

3.11.9.1 MATHODOLOGY

The methodology which is applied for primary source of data collection i.e. gathering data through field survey for socio-economic survey depicted below:

Sampling Method

A judgmental and purposive sampling method was used for choosing respondents of various sections of the society i.e. Sarpanch, adult males and females, teachers, medical practitioners, businessmen, agriculture laborers, fishermen, unemployed group etc. Judgmental and purposive sampling method includes the right cases from the total population that helps to fulfill the purpose of research needs.

Data Collection Method

In order to assess and evaluate the likely impacts arising out of any developmental projects on socio-economic environment, it is necessary to gauge the apprehensions of the people in the project area. For the process of data collection through primary and secondary sources certain methods are used among that are:

Field Survey and Observations

Field Survey and Observations is made at each sampling village and the quality of life of that region is studied. Visits are made at hospitals, primary health centers and sub-centers to know the health status of the region. Various governmental organizations such as statistical department, department of census operations are visited to collect the population details of that region.

Interview Method

Structured interview method is used to collect data regarding the awareness and opinion from the sample selected of the various socio- economic sections of the community. Structured interviews involve the use of a set of predetermined questions that includes fixed and alternative questions. The questionnaire mainly highlights the parameters such as income, employment and working conditions, housing, food, clothing, water supply, sanitation, health, energy, transportation and communication, education, environment and pollution to assess the quality of life of that particular region and general awareness and opinion of the respondents about the project.

The interview method has the advantage that almost all perfect sample of the general population can be reached and respond to the approach. Interview method helps to collect more correct and accurate information as the interviewer is present during the field survey.

Socio-economic survey was conducted in 15 villages within the study area located in all directions with reference to the project site.

The respondents were asked for their awareness/opinion about the project and also of their opinion about the impacts of the project which is an important aspect of socio-economic environment, viz. job opportunities, education, health care, transportation facility and economic status.
The salient observations recorded during survey in the study area:

- Some population is engaged in business activities such as land dealer, shops etc.
- Educational facilities are available in the form of primary school and middle school.
- Communication facility is good in the study area.
- Approach roads are mainly paved road and government bus service and private own vehicles are a mainly used for traveling.
- Tap and spring water the main source of drinking water supply in the region. Sanitation facilities are better in most of the surveyed villages.
- Electricity is available in almost of the village used for Domestic purposes

3.11.9.2 AWARENESS AND OPINION OF PEOPLE ABOUT THE PROJECT

- The respondents were happy to know about the proposed plans and they opined positively because any industrial development activity would definitely contribute towards the society
- The improvement in the local as well as regional economy
- They also want better health services and better transportation facilities.

3.12 BIODIVERSITY OF TERRESTRIAL ENVIRONMENT

Studies on flora and fauna of the area had been carried out both for the core zone and buffer zone. Details of the studies were carried out for assessing the diversity pattern of the floral species. Faunistic pattern of the area was studied based on inquiries from the local population, personal observation and forest officials.

Consistent and regularly updated data on regional and local taxonomy and floristic and faunal diversity of the areas are almost non-existent in country as diverse as India. Instant information on biodiversity profiles of the area, where the proposed project is setting up, is an essential part of the baseline studies of EIA. In such a situation, good primary baseline biodiversity survey is a pre-requisite for the collection of reliable data. The professional ethic of the EIA practitioners should be their will and skill to conduct scientific field surveys. These contributions towards biodiversity surveys may sometimes recognized as the actual value additions in terms of new records or a new data base but are more often recognized in the validation and updating of the existing information base.

Ecological impact assessment (EcIA) is used to predict and evaluate the impacts of development activities on ecosystems and their components, thereby providing the information needed to ensure that ecological issues are given full and proper consideration in development planning. Environmental impact assessment (EIA) has emerged as a key to sustainable development by integrating social, economic and environmental issues in many countries. EcIA has a major part to play as a component of EIA but also has other potential applications in environmental planning and management. Ecological Impact Assessment provides a comprehensive review of the EcIA process and summarizes the ecological theories and tools that can be used to understand, explain and evaluate the ecological consequences of development proposals.
Environmental impact assessments have become an integral part of development projects in India ever since 1994, to formulate policies and guidelines for environmentally sound economic development. Proper assessment of biological environment and compilation of its taxonomical data is essential for the impact prediction.

3.12.1 PERIOD OF THE STUDY AND STUDY AREA

The baseline study, for the evaluation of the floral and faunal biodiversity of the terrestrial environment of the study area, within 10 Km radius from the proposed site of M/s. M/s.Esveegee Breweries (P) Ltd. Located in a part of Manpur village, Taluka Namchi, District south Sikkim, Sikkim state, as an expansion of existing Grain Based Distillery at Plot No. 321/362, 323/363, 323, 324, 325, 339, 340/381, 392/449, 449/451 & 449/455 has been conducted during April-May, 2013.

3.12.2 METHODOLOGY

The primary objective of survey was to describe the floristic and faunal communities within the study area. The sampling plots for floral inventory were selected randomly in the suitable habitats within the 10km radius from the project site. The methodology adopted for faunal survey involve; faunal habitat assessment, random intensive survey, opportunistic observations, diurnal bird observation, active search for reptiles, active search for scats and foot prints and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the project. Emphasis has been placed on presence of rare, endemic, migratory and threatened species, if any present in the study area. Desktop literature review was conducted to identify the representative spectrum of threatened species, population and ecological communities as listed by IUCN, WCMC, ZSI, BSI and in Indian wild Life Protection act, 1972. The status of individual species was assessed using the revised IUCN/ SSC category system.

3.12.3 TERRESTRIAL FLORAL AND FAUNAL COMPONENTS OF THE STUDY AREA

Habitats description of the project site and surrounding

The project site of expansion unit is already developed premises of M/s. Esveegee Breweries (P) limited located in Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim hence no additional land area requirement is envisaged for this expansion project.
Furthermore no natural vegetation clearing is required during construction activities, as this project site is located in already demarcated industrial area.The project site is located is along the Valley of a Hilly terrain along the banks of Rangit river, which is bifurcating study area between West Bengal and Sikkim states.

Habitats description of the study area:

Sikkim is a small and most beautiful state of India well known for its scenic beauty, immensely rich biological diversity manifested by diverse eco-climatic conditions and wide altitudinal variation from about 300 m to 8500 m MSLl. Mount Khangchendzonga, the third highest peak in the world, adjacent Singalila rangeand Chola range plays prominent role in determining physiography of the state. The Rangit and Teesta rivers makes national boundary in south with Darjeeling district of West Bengal state. The area of the present investigation is located Partly in Darjeeling District of west Bengal and South Sikkim of State of Sikkim, The study area is characterized by mostly hilly terrains and steep valleys covered with good forest in the entire study area. Heavy precipitation during winter as well as summer season has given rise to lush green vegetation. The state has strong influence of both West and East Himalayan Biogeographic provinces. Vegetation of this area varies with altitudes and topography. The elevation in the study area varies from 250 feet to 2500 feet.

South Sikkim exhibits a few unique features. Notable among them are sub-tropical forests of Sal (*Shorearobusta*). Majority of the habitats in the study area are divided through two great river systems i.e., the Teesta and Rangit which are drained by numerous tributaries.

As a rugged mountain state of the Indian Union, Sikkim is geographically isolated from the rest of the country. It is encircled by mountain ranges on three sides i.e. Singalila and Kanchanjunga ridge on the west, Rishipangola on the east and the main axis of Himalaya on northern part giving the state a horse-shoe shape (Ali, 1962; Mani, 1974). It opens to the plains through southern side where the project site is situated. The state is described as the catchment area of river Teesta (Risley, 1928). Teesta, the largest river and major physical feature of Sikkim originates at Cho Lhamo Lake (4800 m AMSL) in north Sikkim which chiefly runs in a north-south direction throughout its entire length bisecting the state into two parts. Rangir River running from the western parts of Sikkim merges with Teesta at Melli near Sikkim-West Bengal border (300 m AMSL)

3.12.4 FLORAL DIVERSITY OF THE STUDY AREA

Sikkim lies at the convergence of the Central and Eastern Himalaya. However, the state has often been considered as a part of Eastern Himalaya (Ali, 1962; Mani, 1974; Hajra and Verma, 1996).

It has a varied climate, topography and altitudinal ranges within 7096 km^2 area. Hooker (1854) categorized the vegetation of Sikkim into three major types- Tropical, Temperate and Alpine. This classification of vegetation has been followed widely in several literatures (Gammie, 1928; Ali, 1962; Mani, 1974; Hajra and Verma, 1996; Singh and Chauhan, 1998; Sudhakar et al., 1998). Broadly, Sikkim can be divided into six botanical zones based on elevation and characteristics of vegetation (Haribal, 1992; Hajra and Verma, 1996). These zones are: Tropical semi-deciduous forests (<900 m); Tropical moist and broad-leaved forests (900 – 1800 m); Temperate broadleaved forests (1800 – 2800 m); Temperate coniferous and broad-leaved forests (2800 – 3800 m); Sub-alpine vegetation (3800-4500 m) and Alpine zone (>4500 m).

The objective this floral inventory of the study area, is to provide necessary information on floristic structure in the study area for formulating effective management and conservation measures. The climatic, edaphic and biotic variations with their complex interrelationship and composition of species, which are adapted to these variations, have resulted in different vegetation cover,

characteristic of each region. The following account of floral inventory has been, based on the field survey conducted for a short duration in the April-May, 2013, is not very comprehensive data and is aimed only to give a general pattern of vegetation of this region observed during the study period as a baseline data Listing of the endangered, threatened and endemic species of flora in a locality and drawing the attention to the occurrence of such species, would aid in creating awareness amongst the local people as a whole to protect such species from extinction, and to take necessary measures for their conservation. These type of floristic study is an inventory for such purpose and hence a necessity.

The most dominating family in Sikkim Sate is Lauraceae followed by Euphorbiaceae whilethe most dominating genus is Ficus with 30 species followed by Sorbus and Rhododendron with 15 species each (S. S. Dash and P. Singh,2011). The first ten dominating families contribute 45% of the total species and 35% of the total genera recorded from this regionwhile the first ten dominating genera contribute 19% of the total species. (S. S. Dash and P. Singh, 2011).

3.12.4.1 TREES

The tropical and sub-tropical forests observed in the study area mainly along the Teesta and Rangit rivers and their tributaries at an elevation from 800 to 1500 m. The composition of the tree species in the study area are characterized by mixed nature. These tree species show profuse growth, reaching up to a height of 30m. The commonest species encountered in the study area are given in the annexure-XIII.

3.12.4.2 SHRUBS

Shrubs encountered during the present survey are given in the annexure-XIII

3.12.4.3 FERN VEGETATION

Like in other hilly areas, the habitat of Pteridophytes can be divided here as ferns and fern-allies growing on ground (Mesophyte), on rocks and walls (Lithophyte), on tree trunks (Epiphyte). These habitats are with several micro habitats like ferns growing in shady, exposed, humid and dry places, etc. These mixed forests in the study area, gullies and tributaries of Teesta and Rangit are much humid and provide conducive conditions for tropical moist ferns where abundant growth of ferns can be noted throughout the year.

The common ground ferns growing in these area are *adiantumcaudatum l.*, *Dryopteriscochleata* (*D. Don*) C. Chr., *Dryopterissparsa* (D. Don), Kuntze, *Lycopodiellacernua* (L.) Pic.Serm., *Microlepiarhomboidea* (Wall. ex Kunze) Prantl, *Microlepiaspeluncae* (L.) T. Moore, (L.) C. Presl, *Onychiumsiliculosum* (Desv.) C. Chr., *Pityrogrammacalomelanos* (L.) Link, *Pterisbiaurita subsp. fornicata* Fraser- Jenk., *Pterisbiaurita subsp. walkeriana* Fraser- Jenk.&Dominik *Drynariaquericifolia* were observed on the tree trunks in the forest region. One Giant fern *Glecheniagigantea* was observed on the edges of pine forest in Darjeeling district near Lopchuu in Thakadda range under Drageeling forest Division**.**

3.12.4.4 CULTIVATED PLANTS IN THE STUDY AREA

The topography is characterized by rugged mountainous terrains with wide variations in slopes and altitude, hence the agriculture land are very limited in this region. Agriculture is, by and large, rainfed. But the State receives plenty of rainfall, well distributed over 6 months from May to October. Though, the average size of operational holding in Sikkim is 3.9 ha/person against national average of 0.69 ha the entire holding cannot be used for agriculture due to rugged topography or high slopes. Agriculture is mainly maize based. Barring maize, mandarin and ginger, the production and productivity of other crops are low and below the national average. In many places, traditional system of farming still prevails and agricultural operations are carried out by men and women.

Annual crops are grown in three seasons- pre-kharif, kharif or monsoon season and rabi or winter season. Pre-kharif starts with onset of first shower during spring. The period coincides with Feb-mid March. Maize is the only pre-kharif cereal.

Kharif season begins during May-June. Rice, urd, soybean, finger millet, rice bean, beans, ginger and few solanaceous vegetables are grown during the kharif season.

Wheat, mustard, sarson, rai sag, potato, pea, cabbage, cauliflower, radish and carrot are the Rabi season crops. The Rabi sowing season starts during Sept-Oct.

Tea gardens were observed at many places in Darjeeling districts especially at Peshok region.

3.12.5 FAUNAL BIODIVERSITY OF THE STUDY AREA

For the documentation of the faunal biodiversity of the study area with respect to birds, reptiles, amphibians, and butterfly species, a detailed survey had been conducted, within 10 Km radius from the proposed site of M/s. Esveegee Breweries (P) Ltd. located in a part of Manpur village, Taluka Namchi, District south Sikkim, Sikkim state. This report is based on a short duration study. The following lists are obviously incomplete. It does not include many other species which might occur in this part of Sikkim State, either as resident or as migrant in the other seasons of the year. This data is based on the survey conducted during April-May, 2013.

3.12.5.1 BIRDS OF THE STUDY AREA

Systematic account of the birds in the study area with the status of occurrence is given in the Annexure-XIV

3.12.5.2 BUTTERFLIES FROM THE STUDY AREA

Sikkim is a part of Eastern Himalayas, which is recognized as one among the 34 global biodiversity hotspots. With the record of 689 species that comprises 50% of the species found in India subcontinent (Haribal, M. 1992.), The diversity of butterfly in Sikkim is very high considering its small geographical area. (Bhoj Kumar Acharya and Lalitha Vijayan, 2011). Butterflies observed during the present study are documented in the Annexure-XIV.

3.12.5.3 HERPETOFAUNA

Reptiles in the study area are given in the Annexure- XIV

3.12.5.4 MAMMALS

The wild mammals documented other than domesticated ones from buffer zone of the study area is given in the annexure Annexure-XIV

3.12.6 RARE AND ENDANGERED FAUNA OF THE STUDY AREA

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity.
Of the total 63,837 species globally assessed by IUCN in 2012, 3,947 are classified as Critically Endangered, 81 as Extinct, 63 as Extinct in the Wild. In the lower risk categories, there were 5766 species in Endangered, 10,104 in Vulnerable and 4,467 in Near Threatened categories. Scientific data regarding 10,497 species was not available and hence classified as Data Deficient. Among the Critically Endangered list included 15 bird species, 18 species of amphibians, 14 fishes and 10 mammals..IUCN categorized 310 species as Endangered, including 69 fishes, 38 mammals and 32 amphibians. According to the latest figures, 15 species of Indian birds, including the great Indian bustard, Siberian crane and sociable lapwing are there in the list of Critically Endangered birds. In the lower risk categories, the agency included 14 bird species as Endangered and 51 as vulnerable ones. None of the sighted bird species fall under any threatened category

Wild Life (Protection) Act, 1972, amended on 17th January 2003, is an Act to provide for the protection of wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country. Some of the sighted fauna was given protection by the Indian Wild Life (Protection)Act,1972 by including them in different schedules. Among the birds in the study area, Pea fowl (*Pavocristatus*), is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Common Indian monitor (*Varanusbengalensis*), Indian Cobra (*Najanaja*), and Common rat snake (*Ptyasmucosus*) are provided protection as per Schedule-II of Wild life protection act, (1972) Among mammals; and Jackal (*Canisaureus* (Linnaeus) areschedule –II animals..

3.12.7 STATUS OF THE FOREST, THEIR CATEGORY IN THE STUDY AREA

All the representative forest-types of eastern Himalaya like; sub-Himalayan wet mixed forests, Sub-tropical pine forests, wet temperate forests, mixed coniferous forests, eastern oak-Hemlock forests, Oak-fir forests, moist alpine scrubs and dry alpine scrubs are represented in Sikkim (Champion and Seth,1968, Mehraet al. 1985). Tropical and subtropical forests of Sikkim show a rich concentration of tree species. The Tropical forests occur at low altitude bordering with West Bengal in Tista and Rangit Valleys.The tropical and sub-tropical forests observed in the study area mainly along the Teesta and Rangit rivers and their tributaries and at an elevation from 800to 1500m.Following forest types were observed in the study area Tropical semi ever green Forest, and Pine forest.

Kitam Bird Sanctuary:

Government of Sikkim in 3/2/2005 by its notification number 39/FEWM/F/2005V, in accordance with the approval of State wild life board, in exercising the powers conferred under section 18 of the wild Life (Protection) act,1972 declared an area of 6 sq. km as Kitam Bird sanctuary. The sanctuary has the Namchi – Manpur SPWD road as northern boundary, the Manpur Khola as eastern boundary, the Great Rangit river as Southern Boundary and Gomkhola as Western boundary.

3.13 TRAFFIC DENSITY STUDY

Urban roads are characterized by mixed Traffic conditions, resulting in complex interaction between various kinds of vehicles. To cater to this, it is usual to express the capacity of urban roads in terms of a common unit, The unit generally employed is the Passenger Car Unit, 1PCU), and each vehicle type is converted into equivalent PCUs based on their relative interference value.
The equivalent PCUs of different vehicle categories do not remain constant under all circumstances, Rather, these are a function of the physical dimensions and operational speeds of respective vehicle classes, In urban situations, the speed differential amongst different vehicle classes is generally low, and as such the PCU factors are predominantly a function of the physical dimensions of the various vehicles. Nonetheless, the relative PCU of a particular vehicle type will he affected to a certain extent by increase in its proportion in the total traffic. Considering all these factors, the conversion factors as shown in below table-3.17 are recommended for adoption.

TABLE - 3.17 EQUIVALENT PASSENGER CAR UNIT FACTORS

SR. NO.	VEHICLE TYPE	EQUIVALENT PCU FACTORS PERCENTAGE COMPOSITION OF VEHICLE TYPE IN TRAFFIC STREAM	
		5 %	10 % AND ABOVE
A	**Fast Vehicles**		
1.	Two wheelers Motor cycle or scooter etc,	0.5	0.75
2.	Passenger car, pick-up van	1.0	1.0
4.	Light commercial vehicle	1.4	2.0
5.	Truck or Bus	2.2	3.7

Traffic counts for one day were carried out at Major Road near project site to provide the background traffic density. The result of the traffic monitoring is given in following table-3.18. Three different vehicle categories viz heavy, medium and light were considered. The heavy vehicles include trucks, buses, etc. The medium vehicles include small Cars, Jeeps, etc. The light vehicle includes Motorcycles, Scooter, etc. Due the project the traffic of the study area will be slightly increased.

TABLE - 3.18 TRAFFIC DENSITY

SR. NO.	TYPE OF VEHICLE	TO & FRO PASS	% OF TOTAL VEHICLE PASS	EQUIVALENT PCU FACTORS	PCU VALUE
1	Two wheeler	18	13.23	0.75	13.5
2	LMV	75	55.15	2.0	150.0
3	HMV	43	31.62	3.7	159.1
Total		**136**	-	-	-

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IDENTIFICATION OF IMPACTS

Various sources of pollution with respect to wastewater, the flue gas / process emission, hazardous waste and noise generation along with their qualitative and quantitative analysis as well as measures taken to control them are discussed herein with detail. The network method was adopted to identify potential impact, which involves understanding of cause-condition-effect relationship between an activity and environmental parameters. This method involves the "road map" type of approach to the identification of second and third order effect. The basic idea is to account for the project activity and identify the type of impact that could initially occur followed by the identification of secondary and tertiary impacts.

Identified potential impacts for the various components of the environment, i.e. air, noise, water, land and socio-economic, are presented in figure-4.1 to figure-4.6. It should be noted that in these illustrations the lines are to be read as "might have an effect on".

FIGURE - 4.1 IMPACT NETWORK ON AIR ENVIRONMENT

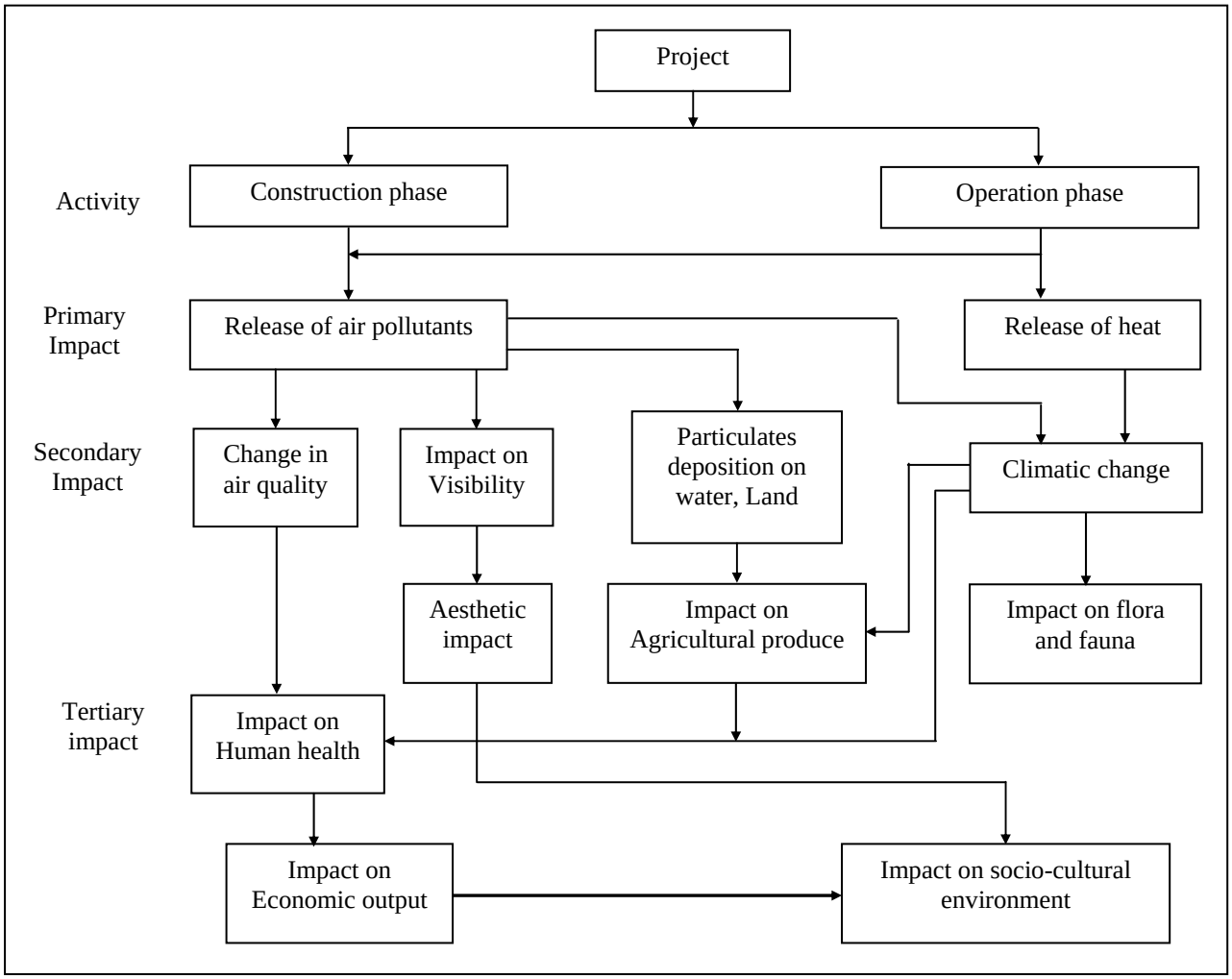


FIGURE - 4.2 IMPACT ON SURFACE WATER ENVIRONMENT

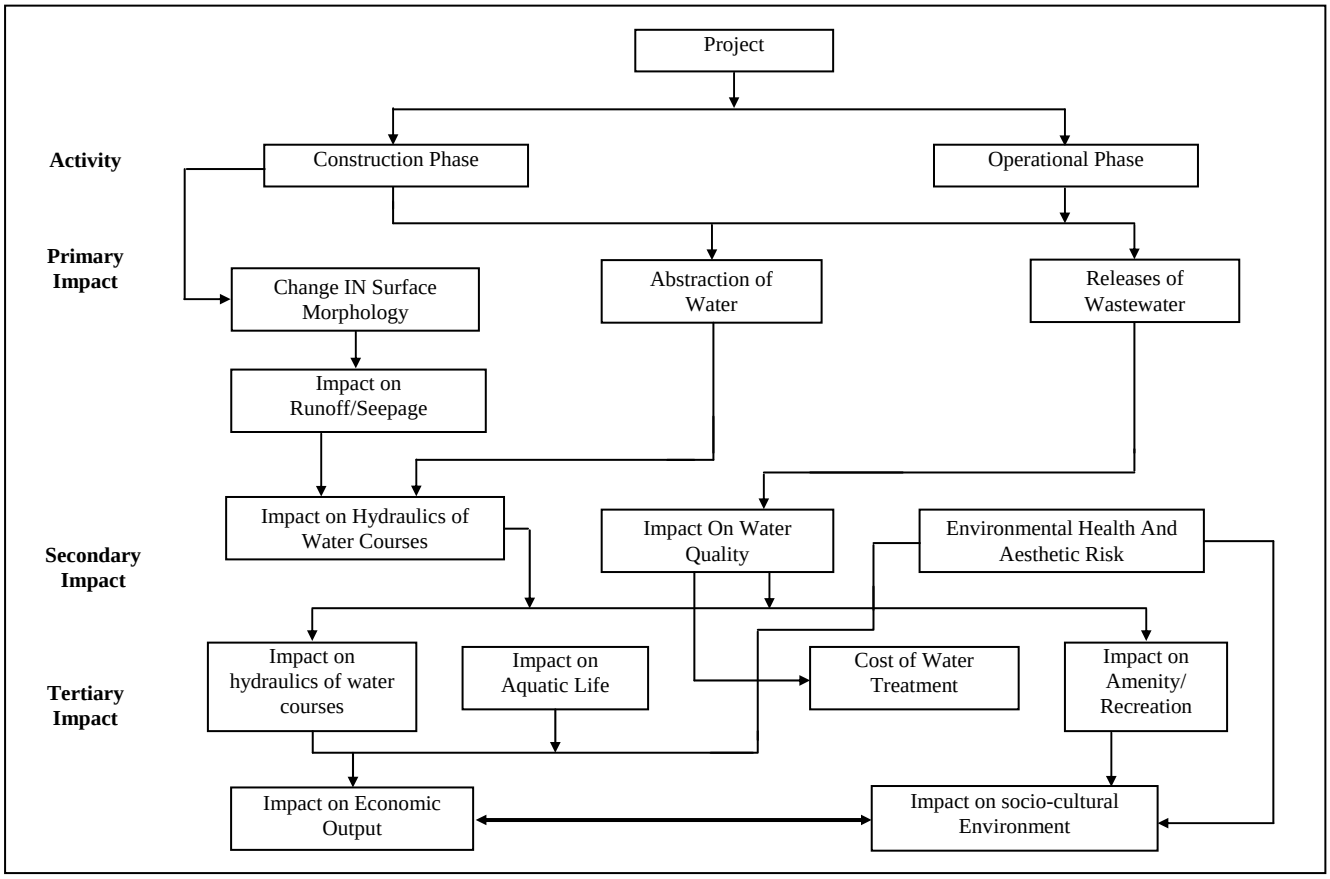


FIGURE - 4.3 IMPACT ON GROUND WATER ENVIRONMENT

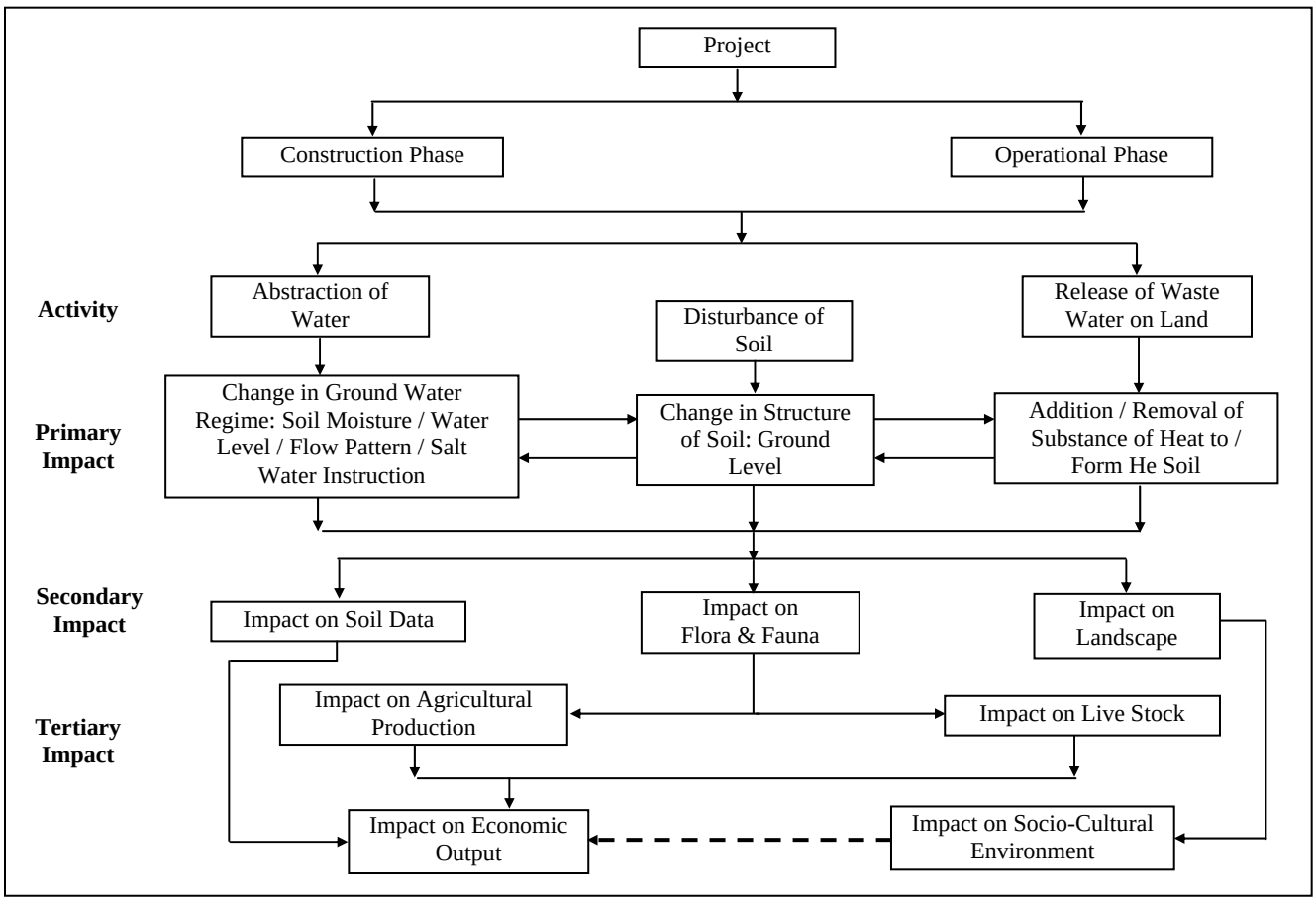


FIGURE - 4.4 IMPACT ON NOISE ENVIRONMENT

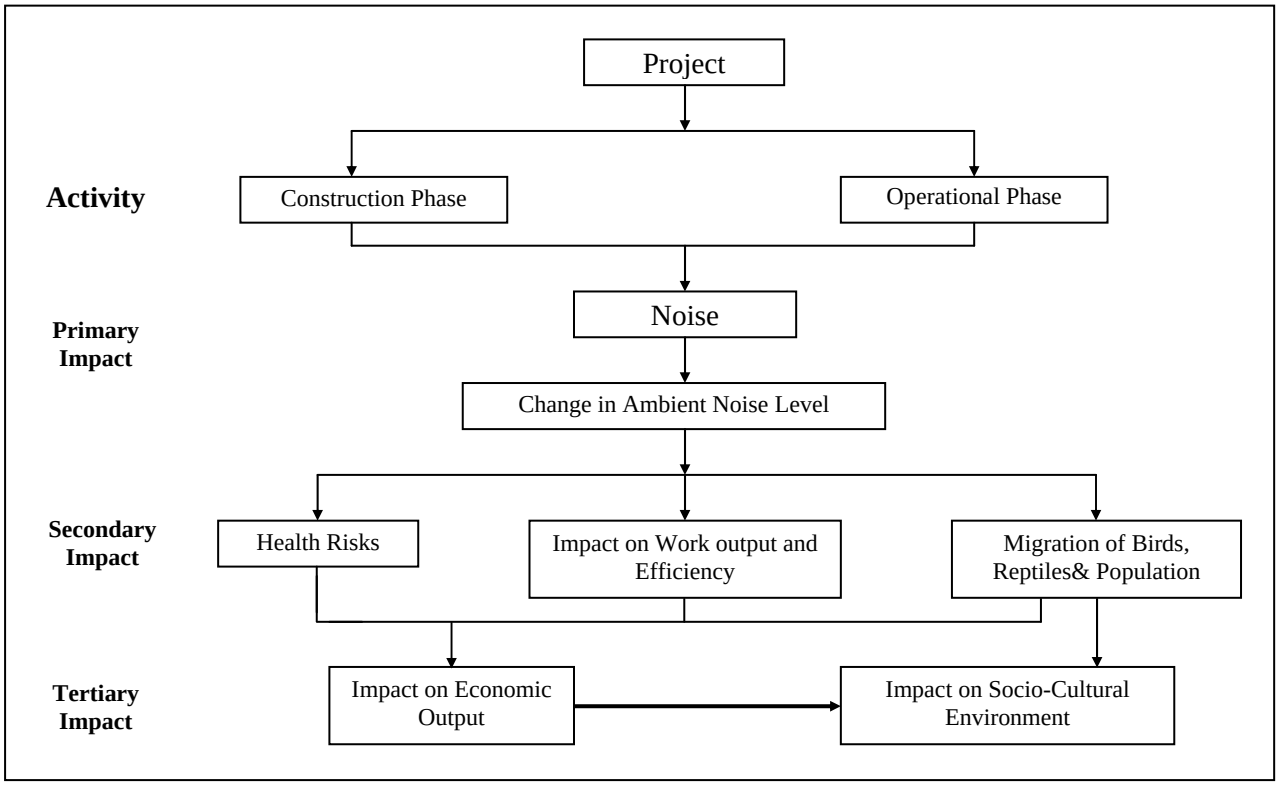


FIGURE - 4.5 IMPACT ON LAND ENVIRONMENT

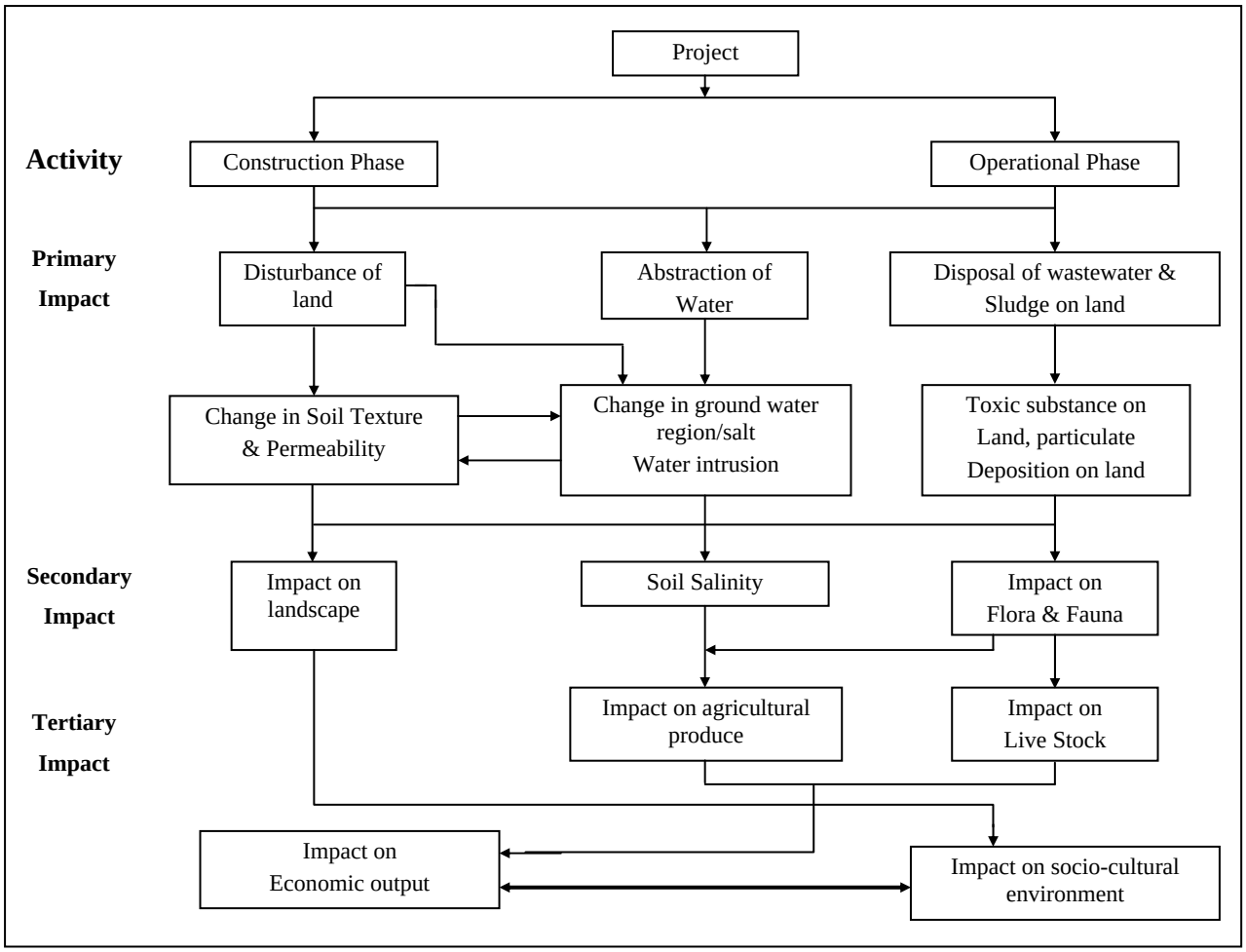
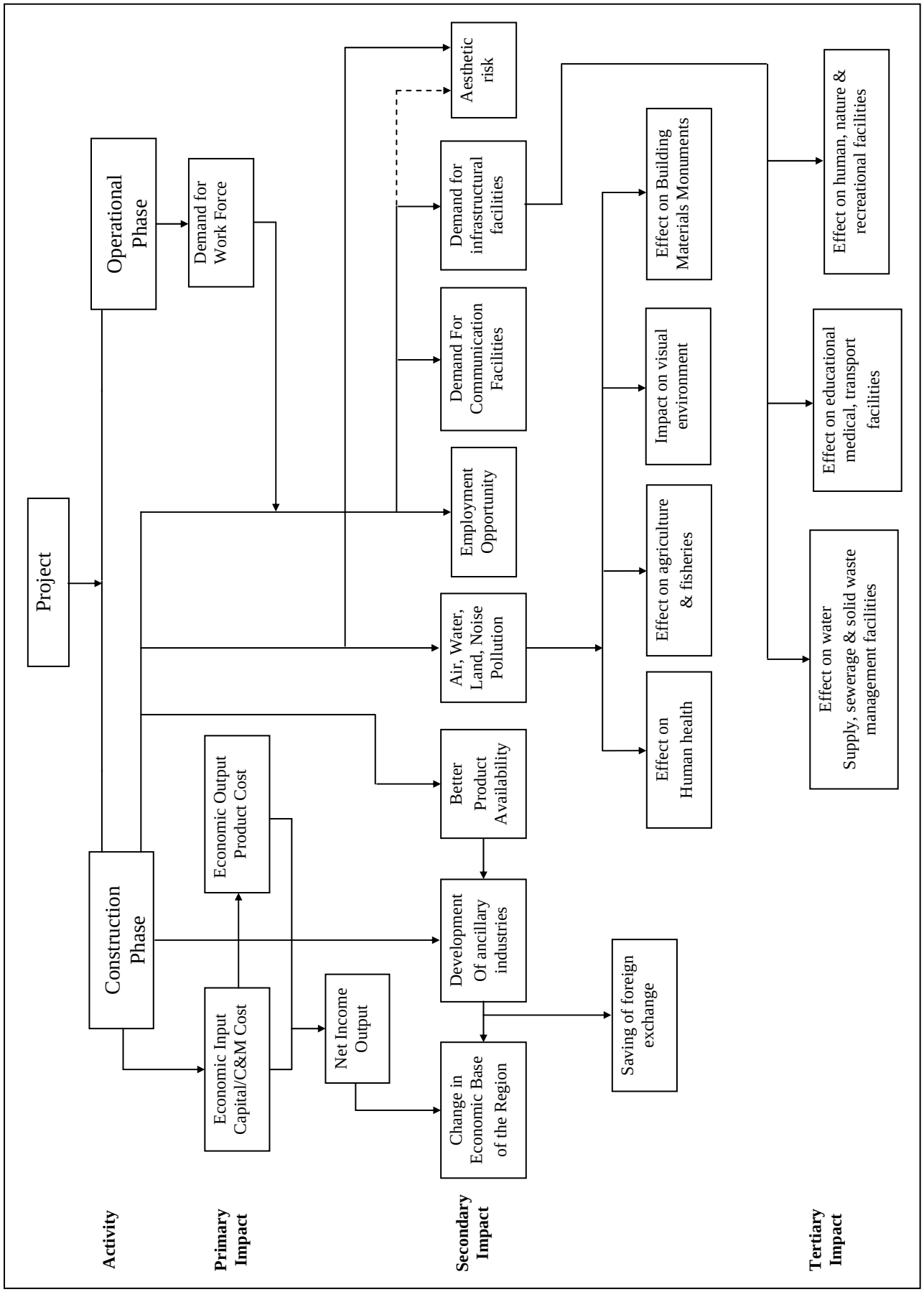


FIGURE- 4.6 IMPACT NETWORK ON SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT



4.2 PREDICTIONS AND EVALUATION OF IMPACTS

Evaluation is an absolute term used for assessment and prediction by means of numerical expression or value. Assessment is the process of identifying and interpreting the environmental consequences of the significant actions. Prediction is a way of mapping the environmental consequences of the significant actions.

Significant Action depicts direct adverse changes caused by the action and its effects on health of biota including flora, fauna and man, socio-economic conditions, landforms and resources, physical and cultural heritage properties and quality of bio-physics surrounds.

Prediction requires scientific skill drawn from many disciplines. Prediction of ecological components is often uncertain, because their response to environmental stress cannot be predicted in absolute terms. The assessor (one who does the assessment) and decision maker (one who take the decision after adequate analysis of assessment report) is expected to be aware of the degree of uncertainty. The assessor generally uses the following methods and resources for impact assessment.

1. Field surveys and monitoring
2. Guideline and modeling
3. Literature surveys and interviews
4. Qualification and experience

An impact can be defined as any change in physical, chemical and biological, cultural and socio-economic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts. The categories of environmental effect and associated impacts widely used for impact identification are provided in figure-4.1 to figure-4.6. Impact assessment is based on conceptual notions on how the universe acts that is intuitive and/or explicit assumption concerning the nature of environmental process. In most of cases the predictions consists of indicating merely whether there will be degradation, no change or enhancement of environment quality. In other cases, quantitative ranking scales are used. The selection of indicator is crucial in assessment because impacts are identifies and interpreted based on impact indicator. An impact indicator is a parameter that provides a measure (At least some qualitative or numerical sense) of the significance and magnitude of the impact. In India indicator is developed by the Central Pollution Control Board (CPCB) in the form of primary water quality criteria, biological water quality criteria, and national ambient quality criteria for air and noise.

The impact of the proposed expansion on the environment has been considered based on the information provided by the proponent and data collected at the site. The environmental impacts have been categorized as long or short term and reversible or irreversible. Primary impacts are those, which are attributed directly by the project while secondary impacts are those, which are indirectly induced. These typically include the associated investment and changed pattern of social and economical activities by the proposed action. The operational phase of the proposed expansion comprises several of which have been considered to assess the impact on one or another environmental parameters.

Scientific techniques and methodologies based on mathematical modeling are available for studying impacts of various project activities on environmental parameters.

The nature of the impacts due to said project activities are discussed herein detail. Each parameter identified in proceeding chapters, is singularly considered for the anticipated impact due to various activities listed. The impact is quantified using numerical scores 0, 1, 2, 3, 4 and 5 in increasing order of activity. In order to assess the impact accurately, each parameter is discussed in detail covering the following:

1) Project activities like to generate impact
2) Quantification and prediction of impact

Minor and temporary impacts are expected due to the construction activities. All the impacts of construction phase will be short term only and it shall be very limited as minor construction work is anticipated for requirement of project.

Operation phase of the project may potential to affect quality of life, air, noise, water, land and flora, fauna and human by increase in air, noise and water pollution by increase in hazardous waste generation, by pollution from spillage/surface run-off, by disturbance to flora and fauna, by loss of trees resulting from increased assess, by increase in land values threatening agriculture, etc.

During the operation phase, the following activities are considered significant.

1. Air emission (Significant)
2. Noise generation (Minor)
3. Hazardous waste generation (Significant)
4. Water use and waste water discharge (Significant)
5. Employment Generation (Significant)

The operation phase of the proposed expansion will involve discharge of pollutants. There will be wastewater generation, air emissions, hazardous waste generation and mechanical noise. An assessment of the quantitative changes in the various environmental components is therefore essential for predicting the impact. Operational phase activities will have impacts, either short terms or long term and reversible or irreversible on ambient air and noise, surface and ground water, land, socio-economic and cultural environment.

4.3 AIR ENVIRONMENT

4.3.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

Dust will be the main pollutant affecting the ambient air quality of the surrounding area during the construction phase. Motor vehicle transportation (to, from and around the site) particularly the traffic of trucks at the site, material movement into the site will introduce particulates and other exhaust gases into the local ambient air and there is some likelihood that during the construction period local air quality may be temporarily affected by these emissions. To reduce air pollution during this phase following mitigation measures will be implemented.

- Suitable surface treatment to ease the traffic flow and regular sprinkling of water to be carried out to control dust/fugitive emission.
- To reduce fugitive dust emission, construction activity shall be covered through shed.
- Construction material to be stored in covered shed.
- Condition of all vehicles, generators and compressors to be maintained and regularly serviced.

4.3.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, relative humidity, wind speed, wind direction, mixing depths, etc. A numbers of models have been developed for the prediction of pollutant concentration at any point within the study area from an emitting source. The Industrial Source Complex – Short Term (ISCST3) dispersion model is a steady-state Gaussian plume model. It is most widely accepted for its interpretability. It gives reasonably correct values because this obeys the equation of continuity and it also takes care of diffusion, which is a random process. For the present study, this model is used for the prediction of maximum ground level concentration (GLC).

With respect to operation phase impact, after proposed expansion, air emission from M/s. Esveegee Breweries (P) Limited will generate particulate matter, sulphur dioxide and nitrogen oxide. Adequate measures will be taken to minimize air pollution from process by providing air pollution control equipment. D. G. set will be installed as standby to be used during emergency only. The site specific and monitored details considered for input data for the software “ISC-AERMOD View” by Lakes Environmental, Canada for prediction of impact on air environment. The summary of site-specific hourly meteorological data measured at site is given in table-3.2 of chapter-3. There is only one stack attached to boiler and details of flue gas emission from the stack are shown as table-4.1.

The air pollution caused by the gaseous emissions from a single or small group of stacks is a local phenomenon. Its impacts will occur at a distance ranging from within the immediate vicinity of the stack to several kilometers away from the stack. Maximum ground level concentration will occur within this range. All plumes at more downwind distances from the source by stack emission become so diluted by diffusion in the ambient atmosphere, that concentrations of pollutants become negligible. Summary of ISCST3 model output and maximum ground level concentration (24 hourly) for different parameters is given in table-4.2 and table-4.3 respectively. Equal concentration contour plots for the PM, SO_2 and NOx are given in figure-4.7.

TABLE - 4.1 DETAILS OF EMISSION FROM STACKS

SR. NO.	OPERATING PARAMETER	UNIT	SOURCE OF EMISSION (STACK)
			BOILER
1.	Stack height	meter	82.5
2.	Stack diameter at top	meter	1.0
3.	Flue gas exit velocity	m/s	18
4.	Fuel used	------	Coal
5.	Emission Rate PM SO_2 NOx	 g/s g/s g/s	 1.5377 2.6850 0.9643
6.	Flue gas temp.	^0K	408

Note: Emission Rate is calculated based on stipulated limit.

Model Options Used For Computations:

- Stack tip down-wash is not considered.
- Calms processing routine is used by default.
- Simple plus complex terrain is used for computations.
- It is assumed that the pollutants do not undergo any physio-chemical transformation and that there is no pollutant removal by dry deposition.
- Washout by rain is not considered.
- Cartesian co-ordinate system has been used for computations.
- As site specific mixing heights were not available, mixing heights based on IMD publication, “Atlas of Hourly Mixing Heights and Assimilative Capacity of Atmosphere in India” has been considered.

FIGURE - 4.7A EQUAL CONCENTRATION CONTOUR PLOT FOR PM

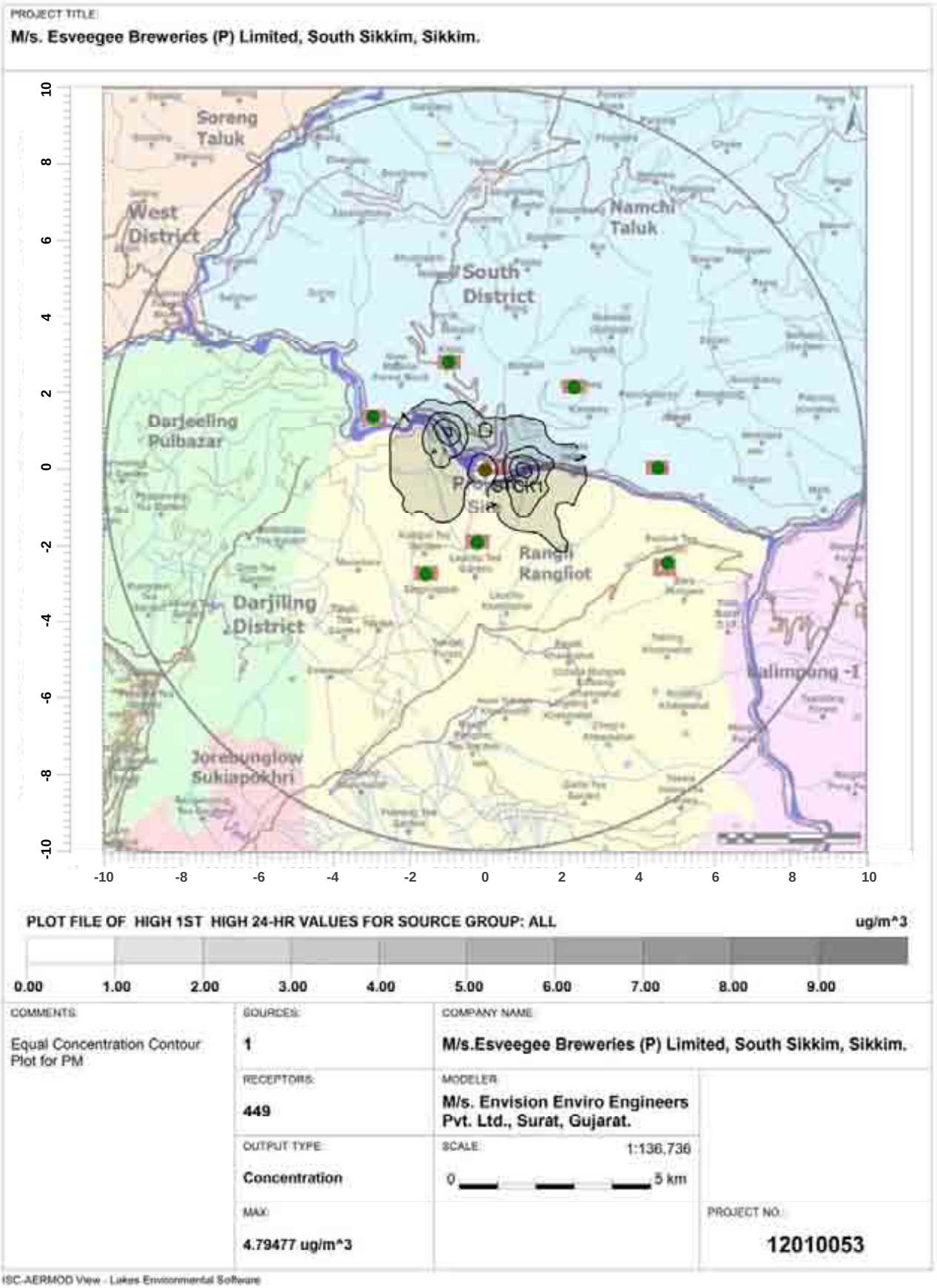


FIGURE - 4.7B EQUAL CONCENTRATION CONTOUR PLOT FOR SO_2

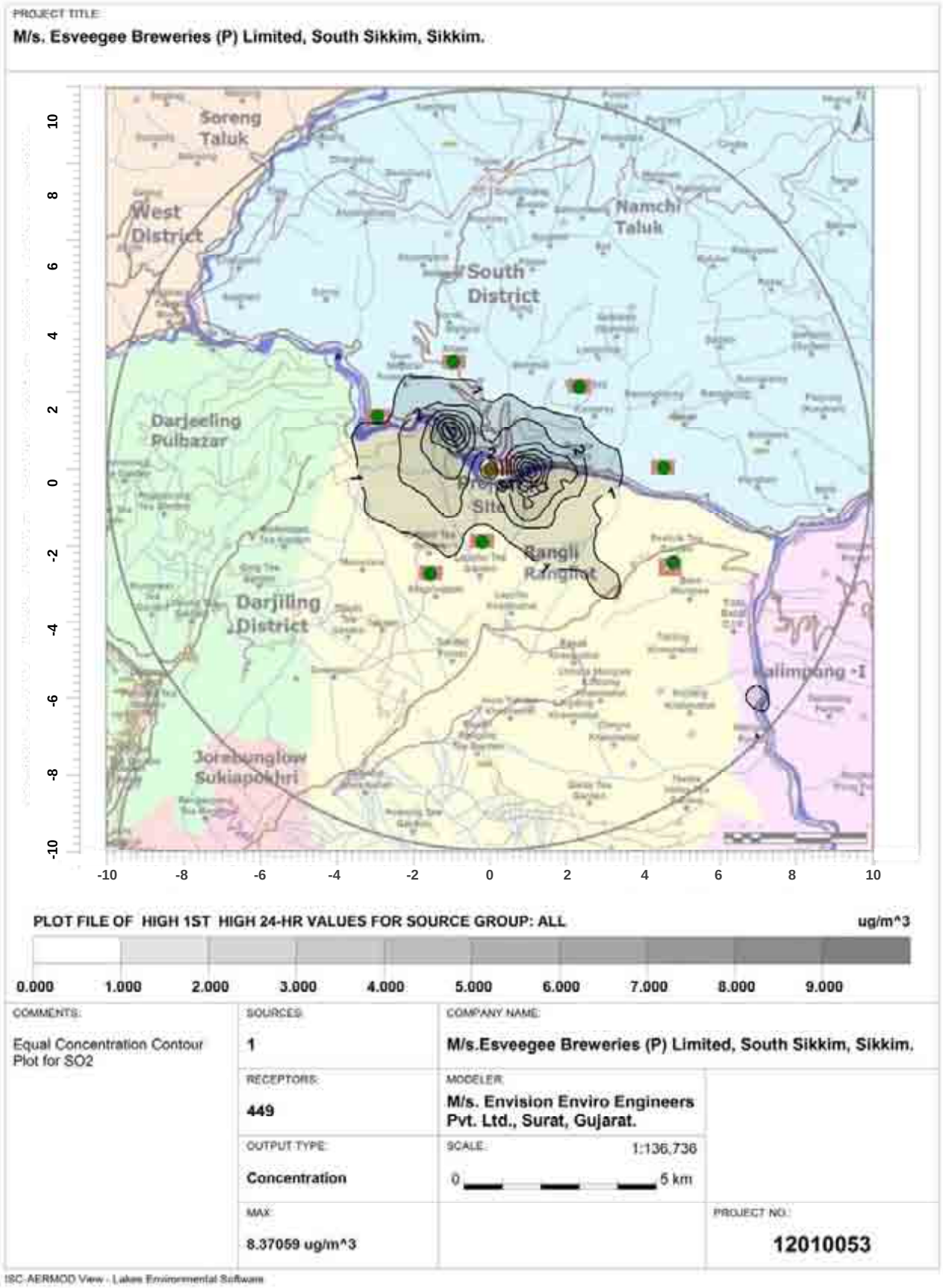


FIGURE - 4.7C EQUAL CONCENTRATION CONTOUR PLOT FOR NO_X

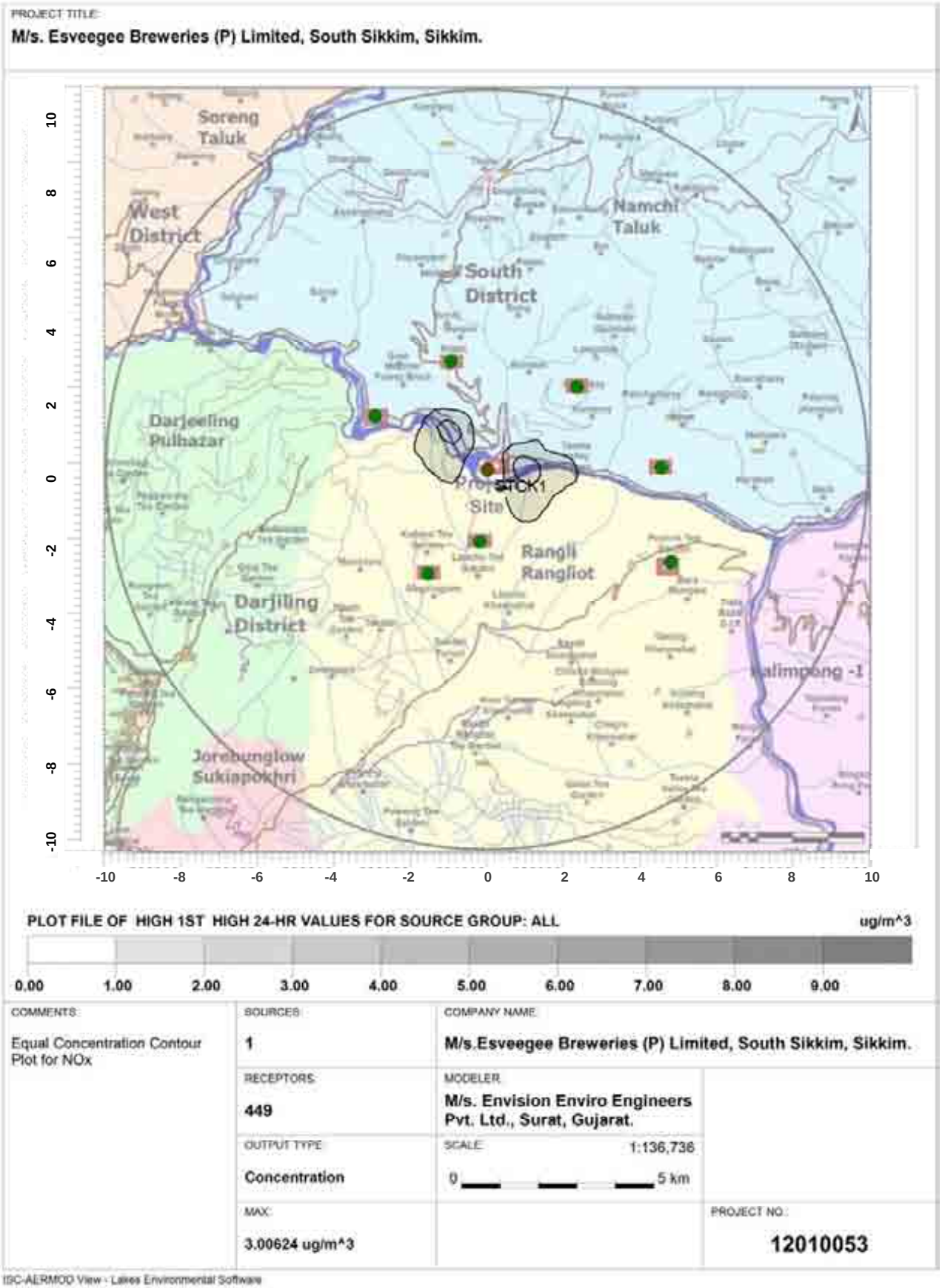


TABLE - 4.2 SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO_2 AND NO_X

SR. NO.	LOCATIONS	CO-ORDINATES		INCREMENTAL CONCENTRATION		
		X	Y	PM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)
1.	Project Site (A1)	0.00	0.00	0.00	0.00	0.00
2.	Manpur (A2)	2335.5	2168.4	0.29	0.51	0.18
3.	Kitam (A3)	-951.7	2834.9	0.27	0.47	0.17
4.	Jorethang (A4)	-2928.5	1413.4	0.24	0.42	0.15
5.	Peshok (A5)	4778.8	-2429.3	0.17	0.30	0.11
6.	Simbong (A6)	-196.5	-1896.3	0.22	0.39	0.14
7.	Shikari Dhuva (A7)	-1551.4	-2718.0	0.27	0.48	0.17
8.	Youdha (A8)	4534.5	58.4	0.31	0.55	0.19

TABLE - 4.3 MAXIMUM GROUND LEVEL CONCENTRATIONOF PM, SO_2 AND NO_X

X, Y CO-ORDINATES	MAXIMUM GROUND LEVEL CONCENTRATION		
	PM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)
(1000.0, 0.0)	4.8	8.4	3.0

Mitigation measures:

- Effective stack height with proper air pollution control equipment to be provided to all stacks.
- Regular maintenance of APCE to be done and recorded.
- Low Sulphur content fuel is used to reduce SO_2 emission.
- Green belt to be developed on 33% is of the total plant area.
- Lime stone as absorbent will be blended with coal to take care of SO_2 emission.

4.3.3 FUGITIVE EMISSION & MITIGATION MEASURES

Fugitive emission is air pollutants released to the air other than those from stacks or vents; typically small releases from leaks in plant equipment such as valves, pump seals, flanges, sampling connections, etc. Looking to nature of the proposed expansion, it may generate fugitive emissions during usage, handling and transportation of raw materials, following mitigation measures to be taken to control or prevent fugitive emission.

i. All treatment vessels and process pumps to be mechanically sealed.
ii. All process pumps to be provided trays to collect probable leakage.
iii. More weightage on selection of MOC of piping to be given to avoid leakage/spillage.
iv. Vent of all hazardous chemicals storage tanks to be connected to condenser.
v. De-dusting system to be provided
vi. Tanker to be used instead of drums for hazardous chemicals.
vii. Proper system to be provided for decontamination and effective cleaning of drums.

4.4 WATER ENVIRONMENT

With respect to water environment, three aspects are generally considered in Environmental Impact Assessment studies, the raw water availability, water consumption and wastewater generation. The first priority in water quality assessment is to maintain and restore the desirable level of water quality in general.

4.4.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

During Construction**,** drainage pattern and water supply system of overland water flow will be somewhat changed due to the site preparation activities. Potential impacts may be on surface water quality during this phase could arise from dust emissions (from vehicles and disturbance of soil). Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the particles to settle down, prior to discharge. Thus there would not be any significant effect on water quality during construction phase.

4.4.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

During operation phase, daily water requirement of M/s. Esveegee Breweries (P) Limited is 1134 KL/Day after expansion and to be met through Ground Water using deep bore well and/or from surface water from river Rangit.

The hydro-geological survey revealed the region has adequate ground water resource as the region falls under the safe category as per the Central Ground Water Authority (CGWA). The company intends to recycle and reuse the treated process effluent in process, ash quenching and internal green belt development after giving proper treatment to reduce fresh water demand and also follows the zero discharge concepts. Furthermore, ground water recharging through rain water harvesting to be adopted. Hence no adverse impact on surface as well as ground water envisaged due to proposed expansion.

4.5 SOIL ENVIRONMENT

The main source of impact on land and soil environment will be due to solid waste generated during construction and operation activities. In addition to this accidental spillage of chemicals and effluent can also degrade the soil environment.

4.5.1 CONSTRUCTION PHASE IMPACT AND MITIGATION MEASURES

The proposed project activity area is located on flat terrain; hence no significant topographical change is expected due to construction activities. The construction of building will help in fixation of soil, thereby reducing the soil erosion. Some construction operations to disturb the soil profile, but the impact will be insignificant. The proposed plant site is suitably located considering availability of transportation, communication, residence and manpower. The project did not involve displacement of any population. All basic amenities like electric, water, road etc. and infrastructure facilities are available at the site.

4.5.2 OPERATION PHASE IMPACT AND MITIGATION MEASURES

All the solid waste will be stored separately in the isolated storage area within the premises. Solid waste generated as Grain residue (DDGS/DWGS) and it will be sent for cattle feeding, another solid waste i.e. fly ash which will be trapped, stored in open underground shed and utilized for brick manufacturing or sold to nearby Cement plant. Used/spent oil will be used as lubricant in the plant machinery. Proper management of solid waste shall be done; hence no adverse impact of proposed project activities is envisaged.

4.6 NOISE ENVIRONMENT

4.6.1 CONSTRUCTION PHASE IMPACT AND MITIGATION MEASURES

Noise level in and around the proposed plant site was measured. These values represent the status of noise level. Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. would be provided. Housing/ casing provide for all noise generating machines. Pump operators are generally exposed to higher noise level for short duration. The noise level within plant would be kept less than 85 dBA. Transport and communication requirement increases due to operation of a plant.

4.6.2 OPERATION PHASE IMPACT AND MITIGATION MEASURES

The main sources of noise pollution in the plant would be boiler, air blower, cooling system, diesel generator and other noise generating units. Vehicular movements during operation phase for loading/unloading of raw and finished materials and other transportation activity may increase noise level. Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. will be provided. Housing / casing will be provided for all noise generating machines. Pump operators are generally exposed to higher noise level for short duration. The noise level within plant will be kept less than 85 dBA. Transportation and communication requirement increases due to operation of plant.

However, the proposed green belt will help to reduce noise. The adverse impact on occupationally exposed workers will not envisaged, as noise protection devices will be provided.

4.7 ECOLOGY

The impact due to construction phase and operation phase of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity.

Ecological Impact Assessment considered the following stages:

- Identification of the likely **zone of influence** arising from the whole lifespan of the project;
- **assessment of the ecological impacts** of the project and definition of the significance of these impacts;
- Identification and evaluation of **ecological resources and features** likely to be affected
- Identification of the **biophysical changes** likely to affect **valued ecological resources and features**;
- Assessment of whether these biophysical changes are likely to give rise to a significant ecological impact, defined as an impact on the **integrity of a defined site or ecosystem**
- The **conservation status of habitats or species within a given geographical area,** including cumulative impacts;
- Refinement of the project to incorporate **ecological enhancement** measures, **mitigation measures** to avoid or reduce negative impacts, and **compensation measures** for any residual significant negative impacts;
- Provision for **monitoring** and following up the implementation and success of mitigation measures and **ecological outcomes**, including feedback in relation to predicted outcomes. (Already covered in Post Project monitoring section)

When describing changes/activities and impacts on ecosystem structure and function, reference have been made to the following parameters and presented in following table,

- Magnitude of Impact;
- Extent;
- duration;
- Reversibility; and
- Timing and frequency.

A detail of ecological impact assessment is discussed below:

ECOLOGICAL CRITERIA	IDENTIFIED IMPACTS	ECOLOGICAL SIGNIFICANCE OF IMPACT	MAGNI-TUDE	DURATION /TIMING/ FREQUENCY	REVER-SIBILITY	MITI-GATION	CUMULATIVE IMPACT
Construction Phase							
Zone of Influence	Project site habitat Due to Site clearance	The project site is located in the Premises of already established Industrial Unit As the site is already occupied for the industrial purpose and privately owned, no ecological impact associated with vegetation clearing or disturbances to the existing vegetation is anticipated from this project	No impact	-	-	-	No impact
Zone of Influence	Ecological Impact Surrounding habitat due to fugitive emission	Not much impact on the surrounding habitat is envisaged due to the construction activity except some fugitive emission. There is small basti located near the project site. The Dense Mixed Forest located nearby may have some impact due to the fugitive emission. Dust emission during monsoon period will be very less.	In significant impact	Only during the construction activity	Reversible	As given in EMP chapter	No impact
Accessibility	Ecological Impact due to road construction	No Road construction is required to assess the project site. The existing internal Roads are connected the project site to the existing village road and then to the highway.	No impact	-	-	-	No Impact
Operation Phase							
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to emission from process and utility emission Major Pollutants are PM, SO_2, NOx, and HC. The increase in GLC of	The project site is located in the Premises of already established Industrial Unit. Nearest habitat is Manpur basti in south direction near the project site. The nearest habitation is located near from the zone of influence, Hence there will be a impact on the basti premises is anticipated during the	In significant impact	-	-	Green belt development in the premises considering the predominant wind direction will further reduce the impact emission with respect to the	No impact

ECOLOGICAL CRITERIA	IDENTIFIED IMPACTS	ECOLOGICAL SIGNIFICANCE OF IMPACT	MAGNI-TUDE	DURATION /TIMING/ FREQUENCY	REVER-SIBILITY	MITI-GATION	CUMULATIVE IMPACT
	PM (4.8 µg/m^3) SO_2 (8.4 µg/m^3) and NOx (3.0 µg/m^3) during the operation phase, will increase in the ambient air quality.	operation phase. More over the predicted pollution load after the incremental increase is within the stipulated standard limit prescribed by CPCB for the concerned parameters.				magnitude and distance. Adequate EMP measures will be provided to the stack attached boiler will reduce the pollution load.	
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to waste water generated from the project activity. The generated waste water will be reused & recycled utilized for process, ash quenching and gardening after treatment.	No impact on the surrounding habitat are envisaged due the waste water generated from the project activity as it is utilized for process, ash quenching and gardening in the premises itself. No waste water will be disposed outside the premises. This will also reduce the ground water withdrawal meant for gardening.	No impact	-	-	ETP design and Efficiency as given in the EMP chapter	No impact
Zone of Influence	Ecological Impact on Surrounding Eco sensitive habitat due to Noise generated from the project activity	The impact on ambient noise level will be restricted only on the factory premises and may not have any significance increase in the surroundings due to the project activity	No Impact	-	-	As given in The EMP section	No impact
Conservation status of Habitat and species encountered	Impact due to the emission from the project activity	Two aquatic water bodies with ecological importance and one Bird sanctuary at Kitam were observed in the study area. As the location of bird species is far away from the zone of influence of the project activity, no impact on this species is envisaged. More over the stack height attached to utilities many not disturb the route taken by these birds	In significant Impact	-	-	-	-

4.8 INFRASTRUCTURE AND SERVICES

As a result of development of industry, the neighboring areas will develop for commercial use. The infrastructure services e.g. roads, state transport, post and telegraph, communication, education and medical facilities, housing, etc. to be improved in the surrounding area.

4.9 ENVIRONMENTAL HAZARD

Raw material and finished product will be transported by road and to be stored in the plant premises. On site emergency plan are to be prepared for storage and handling of Ethanol and submitted to concerned authority. This report to be prepared with the consideration of hazards associated with the Ethanol and care should be taken for all aspects of environmental hazards. The project proponent will consider all the safety aspects in planning, designing and operation of the plant as per standard practices. Hence, no adverse impact on this account is anticipated. Potential impact due to the proposed expansion project and its mitigation measures is shown as below table-4.4.

TABLE - 4.4 POTENTIAL IMPACTS AND MITIGATIVE MEASURES

ENVIRONMENTAL COMPONENTS	POTENTIAL IMPACTS	SOURCES OF IMPACT	MITIGATIVE MEASURE	REMARKS
Water Quality	Deterioration of water quality	Construction activities & abstraction of water for construction and sanitation in housing for workers. Operation activities for process, utility and domestic requirements	Proper management of surface water runoff to be made Decanter, MEE & Dryer to achieve zero discharge Rain water harvesting	No waste water to be discharge outside the premises. Insignificant impact
Air Quality	Increase in SO_2, NO_X, & SPM concentrations in ambient air	Fugitive emissions, Utility stack emissions	Adequate stack height with bag filters/ESP. Lime stone dosing to control SO_2 emission Control of fugitive emissions	Regular monitoring of stack and work zone will be carried out Minor adverse impacts on ambient air quality
Socio-Economic	Overall growth & development of area, increased employment, improvement in infrastructure and growth of downstream industries	Project activities	CSR activities to improve socio economic status	Positive impact due to employment generation,
Terrestrial Ecology	Minor loss of habitat-flora & fauna	Project activities	Green belt, Proper, management of solid waste and liquid effluent	No impact
Noise	Increased noise level	Project operation	Noise abatement at generation point & green belt before receptor	Marginal impact
Infrastructure & Services	Improved communication, transport, housing, educational & medical facilities	Social activities of company	Development has been gradual	Beneficial impact

ENVIRONMENTAL COMPONENTS	POTENTIAL IMPACTS	SOURCES OF IMPACT	MITIGATIVE MEASURE	REMARKS
Environmental Hazards	Risk to environment & neighboring population	Handling and storage of chemicals, Ethanol & fuels	Following OISD norm, OSEP, DMP and Safe practices	Insignificant adverse impact

4.10 HOUSING

Any permanent demand on existing housing facilities is considered as permanent impact. No township will be constructed or proposed. Enough number of dwellings is available in nearby towns and villages for accommodating extra workforce. On neighboring towns or villages, the impact on this account is minimal.

4.11 ECOLOGY

The impact due to operation of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity will be negligible.

4.11.1 NATURAL VEGETATION

The proposed expansion activity will be carried out within the industrial premises only. Moreover, the Company will develop a green belt on the surrounding periphery. Since the effluents and emissions generated from the project activities to be treated and disposed as per the EMP provisions, adverse impact over any of the ecological components of the environment is reduced to minimum.

4.11.2 CROPS

Since, the proposed expansion project is located on Industrial land; it will not alter the crop production. Further, the necessary environmental protection measures have been planned under EMP e.g. air pollution control systems will be designed to take care of even emergency releases of the gaseous pollutants like PM, SO_2, and NOx. Furthermore, regular environmental monitoring will be carried out, so as not to have any short-term or cumulative effect on the crops and the natural vegetation of the area.

4.11.3 FOREST, NATIONAL PARKS / SANCTUARIES

There is no reserved forest and national park within 10 km radius of the plant, only one bird sanctuary (Kitam) is located at a distance of around 2 km. Looking to the project activity its location and Ground Level Concentration there will be insignificant impact on the same.

4.12 DEMOGRAPHY, ECONOMICS, SOCIOLOGY AND HUMAN SETTLEMENT

Proposed project will give direct employment to about 90 employees after expansion. In addition to direct employment, indirect employment will generate ancillary business to some extent for the local population. There is a positive effect due to improved communication and health services, which have lead to economic prosperity, better educational opportunities and access to better health and family welfare facilities. There has been a beneficial effect on human settlement due to direct and indirect employment opportunities from various industries in addition to employment generated by proposed project.

Local quality of life will improve. This factor combined with all other mitigation measures like proper treatment and disposal of solid waste, liquid effluent and gaseous emission has minimized the adverse impact on ecology and has a beneficial impact on human settlement and employment opportunities. There has been a beneficial impact on the local socio-economic environment. There will be no displacement of any population in plant area. Hence, there is no permanent impact on this account.
The increasing industrial activity will boost the commercial and economical status of the locality up to some extent. Increase in the cost of living would affect the lower class people as it may become difficult for them to avail the basic requirement.

4.12.1 PLACES OF ARCHAEOLOGICAL/HISTORICAL/RELIGIOUS/TOURIST INTEREST

There is no place of archaeological, historical, religious or tourist interest within the study area i.e.10 km radius of proposed plant site. Hence, there is no impact on places of interest.

4.13 MATRIX REPRESENTATION

The parameters discussed are presented in the form of a matrix in table-4.5. The impact matrix relating to the activities during construction and operation phase is presented. Potential impact and mitigation measures of construction and operation are given in table-4.6.

The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

The scores for various parameters and activities are presented in table-4.6.

4.13.1 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative impact chart presented in table-4.7. Any particular parameter having an individual score greater than 4 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures.

It is evident from the matrices that the resultant impact is beneficial to the local population and due to export (and import substitution) the resultant impact is beneficial to our country.

TABLE - 4.5 IMPACT IDENTIFICATION MATRIX

ACTIVITIES DURING OPERATION PHASE	Air Quality	Noise & Odor	Water Quality	Land Requi-rement	Infrast-ructure	Env. Haza-rds	Terres-trial Ecology Land-use	Socio-Economic Status	Aquatic Ecology	Re-source Deple-tion
Water Requirement	-	-	✓	-	-	-	-	-	✓	✓
Raw material Storage	✓	-	✓	✓	✓	✓	✓	-	-	✓
Raw Material Handling	✓	✓	✓	✓	✓	✓	✓	-	-	-
Utilities	✓	✓	✓	✓	-	-	✓	-	-	✓
Effluent Discharge	-	✓	✓	-	-	✓	-	-	✓	-
Gaseous Emissions	✓	✓	-	-	-	✓	✓	✓	-	-
Fugitive Emissions	✓	✓	✓	-	-	✓	✓	✓	-	-
Solid & Hazardous Waste Disposal	-	-	-	✓	✓	✓	✓	-	-	-
Product Storage/ Handling	-	✓	-	✓	✓	✓	-	-	-	-
Spills & Leaks	-	-	✓	-	-	✓	✓	-	✓	-
Shutdown/ Startup	✓	✓	✓	-	✓	✓	-	-	-	✓
Equipment Failures	✓	✓	✓	-	-	✓	✓	✓	-	✓
Plant Operations	✓	✓	✓	-	-	✓	✓	✓	✓	✓

ACTIVITIES DURING OPERATION PHASE	Air Quality	Noise & Odor	Water Quality	Land Requi-rement	Infrast-ructure	Env. Haza-rds	Terres-trial Ecology Land-use	Socio-Economic Status	Aquatic Ecology	Re-source Deple-tion
Transport of Workers	✓	✓	-	-	✓	-	-	-	-	-
Movement of Vehicles	✓	✓	-	-	✓	-	✓	-	-	✓
Housing Needs	-	-	-	✓	✓	-	✓	-	-	-
Medical & Other Needs	-	-	-	✓	✓	-	-	-	-	-
Resource Consumption	✓	-	✓	✓	✓	✓	✓	-	✓	✓

TABLE - 4.6 ENVIRONMENTAL IMPACT MATRIX

ACTIVITIES DURING OPERATION PHASE	Air Quality	Noise & Odor	Water Quality	Land Requi-rement	Infrast-ructure	Env. Haza-rds	Terres-trial Ecology Land-use	Socio-Econo-mic Status	Aquatic Ecology	Re-source Deple-tion
Water Requirement	0	0	2	0	0	0	0	0	1	2
Raw material Storage	1	0	1	1	1	2	1	0	0	2
Raw material Handling	2	1	1	1	1	2	1	0	0	0
Utilities	2	2	2	1	0	0	1	0	0	2
Effluent Discharge	0	1	2	0	0	2	0	0	2	0
Gaseous Emissions	2	1	0	0	0	1	1	1	0	0
Fugitive Emissions	2	1	1	0	0	1	1	1	0	0
Solid & Hazardous Waste Disposal	0	0	0	1	1	2	1	0	0	0
Product Storage/ Handling	0	2	0	1	1	1	0	0	0	0
Spills & Leaks	0	0	2	0	0	1	1	0	1	0
Shutdown/ Startup	2	2	1	0	1	1	0	0	0	1
Equipment Failures	2	2	2	0	0	1	1	1	0	1
Plant Operations	1	2	2	0	0	2	2	1	2	4
Transport of workers	1	2	0	0	1	0	0	0	0	0
Movement of Vehicles	2	2	0	0	1	0	1	0	0	2
Housing Needs	0	0	0	1	1	0	1	0	0	0
Medical & Other Needs	0	0	0	1	1	0	0	0	0	0
Resource Consumption	2	0	2	1	1	1	1	0	2	4
Cumulative Score	**19**	**18**	**18**	**8**	**10**	**17**	**13**	**4**	**8**	**18**

TABLE - 4.7 CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	**19**
Noise and Odour	**18**
Water Quality	**18**
Land Requirement	**8**
Infrastructure	**10**
Environmental Hazards	**17**
Terrestrial Ecology / Land use	**13**
Socio Economic Status	**4**
Aquatic Ecology	**8**
Re-source Depletion	**18**

As per cumulative impact chart there will be a significant impact due to the proposed project activities on water quality, Air Quality, Noise & Odor. To reduce the impact suitable mitigation measures are given in table 4.4.

CHAPTER – 5

ENVIRONMENTAL MONITORING PROGRAMME

5.1 INTRODUCTION

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment. All monitoring strategies and programmes have reasons and justifications which are often designed to establish the current status of an environment. In all cases the results of monitoring will be reviewed, analyzed statistically to ensure mitigation measures in place.

Environmental monitoring provides feedback about the actual environmental impacts of a project. Monitoring results help judge the success of mitigation measures in protecting the environment. They are also used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. An environmental monitoring program is important as it provides useful information and helps to:

- Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures.
- Define the responsibilities of the project proponents, contractors and environmental monitors and provides means of effectively communicating environmental issues among them.
- Define monitoring mechanism and identify monitoring parameters.
- Evaluate the performance and effectiveness of mitigation measures proposed in the Environment Management Plan (EMP) and suggest improvements in management plan, if required.

5.2 PROPOSED SCHEDULE OF ENVIRONMENTAL MONITORING

Environmental monitoring programme is a vital process of any management plan of the development project. This helps in assessing the potential problems that result from the proposed expansion, changes in environmental conditions and effectiveness of implemented mitigation measures. Proposed schedule of environmental monitoring for the proposed expansion is given in following table-5.1.

TABLE - 5.1 PROPOSED SCHEDULE OF ENVIRONMENTAL MONITORING

SR. NO.	AREA OF MONITORING	SAMPLING LOCATIONS	PARAMETERS TO BE ANALYSED	FREQUENCY OF SAMPLING
AIR POLLUTION MONITORING				
1.	Stack Emission	Each utility stack	PM, SO_2, NOx & CO	Once in a month
2.	Ambient Air Quality	Three samples	$PM_{2.5}$, PM_{10}, SO_2, NOx and CO	Once in six month
3.	Work Zone Environment	Production area & Storage area	HC, VOC	Once in six month
WATER POLLUTION MONITORING				
4.	Liquid effluent	outlet at Effluent treatment plant	As per consent of PCB	Once in a month
5.	Ground and surface water	Two sampling locations	As per IS Standards	Once in a year
SOIL POLLUTION MONITORING				
6.	Soil	Two sampling locations of Impact Area	As per consent of PCB	Once in year
NOISE POLLUTION MONITORING				
7.	Noise	Noise generating units	Sound Pressure Levels (Leq)	Once in a six month
		Four sampling locations within Plant	Sound Pressure Levels (Leq)	Once in a month

8.	Occupational Health Monitoring	Pre employment Check up	Vision, Audiometry, Spirometry, Chest Skiagram, Urine, RBCs, etc.	Once after appointment
		Periodical Check up	Spirometry, Urine, RBCs, LFT, Anemia, etc.	<30 yrs. Once in five years 31-40 yrs. Once in four years 41-50 yrs. Once in two years Above >50 yrs. once every year
		Post employment check up	Vision, Audiometry, Spirometry, Chest Skiagram, Urine, RBCs, etc.	Once before relief

5.3 MONITORING CAPABILITIES

Company has formed a separate Environmental Management Cell, which is equipped with in house laboratory facility and external laboratory to carry out the Environment Management and monitoring function. An organogram of the Environmental Management Cell is presented in figure-8.1 of chapter-8. List of equipments to be made available in laboratory are given in following table-5.2.

TABLE-5.2 LIST OF EQUIPMENTS FOR ENVIRONMENTAL MONITORING

SR. NO.	NAME OF EQUIPMENT
1.	Analytical Balance
2.	Microwave Oven
3.	COD Digester
4.	BOD incubator
5.	Spectrophotometer
6.	High Volume air sampler
7.	Stack Monitoring Kit
8.	Digital pH meter
9.	Digital TDS meter
10.	Water Bath
11.	Steam Bath
12.	Hot Plate
14.	Noise level meter

CHAPTER – 6

ADDITIONAL STUDIES

6.1 PUBLIC HEARING

Public hearing will be applicable for the proposed expansion project as per Para 7(i) III (b) of EIA Notification, 14th September, 2006 as the project is located outside the notified industrial area.

6.2 INTRODUCTION

Industrial activities including process, production, storage, handling, transportation and operational practices presents levels of hazards to workforce, population and environment at large due to accidents, spills, leaks etc. These accidents results in personal and financial loss. The assessment of the threat posed, its control and prevention through good design, management and operational controls is of primal importance.

Events like the Bhopal tragedy have emphasized the need to address both on-site and off-site safety. It is against this background that the various Section and Rules under the Environment Protection Act, 1986, the Factories Act, 1948 and other Acts specify the requirements for a safe and reliable working of an industry. These require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as "Risk Assessment Studies".

Risk assessment refers to the technical, scientific assessment of the nature and magnitude of risk and uses a factual base to define the health effects of exposure of individuals or populations or ecological receptors to hazardous contaminants and situations.

This chapter explains the basis of Risk Assessment and its objectives.

6.3 OBJECTIVE OF THE STUDY

The main objectives of the Risk Assessment Studies are as given below:

1) To identify the potential hazards and their sources.
2) To define various accident release scenarios with respect to the hazard.
3) To assess the damage caused by the source in the event of accidents
4) To devise strategies for the prevention of the accidents.
5) To define and assess emergencies, including risk impact assessment
6) To control and contain incidents.
7) To safeguard employees and people in vicinity.
8) To minimize damage to property and environment.
9) To inform the employees, the general public and the authority about the hazards / risk assessed, safeguards provided, residual risk if any and the role to be played in them in the event of emergency.
10) To ensure safety of the workers before personnel re - enter and resume work.
11) To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.

6.4 PHILOSOPHY AND METHODOLOGY OF RISK ASSESSMENT

Risk is defined as the probability of an adverse event due to disturbances in the environment. One can also describe risk with the following expression.

Risk = Severity of event (Hazard) x Exposure

Major hazard installations have to be operated to a very high degree of safety; this is the duty of the management. In addition, management holds a key role in the organization and implementation of a major hazard control system. In particular, the management has the responsibility to,

i. Provide the information required to identify major hazard installations;
ii. Carry out hazard assessment;
iii. Report to the authorities on the results of the hazard assessment;

iv. Set up an emergency plan;

v. Take measures to improve plant safety.

In order to fulfill the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents. This means that in order to control a major hazard successfully, the Management must have answers to the following questions:

a. Do toxic, explosive or flammable substances in our facility constitute a major hazard?

b. Which failures or errors can cause abnormal conditions leading to a major accident?

c. If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?

d. What can Management do to prevent these accidents from happening?

e. What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand why accidents occur and how they can be avoided or at least mitigated. A properly conducted assessment will therefore

i. Analyze the existing safety concept or develop a new one;

ii. Identify the remaining hazards; and

iii. Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

6.5 DETAILS OF MANUFACTURING PROCESS

Detail of manufacturing process is given in chapter-2.

6.6 DETAILS OF STORAGE FACILITY

The list of hazardous materials with classification, state and storage details are given in following table-6.1.

TABLE - 6.1 LIST OF HAZARDOUS MATERIALS

SR. NO.	NAME OF THE CHEMICAL	DESCRIPTION OF STORAGE	CAPACITY & No. OF STORAGE	STATE	DIMENSION OF TANK	MAH CATEGORY
	EXISITNG					
1.	Rectified Sprite	Daily Receivers	72 m3 x 1No.	Liquid	4.25m dia x5.1m h	F, T
		Bulk Storage	460 m3 x 1No.	Liquid	8.6m dia x8.66mh	
2.	Extra Natural Alcohol	Daily Receivers	72 m3 x 3No.	Liquid	5.1m dia x4.2m h	F, T
		Bulk Storage	540 m3 x 2No.	Liquid	9.0m diax9.0m h	
3.	Technical Alcohol	Daily Receivers	33 m3 x 1No.	Liquid	3.78m x 3m	F, T
		Bulk Storage	128 m3 x1 No.	Liquid	4.7m x 7.52m	
4.	Fuel Oil	Storage Tank	25 m3 x 1No.	Liquid	2.9m x 3.8m	F
	PROPOSED					
1.	Rectified Sprite	Daily Receivers	72 m3 x 1No.	Liquid	4.25m dia x5.1m h	F, T
2.	Extra Natural Alcohol	Daily Receivers	72 m3 x 3No.	Liquid	5.1m dia x4.2m h	F, T
3.	Technical Alcohol	Daily Receivers	33 m3 x 1No.	Liquid	3.78m x 3m	F, T

Note:

1. Fire fighting system will be provided as per OISD 117 norms.
2. Third Party safety audit to find out probable unsafe condition/ cause & to take remedial action.

6.6.1 SAFETY PRECAUTIONS FOR THE STORAGE OF MATERIALS

Following precautions to be taken while storage of chemicals/products in tanks;

- The tanks to be located and marked in the designated area for the chemical storage.
- The tanks to be filled up to 90% of its capacity
- All tanks to be uniformly tagged.
- Level indicators in tanks to be provided.
- Industrial type electrical fittings to be provided.
- Electrical installation to be of flame proof type.
- Safe working place to be provided in between all tanks/equipments.
- Proper colour coding to be done to all pipe lines.
- Fire fighting equipments as per OISD 117 norms to be provided.
- Anti corrosive painting to be done.
- No smoking board to be displayed.
- Safety instruction board to be displayed.
- Standard Operating Procedure for the storage to be prepared.
- Proper earthing/bonding to be provided.
- Lightning arrestor should be provided.

Precautions for storage in drums or bags;

- Separately stored with proper enclosures, marked and dyke wall, within premises in closed shed
- Proper ventilation to be provided
- Sufficient fire extinguishers and PPE to be provided
- Flame proof fittings to be provided
- Smoking to be prohibited

6.7 IDENTIFICATION OF HAZARDS

The first step in risk assessment is to identify the types of adverse health effects that can be caused by exposure to some agent in question, and to characterize the quality and weight of evidence supporting this identification.

6.7.1 MAJOR HAZARDS

M/s. Esveegee Breweries (P) Ltd. would be manufacturing Extra Neutral Alcohol & Ethanol, 120 KLPD and Absolute Alcohol 30 KLPD. With the nature of product, organization handles hazardous materials in the process. A **hazardous material** is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by virtue of its intrinsic property or through interaction with other factors.

The potential hazards associated with the distillery industry are primarily classified into:

Chemical Hazard:

a. Toxicity
b. Flammable
c. Explosive
d. Corrosive

Physical Hazard:

a. Noise
b. MSD
c. Illumination
d. Striking by and Striking against (Fall)
e. Electrical Hazard

6.7.1.1 SOURCE OF CHEMICAL HAZARD

ETHYL ALCOHOL

Ethanol, also called ethyl alcohol, pure alcohol, grain alcohol, or drinking alcohol, is a volatile, flammable, colorless liquid.

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION
Component: Ethyl Alcohol 95%
OSHA PEL: 1000 ppm (1900 mg/m³)
ACGIH TLV: 1000 ppm (1900 mg/m³)

FIRE AND EXPLOSION HAZARD DATA
Flash Point: 12.8°C TCC
Flammable (Explosive) Limits In Air (% By Volume): Lower 3.3; Upper 19.0
Auto ignition Temperature: 422°C
OSHA Class: 1B Flammable Liquid

HEALTH HAZARD DATA

ACGIH Threshold Limit Value: 1000 ppm (1900 mg/m³)
Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

SIGNS / SYMPTOMS OF EXPOSURE:

Acute: Exposure to ethyl alcohol vapors in excess of 1000 ppm in air may cause headache and irritation of the eyes, note and throat. Prolonged exposure may cause symptoms of alcohol intoxication, drowsiness, weakness, loss of appetite, and inability to concentrate. Exposure to very high concentrations may cause symptoms of alcohol intoxication, headache, drowsiness, tremors, fatigue, dizziness, and unconsciousness. Ingestion of 190 proof ethyl alcohol produces the typical effects of alcohol intoxication. Ingestion of very large doses can cause alcohol poisoning and death. Contact of liquid ethyl alcohol with the skin may cause drying and cracking due to defatting of the tissue.
Chronic: Repeated, prolonged skin contact can cause drying and cracking of the skin and possible dermatitis.
Medical Conditions Generally Aggravated By Exposure: Skin, eyes, liver, respiratory system, central nervous system.

ECOLOGICAL EFFECTS
Pure ethanol has demonstrated lethal concentrations for fish (rainbow trout) at 11,200 to 15,300 milligrams per liter (mg/L). Pure ethanol is expected to biodegrade rapidly and bioaccumulation or concentration in the food chain is not expected. However, the biodegradation may decrease the DO in surface water resulting in fish kills. Ethanol in water will create Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) which will lower DO levels.

SODIUM HYDROXIDE

Sodium hydroxide (NaOH), also known as lye and caustic soda, is a caustic metallic base

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Component: Caustic Soda
OSHA PEL: 2 mg/m^3
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
Decomposition Temperature:Not available.
Explosion Limits: Lower: Not available. Upper: Not available.
Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.

HEALTH HAZARD DATA

ACGIH Threshold Limit Value: 2 mg/m^3
Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

POTENTIAL HEALTH EFFECTS

Eye: Causes eye burns. May cause chemical conjunctivitis and corneal damage.
Skin: Causes skin burns. May cause deep, penetrating ulcers of the skin. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting.

ECOLOGICAL EFFECTS

Highly toxic to aquatic life. As a contaminant in surface water, the primary effect of sodium hydroxide would be to raise the pH. Not bioaccumulated.

SULFURIC ACID

Clear, colorless to dark brown, odourless, dense, oily liquid.

HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

Component: Sulfuric Acid, 52 - 100 %
Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)

Stability: Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.

HEALTH HAZARD DATA

ACGIH Threshold Limit Value: 0.2 mg/m^3 (T) (TWA) for sulfuric acid - A2, Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.
Primary Routes Of Exposure: Skin Contact; Skin absorption; Inhalation

POTENTIAL HEALTH EFFECTS

Inhalation: Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema,.
Ingestion: Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact: Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact: Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure: Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

ECOLOGICAL EFFECTS

Because sulfuric acid is a direct-acting toxicant, rather than a substance that causes toxic effects after being absorbed into the blood stream, bioavailability from different media is not an important issue for sulfur trioxide and sulfuric acid. Lethal doses for fish are 24.5 ppm/24 hour/bluegill/lethal/fresh water and 42.5 ppm/48 hour/prawn/lethal concentration 50% (LC50)/salt water. Sulfur is an important constituent of normal biomolecules. Food chain bioaccumulation is not an important issue for either sulfur trioxide or sulfuric acid. Once sulfuric acid enters the environment, the sulfur enters the natural sulfur cycle which is well defined.

Workers working in the company can expose directly or indirectly to above chemicals and also Carbon Dioxide produced during fermentation process. Concentration of these chemicals in work zone may increase than the Threshold Limit Values (TLV) / Permissible Exposure Levels as per ACGIH recommendation. To keep concentration of these chemicals within TLV/PEL, company has proposed following measures.

Engineering control: Close system to reduce exposure, mechanically sealed pump, dykes in the areas where likelihood of spillages and leakage is greatest, etc.

Administrative control: Regular monitoring of concentration, Proper handling, warning boards will be put up in areas where entry is restricted, Use of personal protective equipment.

M/s. Esveegee Breweries (P) Limited takes due care to overcome the hazard. The complete structure of the manufacturing area is painted with special type of anticorrosive paint. Good quality materials to be used for transferring corrosives. Regular thickness testing of equipment, pipelines etc. to be carried out to have the exact picture of effect of corrosion.
While hazards of other type along with safety measures, flood control measures and earthquake control measures are given in table-6.2, table-6.3 and table-6.4 respectively.

TABLE - 6.2 HAZARDS AND ITS CONTROL

Sr. No	Name of the possible hazard & emergency	It's source & reasons	It's effect on persons property & Environment	Place of effect	Control measures provided
1.	Fire	Transformer Transfer oil short circuit etc.	Electrical power failure Production hindrance Loss of transformer	Transformer near power control centre	* Fire Fighting Equipment's * Graved bed for oil spillage or soaking isolated fenced area * Lightening arrestor nearby * DG set for emergency power supply
2.	Fire & Toxic chemical spillage	Natural Disaster, Earthquakes, Lightening, war.	Production hindrance Trapping under debris, death Chemical burn Toxic chemical spillage	Whole factory & population nearby	* Hydrant system * First aid available * Smoking prohibited inside the factory * Security at all the time guarding important locations
3.	Fire & smoke	Fire in storage tank	Burns Storage tank catching fire Production hindrance	Tank farm area	* Adequate earthing Tanker unloading permit * Unauthorized person not allowed to enter * Breathing Apparatus for rescue operations * Alarm system for indicating unusual incidence

TABLE - 6.3 FLOOD CONTROL MEASURES

SR. NO.	HAZARD	SAFETY PRECAUTIONS	EMERGENCY CONTROL
1.	Electric shock	- All electric line cut off / switch off from main supply - Hand siren use to declare emergency - Shock proof hand gloves should be used if needed	Stop electric power Inform site main controller for outside help
2.	Slippery Surface	- Clean the working place - Keep away all persons at safe assembly points - Evacuate all persons through emergency exit door immediately	Start the emergency water tapping

TABLE - 6.4 EARTHQUAKE CONTROL MEASURES

SR.NO.	HAZARD	SAFETY PRECAUTIONS	EMERGENCY CONTROL
1.	Fire	- Minimum stock of Hazardous chemicals - Earthquake proof building	- Stop the leakage - Inform site main controller for outside help
2.	Mixing of incompatible chemicals	- Safe distance between chemicals - Dyke wall at all storage tank of chemicals	- Stop the leakage - Inform site main controller for outside help

6.8 PROCESS HAZARD AND SAFETY

Process Hazard Analysis

Process Hazard Analysis (PHA) is a method to evaluate and identify credible hazardous scenarios. PHA is a thorough, orderly, systematic approach for identifying, evaluating, and controlling the hazards of processes involving hazardous chemicals. Proposed hazardous process details of plant are given in following table-6.5.

TABLE - 6.5 PROCESS HAZARD AND ITS CONTROL

SR. NO.	PARTICULARS		CONTROL MEASURE
01	Name of the Process	Ethanol Distillation	- Skill Supervisor - Process Safety Information - Operating Procedures - Fire proof electricity fitting - Earthing Bonding - Proper MOC selection - Transportation of raw materials & intermediates through fix piping - Mechanical seal in all pumps and reactors - Process automation with safety lock
	Material involved in process	Ethanol	
	Location	Within Plant	
	Hazard details	Raising in Temperature VOCs emission	

Process Hazard Safety Management:

Process Safety Management is a new discipline covering all aspects of risk and involving the identification, assessment and control of hazards in process facilities. The hazards most commonly considered include fires, explosions and release of hazardous substances.

Process Safety Management System integrates all aspects of risks in a facility and puts them under the control of a management system. By establishing a heightened awareness of the safety impacts of technology, personnel and the management, the system provides a dynamic environment for continual improvement.

6.9 SAFETY PRECAUTIONS FOR HANDLING AND TRANSPORTATION OF MATERIALS

Following safety precautions to be taken for handling and transportation of materials;

- Proper earthing bonding
- Flam arrestor to be used
- Contact with skin and eyes to be avoided
- PPE to be used

6.9.1 SAFETY PRECAUTION FOR HANDLING AND TRANSPORTATION OF ALCOHOL

Grain alcohol, or drinking alcohol, is a volatile, flammable, colorless liquid. It burns with a smokeless blue flame that is not always visible in normal light. Mixtures of ethanol and water that contain more than about 50% ethanol are flammable and easily ignited. At room temperature, ethanol is stable.

ENA (96%Ethanol) produced to be stored in MS tanks in a cool, dry well-ventilated location. Tanks are to be bonded and grounded for transfers to avoid static sparks. Transfer of alcohol to be done using special flame proof pumps with CF8 grade make. The storage area is to be a smoke free zone. Use of non-sparking type tools and equipment, including explosion proof ventilation.

To prevent accidental release or leakage from tank following precaution to be taken;

- A visual external inspection according to a checklist that includes markings, valves, manhole and cover and paint condition
- Through external examination including corrosion, dents or mechanical damage, missing or loose bolts, required markings and frame & support are in acceptable condition.
- Nuts & bolts are of SS material. Valve colour coding & identification with periodical checking.
- The examination to be witnessed by third party competent person.
- Receiving storage tanks to be equipped with load cell arrangement and/or level monitoring device, this displays on line transfer.

6.10 FIREFIGHTING SYSTEM

Management to take into consideration fire prevention measures at the project planning and during plant commissioning stage to avoid any outbreak of fire. But looking to the hazardous nature of process and the product ENA that to be handled and processed, the chances of outbreak of fire cannot be totally refuted. Hence to avoid such a scenario, a well laid fire protection system confirming OISD norm 117 to be provided in the factory. List of proposed fire fighting equipments are given in table-6.6.

The ENA storage area has to be protected by hydrants system. A full flagged hydrant system (with hydrant lines and water spray system are to be provided covering storage areas and at different location within the premises. Water storage reservoir provided for hydrant system. Separate high capacity fire pumps preferably of CS for hydrant system.

Mobile/portable foam system will be provided for suppression of pool fire in ENA storage area. Mobile system includes foam producing unit mounted on wheels towed by a vehicle or self propelled. Foams are supplied through foam towers to the burning surface.

Manually operated sirens located at strategic points to be installed as fire alarm system in case of fire outbreak.

TABLE - 6.6 LIST OF PROPOSED FIRE FIGHTING EQUIPMENTS

SR.NO.	NAME OF EQUIPMENT	EXISITNG	PROPOSED	TOTAL
01.	ABC type fire extinguisher 5 Kgs.	11	9	20
02.	ACB type fire extinguisher 2 Kgs.	2	2	4
03.	Foam type fire extinguisher 50 Ltrs.	2	2	4
04.	CO_2 type fire extinguisher 4.5 Kgs.	4	4	8
05.	Hydrant Post	18	7	25
06.	10 liter Sand Bucket	20	20	40
08.	Hose Reel	2	4	6
09.	Trailer driven pump	-	1	1

6.11 SAFETY FEATURES AND EMERGENCY CAPABILITIES TO BE ADOPTED

6.11.1 OBJECTIVES OF EMERGENCY PROCEDURES

Measures those are required to be taken during emergency are co-ordination of activities with many departments/ services and outside resources.

The objective of the procedure is to define role of key personnel of different services during major emergency to be effectively utilized to:

1) Safeguard lives
2) Contains of incident and bring it under control
3) Minimize damage to property & neighboring environment
4) Rescue & treatment of casualties & evacuation of persons to safe areas
5) Identification of affected persons, information to relatives and extending necessary assistance.
6) Preservation of information, records etc. which helps in investigation
7) Welfare assistance to casualties
8) Providing relevant information to police, district authorities and news media
9) Mobilizing inside resources
10) Initiating and organizing evacuation of affected persons

Collecting latest status, other information and requirement

6.11.2 BASIS OF PLAN AND HANDLING OF EMERGENCY

1) It is not possible to envisage and detail every action, which should be taken during an emergency. The basic philosophy is to get key personnel of necessary discipline who have the knowledge and background to assess the situation and give directions as per the objectives as quickly as possible.
2) The plan identifies the services/departments required to combat emergencies and also identifies the key persons to discharge the duties.
3) Key personnel have been identified for emergencies and are responsible for providing necessary assistance.
4) Any outside assistance, which company to get, to be co-ordinate by the MAIN SITE CONTROLLER on duty.
5) Messages via telephones are restricted to key personnel only. This is required to keep the telephones free for key personnel to contact for necessary feed-back.
6) Senior person who arrives on scene is automatically incharge for the service group. He should not leave the site without entrusting the charge to his deputy. All the key personnel should be available at the main control room. All key personnel of other services to report to main site controller, whom to co- ordinate between various departments and outside agencies.

6.11.3 INFORMATION ABOUT EMERGENCY AND SUBSEQUENT ACTIONS

1) Any person noticing fire/explosion/re lease of hazardous gases should shout FIRE, FIRE or HELP, HELP and to activate the emergency bell
2) Inform respective control rooms
3) The Executive in-charge along with the concerned Dept. Head to immediately rush to the incidence site to assess and take immediate action required to control the source of incidence. They will also inform Security and Safety personnel to come to the place of disaster/emergency and assist them.
4) If he feels that the situation is likely to escalate and may lead to emergency will communicate following minimum information to all senior persons.
    a) Brief description of incident.
    b) Status & seriousness of the situation
    c) Actions immediately taken.
    d) Immediate assistance required.
    e) All key personnel of respective services, depending on nature of emergency will arrive at site to take charge of positions.

6.11.4 INSTRUCTIONS TO EMPLOYEES

The plan assumes certain discipline at site during emergency as given below;

1) Do not get panicky
2) Do not approach the scene of disaster as a spectator
3) Do not engage phones/ P.A. system unnecessarily
4) Non-essential personnel to gather at security gate after receiving instructions
5) Do not move here & there unnecessarily
6) Do not approach unnecessarily to get information or more inquiry
7) Remain at your working place unless called and be attentive to instructions
8) Ensure that all contract laborers working in the premises are immediately sent to main security gate. They will receive further instructions from main site controller

All non - essential staff members should gather at safe assembly point after assessing the wind direction (from the wind sock, stack of boiler chimney) and wait for further instructions which will be communicated through PA system or by other available means.

6.11.5 INSTRUCTIONS TO CONTRACTORS

The plan assumes certain discipline at site during emergencies as given below;

1) Do not get panicky
2) Do not approach the scene of disaster as a spectator
3) Do not engage phones/ P.A. system unnecessarily
4) Non-essential personnel to gather at security gate after receiving instructions
5) Do not move here & there unnecessarily.
6) Do not approach unnecessarily for information or more inquiry.
7) Remain at your working place unless called and be attentive to instructions
8) Ensure that all contract laborers working in the premises are immediately sent to main security gate. They will receive further instructions from main controller. All should gather at safe assembly points after assessing the wind direction (from the wind sock, stack of boiler chimney) and wait for further instructions which will be communicated through PA system or by other available means.
9) All fabricator contractors should ensure that all welding machines are switched off and all cylinders are closed before leaving the working area.
10) All civil contractors should be gathered at assembly points after declared emergency.

6.11.6 MITIGATION OF CONSEQUENCES DURING MAJOR ACCIDENT

No major hazard installation can ever be absolutely safe. Even if a hazard assessment has been carried out, if the hazards have been detected and appropriate measures have been taken, the possibility of an accident cannot be completely ruled out.

So safely systems provide measures, which can mitigate the consequences of accident or emergency situation.

Other measures for mitigating the consequences of an accident deal mainly with the response to Alcohol. In order to be able to initiate counter measures in the event of an accident, company to install various safety systems to mitigate the consequences during Major Accident are as under:

(1) Emergency Control members available round the clock in all plants
(2) ECC room with full equipped with Fire Fighting Equipment
(3) Fire Hydrant system with electric motor and D.G. Set and water reserved for fire fighting
(4) QRA to be done by competent party
(5) Alarm System and method of reporting / declaring emergency
(6) Regular rehearsal of emergency preparedness
(7) Training to all employees regarding emergency preparedness
(8) MSDS of all hazardous chemicals are available in safety department and in concerned department.

6.11.7 EMERGENCY CONTROL CENTRE WITH LIST OF EQUIPMENT AND ACCESSORIES

Safety Office in front of Operation Building will act as Emergency Control Center. It is equipped with all necessary accessories as mentioned below and also given in table-6.7.

(A) DOCUMENTS

- Site Plan
- Disaster Control Plan copy
- List of essential telephone numbers
- List Fire fighting equipment
- Shift Schedule of Emergency Control members

(B) PERSONAL PROTECTIVE EQUIPMENT

- B. A. Sets (Breathing Apparatus)
- Face Masks
- Hand gloves
- Gum boots
- Goggles
- Helmets
- Safety belts
- Aprons
- Fire proximity suit

(C) EQUIPMENT LIST

- Internal / External Telephone
- Portable alarm
- Torches
- Emergency Cupboard with necessary PPE
- Artificial Respirator
- Racer watches (STOP WATCH)
- Gas Detector Tube
- Static Charge Meter

TABLE - 6.7 EMERGENCY CONTROL CENTRE WITH LIST OF EQUIPMENT AND ACCESSORIES

SR. NO.	ITEMS KEPT IN CENTRE	PERSONS WHO WILL HANDLE / OPERATE THIS ITEMS
1.	Safety helmet	Security officer
2.	Safety hand gloves & shoes	
3.	Safety goggles	
4.	Self contained breathing apparatus	
5.	Gas mask with canister	
6.	Nose mask (dust)	
6.	Fire Extinguishers DCP (10 kg. Capacity) CO_2 (3.2 kg Capacity) Foam type	
7.	Fire hose with branches	
8.	Intercom	
9.	Emergency Siren Switch	
10.	First Aid Box	

6.12 RISK ASSESSMENT AND CONSEQUENCE ANALYSIS

In a plant handling hazardous chemicals, the main hazard arises due to storage, handling & use of these chemicals. If these chemicals are released into the atmosphere, they may cause damage due to resulting fires or vapour clouds.

Blast Overpressures depend upon the reactivity class of material and the amount of gas between two explosive limits.

Operating Parameters

Potential vapour release for the same material depends significantly on the operating conditions. Especially for any liquefied gas, the operating conditions are very critical to assess the damage potential. If we take up an example of ammonia, if it is stored at ambient temperature, say 30^{o}C, and then the vapour release potential of the inventory is much higher as compared to the case if it is stored at 0^{o}C.

Inventory

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard. Larger the inventory of a vessel or a system, larger the quantity of potential release. The potential vapour release (source strength) depends upon the quantity of liquid release, the properties of the materials and the operating conditions (pressure, temperature). If all these influencing parameters are combined into a matrix and vapour source strength estimated for each release case, a ranking should become a credible exercise.

Loss of Containment

Plant inventory can get discharged to Environment due to Loss of Containment. Certain features of materials to be handled at the plant need to the clearly understood to firstly list out all significant release cases and then to short list release scenarios for a detailed examination. Liquid release can be either instantaneous or continuous. Failure of a vessel leading to an instantaneous outflow assumes the sudden appearance of such a major crack that practically all of the contents above the crack to be released in a very short time. The more likely event is the case of liquid release from a hole in a pipe connected to the vessel. The flow rate will depend on the size of the hole as well as on the pressure, which was present, in front of the hole, prior to the accident. Such pressure is basically dependent on the pressure in the vessel. The vaporisation of released liquid depends on the vapour pressure and weather conditions. Such consideration and others have been kept in mind both during the initial listing as well as during the short listing procedure. In the study, Maximum Credible Loss accident methodology is to be used, therefore, the largest potential hazard inventories have been considered for consequence estimation.

6.12.1 RISK MATRIX

OBJECTIVE

- To establish and maintain a procedure to identify the occupational, health & safety hazards of all organizational activities, products and services.
- To identify three clauses of risks namely High risk, medium risk and low risk associated with the activities.
- The identification to include the activities of all contractors and facilities at the work place.
- To review the information periodically, introduction of new chemicals, products and services included.

PROCEDURE

The initial evaluation to consider the following:

- The concerned HOD to identify the entire task and their associated activities of the operations under his control, which may have an occupational health and safety hazards. These activities to include routine and non-routine activities, activities of contractors, and sub contractors activities at the facilities provided at the work place within the area of his control.
- The OH & S Hazards are reviewed arising out of normal condition of operation and abnormal condition of operations.
- This review to also include contain hazards likely lead to an emergent situation.
- Each of the OH & S Hazards and their impacts *are* identified and evaluated distinctly.
    1. Will the possible risk affect the human or not
    2. Will the possible risk affect the property or asset
    3. Does the risk invite the attention of regulatory authorities
    4. Will there be long term effect as permanent health Hazards or severe damage to the assets
    5. Does it involve Hazardous substance/process or machinery
    6. Does it arrive out of normal operation
    7. Does it arrive out of abnormal operation
- For every Yes assign the value by 1 and Zero if otherwise
- The evaluation scores to be totaled and if the total exceeds 3 and also if attracts attention of regulatory authorities those Hazards carried over to the format 'rating of OH & S Hazards'.

Identifying High risks

The Hazards are rated as per the probability and duration / detection of the hazards identified as HI and H2 respectively

- The rating score for probability (HI).

SR. NO	THE PROBABILITY OF THE EVENT	SCORE
1	Very high (1 in 100)	10
2	High (1 in 1000)	7
3	Possible (1 in 10000)	3
4	Remote (1 in 100000)	1

- The rating score for detection /duration (H2).

SR.NO	THE TIME FACTORS	SCORE
1	Very large > 24 Hrs	10
2	Large > 8 Hrs	7
3	Low > 1 Hr	3
4	Negligible Immediate	1

- **The impacts arising out of various Hazards are rated as per the severity of the impact on human (I1) on the aspects and properly (I2) and concern generated (13).**
- The rating score for impact (I1) for human.

SR.NO	THE IMPACT SEVERITY	SCORE
1	Death/Long- Term Health Afflictions	10
2	Long time hospitalization	7
3	Loss of man-days serious injury like fracture	3
4	small injury needing first aid- only	1

- The rating score for Impact on assets/property (I2),

SR.NO	THE IMPACT SEVERITY	SCORE
1	Replacement and long time loss	10
2	Repairable but needs long time/costly spares/ Depending on vendor	7
3	Repairable needs some time	3
4	Small damage repairable locally in short time	1

- The rating score for concern due to impact (I3).

SR.NO	THE IMPACT SEVERITY	SCORE
1	High concern authorities interference, Legal concern, Long production stoppage, Long delivery, loss of customers	10
2	Medium concern employees' mistrust, loss of products, Production hold up, etc.	7
3	Some concern of extra expenses, payable compensations, some delay in delivery etc.	3
4	Small concern of minor nature solution can be quick and at HOD level	1

- Overall rating for OH & S risk is calculated based on the formula

  (H1 + H2) X (11 + 12 + 13) = R

- The cut off scores of 'R' dividing the risk into three categories as high risk, medium risk and local risk are as below

176 and above	-	Hight risk
Above 60 & up to 175	-	Medium risk
60 & less than 60	-	Low risk

- The classifications are used for identification of methods to control the risk. Detail risk analysis and hazard management matrix is given in following table-6.8.

TABLE - 6.8 RISK ANALYSIS AND HAZARD MANAGEMENT MATRIX

SR NO	ACTIVITY/ AREA	CONDI-TION N/A/E	HAZARDS	IMPACT	S1	S2	S3	S4	S5	S6	S7	TOTAL	I.1	I.2	I.3	H.1	H.2	RISK FACTOR	CLASS OF RISK MEDIUM/ HIGH/LOW	SAFETY MEASURES
1.	Grain Loading unloading at Ware House	N	Occupational Hazard due to manual handling	Backache	1	0	0	1	0	0	1	3	3	3	1	3	3	42	Low	Platform to avoid improper posture
2.	Grain Storage in Silos	E	Suffocation due to drowning	Fatal	1	0	0	0	0	0	1	2	10	1	10	1	1	42	Low	Guard rail to avoid Human entry; work permit system
3.	Grain Milling section	N	Noise exposure	NIHL	1	0	0	1	0	0	0	2	10	0	3	3	3	78	Medium	Hearing conservation programme
		A	Contact with rotating portion, Fall hazard	Cut injury, Fatal	1	0	0	1	0	0	1	3	3	1	3	1	1	14	Medium	Guard, PPE, Emergency switch
4.	Flour handling	N	Inhalation of flour dust	respiratory problem	1	0	0	1	0	0	0	2	3	0	3	1	1	12	Low	Ventilation, PPE
		A	Contact with nipping point of conveyor	Cut injury	1	0	0	1	0	0	1	3	3	1	7	1	1	22	Low	Top, Middle & toe guard, PPE, Emergency switch
5.	Slurry tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Water splash on body and Eye	Eye irritation	1	0	0	0	0	0	1	2	1	0	0	1	1	2	Low	Proper PPE provided
6.	Liquefaction tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Water splash on body and Eye	Eye Irritation	1	0	0	0	0	0	1		1	0	0	1	1	2	Low	Proper PPE provided
7.	Steam Jet cooker	N	Noise exposure	NIHL	1	0	0	1	0	0	0	2	10	0	3	3	3	78	Medium	Hearing conservation programme
		A	Change in Pressure and Temp.	Rupture	1	1	0	0	0	0	1	3	3	7	7	1	1	34	Low	OISD std, Alarm system for P and T, rupture disc
		E	High Pressure and Temp.	Rupture & Explode	1	1	1	0	0	0	1	4	7	10	10	1	1	54	Low	OISD std, Alarm system for P and T, rupture disc
8.	Retention Vessel	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Over flow of Slurry	Spill	0	1	0	0	0	0	1	2	1	1	1	1	1	6	Low	flow meter
9.	Flash tank	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
10.	Fermentation process	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Over flow of Slurry	Spill	0	1	0	0	0	0	1	2	1	1	1	1	1	6	Low	flow meter
		A	CO_2 Generation leading to asphyxiation	Fatal	1	0	1	1	1	0	1	5	10	7	3	3	7	120	Medium	Proposer Collection of CO_2 gas

SR NO	ACTIVITY/ AREA	CONDI-TION N/A/E	HAZARDS	IMPACT	S1	S2	S3	S4	S5	S6	S7	TOTAL	I.1	I.2	I.3	H.1	H.2	RISK FACTOR	CLASS OF RISK MEDIUM/ HIGH/LOW	SAFETY MEASURES
11.	Beer Well	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
12.	Cleaning process of fermentor	N	Caustic exposure in cleaning	Skin & Eye Irritation	1	0	0	1	0	0	0	2	1	0	1	1	3	8	Low	Proper PPE
13.	Distillation column	N	High Temperature	Heat Stroke	1	0	0	0	0	1	0	2	1	0	0	3	3	6	Low	OISD std, fire hydrant, Alarm system for P and T
		E	High Pressure	Explode or blast	1	1	1	1	1	0	1	6	7	10	10	1	1	54	Low	OISD std, fire hydrant, Alarm system for P and T
14.	Alcohol Transfer	N	Alc. Fugitive Emission	Skin & Eye Irritation	1	0	0	0	0	0	0	1	1	0	0	1	3	4	Low	Vent at height, leakage proof fittings, Earthing, PPE
		A	Alc. Spillage, Fire	Skin & Eye Irritation, Fire	1	1	0	0	0	0	1	3	3	0	0	1	3	12	Low	leakage proof fittings, Earthing, PPE
15.	Alcohol Bulk storage	N	Alc. Fugitive Emission	Skin & Eye Irritation	1	0	0	0	0	0	0	1	1	0	0	3	3	6	Low	Vent at height, leakage proof fittings, PPE
		A	Over flow of Storage	Spillage	1	1	0	0	0	0	1	3	1	3	1	1	1	10	Low	Over flow meter
		E	Fire	Burn injury production loss	1	1	1	0	0	0	1	4	3	10	7	1	3	80	Medium	Fire hydrant system, LEL-UEL detector, Flame electrical fitting, isolated storage, OISD standard, License from PESO
16.	Alcohol transportation	N	---	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	---	---
		A	Fire due to spark	Burn injury production loss	1	1	1	0	0	0	1	4	3	3	7	3	3	78	Medium	HAZCHEM, training to Driver, vehicle maintenance, MSDS, Fire extinguisher , Contact detail of nearest Fire station on the route of transportation
17.	Generator Room	A	Electrical & fire due to open cable	Fatal	1	0	1	1	1	0	1	5	10	3	10	3	1	92	Medium	Cable Trench for cable laying, opening of cable going out from generator room will be closed with plaster of paris or fire retardant paint, Double earthling, Use of PPE
18.	Boiler House	N	Fire hazard due to coal handling	Burn injury and property loss	1	1	1	1	1	0	1	6	10	7	10	3	1	108	Medium	Wetting of coal through fog nozzle, Wet cleaning, Dust mask

6.12.2 DAMAGE CRITERIA

In consequence analysis, a number of calculation models to estimate the physical effects of an accident (spill of hazardous material) and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

a) Determination of the source strength parameters;

b) Determination of the consequential effects;

c) Determination of the damage or damage distances.

The basic physical effect models consist of the following.

Source strength parameters

* Calculation of the outflow of liquid, vapour or gas out of a vessel or a pipe, in case of rupture. Also two-phase outflow can be calculated.
* Calculation, in case of liquid outflow, of the instantaneous flash evaporation and of the dimensions of the remaining liquid pool.
* Calculation of the evaporation rate, as a function of volatility of the material, pool dimensions and wind velocity.
* Source strength equals pump capacities, etc. in some cases.

Consequential effects

* Dispersion of gaseous material in the atmosphere as a function of source strength, relative density of the gas, weather conditions and topographical situation of the surrounding area.
* Intensity of heat radiation [in kW/ m^2] due to a fire or a BLEVE, as a function of the distance to the source.
* Energy of vapour cloud explosions [in N/m^2], as a function of the distance to the distance of the exploding cloud.
* Concentration of gaseous material in the atmosphere, due to the dispersion of evaporated chemical. The latter can be either explosive or toxic.

It may be obvious, that the types of models that must be used in a specific risk study strongly depend upon the type of material involved:

- Gas, vapour, liquid, solid
- Inflammable, explosive, toxic, toxic combustion products
- Stored at high/low temperatures or pressure
- Controlled outflow (pump capacity) or catastrophic failure?

Selection of Damage Criteria

The damage criteria give the relation between extent of the physical effects (exposure) and the percentage of the people that will be killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. For instance, much more is known about the damage caused by heat radiation, than about the damage due to toxic exposure, and for these toxic effects, the knowledge differs strongly between different materials.
In Consequence Analysis studies, in principle three types of exposure to hazardous effects are distinguished:

1. Heat radiation, from a jet, pool fire, a flash fire or a BLEVE.
2. Explosion
3. Toxic effects, from toxic materials or toxic combustion products.

In the next three paragraphs, the chosen damage criteria are given and explained.

Heat Radiation

The consequence caused by exposure to heat radiation is a function of:

- The radiation energy onto the human body [kW/m^2];
- The exposure duration [sec];
- The protection of the skin tissue (clothed or naked body).
- The limits for 1% of the exposed people to be killed due to heat radiation, and for second-degree burns are given in the table herein:

Damages to Human Life Due to Heat Radiation

Exposure Duration	Radiation for 1% lethality (kW/m^2)	Radiation for 2nd degree burns(kW/m^2)	Radiation for first degree burns, (kW/m^2)
10 Sec	21.2	16	12.5
30 Sec	9.3	7.0	4.0

Since in practical situations, only the employees will be exposed to heat radiation in case of a fire, it is reasonable to assume the protection by clothing. It can be assumed that people would be able to find a cover or a shield against thermal radiation in 10 sec. time. Furthermore, 100% lethality may be assumed for all people suffering from direct contact with flames, such as the pool fire, a flash fire or a jet flame. The effects due to relatively lesser incident radiation intensity are given below.

Effects Due To Incident Radiation Intensity

INCIDENT RADIATION – kW/m^2	TYPE OF DAMAGE
0.7	Equivalent to Solar Radiation
1.6	No discomfort for long exposure
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burns are likely)
9.5	Pain threshold reached after 8 sec. second degree burns after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.

Explosion

In case of vapour cloud explosion, two physical effects may occur:

* A flash fire over the whole length of the explosive gas cloud;
* A blast wave, with typical peak overpressures circular around ignition source.

As explained above, 100% lethality is assumed for all people who are present within the cloud proper.

For the blast wave, the lethality criterion is based on:

* A peak overpressure of 0.1 bar will cause serious damage to 10% of the housing/structures.
* Falling fragments will kill one of each eight persons in the destroyed buildings.

The following damage criteria may be distinguished with respect to the peak overpressures resulting from a blast wave:

Damage Due To Overpressures

PEAK OVERPRESSURE	DAMAGE TYPE
0.83 bar	Total Destruction
0.30 bar	Heavy Damage
0.10 bar 0.03 bar	Moderate Damage Significant Damage
0.01 bar	Minor Damage

From this it may be concluded that p = 0.17 E+5 pa corresponds approximately with 1% lethality. Furthermore it is assumed that everyone inside an area in which the peak overpressure is greater than 0.17 E+5 pa will be wounded by mechanical damage. For the gas cloud explosion this will be inside a circle with the ignition source as its centre.

Intoxication

The consequences from inhalation of a toxic vapour/gas are determined by the toxic dose.
This dose D is basically determined by:

- Concentration of the vapour in air;
- Exposure duration.

Furthermore, of course, the breathing rates of the victim, as well as the specific toxic mechanism unto the metabolism play an important role.

The dose is defined as $D = C^n.t$, with:

C = concentration of the toxic vapour, in [ppm] or [mg/m^3];
t = exposure duration, in [sec] or [min];
n = exponent, mostly > 1.0; this exponent takes into account the fact that a high concentration over a short period results in more serious injury than a low concentration over a relatively longer period of exposure. The value of n should be greater than zero but less than 5.

The given definition for D only holds if the concentration is more or less constant over the exposure time; this may be the case for a (semi) continuous source. In case of an instantaneous source, the concentration varies with time; the dose D must be calculated with an integral equation:

$$D = \int C^n.dt$$

For a number of toxic materials, so-called Vulnerability Models (V.M.) have been developed. The general equation for a V.M. (probit function) is:

$$Pr = a + b.\ln (C^n.t), \text{ with}$$

Pr = probit number, being a representation of the percentage of people suffering a certain kind of damage, for instance lethality

Pr = 2.67 means 1% of the population;
Pr = 5.00 means 50% of the population;
a and b material dependent numbers;

$C^n.t$ = dose D, as explained above.

The values for a and b are mostly derived from experiments with animals; occasionally, however, also human toxicity factors have been derived from accidents in past. In case only animal experiments are available, the inhalation experiments with rats seem to be best applicable for predicting the damage to people from acute intoxication. Although much research in this field have been done over the past decades, only for a limited number of toxic materials consequence models have been developed. Often only quite scarce information is available to predict the damage from an acute toxic exposition. Data transformation from oral intoxication data to inhalation toxicity criteria is sometimes necessary. Generally, in safety evaluations pessimistic assumptions are applied in these transformation calculations. The calculated damage (distance) may be regarded as a maximum. For the purposes of a response to a major incident, the IDLH value level has been chosen for the 'wounded'criteria. This type of injury will require medical attention.

6.12.3 MAXIMUM CREDIBLE LOSS ACCIDENT SCENARIOS

A Maximum Credible Accident (MCA) can be characterised as the worst credible accident. In other words: an accident in an activity, resulting in the maximum consequence distance that is still believed to be possible. A MCA-analysis does not include a quantification of the probability of occurrence of the accident. Another aspect, in which the pessimistic approach of MCA studies appears, is the atmospheric condition that is used for dispersion calculations.

The Maximum Credible Loss (MCL) scenarios have been developed for the Facility. The MCL cases considered, attempt to include the worst "Credible" incidents- what constitutes a credible incident is always subjective. Nevertheless, guidelines have evolved over the years and based on basic engineering judgement, the cases have been found to be credible and modelling for assessing vulnerability zones is prepared accordingly. Only catastrophic cases have been considered and not partial or small failures (as is the case in Quantitative Risk Assessment where contributions from low frequency - high outcome effect as well as high frequency - low outcome events are distinguished). The objective of the study is emergency planning, hence only holistic & conservative assumptions are used for obvious reasons. Hence though the outcomes may look pessimistic, the planning for emergency concept should be borne in mind whilst interpreting the results.

6.12.4 SOFTWARE USED FOR CALCULATIONS

Aloha is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA can predict the rates at which chemical vapors may escape into the atmosphere from broken gas pipes, leaking tanks, and evaporating puddles. It can then predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.
ALOHA is an air dispersion model, which you can use as a tool for predicting the movement and dispersion of gases. It predicts pollutant concentrations downwind from the source of a spill, taking into consideration the physical characteristics of the spilled material. ALOHA also accounts for some of the physical characteristics of the release site, weather conditions, and the circumstances of the release. Like many computer programs, it can solve problems rapidly and provide results in a graphic, easy-to-use format. This can be helpful during an emergency response or planning for such a response.

6.12.5 SCENARIOS (VULNERABILITY AREA IDENTIFICATION)

Possible accident scenarios at M/s. Esveegee Breweries (P) Limited are given in following table-6.9.

TABLE - 6.9 POSSIBLE ACCIDENT SCENARIOS

SR. NO.	SHORT DESCRIPTION OF SCENARIO	CAPACITY OF THE TANK	TYPE OF RISK	PROBABILITY	SEVERITY	CONCENTRATION & DAMAGE DISTANCE FROM SOURCE (METERS)
1.	Rectified Spirit Bulk Storage tank	460 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
2.	Rectified Spirit Daily receivers tank	72 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m

SR. NO.	SHORT DESCRIPTION OF SCENARIO	CAPACITY OF THE TANK	TYPE OF RISK	PROBABILITY	SEVERITY	CONCENTRATION & DAMAGE DISTANCE FROM SOURCE (METERS)
3.	Extra Neutral Alcohol Bulk Storage tank	540 m3 x 2 No.	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
4.	Extra Neutral Alcohol Daily receivers tank	72 m3 x 3 No.	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m
5.	Technical Alcohol Bulk Storage tank	128 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 32 m
					2nd degree burns within 60 sec	5 kW/sq m 32 m to 45 m
6.	Technical Alcohol Daily Receivers tank	33 m3	Pool Fire	Very unlikely	Potentially lethal within 60 sec	10 kW/sq m < 19 m
					2nd degree burns within 60 sec	5 kW/sq m 19 m to 27 m

Note: To avoid such major accident hazard preventive and mitigation measures for the storage and handling of Alcohol to be taken.

FIGURE - 6.1 MCA SCENARIO: POOL FIRE OF 460 M3 BULK STORAGE TANK OF RECTIFIED SPIRIT

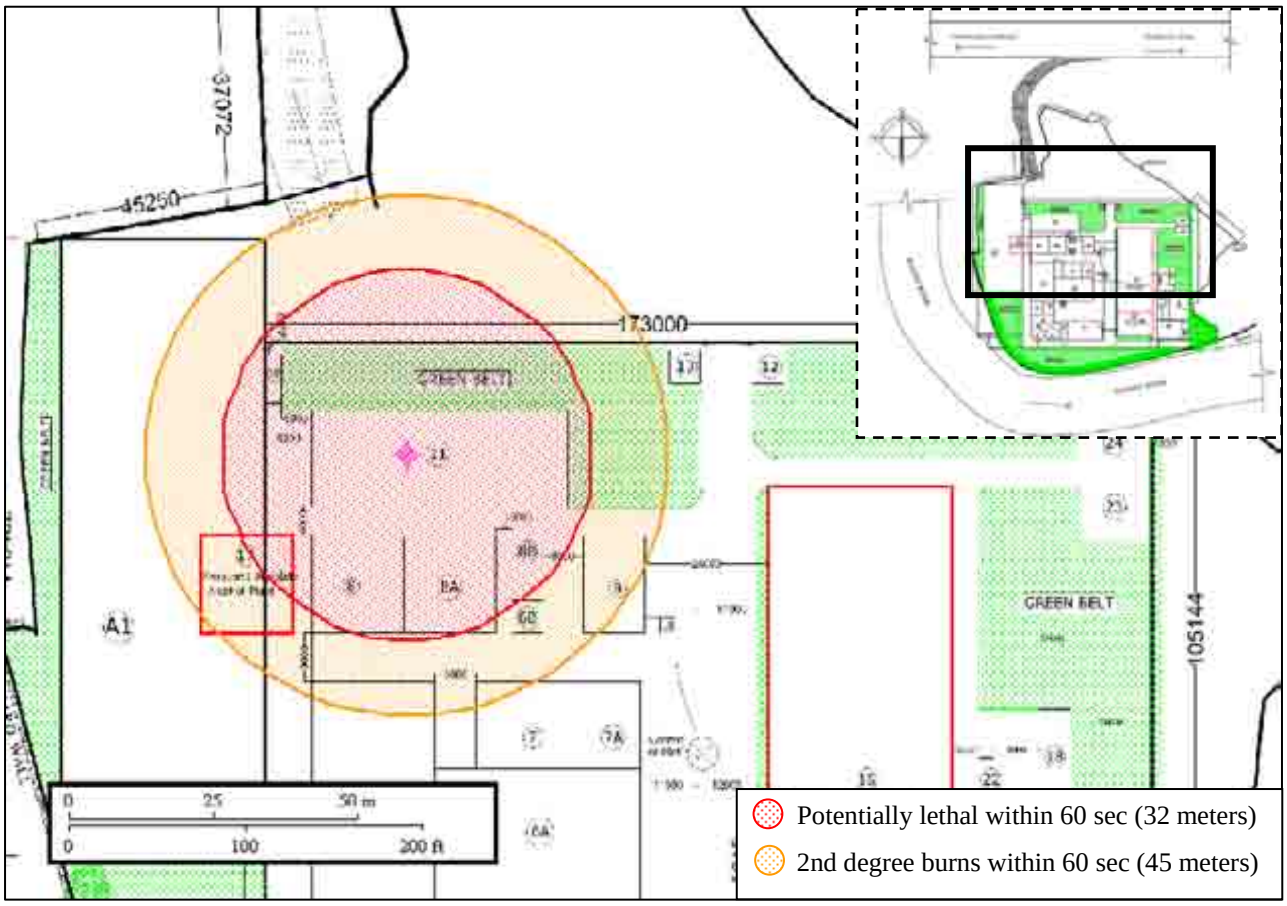


FIGURE - 6.2 MCA SCENARIO: POOL FIRE OF 72 M3 DAILY RECEIVERS TANK OF RECTIFIED SPIRIT

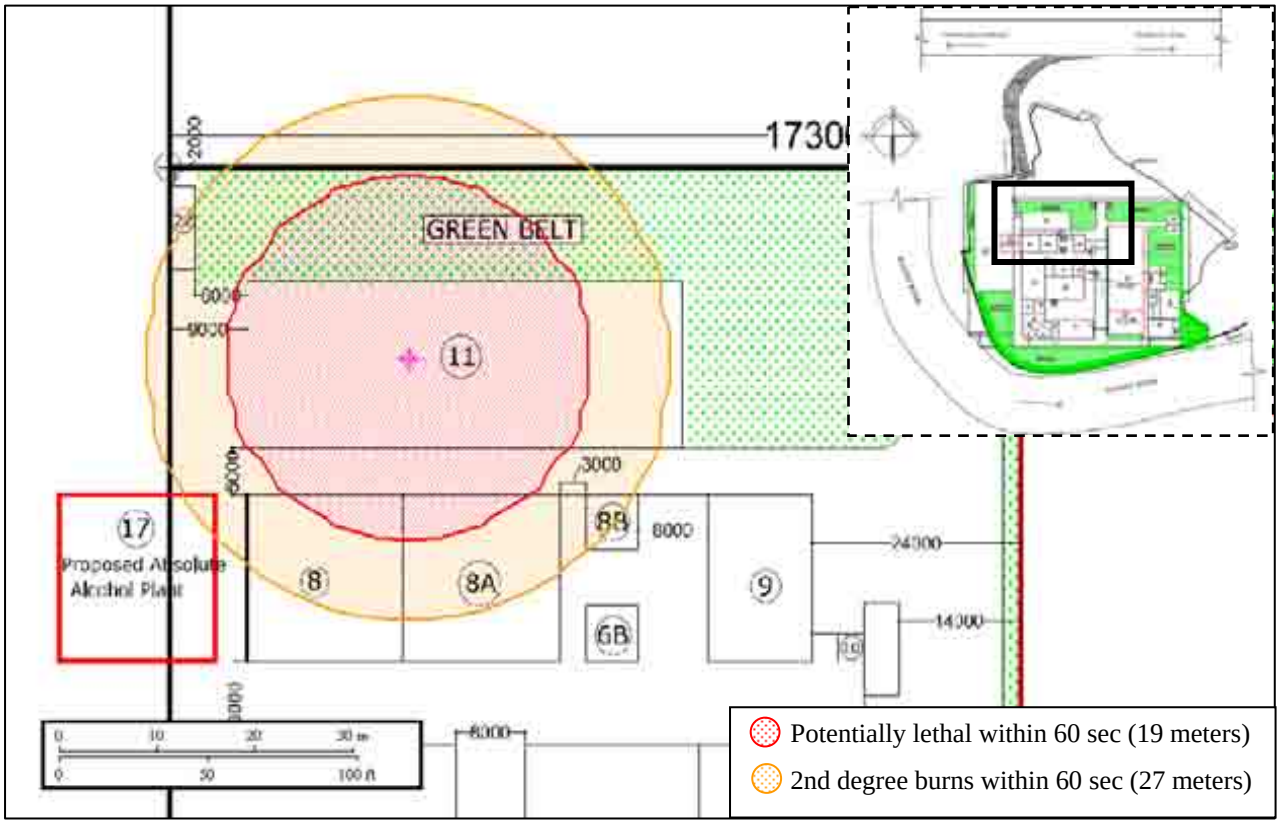


FIGURE - 6.3 MCA SCENARIO: POOL FIRE FOR 540 M3 BULK STORAGE TANK OF EXTRA NEUTRAL ALCOHOL

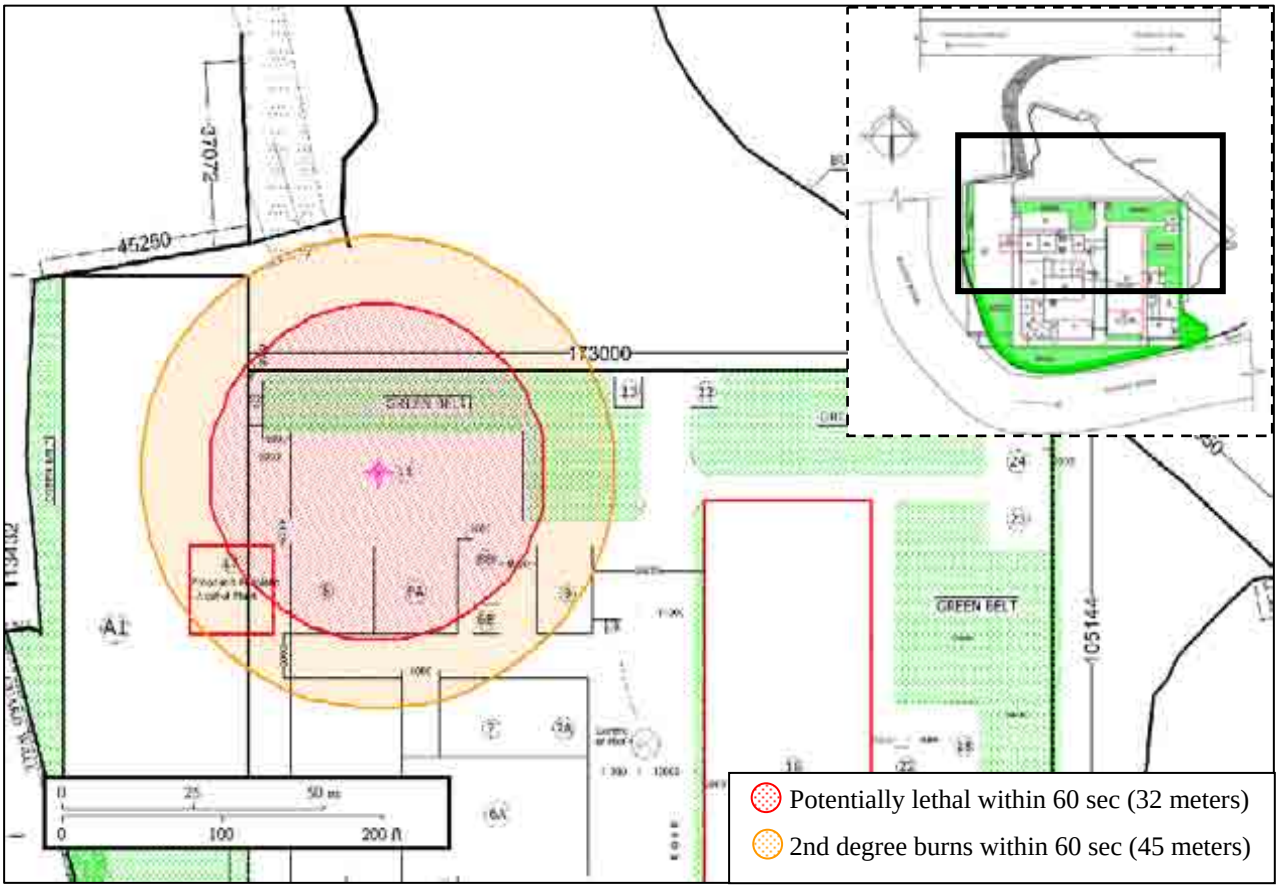


FIGURE - 6.4 MCA SCENARIO: POOL FIRE FOR 72 M3 DAILY RECEIVERS TANK OF EXTRA NEUTRAL ALCOHOL

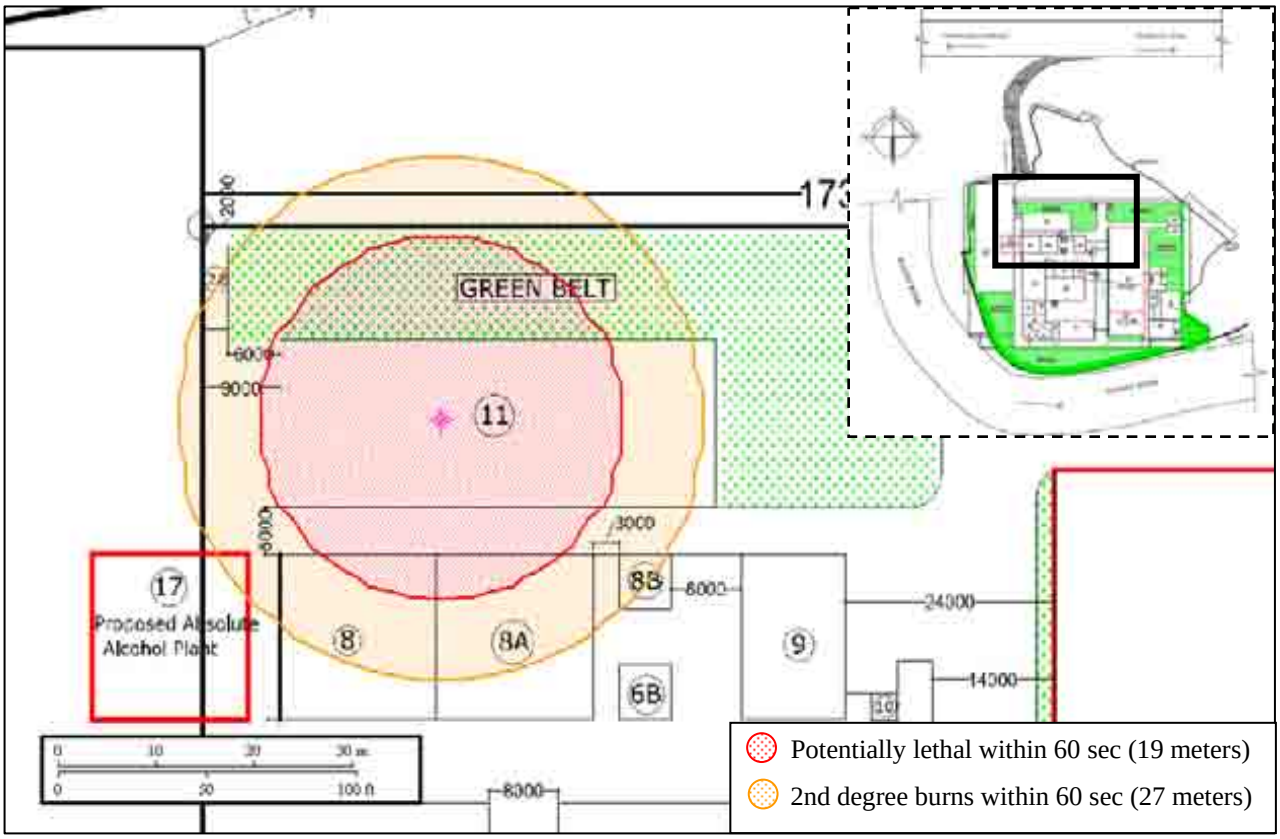


FIGURE - 6.5 MCA SCENARIO : POOL FIRE OF 128 M3 BULK STORAGE TANK OF TECHNICAL ALCOHOL

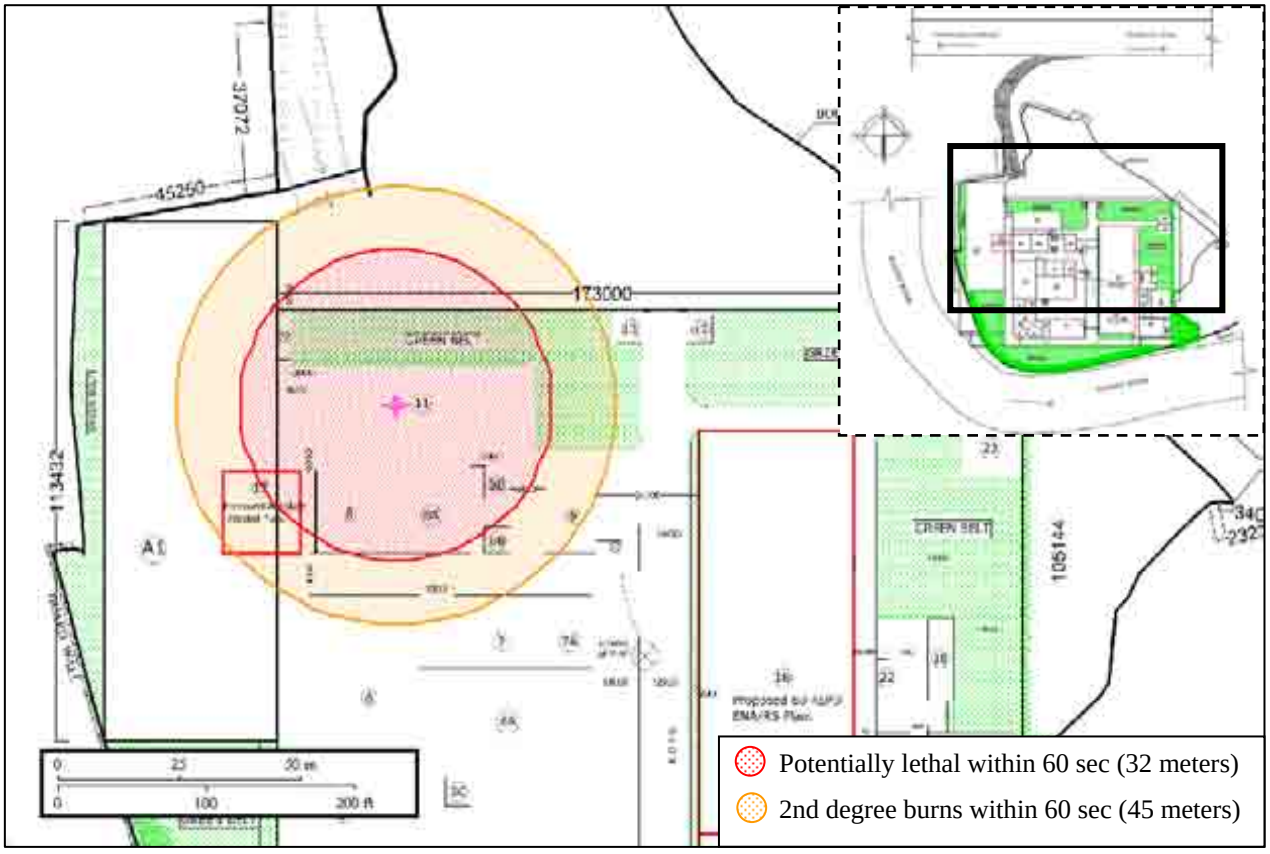
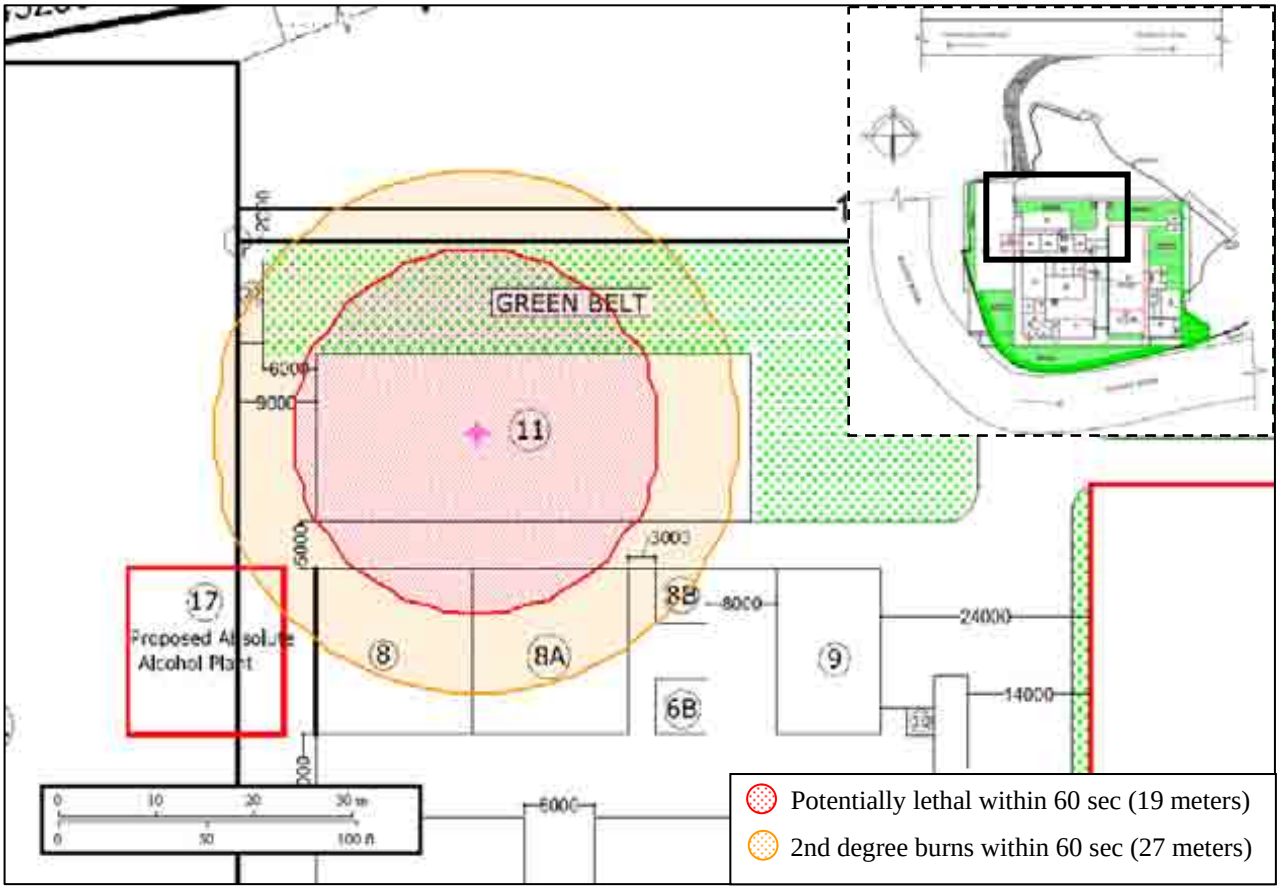


FIGURE - 6.6 MCA SCENARIO : POOL FIRE OF 33 M3 DAILY RECEIVERS TANK OF TECHNICAL ALCOHOL



6.12.6 RECOMMENDATIONS ON THE BASIS OF RISK ASSESSMENT DONE

- CO_2 detection system at fermentation section must be provided if CO_2 not collected.
- Top Guard rail, middle guard rail & Toe guard must be provided at all working platform including stair case to avoid fall of materials or person.
- Integrity of flam proof fitting must be check after every two years from competent agency.
- Cable trench must be provided to protect cables.
- Opening of the cable coming out from the generator room must be closed with Plaster of paris or fire retardant paint.
- PPE must be used to handle bush bar
- Double earthing must be provided.
- Fog nozzles must be used for wetting of coal to avoid fire.
- Wet cleaning must be practiced.
- Mask must be used during handling of coal to avoid health problem.
- Dyke must be provided to store carboys of acid & alkali.
- To avoid losses due to corrosion regular paining must be done.
- Capacity of fire water must be increase as per the calculation.
- Trailer driven pump with sufficient lent of hose pipe must be available for fire fighting,
- Water sprinkler to all the storage tank must be provided as per OISD 117 norms.
- Fix guard must be provided at all the rotating parts.
- Permit system must be implemented for Hot working, working at height(Distillation Colum and tank), working in confined area and tanker loading and unloading.

6.13 DISASTER MANAGEMENT PLAN

6.13.1 INFORMATION REGARDING KEY PERSONS AND THEIR RESPONSIBILITIES DURING EMERGENCY

6.13.1.1 SITE MAIN CONTROLLER

After getting information of emergency, the site main controller will rushed to the Emergency Control Center immediately.

1) On reaching he will assess the magnitude of the situation in consultation with Incident Controller and decide whether inside or outside help are to be called (i.e. Fire Service, Police, Ambulance etc.).
2) Ensure that key persons are called in.
3) Give guidance and direction in vital and important activities to control the emergency situation.
4) Direct to close down and evacuation of the plants in consultation with Incident controller and key personnel.
5) If necessary arrange for evacuation of neighboring population.
6) Inform the Government authorities such as Collector, MC, Factory Inspector, Health Officer & medical Officer and request them for their help as situation demands.
7) Give prime importance to human life and guidance in organizing the rescue operations as well as ensure whether injured people getting proper medical attention in time.
8) Always be in touch with the Incident Controller to get further progress and decide further plan.
9) On completion of emergency situation declare the normalcy through Administrative Officer.
10) Control the re-occupation of the affected areas on discontinuation of emergency.
11) Do not permit to re-start the plant unless it is safe.
12) Give authentic statement of the incident to News Media & Government Authorities.

6.13.1.2 INCIDENT CONTROLLER

1) Take the charge of situation and assess the magnitude of the event
2) Control and guide all the operations with priorities to the Safety of Personnel, minimize pollution, loss of material and loss to the plant equipment and property.
3) Provide advice and guide to the Fire Fighting and Rescuing squad and Fire Brigade while they arrive.
4) Establish communication with emergency control center.
5) Report on all significant developments to the emergency control center through phone/Messenger.
6) Ensure that evacuation of the areas in the factory getting affected is complete.
7) After the emergency situation is brought under control, assure that the necessary evidence for further investigation in the incident is preserved and inform Site Controller regarding control of emergency.

6.13.1.3 TECHNICAL STAFF / DEPARTMENT HEAD

1) As soon as informed, rush to the spot and take charge of the situation till senior group arrives.
2) Ensure that emergency siren is raised which gives information to Security, Safety, Administration Staff and Technical Staff.
3) On arrival of Incident Controller, inform him about the gravity of the situation and then to work under his guidance to control the situation.
4) Ensure that only experienced and essential people remains at the location for controlling, while others to be evacuated from the scene.

6.13.1.4 EMPLOYEES NEAR THE SPOT (INCIDENT AREA)

The employees near affected area, under the guidance of the **Incident Controller** to

1) Tackle the emergency as per laid down procedures for the area bearing in mind the requirements of the situation called for by the progress of the emergency.
2) Remove all non-essential employees (who are not assigned any emergency duty) to evacuate the area and gather at the specified assembly points.
3) Stop the operations as per the information of the Incident Controller.

6.13.1.5 EMPLOYEES OF OTHER DEPARTMENTS

1) On getting information of incident, take permission of superior and confirm own plant, department, safety and then after trained and skill persons will rush to incident spot with necessary personnel protective equipment.
2) Approach the spot from up wind direction and assemble at safe place near to the spot taking in to consideration the wind direction.
3) Extend help to control the situation as per the instruction and guidance given by the senior persons controlling the operation.

6.13.1.6 PERSONNEL OFFICER

1) When emergency declared immediately rushed to emergency control center.
2) Basically he will work as a Liaison Officer and will stationed at emergency control center during emergency. He will work under the direction of Site Controller.
3) To ensure that the casualties receives adequate attention at first aid center, also ensure additional help if require from Government authorities or outside agencies.
4) Arrange transport facility for injured personnel to get timely medical help.
5) He will also arrange for head count at assembly points and will inform Site Controller.
6) Also be in touch with the Security and Other Departments for help.
7) Will check the Roll call from Time Office for availability of trained personnel during emergency situation at the site.
8) Determine the need to inform statutory authorities of the accident and fill the necessary forms for submission with consultation of the Site Controller.
9) When emergency is prolonged, arrange for the relief of personnel as well as inform the families of injured persons and organize refreshments / catering facility.

6.13.1.7 ADMINISTRATIVE OFFICER

1) When emergency declared, immediately rushed to the emergency control center and establish contact with Site Main Controller.
2) Ensure the communication between site controller and incident controller. Keep messenger for communication.
3) Make arrangement to send portable megaphone and torches to the Incident Controller if required.
4) On receiving instructions from Site Controller, organize transportation for the evacuation of people from the assembly points.
5) As per instructions from Site Controller will inform to Head Office, Insurance Surveyor, other relevant authorities and neighboring areas.
6) On getting instructions from Site Controller / Incident Controller, he will be in touch with other Industries for help in emergency.
7) Will arrange to announce necessary instructions for all personnel.

8) Ensure that telephone operator keeps the EPABX free to extend possible for in coming calls.

9) Ensure that Press and other Media do not publish unauthentic news.

6.13.1.8 ENGINEERING SERVICES KEY PERSONNEL

1) When emergency declared, immediately proceed to Emergency Control Center.

2) Ensure the availability of electrical wiremen, utility, maintenance employees and drivers.

3) Ensure the water supply & electric power generator in case of power failure.

4) Be in touch with the Site controller / Incident Controller to extend help as and when required.

5) Ensure availability of Light Motor Vehicles as well as Fork Lifts, JCBs etc.

6) Arrange the vehicle as per required by Administrative / Personnel Officer.

6.13.1.9 SECURITY & FIRE IN-CHARGE

1) When emergency declared, ensure that the Fire man in the fire station and Security guards at the main gate are sufficient.

2) On getting instruction from Site Controller/Incident controller, cordon the affected area to maintain law and order.

3) As per instruction from Site Controller/ Incident controller, arrange to start the fire hydrant pump.

4) Ensure the following duties by Security Guards;

- Stop all vehicles and visitors entering into the factory, except any Government authorities such as Fire Brigade, Police, Factory Inspector, Medical Staff and inform the Administrative Officer on their arrival.
- If any press reporter and local Leader comes at the main gate, take them to the Administration Office.
- Do not allow any vehicle to park at the main gate or nearby at main road.
- Assure that the entrance of the gate is clear for thorough fare. In Similar way control/ guide internal traffic for smooth operations.
- Act according instructions given by Personnel and Administrative Officer.
- Ensure that all essential personnel evacuated and assembled at Assembly points.
- Arrange effective security nearby the incident place.

6.13.1.10 FIRST AID ATTENDANTS

1) As per the instructions given by the Incident Controller, arrange the supply of additional emergency related equipment to the incident place. Give necessary First Aid treatment to the affected persons immediately.

2) Inform the Personnel and Administration Officer regarding the severity of injury and advise for further medical help if necessary.

3) Ask for additional trained First-Aider, if required.

4) On arrival of Doctor, assist him to give medical treatment to the affected people.

6.13.1.11 SAFETY OFFICER

1) On hearing emergency siren rush to the spot and assume the position of incident controller and take care of the situation till a senior personnel arrives and on their arrival work with them in team, extending their own expertise.

2) Give instructions and guideline to the people involved in control measures. As well as help in providing required PPE

3) Give instructions to the safety attendants.
4) Brief the Site Main Controller about the progress of control measures.
5) Advise site controller regarding type of help required from outside.
6) Give instructions to other department through internal phones /Communication Officer.
7) Make arrangement to carry out monitoring whenever necessary and appraise results to the concerned seniors

6.13.1.12 ESSENTIAL EMPLOYEES AND THEIRS DUTIES

[A] Fireman :

1) On getting information, check the water level in emergency tanks and overhead /under ground storage tanks. Maintain the emergency tank water level to its fullest capacity.
2) Start fire hydrant pump as per the instruction from Security & Fire incharge.
3) Ensure continuous water supply to the incident place.
4) Do not leave the Fire Hydrant pump house till further instruction

[B] Driver :

1) On getting information from Communication Officer remain alert and wait for further instructions along with Ambulance van to meet with emergency.
2) Extend help to shift the injured people from site of incident to First-Aid and if required to hospital through Ambulance / Other vehicle.
3) For material handling take Fork-lift / JCB to the spot if required.

[C] Electrical / Utility Personnel:

1) After getting the information rush to the spot with necessary personal protective equipment and if instructed by incident controller cut off the power supply to the affected area.
2) Ensure that the D.G. Set is in running condition.
3) Extend help to the Utility Operator in maintaining adequate supply of water and others under guidance of Supervisors.
4) Water in water hydrant storage tank is in full capacity or not

6.13.2 EMERGENCY ORGANIZATION FOR IDLE HOURS

1. Security:-

i) After getting information through emergency hooter inform at least two senior persons at their residence by telephone/messenger.
   (a) Site controller
   (b) Safety Officer
   (c) Incident controller.
   (d) Technical Staff/Senior Staff

ii) Assure that the front side of the gate is clear for thoroughfare.

iii) Act according to the instructions of Incident Controller/Senior Officers

iv) Inform Emergency Control Center for emergency.

2. Safety/First Aid Attendant:
One attendant remains present around the clock.

Duties:

1) On hearing emergency hooter does not leave the Occupational Health Center.
2) As per the instructions given by the person In charge of the emergency operation or Incident Controller arrange the supply of additional emergency safety equipment to incident place.
3) Give necessary first aid to the affected person immediately. Inform the site controller about the severity of the Injury and advice for further medical help if required. On arrival of doctor, assist him for medical treatment offered to the affected people.

6.13.3 LIST OF IMPORTANT AUTHORITIES WITH THEIR ROLE IN EMERGENCY AND TELEPHONE NUMBERS

List of important authorities with their role in emergency and telephone numbers will be prepared and placed wherever required.

6.13.4 INFORMATION ABOUT EXTERNAL COMMUNICATION SYSTEM

(1) Communication will be through Emergency Central Alarm System.

(2) Telephones: An EPABX unit will be installed to connect all departments internally. Company will also provide mobile connections to all important personnel at site.

(3) STD PHONE & FAX/TELEX: Will be provided at IMP places

(4) IN THE EVENT OF FAILURE OF TELEPHONE SYSTEM: Communication officer will arrange special messengers for communication Minimum one vehicle with driver/trained security personnel are available in the company premises round the clock.
We will communicate through our Administration department by our vehicle to nearby community.

6.13.5 ANNOUCEMENT SYSTEM DETAILS

During emergency it is necessary that the alarm should be heard by all employees wherever they work, for that speakers will be placed at various locations within plant.

6.13.6 OUT SIDE IMPORTANT ADDRESSES AND PHONE NUMBERS

List of Important addresses in the nearby area such as hospitals, ambulance services, fire fighting services, Government personnel (Municipal Commissioner, district collector, zilla panchayat, police station and emergency control services and their telephone numbers will be prepared and will be displayed outside emergency control room.

6.13.7 REHERSAL AND UPDATION OF PLAN

1) Every year mock drills will be organized. Shortfalls in actions observed during drill will be explained to participants and will be corrected accordingly.
2) Any shortcomings regarding On–Site Emergency Plan observed during such drills will be corrected and incorporated in On-Site Emergency Plan and same will be communicated to all.
3) The On-Site Emergency Plan will be updated after any significant development in factory or change in the law.

6.14 OCCUPATIONAL HEALTH HAZARD AND SAFETY PROGRAM

For handling hazardous chemicals and to take care of employees' health, company adopted a practice of preventive and predictive maintenance looking to the nature of hazardous chemicals being handled / processed. As Esveegee Breweries (P) Ltd. is a distillery unit, some occupational health hazard may result on Inhalation, Ingestion, Skin & eye absorption of chemicals. Some anticipated occupational health hazards are discussed in following sections.

6.14.1 PHYSICAL CONTAMINANT

Major sources of the exposure to physical and chemical contaminant are shown in subsequent section.

6.14.1.1 NOISE

SOURCES

Compressors, Fans, Blowers, Material handlers, Material movement and DG sets

EFFECTS

Hearing impairment, Hypertension, Ischemic heart disease, Annoyance, Sleep disturbance

ATTENUATION AND CONSERVATION

Tools for assessing noise levels A successful noise control program that focuses on engineering control of noise requires the institution of a hearing conservation plan and the use of proper monitoring equipment, surveys, maps, and modeling.

A thorough hearing conservation plan should be established where noise exposure exceeds a 85-dBA time weighted average for eight hours. A good program consists of the following components:

- Noise measurement and analysis;
- Engineering control of noise sources where feasible;
- Administrative controls and personal protection where noise control is not feasible;
- Audiometric testing;
- Employee training and education;
- Record keeping; and
- Evaluation

CONTROL MEASURES:

- Introducing good acoustic design for the new production line
- Adopting proper scheduling of construction activities
- Scheduling noisy activities during the daytime periods
- Operating well-maintained mechanical equipment on-site
- Ensuring that equipment that may be intermittent in use should be shut down between work periods or should be throttled down to a minimum
- Using personnel protection gear such as earplugs, muffs, etc.
- Controlling air-flow generated noise by adopting adequate sizing of inlet/outlet ducts
- Installing noise barriers around air blowers, pumps, and generators to reduce noise impacts at nearby receptors
- Devising and implementing a rigorous inspection and maintenance program applicable to equipment on-site

6.14.1.2 ERGONOMICS

Ergonomics is the term applied to the field that studies and designs the human-machine interface to prevent illness and injury and to improve work performance. It attempts to ensure that jobs and work tasks are designed to be compatible with the capabilities of the workers.

SOURCES:

Some physical agents play an important role in ergonomics such as Force, Acceleration and Thermal factors. Force is an "important causal agent in injuries from lifting. Other Important ergonomic considerations include work duration, repetition, contact stresses, postures, and psychosocial issues.

Work-Related Musculoskeletal Disorders

Work-related musculoskeletal disorders (MSDs) are an important occupational health problem that can be managed using an ergonomics health and safety program. The term musculoskeletal disorders refers to chronic muscle, tendon, and nerve disorders caused by repetitive exertions, rapid motions, high forces, contact stresses, extreme postures, vibration, and/or low temperatures. Other commonly used terms for work-related musculoskeletal disorders include cumulative trauma disorders (CTDs), repetitive motion illnesses (RMIs), and repetitive strain injuries (RSIs). Some of these disorders fit established diagnostic criteria such as carpal tunnel syndrome or tendinitis. Other musculoskeletal disorders may be manifested by nonspecific pain. Some transient discomfort is normal consequence of work and is unavoidable, but discomfort that persists from day to day or interferes with activities of work or daily living should not be considered an acceptable outcome of work.

Control Strategies

The incidence and severity of MSDs are best controlled by an integrated ergonomics program. Major program elements include:

- Recognition of the problem,
- Evaluation of suspected jobs for possible risk factors.
- Identification and evaluation of causative factors,
- Involvement of workers as fully informed active participants, and
- Appropriate health care for workers who have developed musculoskeletal disorders.

General programmatic controls should be implemented when risk of MSDs is recognized. These include:

- Education of workers, supervisors, engineers, and managers;
- Early reporting of symptoms by workers; and
- Ongoing surveillance and evaluation of injury, health and medical data, Job-specific controls are directed to individual jobs associated with MSDs. These include engineering controls and administrative controls. Personal protection may he appropriate under some limited circumstances.

CONTROL MEASURES:

Among engineering controls to eliminate or reduce risk factors from the job, the following may be considered:

- Using work, methods engineering, e.g., time study, motion analysis, to eliminate unnecessary motions and exertions.
- Using mechanical assists to eliminate or reduce exertions required to hold tools and work objects.
- Selecting for designing tools that reduce force requirements, reduce holding time, and improve postures.
- Providing user-adjustable workstations that reduce reaching and improve postures.
- Implementing quality control and maintenance programs that reduce unnecessary forces and exertions, especially associated with non value-added work.

Administrative controls reduce risk through reduction of exposure time and sharing the exposure among a larger group of workers. Examples include:

- Implementing work standards that permit workers to pause or stretch as necessary but at least once per hour.
- Re-allocating work assignments (e.g., using worker rotation or work enlargement) so that a worker does not spend an entire work shift per forming high-demand tasks.

Due to the complex nature of musculoskeletal disorders, there is no "one size fits all" approach to reducing the incidence and severity of cases. The following principles apply to selecting actions:

- Appropriate engineering and administrative controls will vary from industry to industry and company to company.
- Informed professional judgment is required to select the appropriate control measures.
- Work-related MSDS typically require periods of weeks to months for recovery. Control measures should be evaluated accordingly to determine their effectiveness.

6.14.1.3 HEAT STRESS

Aim is to maintain body core temperature within +1 °C of normal (37 °C). This core body temperature range can be exceeded under certain circumstances with selected populations, environmental and physiologic monitoring, and other controls.

Source:

High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; inadequate tolerance for hot workplaces; and insufficient water intake can all lead to heat stress; working near furnace area. Different ways of heat disorders, health effects & cure are given below in table-6.10.

TABLE - 6.10 DIFFERENT KINDS OF HEAT DISORDERS & HEALTH EFFECTS & CURE

S. NO.	DEFINITION	PRIMARY SIGNS AND SYMPTOMS	MEDICAL TREATMENT
1.	**Heat Stroke** - Most serious heat related disorder when the body's temperature regulation fails and body temperature rises to critical levels, It's a medical emergency may result in death	Confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature	Placed worker in a shady, cool area and the remove outer clothing; Provide the worker fluids (preferably water); circulate air to improve evaporative cooling
2.	**Heat Exhaustion** - Partly due to exhaustion; it is a result of the combination of excessive heat and dehydration	headache, nausea, dizziness, weakness, thirst, and giddiness; Fainting or heat collapse	Remove from the hot environment and give fluid replacement. Encourage getting adequate rest, and when possible, ice packs should be applied.
3.	**Heat Cramps** - Caused by performing hard physical labor in a hot environment.	electrolyte imbalance caused by sweating and are normally caused by the lack of water replenishment	Workers in hot environments drink water every 15 to 20 minutes and also drink carbohydrate-electrolyte replacement liquids
4.	**Heat Rashes** - the skin is persistently wetted by unevaporated sweat	a red cluster of pimples or small blisters mainly in neck and upper chest, in the groin, under the breasts, and in elbow creases	provide a cooler, less humid environment, powder may be used to increase comfort, avoid using ointments or creams

Administrative or work practice controls to offset heat effects:

- Provide accurate verbal and written instructions, **annual training programs**, and other information about heat stress
- **Acclimatize workers** by exposing them to work in a hot environment for progressively longer periods.
- **Replace fluids** by providing cool water or any cool liquid (except alcoholic and caffeinated beverages) to workers and encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area.
- **Reduce the physical demands** by reducing physical exertion such as excessive lifting, climbing, or digging with heavy objects. Use relief workers or assign extra workers, and minimize overexertion.
- **Provide recovery areas** such as air-conditioned enclosures and rooms and provide intermittent rest periods with water breaks.
- **Reschedule hot jobs** for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.
- **Monitor workers** who are at risk of heat stress, such as those wearing semi-permeable or impermeable clothing when the temperature exceeds 70°F, while working at high energy levels. Personal monitoring can be done by checking the heart rate, recovery heart rate, and oral temperature.

Lighting & illuminations are important portions for all industries. Sufficient light will be providing in and around proposed plant areas, Details of illuminations are given below in the following table-6.11.

TABLE - 6.11 ILLUMINATIONS

SR.NO.	LOCATION	ILLUMINATION BY	ILLUMINATION IN LUX
1.	Low roof buildings	Fluorescent tube lights	100-150/300(control rooms)
2.	Shops/ High roof building	HPSV lamps	100-150
3.	High color rendering required(low color distortion)	Metal halide lamp fittings	-
4.	Open yard and area illumination	HPSV flood light fittings	15-30

The use of energy saving. Power factor lamp fittings shall be preferred.

6.15 OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR THE PROJECT

Health hazards associated with the occupation are called occupational hazards. In chemical industry due to handling of toxic and hazardous chemicals there are possibilities of developing occupational diseases. Company carries out the following checks to curb the problem:

i. Pre - employment medical check up at the time of employment.
ii. Annual medical check-up for all employees.
iii. First aid training for to the employees.
iv. Monitoring of occupational hazards like noise, ventilation, chemical exposure to be carried out at frequent intervals, the records of which to be documented.

All precautionary measures should be taken to avoid foreseeable accidents like spillage, fire and explosion hazards and to minimize the effect of any such accident and to combat any emergency at site level. Some of the preventive safety measures to be taken to minimize the risk of accident with respect to Technical Safety, Organizational Safety and Personal Safety are listed below:

- The factory to take all reasonably practicable measures to minimize the risk of such accident in compliance with the legal obligation under the relevant safety.
- All building plans and installations to be as per relevant acts and duly approved by competent government authorities.
- Process and Equipment to be designed by qualified and experienced professionals and fabricated to applicable national / international codes with stage wise inspection.
- Hazardous processes to be operated by trained workers and to be looked after by qualified & experienced supervisors.
- Safety features such as fire extinguishers, fire hydrant system and suitable Personal Protective Equipment (PPE) to be provided. Regular operations and testing of fire hydrant system and fire extinguishers to be carried out.
- Suitable provisions for control of critical process / storage parameters within specified safe limits (use of pressure relief valves, rupture discs, safety valves, trip circuits, wherever necessary) to be done.
- Use of flameproof electrical equipment, flame arresters and breather valves to be done.
- Provision of Earthing and lighting arrestor to prevent electrical fires and explosions in flammable / explosive chemicals storage / processing areas to be done.
- Drums storing hazardous liquid chemicals to be place separately to confine any spillage and facilitate easy collection. Necessary separation distance to be maintained.
- Periodic inspection and testing of pressure vessels, equipment, machineries and equipment handling hazardous substances to be done.
- Training of workers and Staff to be given for fire fighting, work permit system, first aid, safe handling of hazardous chemicals and integrating safety, in all activities.
- Adequate scrubber system to be provided to control air pollution.
- Good housekeeping in factory premises to be ensured.
- Accident / Incident reporting system and information of employees about the same to be done for better awareness.
- Suitable notices / boards to be displayed at several locations indicating appropriate hazards warning as well as DOs and DON'Ts for ensuring operational and personal Safety for information of workers / staff and visitors.
- Details of the Evacuation plan to be distributed among the workers.

Personal Protective Equipment (PPE) like goggles, safety shoes, helmet, apron, earplugs, facemask & clothing to be provided to employees as per the job requirements. The company to prepare a comprehensive on - site emergency plan with well-defined responsibilities to face any eventuality caused under adverse circumstances and unforeseen reason.
Company to adequately install fire-fighting system in different sections of the plant.

Some of the safeties precautionary measures to be taken for manufacturing process are listed below:

- Safety Relief Valve, Rupture disk, temperature scanner, pressure indicator, and flow meter to be installed to vessel wherever required.
- Cooling / Chilling water circulation arrangement to be provided to avoid abrupt increase of pressure.
- Pressure controller at the process lines to be provided and vent to be connected with scrubber as per the requirement.
- PPE to be provided to workers during charging of various raw materials and exhaust ventilation lines to be provided as per requirement.
- Local Foam based fire extinguisher along with fire hydrant system to be installed.
- Necessary interlocking and alarm system to be installed wherever required.
- Gas detection system to be installed in the plant wherever required

6.16 INFORMATION OF ASSEMBLY POINTS

At the time of emergency, non - essential workers, casual workers, visitors and others are to be replaced to Assembly Points and separate in charge are nominated. No of assembly points and location are decided based on the layout of the plant.

In case of an emergency, the visitors, contract persons and factory employees will gather at nearby assembly point. Pre-designated persons will take their roll call. If needed, they can be evacuated easily through any gate in a short period as per instruction of site main controller.

MEDICAL AID SCHEME

For outside help, company authority will make a mutual understanding with the following authorities to extend their help whenever an emergency occurs;

(1) Doctors from Civil Hospital

(2) Police Station

(3) Fire Brigade

Time to time company has to inform/impart training to concerned employees for awareness about chemicals and its hazards and the precautionary measures on their part. An emergency guide will be provided to each employee, which gives guidance to him or her during an emergency.

CHAPTER – 7

PROJECT BENEFITS

7.1 PHYSICAL INFRASTRUCTURE

As the proposed project is an existing and expansion, all the major physical infrastructure development is already developed, which has improved the existing infrastructure scenario.

7.2 EMPLOYMENT OPPORTUNITIES

Skilled and unskilled manpower is needed which will be increased for the existing and proposed expansion project. For this project direct as well as indirect employment will generate which will improve the socio-economic status of the area.

The manpower requirement for the existing and proposed expansion project will generate some permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct / indirect employment opportunities and ancillary business development to some extent for the local population. This project is expected to create a beneficial impact on the local socio-economic environment.

The project will benefit the people living in the neighboring villages by giving preference to them in relation to direct employment associated with the various project activities. Construction and operation phase of the proposed expansion project will involve a certain number of laborers. There is a possibility that local people will be engaged for this purpose. The operation phase will involve a number of skilled and unskilled workers.

7.3 BENEFIT OF THE INDUSTRY

The required raw materials and skilled and unskilled laborers will be utilized maximum from the local area. The increasing industrial activity will boost the commercial and economical status of the locality, to some extent.

7.4 PUBLIC REVENUE AND EXPENDITURE

- Indirectly, this existing and proposed expansion project will help the Government by paying different taxes (sales tax, excise duty, etc) from time to time, which is a part of revenue and thus, will help in developing the area.
- Due to proposed project, the surrounding environment will not face any problem related to pollution because all kind of wastes will be handled properly.
- The area has well developed transportation routes. No alteration in transport routes will be required.

7.5 SOCIO-ECONOMIC DEVELOPMENT ACTIVITIES

An obligation, beyond that required by the law and economics, for a firm to pursue long term goals those are good for society.

The continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as that of the local community and society at large

Corporate Social Responsibility (CSR)

The Company shall continue to have among its objectives the promotion and growth of the national economy through increased productivity, effective utilization of material and manpower resources and continued application of modern scientific and managerial techniques, in keeping with the national aspiration; and the company shall continue to be mindful of its social and moral responsibilities to consumers, employees, shareholders, society and the local community.

Funds to the extent of Rs. 4 Crore shall be earmarked for CSR activities, this fund shall be utilized over a period of 5 years which is a 5% of the total project cost. After words Rs. 5.0 Lacs shall be utilized per annum as Recurring expenditure for CSR. Following activity given in table-7.1 shall be under taken a part of CSR.

TABLE – 7.1 PROPOSED CSR ACTIVITIES

SR. NO.	PARTICULARS	CSR ACTIVITIES	AMOUNT
A	**For Community Assets**		
1.	Development of Road	------	35 lacs
2.	Health Care Facility i.e.	Clinic, Hospital, Health Centre, etc.	45 lacs
3.	Educational Facility i.e.	Anganvadi, Schools, College, Training Centre, etc.	30 lacs
4.	Drinking Water facility i.e.	Tanks, water Purifying system, etc	80 lacs
5.	Village Infrastructure i.e.	Sanitation facilities, Street Light, Play Ground, Garden, Community Centre, etc.	20 lacs
B	**For Community Welfare**		
1.	Education development i.e.	Education Enrolment, Education Material Distribution, scholarship, Training to Teachers, Promote to 10^{th} and 12^{th} std. students, etc	55 lacs
2.	Health Care i.e.	Immunization Camp, General & specialization Camp, training & awareness, Mobile clinic Van, Facilities for drinking water like, R.O. Plant	50 lacs
3.	Sustainable livelihood i.e.	Training to rural woman for cottage industry, Job fair, Handicraft group, Self Help Group.	25 lacs
4.	Agricultural Initiative i.e.	Farmer Club, Training & awareness	25 lacs
5.	Community activities	Support to Village Cultural activities, Participate, Encouragement for sport, Disaster Support	10 lacs
6.	Other	Environmental awareness programmes, Making Charitable trust, foundations, Relief Societies, etc.	25 lacs

CHAPTER – 8

ENVIRONMENTAL MANAGEMENT PLAN

8.1 INTRODUCTION

Industrial development is associated with a few positive and negative impacts on the environment. The negative impacts should not hinder industrial development but they should be properly mitigated.

An environmental management plan (EMP) has been prepared for the proposed expansion, to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of this project on various environmental parameters. This plan will also facilitate monitoring of environmental parameters.

Preparation of EMP is required for the formulation, implementation and monitoring of environmental protection measure. EMP includes schemes for proper and scientific treatment and disposal mechanism for air, liquid and solid hazardous pollutants. Apart from this, green belt development, safety aspect of the workers, noise control, fire protection etc. are also included in it. The various components of the EMP are outlined in subsequent sections.

8.2 PURPOSE OF ENVIRONMENTAL MANAGEMENT PLAN

Various purposes of the environmental management plan are:

- To treat and dispose off all the pollutants viz. air, liquid, gaseous and solid waste so as to meet statutory requirements (Relevant Pollution Control Acts) with appropriate technology. It will help to reduce the adverse effect on human being as well as on environment due to the proposed activity.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote green-belt development.
- To encourage good working conditions for employees.
- To reduce fire and accident hazards.
- Budgeting and allocation of funds for environment management system.
- To adopt cleaner production technology and waste minimization program.

8.3 DETAILS OF ENVIRONMENTAL MANAGEMENT PLAN

8.3.1 DURING CONSTRUCTION PHASE

8.3.1.1 AIR ENVIRONMENT

Construction phase will be for a short period and hence the impacts will also be for a short and temporary period. During construction activities, mainly emission of dust and gases from movement of vehicles and construction activity is expected. However, following measures will be taken to reduce / contain such emissions:

- Preparation of paved internal movement roads will be taken up at the initial stage of civil construction work.
- Water will be sprinkled on loose top soil to prevent re-suspension of dust into ambient air due to movement of vehicles etc.
- Separate civil construction material storage yard will be created within the site and it will be enclosed.
- Possibility of raising green belt along with construction activity will also be explored.
- Transport vehicles and construction equipments / machineries will be properly maintained to reduce air emissions.
- Vehicles and equipments will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations.
- Exhaust vent of D.G. set will be kept at proper height to ensure quick dispersal of gaseous emissions.
- All construction workers will be provided appropriate PPEs like dust mask, ear plug, helmet, safety belt etc. and made to wear them during working hours.

8.3.1.2 WATER ENVIRONMENT

In existing scenario, water is sourced from surface water and/or ground water through existing bore well & for proposed scenario water source will be the same. Further, there will be no housing facilities at site for construction workers and hence a major source of impact on water environment will be avoided. Proper and sufficient sanitary facilities will be provided to construction workers to maintain all hygienic conditions at site. Furthermore, existing sanitary facilities shall be utilized. Storm water drains compatible with the local hydrological pattern of the area which will be provided to carry-off, any run-off or storm water from the premises. Care shall be taken during construction work and will not create any obstruction / dips in the topography which can lead to accumulation of water within premises leading to undesirable consequences like health and hygiene problems etc.

8.3.1.3 SOLID WASTE

Main solid waste generation during construction phase will be construction debris like rubble, brick bats, steel scrap, wooden scrap, sand, gravel etc. However, these materials are inert in nature and will not result into leaching of any substance or constituent.

These materials will be properly sorted and will be used within premises for filling of low lying areas. Wooden scrap, steel scrap will be given to scrap dealers.

On completion of civil work, all debris etc. will be completely removed from the site to avoid any incompatibility with future use.

8.3.1.4 NOISE ENVIRONMENT

Following measures are proposed during construction period to mitigate adverse impacts:

- Construction machinery and vehicles will undergo periodic maintenance to keep them in good working condition.
- All machineries to be used for construction purpose will be of highest standard of reputed make and compliance of noise pollution control norms by these equipments will be emphasized by company.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels will also be explored.
- All construction workers working in high noise areas will be provided appropriate PPEs like ear muffs and made to wear them during working hours.
- Possibility of raising green belt along with construction activity will also be explored so as to serve as a noise barrier.

8.3.1.5 LAND ENVIRONMENT

Following steps are proposed to take care of impact of construction activity on project land area:

- On completion of civil works, all debris etc. will be completely removed from site to avoid any incompatibility with future use.
- Other materials like paints, diesel etc. will be properly stored and handled to prevent any spillage on land.
- All the wastes will be stored at a designated site within the premises to prevent scattered discharge on land.

8.3.1.6 ECOLOGY

Proposed expansion activity will not involve any major trees cutting exercise so, there will be no major impact on ecology is anticipated. However, existing green belt will help to develop further more as proposed activity will be started.

8.3.1.7 SOCIO-ECONOMIC

As there will be no temporary housing colony for construction workers, neither socio - economic impact due to the same is envisaged.

Overall socio - economic effect of construction phase will be positive due to direct and indirect employment opportunity for the local livings. Local people from nearby villages of the surroundings from the site will be employed for construction work to the maximum extent possible.

8.3.2 DURING OPERATION PHASE

Operation phase of any industry being longer in duration and because of its potential to create continuous impacts is quite important from the impact point of view. Comprehensive and effective EMP has to be prepared and implemented to safe-guard environmental concerns during operation phase of any unit.

8.3.2.1 AIR ENVIRONMENT

The air pollutants in the plant may be classified broadly into particulate matter like dust, fumes etc. and gases like Sulphur dioxide, Nitrogen oxide etc. The measure to control the air pollution will ensure the ambient air quality standards as laid down by Central Pollution Control Board for industrial areas.

The system proposed for air pollution control will provide acceptable environment condition in the working areas and abate air pollution in the surrounding area of the plant. The technological equipment and processes have been selected with the above objectives. Depending on quality of emission from different sources, suitable air pollution control system will be provided. The chimney height will be as per CPCB norms to ensure ground level concentration of different pollutants within permissible limit.

Dust collection equipment such as fabric filter etc. will be adopted to remove particulate matter from gas streams. The pollutant itself will be collected through suction hoods, ducts etc.

Following measures are proposed to mitigate negative impact of operation phase of the project on the surrounding air environment:

- All transfer points will have bag filter attached to them to control and capture dust emission.
- Height of all the stacks will be as per statutory requirement. All the stacks will have stack monitoring facility (SMF) consisting of sampling port-hole, platform and access ladder.
- Adequate spares of critical components of dust collection systems will be kept to ensure trouble - free operations and continuous compliance to emission norms.
- A comprehensive plan for fugitive emission control based on CPCB guidelines will be followed.
- Transport vehicles will be properly maintained to reduce air emissions.
- Vehicles will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations.

8.3.2.2 CONTROL AND MONITORING OF SECONDARY FUGITIVE EMISSIONS

Fugitive emissions from the proposed expansion would be significant as there will be air pollution due to activities like material handling, transfer points of materials and movement of vehicles. These operations generate large quantity of dust. Specific instances of fugitive dust generation may include dust blown by wind from the raw-materials stockpile, dust caused by vehicular traffic etc, good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc., would considerably reduce fugitive dust.

For effective prevention and control of fugitive emissions, the **M/s**. **Essveejee Breweries Pvt. Ltd** has implemented following:

- Enclosures are provided for all the loading and unloading operations, if possible.
- All transfer points are fully enclosed.
- Airborne dust is controlled by sprinkling of water.
- Preventive measures are employed to minimize dust build up on road.
- Maintenance of air pollution control equipment is done regularly.
- All the workers are provided with the dust mask.
- Green belt will be developed around the plant to arrest the fugitive emissions.
- Regular training is given to the personnel operating and maintaining fugitive emissions control systems.

The fugitive emission will be monitored at following locations within plant area as per CPCB guidelines, details of such locations is given in following table-8.1.

TABLE - 8.1 LOCATION OF FUGITIVE EMISSION MONITORING

SR.NO.	AREA	Monitoring Location
1.	Raw material handling	Transfer points
2.	Product processing area	Process area

8.3.2.3 WATER ENVIRONMENT

- Total water requirement for the proposed expansion would be 1134 KLPD which will be sourced from surface water irrigation & flood control department (IFCD) and ground water through existing bore well. Water conservation measures shall be taken to optimize the fresh water requirement. Moreover, record of water consumption for different usages shall be maintained.
- Spent wash holding tank shall be provided having capacity of 5 day retention time with HDPE lining as per CPCB guidelines. Regular monitoring will be carried out of ground water around spent wash holding tank.
- Proper and sufficient sanitary facility will be provided to construction workers to maintain hygienic conditions at site. The sewage is treated in a common sewage treatment plant. While the purified water will be reused for the plant, the sewage sludge, which is an excellent fertilizer, shall be set out in the areas where reforestation is anticipated.
- Philosophy of maximum recycling and reuse of treated waste water within the plant will be adopted to minimize consumptive water requirements and to achieve "zero" effluent discharge from the plant.
- Adequate spares for effluent collection, handling, treatment and disposal system shall be maintained.
- Records of analysis results of treated and untreated wastewater should also be maintained.
- Record of the wastewater generation and recycle shall be maintained on printed logbook/computer.
- Proper housekeeping shall be adopted to prevent spillages and contaminated surface runoff going to storm water drains.

RAIN WATER HARVESTING SCHEME:

Rain Water Harvesting is a way to capture the rain water when it rains, store that water above ground or charge the underground and use it later.

There are a number of types of systems to harvest rainwater ranging from very simple to the complex industrial systems. Generally, rainwater is either harvested from the ground or from a roof. The rate at which water can be collected from either system is dependent on the plan area of the system, its efficiency, and the intensity of rainfall.

As the company will require continuous water, it would be withdrawn from ground. To compensate the ground water loss, it is proposed to recharge the water through rain water harvesting system.

For the proposed expansion project rain water harvesting will be done through roof top rainwater harvesting system. Considering total 6,246 sq. m. roof top area of the project, company can harvest approx 8,11,980 m^3 rain water. Harvested rain water will be either stored in underground water storage tanks and/or recharged through recharge pit.

Water Reservoir: Company has constructed one reservoir in the premises as the precaution measure of fire hazard.

Filter: Sand Filter will be used to remove suspended pollutants from the rainwater.

Recharge: After filtration, water will be recharged using percolation pit, filled with pebbles or brick and river sand and covered with perforated concrete slabs. Depth of recharge pit will be designed according to Water table of the area.

Storm Water Drainage Line: Channels will be installed wherever required to collect and transport rain water to the reservoir and percolation pit. Drainage will be semi-circular and will be made using Galvanized Iron sheet folded to required shapes. Drainages will be fixed using Iron Brackets.

8.3.2.4 NOISE ENVIRONMENT

Following precautionary measures will be adopted to control the noise level:

- Noise generating sources and their platforms will be maintained properly to minimize noise vibrations generated by them
- Personnel working near the noisy machines in different plant locations, will be provided with well designed ear muffs / plugs (effective noise reduction 10-15 dBA)
- Green belt will be developed to act as a noise barrier.
- Noise barriers / shields in the form of walls, beams will be provided around the units wherever found feasible
- Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs.

8.3.2.5 LAND ENVIRONMENT

Treated effluent is/will utilized for gardening/plantation after ensuring norms specified by pollution control board by which impact on soil and ground water will be insignificant.

8.3.2.6 SOLID WASTE

Solid wastes shall be generated in the form Distillers Wet Grains with Soluble (DWGS) and Dried Distillers Grains with Soluble (DDGS) from process and Fly ash from boiler. Following steps shall be taken;

- Dried Distillers Grains with Soluble (DDGS) will be used as cattle feed.
- Fly ash generated from boiler will be sold to the cement or brick manufacturer.
- Record of solid waste generation and disposal shall be maintained.
- All Necessary precaution shall be taken during handling, loading and unloading of solid waste.

There will be no major generation of hazardous waste from the project. A small quantity of used lubricating oil will be generated which will be properly stored and sell to MoEF authorized re-preprocessors. There will be no disposal of industrial effluent on land as small quantity of treated industrial effluent will be used plantation / gardening purpose and sewage waste water will be discharged through soak pit.

8.3.2.7 BIOLOGICAL ENVIRONMENT

8.3.2.7.1 GREEN BELT DEVELOPMENT

Green belt with properly selected plant species can serve as a useful buffer to contain the menace of pollution from the different sources. As a control measure of atmospheric pollution, as a barriers noise generated in the plant premises and to utilize the wastewater generated as treated effluent, it is recommended to develop vast green belt around the periphery of the plant, along the road side and other area available for the plantation. Total 15,870 sq. m. of land are earmarked in the layout plan for the development of green belt.

Guidelines for plantation

The plant species identified for greenbelt development shall be planted using pitting technique. The pit size will be either 45 cm x 45 cm x 45 cm or 60 cm x 60 cm x 60 cm. bigger pit size will be considered at marginal and poor quality soil. Soil used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45cm x 45 cm x 45 cm and 60 cm x 60 cm x 60 cm size pits respectively. The filling of soil should be completed at least 5-10 days before actual plantation. Healthy sapling of identified species should be planted in each pit with the commencement of monsoon. Provision for regular and liberal watering during the summer period during the commissioning stage of the plant will be arranged from the local available resources. The authorities responsible for plantation will also make adequate measures for the protection of the saplings.

While making choices of plant species for cultivation in green belts, weightage has been given to the natural native species, bio climatic condition, plants which can be grown as per normal horticultural practices. Plant species identified for greenbelt development, considering the bio-climatic and soil condition, are listed in table-8.2.

8.3.2.7.2 RECOMMENDED PLANTS FOR GREEN BELT DEVELOPMENT

Greenbelt is an effective mode of control of air pollution, where green plants form a surface capable of absorbing air pollutants and forming a sink of pollutants. Leaves with their vast area in a tree crown, sorbs pollutants on their surface, thus effectively reduce pollutant concentration in the ambient air. Often the adsorbed pollutants are incorporated in the metabolic pathway and the air is purified. Plants grown to function as pollution sink are collectively referred as greenbelts.

An important aspect of a greenbelt is that the plants are living organism with their varied tolerance limit towards the air pollutants. A green belt is effective as a pollutant sink only within the tolerance limit of constituent plants. Planting few, known pollutant sensitive species along with the tolerant species within a green belt however, do carry out an important function of indicator species

Apart from function as pollution sink, greenbelt would provide other benefit like aesthetic improvement of the area and providing suitable habitats for birds and animals.

8.3.2.7.3 SELECTION OF PLANTS FOR GREEN BELTS

The main limitation for plants to function as scavenger of pollutants are, plant's interaction to air pollutants, sensitivity to pollutants, climatic conditions and soil characteristics. While making choice of plants species for cultivation in green belts, due consideration has to be given to the natural factor of bio- climate. Xerophytes plants are not necessarily good for greenbelts; they with their sunken stomata can withstand pollution by avoidance but are poor absorber of pollutants.

Character of plants mainly considered for affecting absorption of pollutant gases and removal of dust particle are as follows.

FOR ABSORPTION OF GASES:

- Tolerance towards pollutants in question, at concentration, that are not too high to be instantaneously lethal
- Longer duration of foliage
- Freely exposed foliage
- Adequate height of crown
- Openness of foliage in canopy
- Big leaves(long and broad laminar surface)
- Large number of stomatal apertures

FOR REMOVAL OF SUSPENDED PARTICULAR MATTER

- Height and spread of crown.
- Leaves supported on firm petiole
- Abundance of surface on bark and foliage
- Roughness of bark
- Abundance of axillary hairs
- Hairs or scales on laminar surface
- Protected Stomata

TABLE-8.2 RECOMMENDED PLANT SPECIES FOR GREEN BELT DEVELOPMENT

PLANT SPECIES	HABIT	TOLERANCE LIMIT	STOMATAL INDEX	MODE OF REGENERATION
Acacia farnesina wild	Tree	T	--	seeds
Azadirachta indica	Tree	T	29.2	Seeds
Alstonianeriifolia D. Das	Tree	T	32.53	Cutting
Alstoniascholoris L. R.	Tree	T	29.09	Seeds and Cuttings
*Casearia**glomerata*Roxb.	Tree	T	9.93	Seeds
*Casearietomentesa**Roxb.*	Tree	T	21.2	Seeds
*Erythrinastricta**Roxb.*	Tree	T	**14.38**	Seeds /stem cutting
Erythrina variegate Roxb.	Tree	T	NA	Cuttings
Garuga floribunda Decne	Tree	T	23.32	stem cutting
Mangifera indica (Am)	Tree	T	30.77	Seeds/ grafting
Miliusaglobossa (D.C)	Tree	T	25.78	**Grafting**
Miliusamacrocarpa Hook	Tree	T	15.7	Cutting
*Syzygiumcumini*L. Skeel	Tree	T	19.2	Seeds
Syzygium spp.	Tree	T	18.4	Seeds
Zanthoxylumacanthopodium	Tree	T	29.81	Seeds /stem cutting
Zanthoxylumaramatum	Tree	T	27.8	Seeds /stem cutting

Note: T: Tolerant, NA =Not available

Highlighted species are most suitable for this locality, considering its terrain and other existing natural vegetative cover in the study area

Sources: CPCB (March, 2000) PROBES/75/1999-2000

8.3.2.7.4 PLANTATION ALONG ROAD SIDES

Automobiles are the source of pollution of gaseous and particulate pollutants. Component of green belt on road side hence should be with both absorbers of gases as well as of dust particles. The choice of plants for road side should include shrubs of height 1 to 1.5 meter and trees of 3-5 meter height. Medium sized trees, alternating with shrubs are ideal for sorption of particulates and gases, as the company is doing the same in existing plant. The budgetary plan is given in the table-8.3.

TABLE-8.3 BUDGETARY OUTLETS OF GREENBELT DEVELOPMENT FOR FIVE YEARS

SR. No.	YEAR	NO. OF PLANTS	BUDGET (RS. IN LAKHS)
1.	1st Year	1700	1,20,000
2.	2nd Year	1200	85,000
3.	3rd Year	800	42,000
4.	4th Year	500	35,000
5.	5th Year	300	18,000
TOTAL		**4,500**	**3,00,000**

8.3.2.8 SOCIO - ECONOMIC ENVIRONMENT

Management Plan for the socio-economic aspects can be prepared by managing all the other aspects like Air pollution, water pollution, Noise pollution, etc. when all pollutions will be managed properly, regular environment awareness programmes organization and maximize the possibility of employment to local people, provide educational facilities, improve health facilities and improve CSR activities then only socio-economic environment will be managed properly.

8.3.2.9 GENERAL CONSIDERATIONS

For good house keeping of the proposed expansion, following measures will be planned:

- Maintaining cleanliness of roads to prevent accumulation of dust and waste material.
- Inculcating positive attitude among employees for good house-keeping.
- Maintaining hygienic conditions in canteens, near drinking water source and toilets.

8.3.2.10 CONCEPT OF WASTE-MINIMISATION, RECYCLE/REUSE/RECOVER TECHNIQUES, ENERGY CONSERVATION, AND NATURAL RESOURCE CONSERVATION

Waste-minimisation: Process optimization by using latest technology equipment.

Recycle/reuse/recover: Wastewater generated from the process and other sources shall be reutilized in the process and or shall be used for gardening and green belt development after giving suitable treatment as explained in chapter2.
The solid waste generated from the process shall be dried and sold as cattle feed.
The boiler ash shall be sold to MoEF authorized cement or brick manufacturer.

Energy conservation: Reduction in usage of traditional light bulbs with Compact Fluorescent Lamps (CFLs) means reduction in usage of 1/4th of the total energy consumption. Usage of Solar energy at different locations in the plant like parking light, roadside light etc. will be explored.

Natural Resource Conservation: To conserve ground water rain water harvesting will be carried out to store rain water for future use and also to recharge ground water.

8.4 ENVIRONMENTAL MANAGEMENT CELL

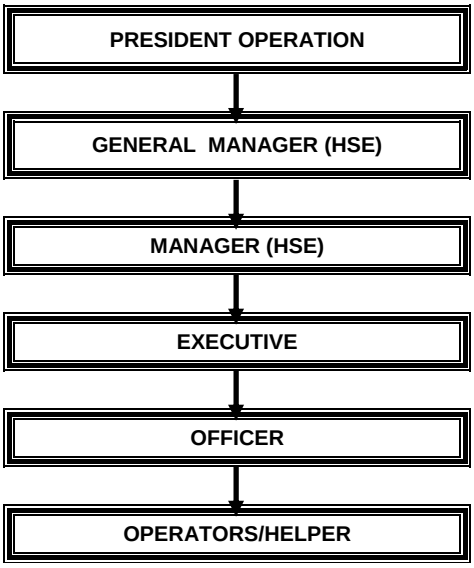
In addition to preparing an EMP, it is also necessary to have a permanent organizational set up to ensure its effective implementation. Hence, proposed expansion unit will create a team consisting of officers from various departments to co-ordinate the activities concerned with management for reporting of non compliance / violations of environmental norms and implementation of the environmental control measures. This team will undertake the activity of monitoring the stack emissions, ambient air quality, noise level, etc. either departmentally or by appointing external agencies wherever necessary. Regular monitoring of environmental parameters will be carried-out to find out any deterioration in environmental quality and also to take corrective steps, if required, through respective internal departments.

The Environmental Management Cell will also collect data about health of workers, green belt development etc. EMC will have qualified Industrial Hygienist, Safety Officer, Factory Medical Officer Employees for hazardous operations and monitoring of the occupational injury to works as well as impact on the worker. An organogram of the Environmental Management Cell is presented in figure-8.1.

The cell will also be responsible for monitoring of the plant safety and safety related systems which include:

- Checking of safety related operating conditions.
- Visual inspection of safety equipments.
- Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed.
- Other responsibilities of the cell will include followings:
- Conduct and submit annual Environmental Audit. A SPCB registered agency will be retained to generate the data in respect of air, water, noise, soil and meteorological data and prepare the Environmental Audit report. Timely renewal of Consolidated Consents & Authorization (CC & A) will also be taken care of.
- Submitting environmental monitoring report to SPCB. Data monitored by the cell will be submitted to the Board regularly and as per the requirement of SPCB. The cell will also take mitigative or corrective measures as required or suggested by the Board.
- Keeping the management updated on regular basis about the conclusions/results of monitoring activities and proposes measures to improve environment preservation and protection.
- Conducting regular safety drills and training programs to educate employees on safety practices. A qualified and experienced safety officer will be responsible for the identification of the hazardous conditions and unsafe acts of workers and advise on corrective actions, organize training programs and provide professional expert advice on various issues related to occupational safety and health.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

FIGURE-8.1 AN ORGANOGRAM OF ENVIRONMENT MANAGEMENT CELL



RESPONSIBILITIES:

President Operation: Site in-charge

General Manager (HSE): To assume Overall responsibility of all environmental/HSE issues

Manager (HSE): Monitor day to day activities

Executive/Officer: Monitoring shift operation

Opeartor/Helper: Operating the system duiring the shift

8.5 ENVIRONMENTAL POLICY

M/s. Esveegee Breweries (P) Limited has an environment policy approved by the Director which is attached as Annexure-XII. The standard Operating procedure will be prepared after implementation of the project.

8.6 REPORTING SYSTEM TO THE DIRECTORS

All the safety officers and HSE officers collect the Environment and safety compliance data and submit it to their respective Heads and then safety & HSE Heads submit a signed Environment and safety compliance report to the manager who submit it with his sign to the Directors. Any Environment related non compliances / violations / notices are taken as immediate action.

8.7 BUDGETORY PROVISIONS FOR EMP

Adequate budgetary provisions have been made by **M/s. Esveegee Breweries Pvt. Ltd.** Management for execution of environmental management plans. The details of capital and recurring (per annum) budget earmarked for pollution control / monitoring equipment; operation and maintenance of pollution control facilities, for greenbelt development and maintenance as given in table-8.4.

TABLE - 8.4 COST OF ENVIRONMENTAL PROTECTION MEASURES (RS. IN LAKHS)

SR. NO.	ITEM	RS. IN LAKHS EXISTING	RS. IN LAKHS PROPOSED
CAPITAL EXPENDITURE:			
1.	Waste water management System	484.00	750.00
2.	Air pollution control measures	50.00	123.00
3.	Solid waste management	10.00	15.00
4.	Noise pollution control measures	5.00	9.00
5.	Green belt development	1.00	3.00
	TOTAL COST OF ENVIRONMENTAL PROTECTION MEASURES	**550.00**	**900.00**
RECURRING EXPENDITURE PER ANNUM:			
6.	Recurring expenditure on environmental management cell and on pollution control systems	**42.00**	**55.00**

CHAPTER – 9

SUMMARY AND CONCLUSION

9.1 PROJECT DETAILS

Name of the company	M/s. Esveegee Breweries (P). Ltd.
Capacity of the project	Grain Based Distillery (ENA/RS 60 KLPD) and Expansion (ENA/RS 60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD) with Cogeneration Power Plant (3.5 MW).
Total project cost	Existing: Rs. 44.90 Crores, For proposed expansion: Rs. 79.50 Crores
Cost for EPCM	Existing: Rs. 5.5 Crores, For proposed expansion: Rs. 9.0 Crores
Cost for CSR activity	Rs. 4 Crores shall be utilized over a period of 5 years as 5% of project cost. After words Rs. 5.0 Lacs shall be utilized per annum as Recurring expenditure.

9.2 PROJECT REQUIREMENT:

Land requirement	Existing land area is 12 acres (4.80 ha). No new land will be acquired.
Water requirement & its source	Total 1134 KLPD water will be required after proposed expansion of existing project and will be sourced from surface water of Rangit River and/or ground water through.
Electricity requirement & its source	3.5 MW and shall be sourced from Proposed 3.5 MW Cogeneration Power Plant.
Manpower requirements	In existing 60 personnel are working additionally 30 no. of personnel will be employed. First preference will be given to local people as far as possible.
Fuel requirement & its source	Coal: 110 TPD for CPP and will be Source from Meghalaya. HSD: 120 lit/hr for D. G. Set, from nearest sources.
D.G. set for emergency use	Two D. G. Sets of 860 KVA Capacity for emergency purposes

9.2.1 WASTE WATER GENERATION

Entire waste water generated after proposed expansion project will be treated and reuse for the use of process, ash quenching and internal green belt development purposed to follow zero discharge concept.

9.2.2 AIR EMISSION & AIR POLLUTION CONTROL MEASURES

The air emission from the proposed expansion of the existing project would be the flue gas emission from, coal based boiler. To control air emission company will installed filter/ESP as a pollution control system with adequate stack height.

9.2.3 SOLID WASTE GENERATION & DISPOSAL:

All the solid waste i.e. Fly ash will be trapped, stored in open underground shed and utilized for brick manufacturing or sold to nearby Cement plant, DDGS/DWGS will be Use as cattle feed and spent oil will be reused in the plant for libration or sell to MoEF authorized reprocessors.

9.3 BASELINE ENVIRONMENT

The baseline environmental quality of Air, water, soil, noise, socioeconomic status and ecology has been assessed in the post-monsoon season (9th January to 8th April, 2013) in a study area of 10 km radial distance from the project site.

The ambient air quality monitoring was carried at eight locations to monitor PM_{10}, $PM_{2.5}$, SO_2, NOx & HC as Methane & HC as Non-Methane concentration, which are found well below the NAAQS of CPCB.

A no. of ground & surface water samples were collected from the study area. The result of the entire water sample collected shows that the water quality of the area is good. Values of the parameters found within the permissible limit of Indian standards/specifications for Drinking water IS: 10500-1991.

Background noise levels were measured at 8 locations. Noise levels found within norms at all the location.

Land use within 10 km radius of the study area has been determined with the help of satellite imagery, and broadly consists of settlements, Industrial land, Tank/River, land with scrub, land without scrub, mining area and predominant land use is Dense Mixed Jungle.

During the eco-biological study, endangered and endemic species is not observed in the stud area.

The study area consists of two States viz. Sikkim and West Bengal. The total population of the study area was as per 2,65,065 as per census 2001. All the villages were having almost all the infrastructure facilities like, educational, drinking, sanitation, health, etc.

9.4.1 ENVIRONMENTAL IMPACTS DURING CONSTRUCTION PHASE

During construction phase there will be minor impact of the air, water and noise due to the construction activities because more than half of the construction activity is already completed which will be mitigated through proper control system.

9.4.2 ENVIRONMENTAL IMPACT DURING OPERATION PHASE & MITIGATION MEASURES

Due to this proposed expansion project, there will be minor increment in the air pollution due to the fugitive dust emission and air emissions like, PM, SO_2 and NOx from boiler stack. Entire waste water generated from the process will be recycle and reuse for the process, ash quenching and internal green belt development to follow Zero discharge concept. During operation phase noise pollution will be increased nominal. Solid waste generated in the form of Fly ash and grain residue will be disposed as per guideline to reduce impact on soil environment.

9.5 ENVIRONMENTAL MONITORING PROGRAMME

A regular monitoring of the environment parameters like air, water, noise and soil, etc. will be carried out periodically as recommended.

9.6 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Funds to the extent of Rs. 4 Crores shall be earmarked for CSR activities, this fund shall be utilized over a period of 5 years. After words Rs. 5.0 Lacs shall be utilized per annum as Recurring expenditure for CSR.

9.7 ENVIRONMENTAL MANAGEMENT PLAN

The management team is very much concern about environmental issues. All the environmental components will be looked out by Environmental Management Cell (EMC). Mitigation of environmental impacts has to be implemented according to the suggestions and will be monitored regularly to prevent any lapse.

9.8 CONCLUSION

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. Industrial growth is an indication of socio economic development. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

CHAPTER – 10

CONSULTANT ENGAGED

Environmental Impact Assessment Study of the proposed expansion of distillery Plant of **M/s. Esveegee Breweries (P) Limited** conducted by,

Name	**:**	**M/s. Envision Enviro Engineers Pvt. Ltd.**
Address	**:**	**208, G-Tower, Shankheshwar Complex, Above Girish Group of Hospitals, Sagrampura, Surat-395 002, Gujarat.**
Phone	**:**	**(0261) 2470653, 2472374, 2473905**
Fax	**:**	**91-261-2478518**
E-mail	**:**	**eia@en-vision.in**
Website	**:**	**www.en-vision.in**
Status of accreditation with QCI/NABET	**:**	**Listed on S. No. 60 of List of Accredited EIA Consultant organizations – 157 (as on May 5, 2013)**

M/s. En-vision Enviro Engineers Pvt. Ltd. (ISO 9001:2008 certified company) is a consulting, engineering and equipment supplier firm delivering exceptional service and quality to public and private clients in India. En-vision is working with zeal in the field of environmental engineering for more than 15 years. En-vision has a vision of supporting and being a part of development that is sustainable to our environment.

En-vision is one of the leading companies as Environmental Consultants providing the EIA study required for Environmental Clearance from MoEF/DoEF and NOC (Consent to establish), CCA (Consent to Operate) from Pollution Control Board. En-vision has a well established laboratory with environmental monitoring and analysis of environmental parameters (Air & Water monitoring, Waste Water analysis, Stack analysis).

En-vision is also working as consultants, turnkey project executors and equipment suppliers in the field of Pollution Control (Environmental) Engineering and deals with turnkey projects in Incineration System for Solid and Hazardous waste. En-vision also does the Design, construction, erection and commission of Water Treatment Facility (Effluent treatment plants, Sewage treatment plants, etc.) and Secured Landfill sites.

En-vision is enlisted contractor with PWD, Goa as Class-I-A (One-A) in the category of Water Supply & Waste Water Disposal. En-vision is recognized as Environmental Auditors and enlisted as consultants and pollution control equipment suppliers with Gujarat Pollution Control Board. Provide Services in the field of Structural Engineering, Water Supply Engineering and Civil Engineering. It has national cliental from state of Gujarat, Chhattisgarh, Assam, Haryana, Andra Pradesh, Rajesthan, Goa, etc and international cliental from Dubai and Egypt.

EEEPL is Member of Consulting Engineers Association of India, Indo-German Chamber of Commerce, Society of Environmental Auditors and Consultants, Ahmedabad and Member of CII. EEEPL is operated by Mr. Nihar Doctor and Mr. Kunhal Shah, who are actively involved in achieving their vision to be a significant contributor in the development sustainable by Environment using collective technical acumen to provide services & equipments and be a part of movement of building Modern India with better environment and safety aim.

Mr. Nihar Doctor: He possesses Bachelor's degree in Civil Engineering and Master's Degree exclusively in the specialized field of structural Engineering as well as Environmental Engineering. Presently he is holding the position of Director in M/s. Envision Enviro Engineers Pvt. Ltd. He is having fourteen years experience in Environmental Engineering field.

Mr. Kunhal Shah: He possesses Bachelor's degree in Civil Engineering and Master's Degree exclusively in the specialized field of Environmental Engineering. Presently he is holding the position of Director in M/s. Envision Enviro Engineers Pvt. Ltd. He is having fourteen years experience in Environmental Engineering field.

ACCREDITATION CERTIFICATE ISSUED BY QCI NABET

National Accreditation Board for Education and Training

NABET

The Director
En-vision Enviro Engineers Pvt. Ltd.
208, G-Tower, Shankheshwar Complex,
Sagrampura, Surat 385002
(Kind Attention: **Mr. Kunhal Shah**)

June 22, 2011

Dear Sir,

QCI – NABET Scheme for Accreditation of EIA Consultant Organization

This is with reference to your application for QCI – NABET Accreditation as EIA Consultant Organization.

We are pleased to inform you that based on Document & Office Assessment, the Accreditation Committee has recommended the conditional accreditation of **En-vision Enviro Engineers Pvt. Ltd.** as per the scope given in Annexure I (A & B).

Please confirm the correctness of spellings of the names of the experts mentioned in Annexure I & The detailed terms and conditions are mentioned in Annexure II. You are also advised to check the QCI website for the Minutes of the Accreditation Committee Meeting held on May 03, 2011, for observations related to your application or any decisions with respect to Scheme/ assessment process and take necessary action for compliance.

The accreditation of your organization will be for three year period starting March 17, 2011. The annual renewal of the accreditation will be confirmed after surveillance assessment every year. Surveillance assessments will be conducted to ensure compliance with NABET Scheme and the details mentioned in your Quality Manual.

May we request you for an early payment of the annual fees and your confirmation of acceptance of the terms and conditions attached. This will enable us to issue you the requisite accreditation letter & certificate which will be valid for one year duration.

We thank you for your esteemed support in making this scheme successful and for your participation in this national cause.

Thanks and best regards,

Yours sincerely,

Vipin Sahni
Director
NABET

Page 1 of 7

Institution of Engineers Building, 2nd Floor, Bahadur Shah Zafar Marg, New Delhi-110 002, India
Tel : +91-11-2337 9321, 2337 8057 Fax : +91-11-2337 9621 e-mail : nabet@qcin.org Website : www.qcin.org

QCI – NABET Scheme for Accreditation of EIA Consultant Organizations

Annexure I-A

Name of the Consultant: En-vision Enviro Engineers Pvt. Ltd.

208, G-Tower, Shankheshwar Complex,
Sagrampura, Surat - 385002

Sectors Approved – 09 Nos.

Sl. No.	Sector No.	Name of Sector	Category A/B
1	8	Metallurgical industries (ferrous only) – both primary and secondary	A
2	9	Cement plants	B
3	17	Pesticides industry and pesticide specific intermediates (excluding formulations)	A
4	19	Textile – manmade fibers	B
5	21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A
6	22	Distilleries	A
7	25	Sugar Industry	B
8	32	Common hazardous waste treatment, storage and disposal facilities (TSDFs)	A
9	36	Common Effluent Treatment Plants (CETPs)	A

Total = 09 Sectors*

**Sectors allocated to individual EIA Coordinators are mentioned in Annexure I-B*

Vipin Sahni
Director
NABET

Functional area experts and assistances to FAE involved in the EIA study for M/s. Esveegee Breweries (P). Limited is as follow:

FUNCTIONAL AREA EXPERTS INVOLVED IN THE EIA

Name of EIA Coordinator / Assignment Head involved	FUNCTIONAL AREA EXPERTS INVOLVED	
	FUNCTIONAL AREA	**NAME/S**
Mr. Nihar Doctor **Associate Coordinator:** Mr. Jignesh Patel, Mr. Shwetang Patel	LU (Land Use)	Dr. Y. Rama Mohan Team Member: Ms. Alifiya Motorwala
	AQ (Meteorology, Air Quality Modeling & Prediction)	Mr. Nihar Doctor Team Member: Ms. Smitha Rajesh, Ms. Alifiya Motorwala
	AP (Air Pollution Monitoring, Prevention & Control)	Mr. Shwetang Patel Team Member: Mr. Mayur Jyoti Mahanta, Dr. Manojkumar Mishra
	WP (Water Pollution Monitoring, Prevention, & Control)	Mr. Nihar Doctor Team Member: Ms. Alifiya Motorwala, Mr. Mayur Harshora
	EB (Ecology & Biodiversity)	Dr. Manoj Eldath Team Member: Mr. Satyendra Singh
	SE (Socio-Economic)	Dr. Rahul Deshmukh Team Member: Mr. Shaikh M. Arifalam
	NV (Noise & Vibration)	Dr. Manojkumar Mishra Team Member: Mr. Mayur Harshora
	GEO-HG (Geology & Hydrology)	Mr. Ravi Kant Sharma
	RH (Risk Assessment & Hazard Management)	Mr. D. H. Patel Team Member: Ms. Smitha Rajesh, Mr. Jignesh Patel
	SHW (Solid & Hazardous Waste Management)	Mr. Nihar Doctor Team Member: Ms. Smitha Rajesh

Laboratory for Analysis:

SR. NO.	NAME OF LABORATORY	NABL REGISTRATION STATUS	ROLE
1	Cleenviron Private Limited: D-124, Koelnagar, Rourkela - 769014, Odisha, India	NABL certified laboratory, Certificate No. T-2082 valid up to 08.11.2013	Monitoring, Collection and Analysis of Air, water, Noise and soil samples; MoEF certified laboratory

ANNEXURE

ANNEXURE – I

A COPY OF TERMS OF REFERENCE LETTER

F. No. J-11011/32/2012 - IA II (I)
Government of India
Ministry of Environment and Forests
(I.A. Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road

E-mail : vp.upadhyay@nic.in
Telefax : 011: 2436 2875
Dated : 21st March, 2013

To,

The General Manager,
M/s Esveegee Breweries (P) Ltd.
Antaraa Tower, Danish Road
Panbazar, Guwahati-781001 (Assam)

E-mail: rajesh_jalan1@yahoo.com ; rkdubey_rk@rediffmail.com;

Subject: Grain based Distillery (ENA/RS 60 KLPD) and Expansion (ENA RS/60 KLPD to 120 KLPD and Absolute Alcohol 30 KLPD) with Cogeneration Power Plant (3.5 MW) at Plot no.321, 323-325, 339-340, 362-363, 381, 392, 403 & 449, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim by M/s Esvee Breweries (P) Ltd. - regarding TORs

Ref. : Your letter no. nil dated 12th January, 2012.

Sir,

Kindly refer your letter no. dated 25th October, 2012 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 for setting up Grain based Distillery (ENA/RS 60 KLPD) and Expansion (ENA RS/60 KLPD to 120 KLPD) and Absolute Alcohol 30 KLPD) with Cogeneration Power Plant (3.5 MW) at Plot no. 321, 323-325, 339-340, 362-363, 381, 392, 403 & 449, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim by M/s Esvee Breweries (P) Ltd. It is noted that the Company passed a resolution in a meeting of the Board of Directors held on 5.01.2012 that violation of the Environmental (Protection) Act, 1986 will not be repeated. A copy of Board Resolution is **Annexed**.

2.0 Draft Terms of Reference (TOR) have been discussed and finalized during **the 3rd *Reconstituted Expert Appraisal Committee (Industry) held during 3rd – 5th December, 2012*** for preparation of EIA/EMP report. Following are the 'TORs':

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.

ANNEXURE – I (CONT.)

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 (coal etc.) for the boiler. Measures to take care of SO_2 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 PM_{10}, $PM_{2.5}$, SO_2 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 PM_{10}, SO_2, 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 ground water Board.
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.

ANNEXURE – I (CONT.)

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.
    vii) Details of occupational health surveillance programme.
39. Details of socio-economic welfare activities.
40. 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.
41. Action plan for post-project environmental monitoring.
42. 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.
43. Any litigation pending against the project and /or any direction /order passed by any Court of Law against the project, if so, details thereof.
44. 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.
45. A tabular chart with index for point-wise compliance of above TORs.

The following general points should be noted:

i. All documents should be properly indexed, page numbered.
ii. Period/date of data collection should be clearly indicated.
iii. Authenticated English translation of all material provided in Regional languages.

ANNEXURE – I (CONT.)

iv. The letter/application for EC should quote the MOEF file No. and also attach a copy of the letter.

v. The copy of the letter received from the Ministry should 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 and that raised in Public Hearing/consultation alongwith duly filled in Industry Sector questionnaire. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report where the above issues and the issues raised in the Public hearing have been incorporated.

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 report for setting up Grain based Distillery (ENA/RS 60 KLPD) and expansion (ENA RS/60 KLPD to 120 KLPD) and Absolute Alcohol 30 KLPD) with Cogeneration Power Plant (3.5 MW) at Plot no.321, 323-325, 339-340, 362-363, 381, 392, 403 & 449, Village Manpur, Tehsil Namchi, District South Sikkim, Sikkim 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, Sikkim Pollution Control Board, (SPCB)** 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 2 years as per the MoEF O.M. No. J-11013/41/2006-IA.II (I) dated 22nd March, 2010***.

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.

(V P Upadhayay)
Director

Copy to :

1. The Chairman, Sikkim Pollution Control Board Forest, Environment Wildlife Management Department Government of Sikkim Forest Secretariat Annex I, Ground Floor,, Deorali, Gangtok -737102, East Sikkim Email: membersecretary@spcbsikkim.org Tele/Fax:+91 3592-281778 (Fax)+91 94341-53471
2. Dr. Anil Kumar Addl. Principal Chief Conservator of Forests (Central) Ministry of Environment & Forests Law-U-SIB, LUMBATNGEN, Near MTC Workshop Shillong-793021 Tel:0364-2537609/7395/7278 Fax : 0364-2536041 E-mail : mofner-meg@nic.in – for kind information & necessary action.

(V P Upadhayay)
Director

ANNEXURE – II

A COPY OF LEASE DEED

TEN RUPEES

GOVERNMENT OF SIKKIM

सिक्किम सरकार

दश रुपया

LEASE DEED

This LEASE DEED is made at Manpur, South Sikkim on the 25th day of June 2008

BETWEEN

Smt. Bidya Wati Pradhan, Wife of Shri Late Madan Prasad Pradhan, Dr. Rajan Prasad Pradhan & Shri Bikram Prasad Pradhan, son of Late Madan Prasad Pradhan, resident of Sumbuk, South Sikkim, hereinafter referred to as LESSSOR of the other part which expression shall include its successors and assigns wherever the context or meaning shall so require or permit of the other part.

AND

M/s Esveegee Breweries, a Private Limited Company having its registered office at Ambuja towers, Navrangpura, Ahmedabad – 380014, hereinafter referred to as LESSEE of the other part which expression shall include its successors and assigns wherever the context or meaning shall so require of permit of the other part. Duly represented by its authorized signatory, Sunil Goel.

WHEREAS THE LESSEE has expressed their desire to take on lease two plot of land having approximate are of 0.833 hectares located at Manpur in the South District of Sikkim more fully described in schedule hereunder written for setting up unit or for construction building / Factory shed thereon or for carrying on any business or location as the considers fit.

Revenue

Revenue

Revenue

Revenue

ANNEXURE – II (CONT.)

4. THE LESSOR HEREBY FURTHUR CONVENANTS WITH THE LESSEE AS FOLLOWS:

a. That there are no encumbrance, charges, trust ,liens, attachment, claims, or demands whatsoever not subsisting on the leased property and the same is not the subject matter of any suit or litigation or proceedings and has not been offered as security or otherwise to any court or revenue authority.

b. That the LESSORS shall and will at all times indemnified and save harmless the LESSEE against all claims and demands whatsoever in respect of the said leased property and make good to the LESSEE as may be put to incur of suffer by reason of any detect, flaw or deficiency in the title of the LESSORS to the said leased property or any mistake or deficiency in the extent, description or other particulars of the said leased land.

c. That the LESSEE shall enjoy quiet possession of land leased without disturbance by him or his successors interest or any person claiming title paramount thereto.

d. That LESSORS shall pay taxes, charges or other dues, which may be levieable in respect of the leased land as per the orders of any local or other authority.

ANNEXURE – II (CONT.)

AND WHEREAS the LESSORS has agreed to let the same for the aforesaid purpose on the terms mentioned below:

NOW THIS DEED OF LEASE WITNESSES AS UNDER:

1. That as the LESSORS hereby agreed to convey by way of lease deed said plot of land unto the said lessee to hold the same for the period of 30 years commencing from 25th day of June, 2008 on annual lease Rent of Rs70000 /= (Rupees seventy thousand only) on advance payment for one year which the LESSORS hereby acknowledge as lease rent for first one year. Subsequently the same arrangement will continue for the further period of Lease.

2. The LESSEE shall be entitled to occupy the said piece of land, and possession whereof has been delivered to him in such manner as they think fit and may erect structures or build thereon and may demolish or re-erect the same.

3. **THE LESSEE HEREBY FURTHUR CONVENANTS WITH THE LESSORS AS FOLLOWS:**

a That the LESSEE shall not carry on or permit to be carried in any parts of the demised plot any offensive , illegal of unlawful manufacture, trade or business but to use the same for the purpose of any legal manufacturing of trading business whatsoever.

b. That the LESSEE shall take all reasonable steps to prevent any encroachment on the demised premises or any part thereof by any person and to notice to the LESSORS for any threatened encroachment.

ANNEXURE – II (CONT.)

SCHEDULE OF LEASE PLOT OF LAND

All that part of the land bearing khatian No. 69, and plot Nos. 392/449 & 449 (P) ,measuring total area 0.833 Hectares situated at Manpur, south Sikkim Which is butted and bounded as follows:-

East: Paddy field of Smt. Ratna

West: Land of smt. Chandra Kumari Rai

South: Land of Shri Dinesh Kumar Pradhan

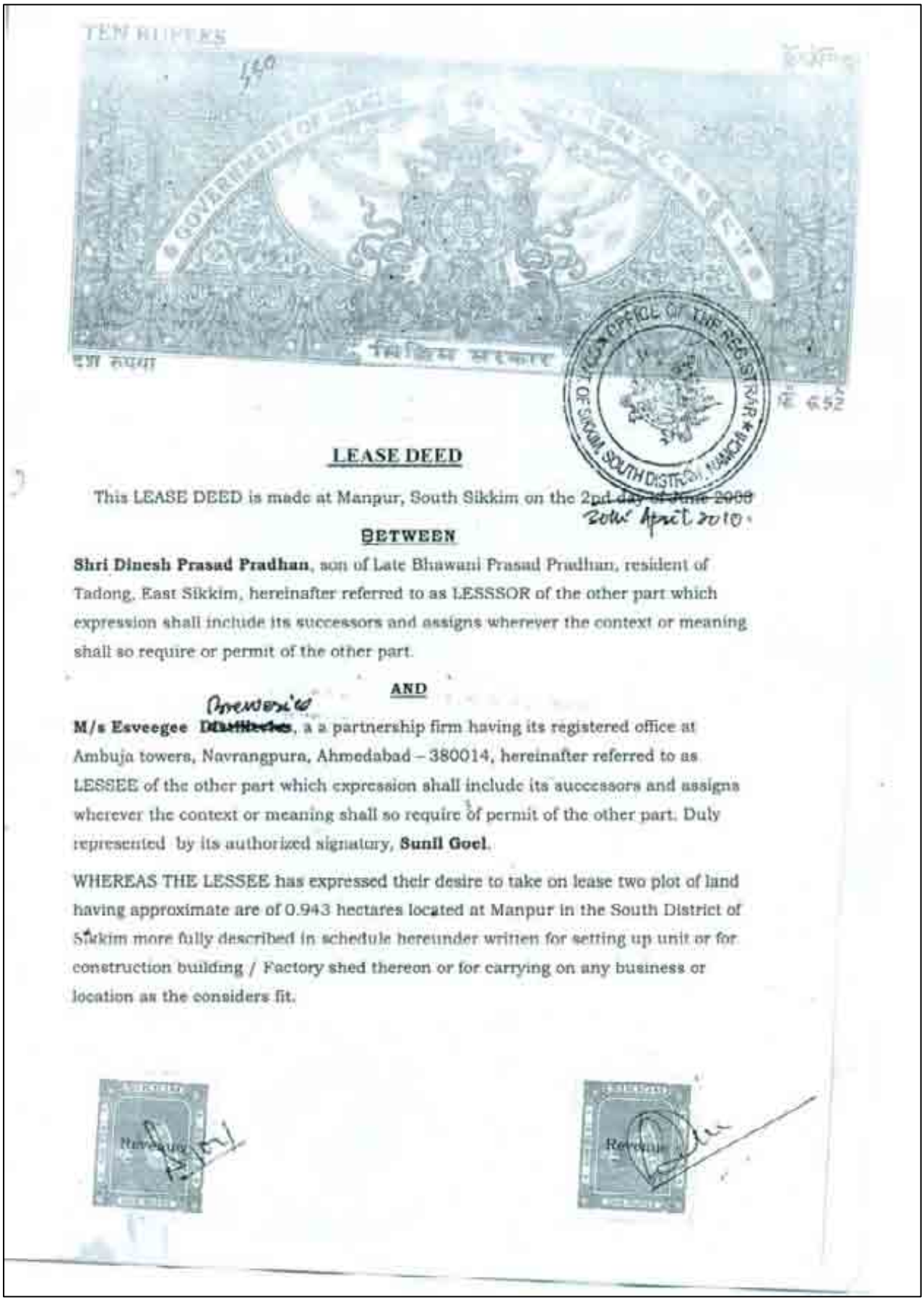
North: Paddy field of Smt. Ratna

(LESSOR) a. Smt Bidya Wati Pradhan
b. Dr. Rajan Prasad Pradhan
c. Shri Bikram Pradhan

(LESSEE) M/s Esveegee Breweries (P) Ltd.

Authorized Signatory

ANNEXURE – II (CONT.)



TEN RUPEES

GOVERNMENT OF SIKKIM

सिक्किम सरकार

OFFICE OF THE REGISTRAR * DIST. OF SIKKIM, SOUTH DISTRICT, NAMCHI *

Rs 652

LEASE DEED

This LEASE DEED is made at Manpur, South Sikkim on the 2nd ~~day of June 2008~~ 20th April 2010.

BETWEEN

Shri Dinesh Prasad Pradhan, son of Late Bhawani Prasad Pradhan, resident of Tadong, East Sikkim, hereinafter referred to as LESSSOR of the other part which expression shall include its successors and assigns wherever the context or meaning shall so require or permit of the other part.

AND

M/s Esveegee ~~Distilleries~~ Breweries Ltd, a a partnership firm having its registered office at Ambuja towers, Navrangpura, Ahmedabad – 380014, hereinafter referred to as LESSEE of the other part which expression shall include its successors and assigns wherever the context or meaning shall so require of permit of the other part. Duly represented by its authorized signatory, **Sunil Goel**.

WHEREAS THE LESSEE has expressed their desire to take on lease two plot of land having approximate are of 0.943 hectares located at Manpur in the South District of Sikkim more fully described in schedule hereunder written for setting up unit or for construction building / Factory shed thereon or for carrying on any business or location as the considers fit.

ANNEXURE – II (CONT.)

AND WHEREAS the LESSORS has agreed to let the same for the aforesaid purpose on the terms mentioned below:

NOW THIS DEED OF LEASE WITNESSES AS UNDER:

1. That as the LESSORS hereby agreed to convey by way of lease deed said plot of land unto the said lessee to hold the same for the period of 30 years commencing from 2nd day of June, 2008 on annual lease Rent of Rs 60000 /= (Rupees sixty thousand only) on advance payment for one year which the LESSORS hereby acknowledge as lease rent for first one year. Subsequently the same arrangement will continue for the further period of Lease.

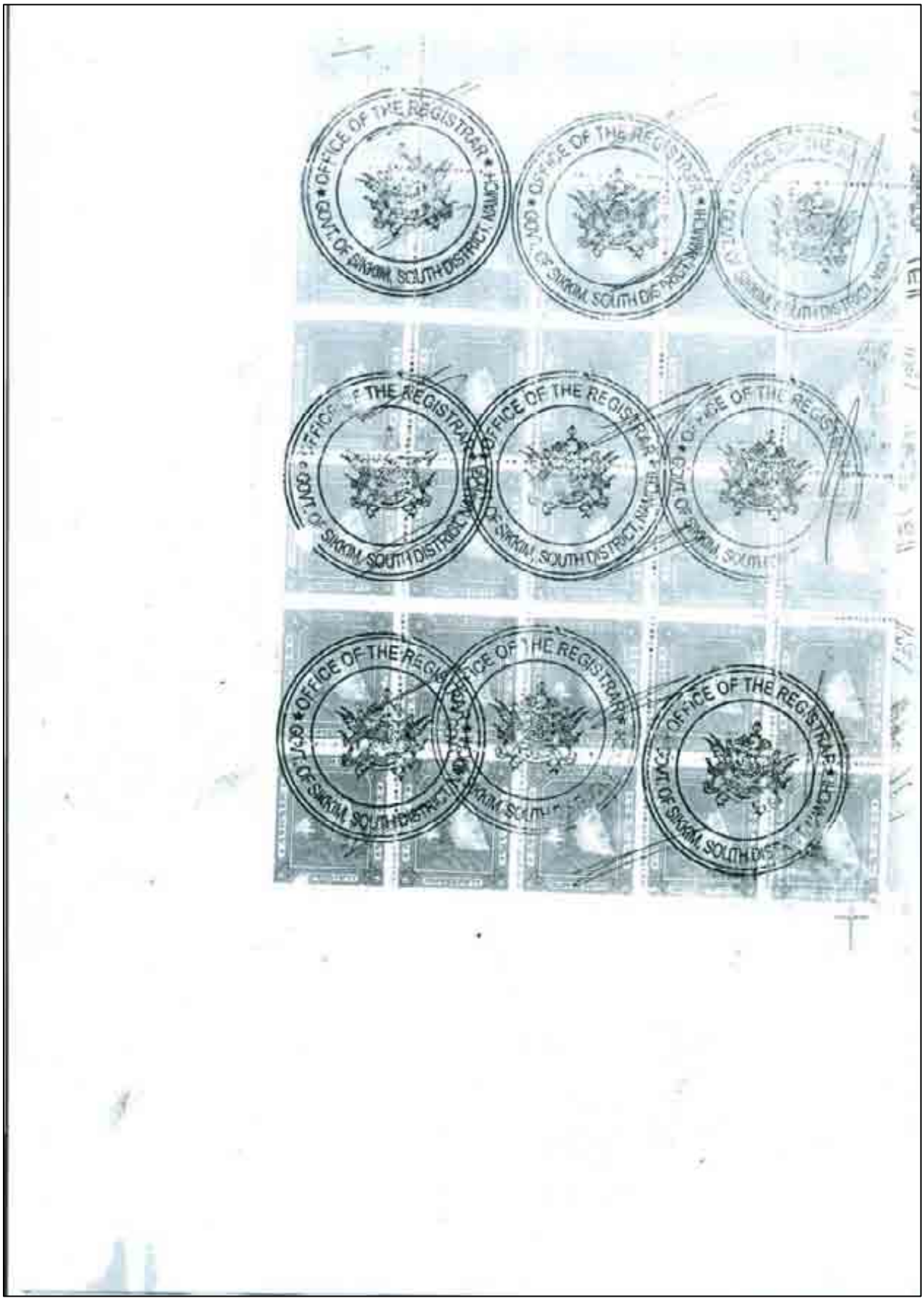
2. The LESSEE shall be entitled to occupy the said piece of land, and possession whereof has been delivered to him in such manner as they think fit and may erect structures or build thereon and may demolish or re-erect the same.

3. THE LESSEE HEREBY FURTHUR CONVENANTS WITH THE LESSORS AS FOLLOWS:

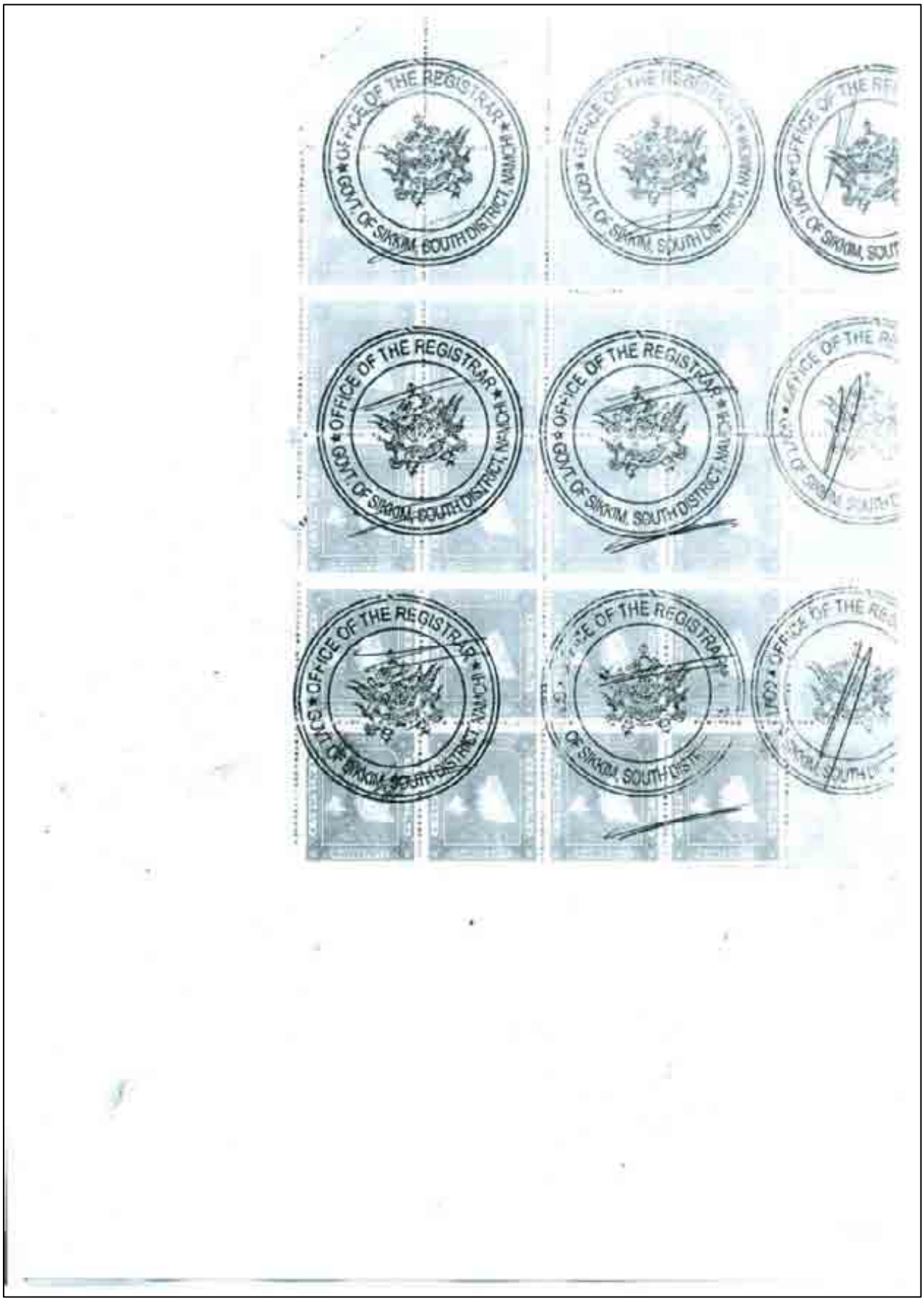
a That the LESSEE shall not carry on or permit to be carried in any parts of the demised plot any offensive , illegal of unlawful manufacture, trade or business but to use the same for the purpose of any legal manufacturing of trading business whatsoever.

b. That the LESSEE shall take all reasonable steps to prevent any encroachment on the demised premises or any part thereof by any person and to notice to the LESSORS for any threatened encroachment.

ANNEXURE – II (CONT.)



ANNEXURE – II (CONT.)



ANNEXURE – II (CONT.)

4. THE LESSEE HEREBY FURTHUR CONVENANTS WITH THE LESSORS AS FOLLOWS:

a. That there are no encumbrance, charges, trust, liens, attachment, claims, or demands whatsoever not subsisting on the leased property and the same is not the subject matter of any suit or litigation or proceedings and has not been offered as security or otherwise to any court or revenue authority.

b. That the LESSORS shall and will at all times indemnified and save harmless the LESSEE against all claims and demands whatsoever in respect of the said leased property and make good to the LESSEE as may be put to incur or suffer by reason of any detect, flaw or deficiency in the title of the LESSORS to the said leased property or any mistake or deficiency in the extent, description or other particulars of the said leased land.

c. That the LESSEE shall enjoy quiet possession of land leased without disturbance by him or his successors interest or any person claiming title paramount thereto.

b. That LESSORS shall pay taxes, charges or other dues, which may be livable in respect of the leased land as per the of any local or other authority.

ANNEXURE – II (CONT.)

SCHEDULE OF LEASE PLOT OF LAND

All that part of the land bearing khatian No. 25, and plot Nos. 339 & 340 / 381 measuring total area .943 Hectares situated at Manpur, south Sikkim Which is butted and bounded as follows:-

East: River Rangit Banks.

West: River Rangit Banks.

South: River Rangit Banks.

North: Paddy field of Late M.P. Pradhan and Smt. Ratna.

OFFICE OF THE REGISTRAR ★ SOUTH DISTRICT, NAMCHI ★

LESSOR (Shri Dinesh Prasad Pradhan)

LESSEE (M/s Esveegee Distilleries).

Authorized Signatory

Revenue

Revenue

ANNEXURE – II (CONT.)

Received Stamp worth Rs. 18,000/-
Rupees Eighteen thousand only
affixed in the original deed and registration
Rs. 90,000/- (Rupees Ninety thousand) Only credited vide
B.R. No. 329/N of 26/4/10

Presented for registration 27/11/2008
in the office of registrar Namchi.

Signature of Presentor

Sd/-
Sign. Of Registrar

execution is admitted by

who is identified by

Subash Khandal
P.O: Rateey, Ratey
East Sikkim.

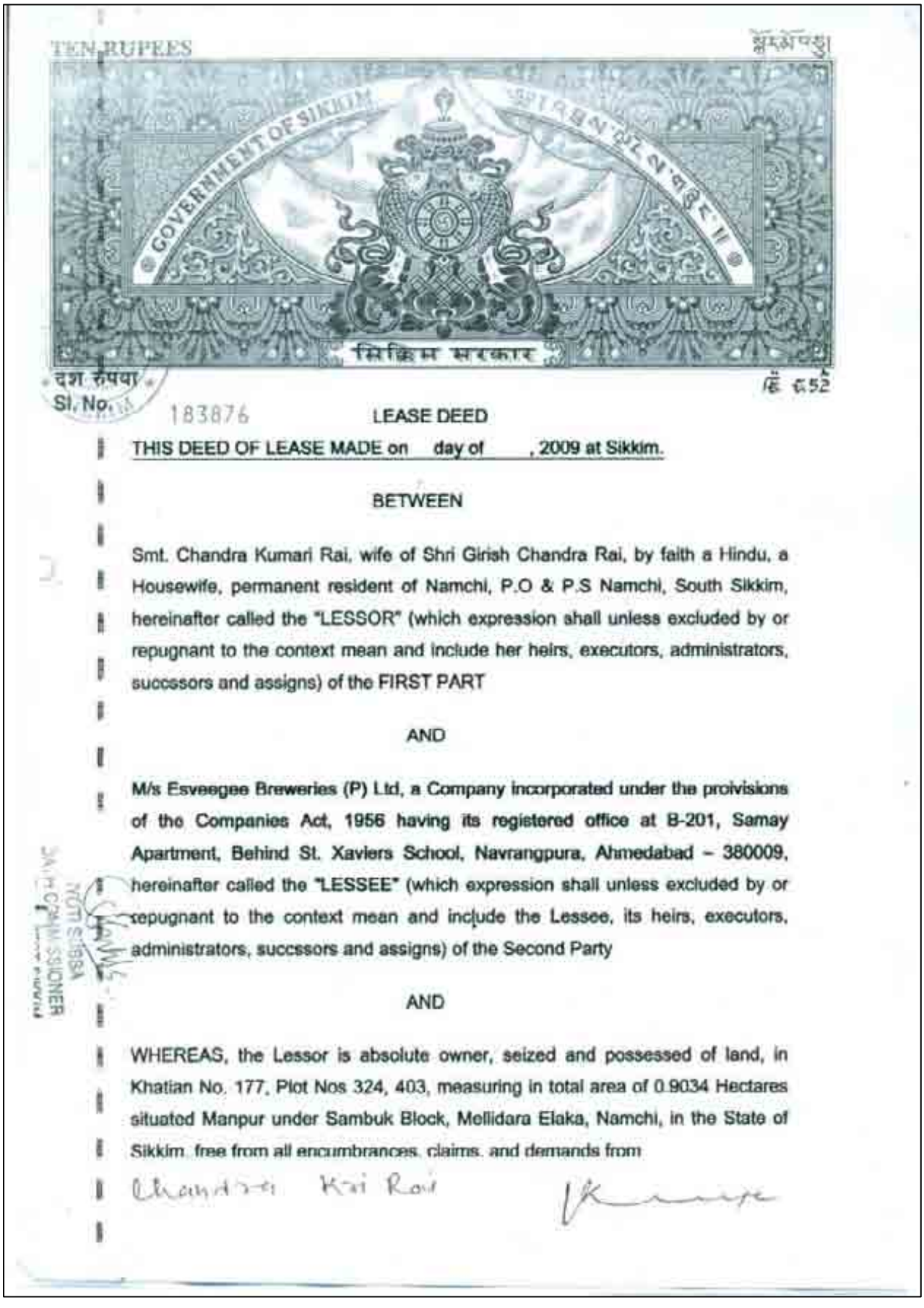
Deepak Rai
Melli south
Sikkim, Melli Bazar.

Registered in the office of Registrar, South
District at Namchi Vide Book No. A
Serial No. 09 Page 02
Registered on the 30/04 for the year 2010

OFFICE OF THE REGISTRAR

Sub Registrar
SOUTH DISTRICT
NAMCHI

ANNEXURE – II (CONT.)



TEN RUPEES

GOVERNMENT OF SIKKIM

सिक्किम सरकार

दश रुपया

Sl. No. 183876

LEASE DEED

THIS DEED OF LEASE MADE on day of , 2009 at Sikkim.

BETWEEN

Smt. Chandra Kumari Rai, wife of Shri Girish Chandra Rai, by faith a Hindu, a Housewife, permanent resident of Namchi, P.O & P.S Namchi, South Sikkim, hereinafter called the "LESSOR" (which expression shall unless excluded by or repugnant to the context mean and include her heirs, executors, administrators, successors and assigns) of the FIRST PART

AND

M/s Esveegee Breweries (P) Ltd, a Company incorporated under the proivisions of the Companies Act, 1956 having its registered office at B-201, Samay Apartment, Behind St. Xaviers School, Navrangpura, Ahmedabad – 380009, hereinafter called the "LESSEE" (which expression shall unless excluded by or repugnant to the context mean and include the Lessee, its heirs, executors, administrators, successors and assigns) of the Second Party

AND

WHEREAS, the Lessor is absolute owner, seized and possessed of land, in Khatian No. 177, Plot Nos 324, 403, measuring in total area of 0.9034 Hectares situated Manpur under Sambuk Block, Mellidara Elaka, Namchi, in the State of Sikkim, free from all encumbrances, claims, and demands from

Chandra Kri Rai

ANNEXURE – II (CONT.)

interests unto the said land and every part thereof (Fully described in the schedule below).

AND

WHEREAS, the Lessee being a Private Limited Company and being interested in setting up of a Brewery in the state of Sikkim required a suitable land for the proposed brewery and other allied purposes, approached the Lessor for leasing out the plots of land, fully described in the schedule herein below to it for the purpose for setting up the above said brewery and its allied units.

AND

WHEREAS the lessor finding the proposal of the lessee company suitable and in consideration of the rent proposed to be paid by the lessee fair, according to the prevailing market rate, has agreed to lease out the land more fully described in the schedule below free from all encumbrances under the terms and conditions as set forth herein below.

WHEREBY IT IS MUTUALLY AGREED AS FOLLOWS:

1. That the Lessor agrees to lease out the said land and the Lessee agrees to take on lease all that piece and parcel of the said land situated at Manpur under Sumbuk Block, Mellidara Elaka, Namchi, South Sikkim more fully described in the Schedule hereinunder, for a period of **15 years** (Fifteen Years) commencing on and from the date of execution of the Lease Deed, and accordingly the Lessor will handover the possession of the said land to the Lessee free from all encumbrances.

2. That the Lessor agrees that the Lease period shall be automatically renewed for the **next term of 15 years** on the expiry of the first term at

Chandra Kiri Rai

JYOTI SUBBA
DA. H. COMMISSIONER
SOUTH & WEST SIKKIM

ANNEXURE – II (CONT.)

a nominal lease rent of Rs 1,000/- (Rupees one thousand) only for the next term subject to approval from concerned authority.

3. That the rent of the entire demised land more fully described in the schedule hereinbelow is fixed at Rs 2100000/- (Rupees Twenty One Lacs only) for the **entire lease period of 30 years** at the rate of Rs 70000/- per annum.

4. That the Lessor shall issue valid receipt for the rents received by the Lessor from the Lessee.

5. That the lessee shall occupy and use the said land absolutely at its sweet discretion for any commercial venture, industry, brewery, agriculture, or non- agricultural purposes such as cultivation, horticulture, forestry, plantation, business trade, and/or for other purposes as the lessee may deem fit and proper and the lessor shall have no right whatsoever to interfere with regards to the use of the demised land.

6. That the Lessee shall be solely liable for the payment of electricity bills in connection with the power consumed in the land and the proposed brewery during the entire period of the lease as per the bills raised by the Energy and Power Department, Government of Sikkim.

7. That the Lessee shall bear all the expenses towards water charges, sanitation charges as per the bills raised by the concerned authority for the lease period.

8. That the lessee shall be at liberty to insure the premises and properties as demised at its own cost if it so desires.

Chandra Kri Rai

JYOTI SUBBA
JA..h COMMISSIONER
SOUTH & WEST SIKKIM

ANNEXURE – II (CONT.)

09. That the lessee shall have the liberty to transfer, assign, lien, mortgage is lease right onto the said land under these presents to any financial institution without any written permission of the lessor and it shall also be entitled to alter / modify the demised land within its four comers as per its requirements and it shall at all times be entitled to apply for and obtain own electricity, water, telephone, telex and other utilities and services at the demised land and it shall also be at liberty to construct or build houses, tenements, sheds, passage, drains, electrification, boundarywall, place of worship, whatsoever thereon at its own cost without any written consent from the lessor or any other person claiming under her directly or indirectly and to fix and to set up plant and machinery, tools, equipments, fixtures, fittings, laying of wire, conduits and pipes underneath or over the said land as lessee shall think fir and proper.

10. The lessee shall have the right to obtain loan from scheduled bank, financial institutions or any individual by mortgaging the lease right of the land as security against such loans without any written consent from the lessor.

11. That if by fire, tempest, flood or landslide or riot or violence or other irresistible force or natural calamities, the said land or part thereof is destroyed / damaged or rendered unfir, the lessee can restore or build, construct the whole and or part thereof as the case may be at its own cost and the lessor shall have no right to raise any kind of objection.

12. All taxes and other outgoings in respect of the said land upto the date of completion of the registration of the Deed of lease shall be paid by the lessor.

13. That the lease rent shall be exclusive of the future taxes, assessments, dues, levies and duties payable in respect to the said land and the plant, the building or buildings to be constructed thereon, to the

Chandra Kri Rai

JYOTI SUBBA
OATH COMMISSIONER
SOUTH & WEST SIKKIM

ANNEXURE – II (CONT.)

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Chandra Kri Rai

JYOTI SUBBA
DA.H COMMISSIONER
SOUTH & WEST SIKKIM

ANNEXURE – II (CONT.)

government or the municipal corporation or any other local authority or public body and which taxes etc., will be payable by the lessee as and when they become due and payable.

14. That the cost by way of stamp duty and registration charges in respect of the Deed of Lease shall be borne by the Lessee

15. That the lessee shall keep the premises in such condition so as not to endanger human life and property.

16. That the Lessee shall keep the premises in a good and healthy condition and shall maintain the neatness and cleanliness so as not to cause nuisance or danger or harm to any person or persons living in the vicinity of the demised premises.

17. That in the event of earlier determination of this lease on the part of the lessor, the lessor shall make good to the lessee all the rent paid by the lessee and shall also make arrangement for an alternate land and bear all the cost of setting up new structures or factory or shifting of the existing structure/ factory to the new land so arranged. The lessor shall also be liable to compensate the lessee for the losses suffered by the lessee.

18. That during the period of lease the lessor shall not interfere with the lessee in connection with the demised land and the running of the commercial venture or the factory and its business and shall extend all co-operation as and when the same is sought by the lessee.

19. That by virtue of this Lease Deed it shall be construed that the Lessee shall not require any no objection certificate from the Lessor for any purpose and it shall be construed that the Lessor has no objection to all the lawful acts that the Lessee may do or plan to do in the demised land. However as and when demanded the Lessor shall give No Objection Certificate to the Lessee for any lawful purposes such as

Chandra Kai Rai

ANNEXURE – II (CONT.)

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17. That in the event of earlier determination of this lease on the part of the lessor, the lessor shall make good to the lessee all the rent paid by the lessee and shall also make arrangement for an alternate land and bear all the cost of setting up new structures or factory or shifting of the existing structure/ factory to the new land so arranged. The lessor shall also be liable to compensate the lessee for the losses suffered by the lessee.

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Chandra KM Rai

SOUTH SIKKIM

ANNEXURE – II (CONT.)

obtaining electricity connection, water connection, sanitation work, all the civil work to be carried out in the land, to procure licences from the concerned authorities etc.

20. That the Lessee, paying the rent hereby reserved and observing and performing the conditions of the covenants shall quietly and peacefully hold, possess, run and enjoy the abovesaid demised land during the said term without any interference, disturbance and interruption by the lessor or any person claiming under him.

IN WITNESS WHEREOF the parties hereto have set and subscribed their respective hands the day, month and the year hereinabove mentioned.

Witnesses.

LESSOR

Chandra Kri Rai

1. Smt. Chandra Kumari Rai)

SUTI SUBBA
DA, m COMMISSIONER
SOUTH & WEST SIKKIM

LESSEE

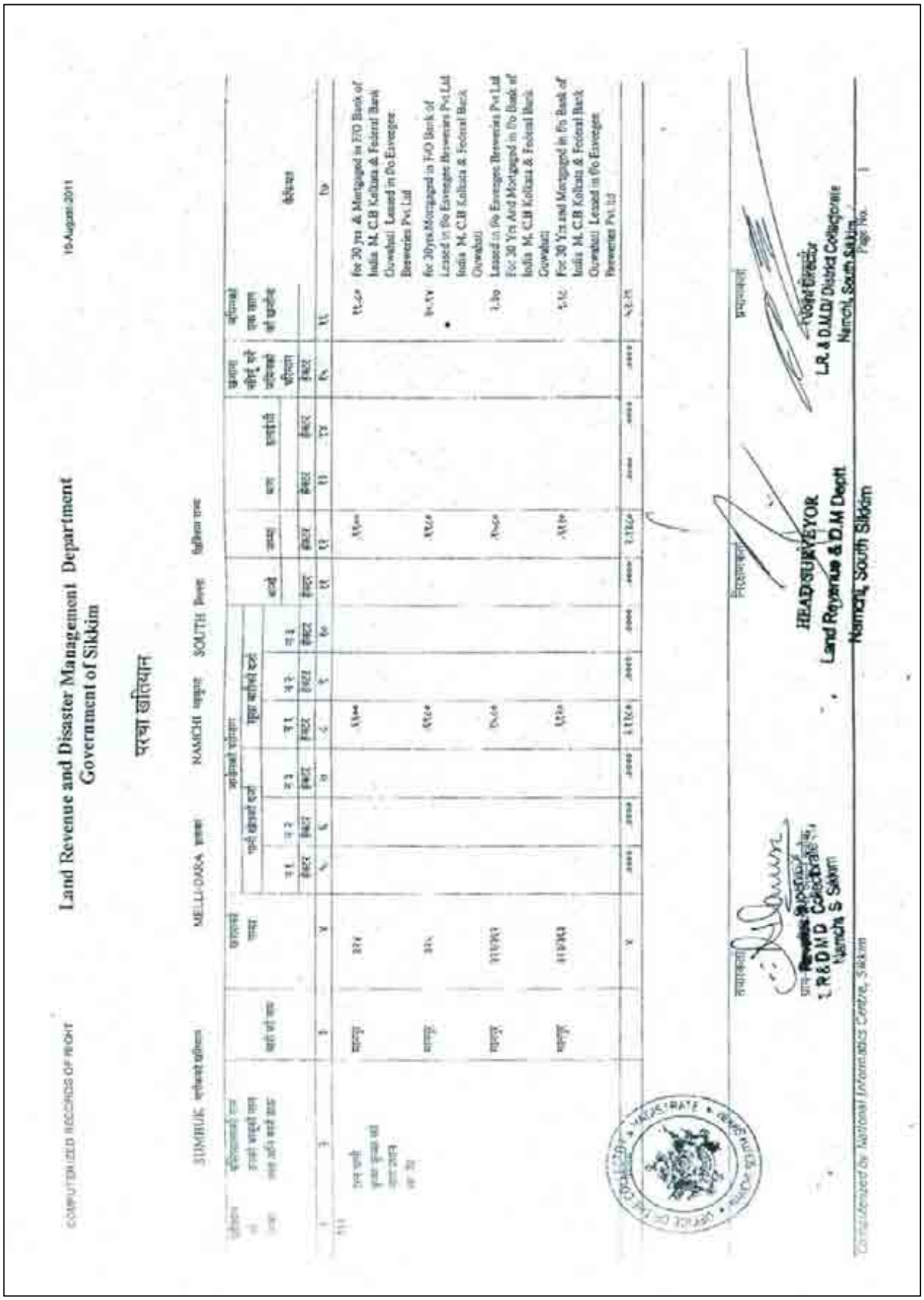
2. For Esveegee Breweries Pvt. Ltd.

(Shri Vijaykumar D. Gupta)
Chairman & Managing Director

Solemnly affirmed before me on this the ... day of ...
by Shri/Smt. Chandra Kri. Rai & Shri Vijaykumar D. Gupta Manager, South Sikkim and identified by Shri/Smt. ... of ...

6

ANNEXURE – II (CONT.)



ANNEXURE – III

WATER WITHDRAWAL PERMISSION LETTER

IRRIGATION & FLOOD CONTROL DEPARTMENT
GOVERNMENT OF SIKKIM
GANGTOK

Memo No.336/SE(S/W)IFCD/11(377), Date.28/02/2012.

To

M/s Esveegee Breweries (P) Ltd
3rd Floor. Antaraa Tower .Opp. Police Hospital Road, Panbazar
Guwahati-781001 (Assam).
Ph.No. 0361-2512399, 2519611, Fax No. 91-3612603454.

Sub: **Permission for the use of River Water.**

Sir,

Reference your letter dated 12.01.2012 in regard to the above subject, I am directed to convey the approval by the Irrigation & Flood Control Department to allow the M/s Breweries Company (P) Ltd to use approximately 1440 KL/D of water from River Rangit for the industrial unit situated in industrial area of Manpur in South Sikkim.

Your's faithfully,

(P.K.Pradhan)
Superintending Engineer(S/W)
Irrigation & F.C.Department.

ANNEXURE – IV

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (2009)

NATIONAL AMBIENT AIR QUALITY STANDARDS
CENTRAL POLLUTION CONTROL BOARD
NOTIFICATION

New Delhi, the 18th November, 2009

No. B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), µg/m³	Annual*	50	20	- Improved West and Gaeke
		24 hours**	80	80	-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m³	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM_{10} µg/m³	Annual*	60	60	- Gravimetric - TOEM
		24 hours**	100	100	- Beta attenuation
4	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ µg/m³	Annual*	40	40	- Gravimetric - TOEM
		24 hours**	60	60	- Beta attenuation
5	Ozone (O_3) µg/m³	8 hours**	100	100	- UV photometric - Chemilminescence
		1 hour**	180	180	- Chemical Method
6	Lead (Pb) µg/m³	Annual*	0.50	0.50	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 hours**	1.0	1.0	
7	Carbon Monoxide (CO) mg/m³	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour**	04	04	
8	Ammonia (NH_3) µg/m³	Annual*	100	100	-Chemiluminescence -Indophenol blue method
		24 hours**	400	400	

ANNEXURE – IV (CONT.)

(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C_6H_6) $\mu g/m^3$	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m^3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m^3	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m^3	Annual*	20	20	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman
[ADVT-III/4/184/09/Exty.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998.

ANNEXURE – V

INDIAN STANDARDS/SPECIFICATIONS FOR DRINKING WATER IS: 10500-1991

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
ESSENTIAL CHARACTERISTICS						
1	Colour, Hazen unit	5	Above this, consumer acceptance decreases	25	4 of 3025, 1983	Extended upto 25 only if toxic substances are not suspected in absence of alternate Source.
2	Odour		Unobjectionable	-	5 of 3025,1983	a. Test cold and when heated b. Test at several dilutions
3	Taste		Agreeable	-	-	Test to be conducted only after safety has been established
4	Turbidity, NTU	5	Above this, consumer acceptance decreases	10	8	Test to be conducted only after safety has been established
5	pH Value	6.5-8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No relaxation	8	-
6	Total Hardness mg/L (as $CaCO_3$)	300	Encrustation on water supply structure and adverse effects on domestic use	600	-	-
7	Iron (as Fe), mg/L	0.3	Beyond this limit,, taste/appearance are affected has adverse effect on domestic uses and water supply structures & promotes iron bacteria	1.0	32 of 3025, 1964	-
8	Chlorides (as Cl^-) mg/L	250	Beyond this limit taste, corrosion and palatability are affected	1000	32 of 3025	-
9	Residual free chlorine, mg/L	0.2	-	-	26 of 3025, 1986	To be applicable only when water is chlorinated tested at consumer end, when protection against viral infection is required it should be min 0.5 mg/L

ANNEXURE – V (CONT.)

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
DESIRABLE CHARACTERISTICS						
10	Dissolved Solids, mg/L	500	Beyond this palatability decrease and may cause gastrointestinal irritation	2000	16 of 3025	
11	Calcium (as Ca) mg/L	75	-	200	40 of 3025, 1984	
12	Copper (as Cu), mg/L	0.05	Astringent,taste discoloration of pipes, fittings and utensils will be caused beyond this	1.5	36 of 3025, 1964	
13	Manganese (as Mn), mg/L	0.1	Astringent ,taste discoloration of pipes, fittings and utensils will be caused beyond this	0.3	35 of 3025,1964	
14	Sulphate (as SO_4^{-2}), mg/L	200	Beyond this causes gastrointestinal irritation when magnesium or sodium are present	400	24 of 3025, 1986	May be extended upto 400 provided (as Mg) does not exceed 30 mg/l
15	Nitrate (as NO_3^-), mg/L	45	Beyond this methaemoglo-binemia	100	-	-
16	Fluoride (as F^-), mg/L	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1. 5	23 of 3025, 1964	-
17	Phenolic substances mg/L (as C_6H_5OH)	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025	
18	Mercury (as Hg), mg/L	0.01	Beyond this, the water becomes toxic	No relaxation	See note mercury ion analyzer	To be tested when pollution is suspected
19	Cadmium (as Cd), mg/L	0.01	Beyond this the water becomes toxic	No relaxation	See note mercury ion analyser	To be tested when pollution is suspected
20	Selenium (as Se) mg/L	0.01	Beyond this the water becomes toxic	No relaxation	28 of 3025, 1964	To be tested when pollution is suspected
21	Arsenic (As), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	37 of 3025, 1988	To be tested when pollution is suspected

ANNEXURE – V (CONT.)

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
22	Cyanide (CN^-), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	27 of 3025, 1986	To be tested when pollution is suspected
23	Lead (Pb), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	See note 86	To be tested when pollution plumbosolvenc y is suspected
24	Zinc (as Zn), mg/L	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025,1964	To be tested when pollution is suspected
25	Anionic detergents mg/L (as MBAS)	0.2	Beyond this limit undesirable taste and odour after Chlorination takes place	1.0	Methylene blue extraction method	To be tested when pollution is suspected
26	Chromium (as Cr^{+6}), mg/L	0.01	May be carcinogenic above this limit	0.05	28 0f 3025	To be tested when pollution is suspected
27	Polynuclear aromatic hydrocarbons, mg/L	-	May be carcinogenic	-	28 of 3025,1964	To be tested when pollution is suspected
28	Mineral Oil, mg/L	0.01	Beyond this limit undesirable taste and odour after Chlorination takes place	0.03	Gas chromatogra phic method	To be tested when pollution is suspected
29	Pesticides mg/L	Absent	Toxic	0.001	58 of 3025, 1964	-
30	Radioactive materials a. Alpha emitters Bq/L b. Beta emitters pci/L	 - -	 - -	 0.1 1.0	 - -	 - -
31	Alkalinity (as $CaCO_3$), mg/L	200	Beyond this limit taste becomes unpleasant	600	13 of 3025,1964	-
32	Aluminum (as Al), mg/L	0.03	Cumulative effect is reported to cause dementia	0.2	31 0f 3025,1964	-
33	Boron (as B), mg/L	1	-	5	29 of 3025,1964	-

Note: Atomic absorption spectrophotometric method may be used.

ANNEXURE – VI

CLASSIFICATION OF INLAND SURFACE WATER (CPCB STANDARDS)

SR NO.	CHARACTERISTICS	A@	B@	C@	D@	E@
1	Dissolved Oxygen (mg/L), Min	6	5	4	4	-
2	Biochemical Oxygen Demand (mg/L), Min	2	3	3	-	-
3	Total Coliform Organisms, MPN/100 ml, Max.	50	500	5000	-	-
4	Total Dissolved Solids (mg/L), Max	500	-	1500	-	2100
5	Chlorides (as Cl^-), mg/L, Max.	250	-	600	-	600
6	Colour, Hazen units, Max	10	300	300	-	-
7	Sodium absorption ratio, Max	-	-	-	-	26
8	Boron (as B), mg/L, Max	-	-	-	-	2
9	Sulphates (as SO_4^{-2}), mg/L, Max.	400	-	400	-	1000
10	Nitrates (as NO_3^-), mg/L, Max	20	-	50	-	-
11	Free Ammonia (as N), mg/L, Max	-	-	-	1.2	-
12	Conductivity at 25°C, micromhos/cm, Max	-	-	-	1.0	2.25
13	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0
14.	Arsenic (as As), mg/L, Max	0.05	0.2	0.2	-	-
15	Iron (as Fe), mg/L, Max	0.3	-	50	-	-
16	Fluorides (as F), mg/L, Max	1.5	1.5	1.5	-	-
17	Lead (as Pb), mg/L, Max	0.1	-	0.1	-	-
18	Copper (as Cu), mg/L, Max	1.5	-	1.5	-	-
19	Zinc (as Zn), mg/L, Max	15	-	15	-	-

Note: If the Coliform count is found to be more than the prescribed tolerance limits, the criteria for coliforms shall be satisfied if not more than 20 percent of samples show more than the tolerance limits specified, and not more than 5 percent of samples show values more than 4 times the tolerance limit. Further, the feacal coliform should not be more than 20 percent of the coliform.

A@ Drinking water surface Without conventional treatment but after disinfection
B@ Outdoor bathing (organized)
C@ Drinking water source with conventional treatment followed by disinfection
D@ Propagation of wild life, fisheries
E@ Irrigation, industrial, cooling, controlled waste disposal

ANNEXURE – VII

CPCB RECOMMENDATIONS FOR COMMUNITY NOISE EXPOSURE (1989)

CATEGORY OF AREA	Leq (dBA) (DAYTIME) (0600 TO 2100 HRS)	Ldn (dBA) (NIGHT TIME) (2100 TO 0600 HRS)
Industrial Area	75	70
Commercial Area	65	55
Residential Area	55	45
Silence Zone	50	40

ANNEXURE – VIII

DAMAGE RISK CRITERIA FOR HEARING LOSS OCCUPATIONAL SAFETY& HEALTH ADMINISTRATION (OSHA)

MAXIMUM ALLOWABLE DURATION PER DAY (HOURS)	NOISE LEVEL (SLOW RESPONSE) dBA
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or Less	115

ANNEXURE – IX

DEMOGRAPHIC STRUCTURE & LITERACY OF THE STUDY AREA AS PER CENSUS – 2001

Sr. No	Village Names	Area in Hector	No. of HH	Population Details			P_SC	P_ST	Literacy		
				TOT_P	TOT_M	TOT_F			P_LIT	M_LIT	F_LIT
STATE SIKKIM											
TEHSIL- SORENG, ***DISTRICT***- WEST SIKKIM											
1.	Chumbong	600	357	1785	904	881	73	262	1013	583	430
2.	Zoom	436	369	1782	897	885	125	44	1086	620	466
3.	Geling	275	215	1010	517	493	61	87	476	286	190
4.	Samsing	386	307	1796	942	854	146	116	1042	595	447
	Total	**1697**	**1248**	**6373**	**3260**	**3113**	**405**	**509**	**3617**	**2084**	**1533**
TEHSIL - NAMCHI, ***DISTRICT***- SOUTH SIKKIM											
5.	Salghari	193	1381	6366	3356	3010	595	332	4167	2394	1773
6.	Chisopani	221	176	980	483	497	123	3	522	299	223
7.	Tinik	169	142	712	386	326	48	0	447	265	182
8.	Poklok (polok)	411	300	1591	826	765	47	0	984	598	386
9.	Sangbung	182	161	766	393	373	42	186	379	213	166
10.	Dhargaon	190	65	344	168	176	13	32	220	117	103
11.	Dorop	276	180	876	438	438	28	3	483	275	208
12.	Shyampani	171	33	177	94	83	4	35	108	63	45
13.	Gom	353	188	1024	530	494	90	17	622	362	260
14.	Assangthang	228	121	600	318	282	27	16	401	234	167
15.	Denchung	398	191	1028	545	483	7	118	624	375	249
16.	Kamrang	491	270	1326	698	628	32	66	802	474	328
17.	Tinzer	143	69	314	153	161	5	2	236	126	110
18.	Singhithang	270	1303	5749	2959	2790	211	916	4086	2251	1835
19.	Kopchey	233	244	1240	615	625	0	155	801	440	361
20.	Bomtar	175	532	2521	1317	1204	203	293	1745	961	784
21.	Sorok	133	80	409	221	188	62	0	171	104	67
22.	Mikkhola	247	124	620	299	321	61	86	419	225	194
23.	Manpur	107	33	210	112	98	2	0	131	83	48
24.	Kitam	212	165	965	463	502	70	11	582	306	276
25.	Rong	323	99	499	263	236	0	36	328	192	136
26.	Kartickey	159	135	761	384	377	107	11	475	270	205
27.	Palum	144	40	192	99	93	14	0	90	50	40
28.	Sumbuk	116	253	1036	571	465	51	25	585	360	225
29.	Suntaley (Sumbuk)	219	76	345	172	173	14	70	220	112	108
30.	Singtam	128	44	210	118	92	0	1	121	69	52
31.	Bul	133	44	237	118	119	0	0	140	84	56
32.	Saleumbong	240	114	622	330	292	87	15	351	209	142
33.	Phalidara	329	141	811	418	393	0	223	482	267	215
34.	Gumpa-ghurpisey	172	329	1596	813	783	82	504	1140	608	532
35.	Maniram	252	189	912	473	439	16	208	496	284	212
36.	Rabitar	296	116	637	333	304	21	116	276	171	105
37.	Rabikhola	170	73	397	208	189	0	12	222	130	92
38.	Rateypani	337	220	1164	586	578	220	180	629	361	268
39.	Bikmat	258	103	567	277	290	10	46	342	172	170
40.	Paleytam	83	41	216	106	110	0	43	162	89	73
41.	Sadam	374	165	906	469	437	52	54	534	308	226
42.	Sukrabarey	241	227	1106	569	537	59	18	719	393	326

ANNEXURE – IX (CONT.)

Sr. No	Village Names	Area in Hector	No. of HH	Population Details			P_SC	P_ST	Literacy		
				TOT_P	TOT_M	TOT_F			P_LIT	M_LIT	F_LIT
43.	Suntaley (Sadam)	364	197	1149	583	566	90	142	595	343	252
44.	Longchok	324	146	777	395	382	0	147	403	223	180
45.	Panchgharey	190	195	980	517	463	24	60	498	305	193
46.	Turuk	414	120	638	336	302	0	27	457	264	193
47.	Kamarey	170	145	755	377	378	39	8	456	264	192
48.	Ramabong	294	193	1048	510	538	77	62	512	291	221
49.	Kerabari	148	128	637	341	296	71	5	262	165	97
50.	Mellidara	362	294	1605	812	793	55	5	854	489	365
51.	Paiyong (kerabari)	285	206	1082	561	521	102	35	697	392	305
	Total	**11328**	**9791**	**48703**	**25113**	**23590**	**2861**	**4324**	**29976**	**17030**	**12946**
STATE WEST BENGAL											
TEHSIL - DARJEELING PULBAZAR**, DISTRICT**- DARJILING											
52.	Goke	1857	1479	8061	4111	3950	571	277	4531	2625	1906
53.	Singla Tea Garden	245	623	2957	1520	1437	127	97	1663	1004	659
54.	Barnesbeg Tea Garden	290	275	1371	731	640	0	0	898	549	349
55.	Tukvar Tea Garden	634	862	3995	1971	2024	327	46	2875	1577	1298
56.	Badamtam Tea Garden	1200	1070	5184	2577	2607	385	50	3463	1940	1523
57.	Phub Sering Tea Garden	504	621	2950	1482	1468	145	83	2211	1217	994
58.	Patta Bong Tea Garden	-	377	1633	806	827	51	3	1213	674	539
59.	Lebong Tea Garden	454	465	2088	1060	1028	44	27	1399	819	580
60.	Rungneet Tea Garden	169	274	1227	627	600	3	22	922	518	404
61.	Darjiling	1038	17247	107197	55963	51234	7150	12747	90009	48929	41080
62.	Ging Tea Garden	681	837	4067	2018	2049	132	48	2953	1642	1311
63.	Banockburn Tea Garden	501	340	1663	844	819	40	0	1046	632	414
64.	Lebong And Mineral Spring Tea	822	1121	5370	2750	2620	281	328	3801	2114	1687
65.	Pandam Tea Garden	485	854	3912	1957	1955	236	232	2855	1535	1320
	Total	**8879**	**26445**	**151675**	**78417**	**73258**	**9492**	**13960**	**119839**	**65775**	**54064**
TEHSIL - JOREBUNGLOW SUKIAPOKHRI***, DISTRICT***- DARJILING											
66.	Rangaroong Tea Garden	148	303	1352	692	660	116	154	940	540	400
67.	Senchal Forest	3020	45	181	87	94	7	31	143	76	67
	Total	**3168**	**348**	**1533**	**779**	**754**	**123**	**185**	**1083**	**616**	**467**
TEHSIL - RANGLI RANGLIOT ***,DISTRICT***- DARJILING											
68.	Kambal Tea Garden	740	715	3655	1807	1848	173	56	2112	1217	895
69.	Mane Dara	339	238	1329	706	623	94	409	893	543	350
70.	Tukdh Tea Garden	622	649	3451	1777	1674	342	1	2317	1324	993
71.	Dawai Pani	172	207	1094	581	513	27	136	800	469	331
72.	Pubong Khas Mahal	259	313	1606	837	769	8	71	1182	669	513

ANNEXURE – IX (CONT.)

Sr. No	Village Names	Area in Hector	No. of HH	Population Details			P_SC	P_ST	Literacy		
				TOT_P	TOT_M	TOT_F			P_LIT	M_LIT	F_LIT
73.	Tukdah Forest	757	302	1446	749	697	32	202	984	549	435
74.	Tukdah	411	614	2977	1499	1478	192	1130	2162	1226	936
75.	Teesta Valley Forest	5414	27	161	91	70	5	21	113	70	43
76.	Lapchu Khas Mahal	110	160	744	398	346	20	136	498	292	206
77.	Lapchu Tea Garden	275	357	1669	831	838	19	4	1184	660	524
78.	Peshok Tea Garden	1023	782	3542	1741	1801	115	67	1939	1122	817
79.	Rayak Khas Mahal	26	19	101	55	46	1	0	64	36	28
80.	Bara Mungwa	229	250	1297	661	636	1	166	870	497	373
81.	Takling Khas Mohal	230	222	1038	535	503	110	306	688	382	306
82.	Chhota Mungwa	204	135	742	378	364	23	200	517	284	233
83.	Soriang Khas Mahal	204	299	1435	700	735	85	92	668	376	292
84.	Hum Tukdah Khas Mahal	189	493	2329	1138	1191	60	264	1584	812	772
85.	Ling Ding Khas Mahal	156	152	756	372	384	0	102	456	244	212
86.	Chegra Khas Mahal	367	202	982	531	451	6	326	629	374	255
87.	Teesta Valley Tea Garden	760	1113	5511	2732	2779	217	19	3345	1931	1414
88.	Rangli Rangliot Tea Garden	412	518	2501	1199	1302	61	51	1806	984	822
89.	Gielie Tea Garden	488	678	3184	1554	1630	94	7	1909	1079	830
90.	Pumong Tea Garden	1081	1281	5941	2875	3066	225	7	3987	2214	1773
Total		**14468**	**9726**	**47491**	**23747**	**23744**	**1910**	**3773**	**30707**	**17354**	**13353**
TEHSIL-KALIMPONG-I***, DISTRICT***- DARJILING											
91.	Mangwa Forest	467	127	661	348	313	65	7	332	202	130
92.	Kalimpong Dansong Forest	186	144	765	408	357	42	42	435	266	169
93.	Kalimpong Khas Mahal	745	1513	7764	3811	3953	925	1645	5575	2955	2620
94.	Mangber Forest	471	10	41	18	23	0	8	32	16	16
95.	Tashiding Forest	599	10	59	30	29	0	0	30	18	12
Total		**2468**	**1804**	**9290**	**4615**	**4675**	**1032**	**1702**	**6404**	**3457**	**2947**
Grand Total		**42009**	**49362**	**265065**	**135931**	**129134**	**15823**	**24453**	**191626**	**106316**	**85310**

Source: *Primary Census Abstract 2001,West & South Sikkim District, Darjiling District*

ANNEXURE – X

DETAILS OF AMENITIES

Sr. No.	Village	Educational Institutions	Medical Facilities	Drinking Water Supply	Commu-nication	Transp ortation	Approach Road	Power Supply
STATE SIKKIM								
TEHSIL- SORENG ,***DISTRICT***- WEST SIKKIM								
1.	Chumbong	P(2),M,S	CWC,PHS	T,S	PO(2)	BS	PR,MR,FP	ED
2.	Zoom	P(2),M	CWC,PHS	T,S	PO,PH(19)	BS	PR,FP	ED
3.	Geling	P(2),M	CWC	T,S	-	BS	PR,MR,FP	ED
4.	Samsing	P(2),O	CWC	T,S	PO,PH(24)	BS	PR,MR,FP	ED
TEHSIL - NAMCHI ***, DISTRICT*** - SOUTH SIKKIM								
5.	Salghari	P(4),M,S	CWC	T,S	PO,PH(211)	BS	PR,FP	EA
6.	Chisopani	P(2)	CWC	T,S	PH(12)	BS	PR,FP	ED
7.	Tinik	P	-	T,S	PH(4)	BS	PR,FP	ED
8.	Poklok (Polok)	P(4),M,S	CWC,PHS(2)	T,S	PO,PH(13)	BS	PR,FP	ED
9.	Sangbung	P	CWC	T,S	PH(2)	BS	MR,FP	ED
10.	Dhargaon	P	CWC	T,S	-	-	MR,FP	ED
11.	Dorop	P(2),M	PHS	T,S	PH(6)	-	MR,FP	ED
12.	Shyampani	-	CWC	T,S	PH(2)	-	MR,FP	ED
13.	Gom	P(3),M	CWC	T,S	PO,PH(14)	BS	PR,FP	ED
14.	Assangthang	P(2),M	CWC	T,S	PO,PH(18)	BS	PR,FP	ED
15.	Denchung	P(2),M	CWC	T,S	-	BS	PR,FP	ED
16.	Kamrang	P,M	CWC(2),PHS	T,S	PH(6)		MR,FP	ED
17.	Tinzer	P	-	T,S	PH(11)	BS	PR,FP	ED
18.	Singhithang	P(6),M(2),S(2), PUC,C,O	H,MCW,MH, HC,TB,RMP	T,S	PO,TO,PT O,PH(501)	BS	PR,MR,FP	EA
19.	Kopchey	P(3)	CWC	T,S	PH(64)	BS	PR,FP	ED
20.	Bomtar	P(2),M,S,O	CWC	T,S	PH(187)	BS	PR,MR,FP	EA
21.	Sorok	P	CWC	T,S	PO,PH(10)	BS	PR,FP	ED
22.	Mikkhola	P(2),M	--	T,S	PO,PH(24)	BS	PR,FP	ED
23.	Manpur	P	--	T,S	PO	BS	PR,FP	ED
24.	Kitam	P(2),M,S	CWC,PHS	T,S	PO,PH(17)	BS	PR,FP	ED
25.	Rong	P,M	CWC,PHS	T,S	PO	-	MR,FP	ED
26.	Kartickey	P	-	T,S	PO,PH(2)	BS	PR,FP	ED
27.	Palum	-	-	T,S	-	-	MR,FP	ED
28.	Sumbuk	P	-	T,S	-	BS	PR,MR,FP	ED
29.	Suntaley (Sumbuk)	P(2),M,S	PHS	T,S	-	-	PR,MR,FP	ED
30.	Singtam	P(2)		T,S	-	-	MR,FP	ED
31.	Bul	P	CWC	T,S	-	-	FP	ED
32.	Saleumbong	P		T,S	-	-	MR,FP	ED
33.	Phalidara	P,M	CWC	T,S	PO	BS	PR,FP	ED
34.	Gumpa-Ghurpisey	P(3),M(2),S(2), C,O	CWC	T,S	PH(78)	BS	PR,FP	ED
35.	Maniram	P(3),M,S	CWC	T,S	PO	BS	PR,FP	EA
36.	Rabitar	P(2)	-	T,S	-	BS	PR,FP	ED
37.	Rabikhola	P	-	T,S	-	BS	PR,FP	ED
38.	Rateypani	P(2),M,S	PHS	T,S	PO	BS	PR,FP	ED
39.	Bikmat	P(2),M,S	CWC	T,S	-	BS	PR,FP	ED
40.	Paleytam	P	CWC	T,S	PH(9)	-	FP	ED
41.	Sadam	P	CWC	T,S	PO,PH(11)	BS	PR,FP	ED

ANNEXURE – X (CONT.)

Sr. No.	Village	Educational Institutions	Medical Facilities	Drinking Water Supply	Commu-nication	Transp ortation	Approach Road	Power Supply
42.	Sukrabarey	P(4),M,S,PUC	PHS	T,S	PH(32)	BS	PR,FP	ED
43.	Suntaley (Sadam)	P(3),M	CWC	T,S	PH(3)	BS	PR,FP	ED
44.	Longchok	P(2),M	-	T,S	PO	-	MR,FP	ED
45.	Panchgharey	P	-	T,S	PH(8)	BS	PR,FP	ED
46.	Turuk	P(3)	PHS	T,S	PO,PH(7)	BS	PR,FP	ED
47.	Kamarey	P(2)	-	T,S		BS	PR,FP	ED
48.	Ramabong	P(2),M	CWC	T,S	PO,PH(7)	BS	PR,FP	ED
49.	Kerabari	P	CWC	T,S		BS	PR,FP	ED
50.	Mellidara	P(3),M,S,O	CWC,PHS	T,S	PO,PH(16)	BS	PR,FP	ED
51.	Paiyong (Kerabari)	P(3),M	CWC	T,S	PO,PH(2)	BS	PR,FP	ED
WEST BENGAL								
TEHSIL - DARJEELING PULBAZAR ***,DISTRICT***- DARJILING								
52.	Goke	P(12),M,S,AC	DA,PHS,CHW	S	,PO,PH(5)	-	PR,MR,FP	ED
53.	Singla Tea Garden	P(4)	DA	S		-	PR,FP	EO
54.	Barnesbeg Tea Garden	P(2),M	DA	S	PO,PH(2)	-	PR,FP	EO
55.	Tukvar Tea Garden	P(4),M,S	H	S	PO	-	PR,FP	EO
56.	Badamtam Tea Garden	P(3),M(2)	D	S	-	BS	MR,FP	ED
57.	Phub Sering Tea Garden	P(3)	-	S	PH(8)	-	MR,FP	ED
58.	Lebong Tea Garden	P	-	S	-	-	PR,MR,FP	
59.	Rungneet Tea Garden	P	-	S	PO,PH(3)	-	MR,FP	ED,EO
60.	Darjiling	P(3),M,S	PHS	T,S	PO(2),PH (25)	-	PR,MR,FP	ED
61.	Ging Tea Garden	P(3)	-	S	PH(10)	-	MR,FP	ED
62.	Banockburn Tea Garden	P	D	S	-	--	PR,MR,FP	ED
63.	Lebong And Mineral Spring Tea	P(11),M(2)	D(3),CWC(5),H C(2),CHW(5)	S	PH(2)	BS	PR,MR,FP	ED
64.	Pandam Tea Garden	P	-	S	-	-	PR,MR,FP	ED,EO
TEHSIL - JOREBUNGLOW SUKIAPOKHRI***, DISTRICT***- DARJILING								
65.	Rangaroong Tea Garden	P	D,PHS	T,S	PH	-	PR,MR,FP	ED
66.	Senchal Forest	-	-	T,S	PH(2)	-	PR,MR,FP	ED
TEHSIL - RANGLI RANGLIOT ***,DISTRICT***- DARJILING								
67.	Kambal Tea Garden	P(3)	H,D	T,S		BS	PR,MR,FP	ED
68.	Mane Dara	P(2)	D,PHS,CHW	T,S	PO,PH(2)	BS	PR,MR,FP	ED
69.	Tukdh Tea Garden	P(6)	D(2),PHS	T,TK,S	PO,PH(3)	BS	PR,MR,FP	ED,EO
70.	Dawai Pani	P(2)	-	S	-	BS	MR,FP	ED
71.	Pubong Khas Mahal	P(2)	CWC(5),PHS	T,TK,S	-	BS	MR,FP	ED
72.	Tukdah Forest	P(2),M(2)AC	MCW	T,S	PH(8)	BS	PR,MR,FP	ED
73.	Tukdah	P(9),M,S	CWC(8),PHC, PHS,CHW	T,S	PO,PH	BS	PR,MR,FP	ED
74.	Teesta Valley Forest	P,AC(2)	-	T	-	-	PR,MR,FP	ED
75.	Lapchu Khas Mahal	P(3),M,AC(3)	CWC(2),RMP	T,S	PH(3)	BS	PR,MR,FP	ED
76.	Lapchu Tea Garden	P(2),AC(8)	D	T,S	PO,PH(3)	BS	MR,FP	ED
77.	Peshok Tea Garden	P(3),M	RMP	T,S	PH(3)	BS	PR,MR,FP	ED
78.	Rayak Khas Mahal	P,AC(3)		T,S		BS	MR,FP	
79.	Bara Mungwa	P	CWC(3)	T,S	PO,PH	BS	MR,FP	ED

ANNEXURE – X (CONT.)

Sr. No.	Village	Educational Institutions	Medical Facilities	Drinking Water Supply	Commu-nication	Transp ortation	Approach Road	Power Supply
80.	Takling Khas Mohal	P(3)	CWC(3),PHC	T,S	PO	BS	MR,FP	ED
81.	Chhota Mungwa	P,AC(4)	CWC	T,S	PO		MR,FP	ED
82.	Soriang Khas Mahal	P(4),M	D,CWC(3)	T,S	PO	BS	MR,FP	ED
83.	Hum Tukdah Khas Mahal	P(3),M,S,PUC, AC(2)	H,D,CWC(6), RMP	T,S	PO,PH(30)	BS	PR,MR,FP	ED
84.	Ling Ding Khas Mahal	P(2),M(2)AC(2)		T,S	-	BS	PR,MR,FP	ED
85.	Chegra Khas Mahal	P(2)	D,CWC(4)	T,S	-	BS	MR,FP	ED
86.	Teesta Valley Tea Garden	P(5),M	H,RMP(3),CH W	T,S	PO,PH(2)	BS	PR,MR,FP	ED
87.	Rangli Rangliot Tea Garden	P(4)	D	T,S	-	-	PR,MR,FP	ED
88.	Gielie Tea Garden	P(3),M	D,CHW	S	-	-	PR,MR,FP	ED
89.	Pumong Tea Garden	P(7),M,S	D(3),PHS(2),C HW	T,S	PO,PH(4)	BS	MR,FP	ED,EO
TEHSIL - KALIMPONG - I***, DISTRICT***- DARJILING								
90.	Mangwa Forest	-	-	T,S	-	-	FP	-
91.	Kalimpong Dansong Forest	-	-	S	-	-	MR,FP	-
92.	Kalimpong Khas Mahal	P(7),M	PHS(2)	T,S	PO(3),PH (250)	BS	PR,MR,FP	ED,EO
93.	Mangber Forest	P	-	T,S	PH(2)	BS	PR,FP	ED
94.	Tashiding Forest	-	-	S	-	-	MR,FP	-

Source: *Village Directory 2001, West & South Sikkim District, Darjiling District*

ANNEXURE – XI

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: PROJECT SITE (A1)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	09.01.2013	32	91	< 4	12	1	< 0.1
2.	12.01.2013	25	75	< 4	14	2	< 0.1
3.	15.01.2013	23	73	< 4	< 9	1	< 0.1
4.	18.01.2013	18	52	< 4	14	1	< 0.1
5.	21.01.2013	18	53	4	14	2	< 0.1
6.	24.01.2013	19	55	4	15	3	< 0.1
7.	27.01.2013	20	57	5	15	2	< 0.1
8.	30.01.2013	21	59	< 4	12	2	< 0.1
9.	02.02.2013	23	70	< 4	10	1	< 0.1
10.	05.02.2013	22	68	< 4	13	1	< 0.1
11.	08.02.2013	20	60	4	12	1	< 0.1
12.	11.02.2013	18	59	5	14	2	< 0.1
13.	14.02.2013	23	70	6	17	1	< 0.1
14.	17.02.2013	25	74	6	13	1	< 0.1
15.	20.02.2013	28	79	5	12	1	< 0.1
16.	23.02.2013	24	73	5	16	1	< 0.1
17.	26.02.2013	29	82	6	18	1	< 0.1
18.	01.03.2013	25	76	5	12	1	< 0.1
19.	04.03.2013	27	78	4	12	1	< 0.1
20.	07.03.2013	26	76	< 4	10	1	< 0.1
21.	10.03.2013	24	73	< 4	< 9	1	< 0.1
22.	13.03.2013	23	72	5	9	1	< 0.1
23.	16.03.2013	22	65	< 4	< 9	1	< 0.1
24.	19.03.2013	27	74	< 4	12	1	< 0.1
Min		**18**	**52**	**4**	**9**	**1**	**-**
Max		**32**	**91**	**6**	**18**	**3**	**-**
98th Percentile		**30.62**	**86.86**	**6**	**17.6**	**2.54**	**-**
Average		**23.42**	**69.33**	**4.92**	**13.14**	**1.29**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: VILLAGE LAPCHU MANPUR (A2)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	10.01.2013	24	72	< 4	< 9	< 0.1	< 0.1
2.	13.01.2013	22	67	< 4	< 9	< 0.1	< 0.1
3.	16.01.2013	27	80	< 4	9	< 0.1	< 0.1
4.	19.01.2013	18	56	< 4	9	< 0.1	< 0.1
5.	22.01.2013	19	58	< 4	9	< 0.1	< 0.1
6.	25.01.2013	19	59	< 4	9	< 0.1	< 0.1
7.	28.01.2013	19	63	< 4	9	< 0.1	< 0.1
8.	31.01.2013	18	61	< 4	9	< 0.1	< 0.1
9.	03.02.2013	17	60	< 4	< 9	< 0.1	< 0.1
10.	06.02.2013	16	56	< 4	< 9	< 0.1	< 0.1
11.	09.02.2013	20	69	< 4	< 9	< 0.1	< 0.1
12.	12.02.2013	19	65	< 4	< 9	< 0.1	< 0.1
13.	15.02.2013	20	66	< 4	< 9	< 0.1	< 0.1
14.	18.02.2013	19	60	< 4	< 9	< 0.1	< 0.1
15.	21.02.2013	19	63	< 4	< 9	< 0.1	< 0.1
16.	24.02.2013	22	70	< 4	10	< 0.1	< 0.1
17.	27.02.2013	23	72	< 4	9	< 0.1	< 0.1
18.	02.03.2013	21	70	< 4	9	< 0.1	< 0.1
19.	05.03.2013	20	65	< 4	< 9	< 0.1	< 0.1
20.	08.03.2013	21	68	< 4	< 9	< 0.1	< 0.1
21.	11.03.2013	19	59	< 4	9	< 0.1	< 0.1
22.	14.03.2013	19	57	< 4	9	< 0.1	< 0.1
23.	17.03.2013	18	56	< 4	< 9	< 0.1	< 0.1
24.	20.03.2013	20	60	< 4	9	< 0.1	< 0.1
Min		**16**	**56**	**-**	**9**	**-**	**-**
Max		**27**	**80**	**-**	**10**	**-**	**-**
98th Percentile		**25.62**	**76.32**	**-**	**9.78**	**-**	**-**
Average		**19.96**	**63.83**	**-**	**9.08**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: VILLAGE KITAM (A3)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	11.01.2013	22	65	4	19	< 0.1	< 0.1
2.	14.01.2013	18	52	4	18	< 0.1	< 0.1
3.	17.01.2013	32	96	4	20	< 0.1	< 0.1
4.	20.01.2013	24	72	4	19	< 0.1	< 0.1
5.	23.01.2013	18	53	4	19	< 0.1	< 0.1
6.	26.01.2013	18	56	4	20	< 0.1	< 0.1
7.	29.01.2013	19	59	4	18	< 0.1	< 0.1
8.	01.02.2013	18	57	< 4	10	< 0.1	< 0.1
9.	04.02.2013	19	60	< 4	12	< 0.1	< 0.1
10.	07.02.2013	20	63	< 4	10	< 0.1	< 0.1
11.	10.02.2013	17	57	< 4	18	< 0.1	< 0.1
12.	13.02.2013	16	52	< 4	12	< 0.1	< 0.1
13.	16.02.2013	17	53	< 4	16	< 0.1	< 0.1
14.	19.02.2013	18	55	< 4	15	< 0.1	< 0.1
15.	22.02.2013	18	56	< 4	12	< 0.1	< 0.1
16.	25.02.2013	19	59	< 4	15	< 0.1	< 0.1
17.	28.02.2013	20	61	4	12	< 0.1	< 0.1
18.	03.03.2013	16	55	4	18	< 0.1	< 0.1
19.	06.03.2013	24	70	4	12	< 0.1	< 0.1
20.	09.03.2013	21	68	< 4	11	< 0.1	< 0.1
21.	12.03.2013	21	67	< 4	13	< 0.1	< 0.1
22.	15.03.2013	23	71	< 4	10	< 0.1	< 0.1
23.	18.03.2013	20	59	< 4	12	< 0.1	< 0.1
24.	21.03.2013	18	56	< 4	15	< 0.1	< 0.1
Min		**16**	**52**	**4**	**10**	**-**	**-**
Max		**32**	**96**	**4**	**20**	**-**	**-**
98th Percentile		**28.32**	**84.96**	**4**	**20**	**-**	**-**
Average		**19.83**	**61.33**	**4.00**	**14.83**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: VILLAGE JORETHANG (A4)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	09.01.2013	8	22	< 4	< 9	< 0.1	< 0.1
2.	12.01.2013	11	32	< 4	< 9	< 0.1	< 0.1
3.	15.01.2013	10	32	< 4	< 9	< 0.1	< 0.1
4.	18.01.2013	5	12	< 4	< 9	< 0.1	< 0.1
5.	21.01.2013	14	40	< 4	< 9	< 0.1	< 0.1
6.	24.01.2013	15	44	< 4	< 9	< 0.1	< 0.1
7.	27.01.2013	12	39	< 4	< 9	< 0.1	< 0.1
8.	30.01.2013	15	49	< 4	< 9	< 0.1	< 0.1
9.	02.02.2013	17	55	< 4	< 9	< 0.1	< 0.1
10.	05.02.2013	16	50	< 4	< 9	< 0.1	< 0.1
11.	08.02.2013	18	63	< 4	< 9	< 0.1	< 0.1
12.	11.02.2013	17	59	< 4	< 9	< 0.1	< 0.1
13.	14.02.2013	17	61	< 4	< 9	< 0.1	< 0.1
14.	17.02.2013	16	56	< 4	< 9	< 0.1	< 0.1
15.	20.02.2013	15	48	< 4	< 9	< 0.1	< 0.1
16.	23.02.2013	16	52	< 4	< 9	< 0.1	< 0.1
17.	26.02.2013	17	54	< 4	9	< 0.1	< 0.1
18.	01.03.2013	15	49	< 4	9	< 0.1	< 0.1
19.	04.03.2013	15	48	< 4	< 9	< 0.1	< 0.1
20.	07.03.2013	14	45	< 4	< 9	< 0.1	< 0.1
21.	10.03.2013	12	40	< 4	< 9	< 0.1	< 0.1
22.	13.03.2013	13	39	< 4	< 9	< 0.1	< 0.1
23.	16.03.2013	13	36	< 4	< 9	< 0.1	< 0.1
24.	19.03.2013	14	43	< 4	9	< 0.1	< 0.1
Min		**5**	**12**	**-**	**9**	**-**	**-**
Max		**18**	**63**	**-**	**9**	**-**	**-**
98th Percentile		**17.54**	**62.08**	**-**	**9**	**-**	**-**
Average		**13.96**	**44.50**	**-**	**9.00**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: VILLAGE PESHOK (A5)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	10.01.2013	19	56	4	25	< 0.1	< 0.1
2.	13.01.2013	30	88	< 4	11	< 0.1	< 0.1
3.	16.01.2013	24	70	< 4	9	< 0.1	< 0.1
4.	19.01.2013	20	62	4	12	< 0.1	< 0.1
5.	22.01.2013	17	59	< 4	10	< 0.1	< 0.1
6.	25.01.2013	16	57	< 4	14	< 0.1	< 0.1
7.	28.01.2013	19	64	< 4	15	< 0.1	< 0.1
8.	31.01.2013	21	68	< 4	12	< 0.1	< 0.1
9.	03.02.2013	20	63	< 4	11	< 0.1	< 0.1
10.	06.02.2013	19	60	< 4	15	< 0.1	< 0.1
11.	09.02.2013	23	70	< 4	17	< 0.1	< 0.1
12.	12.02.2013	23	72	4	12	< 0.1	< 0.1
13.	15.02.2013	24	74	4	13	< 0.1	< 0.1
14.	18.02.2013	18	59	4	14	< 0.1	< 0.1
15.	21.02.2013	20	67	4	15	< 0.1	< 0.1
16.	24.02.2013	21	69	< 4	12	< 0.1	< 0.1
17.	27.02.2013	18	58	< 4	12	< 0.1	< 0.1
18.	02.03.2013	16	56	< 4	15	< 0.1	< 0.1
19.	05.03.2013	19	61	< 4	12	< 0.1	< 0.1
20.	08.03.2013	22	67	< 4	13	< 0.1	< 0.1
21.	11.03.2013	23	70	4	14	< 0.1	< 0.1
22.	14.03.2013	24	74	4	14	< 0.1	< 0.1
23.	17.03.2013	26	77	< 4	16	< 0.1	< 0.1
24.	20.03.2013	22	70	< 4	12	< 0.1	< 0.1
Min		**16**	**56**	**4**	**9**	**-**	**-**
Max		**30**	**88**	**4**	**25**	**-**	**-**
98th Percentile		**28.16**	**82.94**	**4**	**21.32**	**-**	**-**
Average		**21.00**	**66.29**	**4.00**	**13.54**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: VILLAGE SIMBONG (A6)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	10.01.2013	20	66	< 4	< 9	< 0.1	< 0.1
2.	13.01.2013	26	77	< 4	14	< 0.1	< 0.1
3.	16.01.2013	28	80	< 4	13	< 0.1	< 0.1
4.	19.01.2013	23	71	< 4	12	< 0.1	< 0.1
5.	22.01.2013	17	60	< 4	9	< 0.1	< 0.1
6.	25.01.2013	19	65	< 4	12	< 0.1	< 0.1
7.	28.01.2013	20	70	< 4	12	< 0.1	< 0.1
8.	31.01.2013	19	69	< 4	13	< 0.1	< 0.1
9.	03.02.2013	18	62	< 4	12	< 0.1	< 0.1
10.	06.02.2013	15	55	< 4	10	< 0.1	< 0.1
11.	09.02.2013	17	62	< 4	10	< 0.1	< 0.1
12.	12.02.2013	18	67	< 4	9	< 0.1	< 0.1
13.	15.02.2013	16	60	< 4	9	< 0.1	< 0.1
14.	18.02.2013	14	55	< 4	10	< 0.1	< 0.1
15.	21.02.2013	18	63	< 4	12	< 0.1	< 0.1
16.	24.02.2013	17	67	< 4	11	< 0.1	< 0.1
17.	27.02.2013	19	70	< 4	12	< 0.1	< 0.1
18.	02.03.2013	20	71	< 4	10	< 0.1	< 0.1
19.	05.03.2013	18	68	< 4	9	< 0.1	< 0.1
20.	08.03.2013	25	75	< 4	12	< 0.1	< 0.1
21.	11.03.2013	20	70	< 4	14	< 0.1	< 0.1
22.	14.03.2013	19	62	< 4	12	< 0.1	< 0.1
23.	17.03.2013	20	64	< 4	11	< 0.1	< 0.1
24.	20.03.2013	22	68	< 4	10	< 0.1	< 0.1
Min		**14**	**55**	**-**	**9**	**-**	**-**
Max		**28**	**80**	**-**	**14**	**-**	**-**
98th Percentile		**27.08**	**78.62**	**-**	**14**	**-**	**-**
Average		**19.50**	**66.54**	**-**	**11.22**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: SIKARIDURA (A7)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	09.01.2013	21	63	< 4	9	< 0.1	< 0.1
2.	15.01.2013	14	43	< 4	< 9	< 0.1	< 0.1
3.	12.01.2013	20	59	< 4	< 9	< 0.1	< 0.1
4.	18.01.2013	21	64	< 4	< 9	< 0.1	< 0.1
5.	21.01.2013	20	61	< 4	9	< 0.1	< 0.1
6.	24.01.2013	20	60	< 4	9	< 0.1	< 0.1
7.	27.01.2013	19	57	< 4	< 9	< 0.1	< 0.1
8.	30.01.2013	18	55	< 4	< 9	< 0.1	< 0.1
9.	02.02.2013	15	49	< 4	< 9	< 0.1	< 0.1
10.	05.02.2013	17	56	4	< 9	< 0.1	< 0.1
11.	08.02.2013	16	45	4	9	< 0.1	< 0.1
12.	11.02.2013	18	60	< 4	< 9	< 0.1	< 0.1
13.	14.02.2013	17	58	< 4	< 9	< 0.1	< 0.1
14.	17.02.2013	16	55	< 4	< 9	< 0.1	< 0.1
15.	20.02.2013	15	52	< 4	< 9	< 0.1	< 0.1
16.	23.02.2013	16	51	< 4	9	< 0.1	< 0.1
17.	26.02.2013	17	56	4	9	< 0.1	< 0.1
18.	01.03.2013	14	49	4	10	< 0.1	< 0.1
19.	04.03.2013	15	50	< 4	< 9	< 0.1	< 0.1
20.	07.03.2013	16	57	< 4	< 9	< 0.1	< 0.1
21.	10.03.2013	17	58	< 4	9	< 0.1	< 0.1
22.	13.03.2013	19	60	< 4	< 9	< 0.1	< 0.1
23.	16.03.2013	20	61	< 4	9	< 0.1	< 0.1
24.	19.03.2013	21	63	< 4	< 9	< 0.1	< 0.1
Min		**14**	**43**	**4**	**9**	**-**	**-**
Max		**21**	**64**	**4**	**10**	**-**	**-**
98th Percentile		**21**	**63.54**	**4**	**9.84**	**-**	**-**
Average		**17.58**	**55.92**	**4.00**	**9.11**	**-**	**-**

ANNEXURE – XI (CONT.)

AMBIENT AIR QUALITY MONITORING RESULTS

LOCATION: LOCATION : VILLAGE YOUDHA (A8)

SL NO	DATE	PARAMETERS					
		PM2.5 (µg/m3)	PM10 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	HC AS METHANE (ppm)	HC AS NON METHANE (ppm)
1.	11.01.2013	22	66	< 4	< 9	< 0.1	< 0.1
2.	14.01.2013	26	79	< 4	< 9	< 0.1	< 0.1
3.	17.01.2013	23	66	< 4	< 9	< 0.1	< 0.1
4.	20.01.2013	20	60	< 4	< 9	< 0.1	< 0.1
5.	23.01.2013	21	64	< 4	< 9	< 0.1	< 0.1
6.	26.01.2013	23	70	< 4	< 9	< 0.1	< 0.1
7.	29.01.2013	24	73	< 4	< 9	< 0.1	< 0.1
8.	01.02.2013	22	63	< 4	< 9	< 0.1	< 0.1
9.	04.02.2013	25	77	< 4	< 9	< 0.1	< 0.1
10.	07.02.2013	26	78	< 4	< 9	< 0.1	< 0.1
11.	10.02.2013	26	77	< 4	< 9	< 0.1	< 0.1
12.	13.02.2013	22	65	< 4	< 9	< 0.1	< 0.1
13.	16.02.2013	20	61	< 4	< 9	< 0.1	< 0.1
14.	19.02.2013	21	63	< 4	< 9	< 0.1	< 0.1
15.	22.02.2013	22	66	< 4	< 9	< 0.1	< 0.1
16.	25.02.2013	23	67	< 4	9	< 0.1	< 0.1
17.	28.02.2013	22	69	< 4	9	< 0.1	< 0.1
18.	03.03.2013	24	71	< 4	< 9	< 0.1	< 0.1
19.	06.03.2013	24	73	< 4	< 9	< 0.1	< 0.1
20.	09.03.2013	23	74	< 4	9	< 0.1	< 0.1
21.	12.03.2013	25	71	< 4	9	< 0.1	< 0.1
22.	15.03.2013	24	70	< 4	< 9	< 0.1	< 0.1
23.	18.03.2013	22	67	< 4	9	< 0.1	< 0.1
24.	21.03.2013	20	65	< 4	9	< 0.1	< 0.1
Min		**20**	**60**	**-**	**9**	**-**	**-**
Max		**26**	**79**	**-**	**9**	**-**	**-**
98th Percentile		**26**	**78.54**	**-**	**9**	**-**	**-**
Average		**22.92**	**68.96**	**-**	**9.00**	**-**	**-**

ANNEXURE – XII

A COPY ENVIRONMENT POLICY APPROVED BY BOARD OF DIRECTORS

ESVEE group
WE MAKE DREAMS COME TRUE

ESVEEGEE BREWERIES (P) LTD.

Administrative Office : 3rd Floor, Antaraa Tower, Opp. Police Hospital, Dansh Road, Panbazar
GUWAHATI - 781001 (Assam)
☎ 0361-2512388, 2518611, Fax : 91-361-2603454
e-mail : jitendra.mewalal@gmail.com, rajesh_jalan1@yahoo.com, bimd54@yahoo.com

ENVIRONMENTAL POLICY

M/s. Esveegee Breweries (P) Limited, believe that we have a responsibility to care for and protect the environment in which we operate. We are fully committed to improving environmental performance across all of our business activities, and will encourage our business partners and members of the wider community to join us in this effort.

M/s. Esveegee Breweries (P) Limited, recognizes our key impacts to be in the areas of Water, Air, Soil and Noise.
Further, we are willing to reduce the following:

- Energy Use
- Raw Material Use
- Waste Generation
- Emissions to Air/Water
- Water Use
- Transport
- Procurement

We will strive to:

- Adopt the highest environmental standards in all areas of operation, meeting and exceeding all relevant legislative requirements.
- Assess our organizational activities and identify areas where we can minimize impacts.
- Minimize waste through careful and efficient use of all materials and energy.
- Purchase sustainable products wherever feasible [e.g. recycled, low environmental impact products and energy from renewable sources]
- Publicize our environmental position.
- Trained employees in good environmental practice and encourage employee involvement in environmental action.
- Reduce risks from environmental, health or safety hazards for employees and others in the vicinity of our operation.
- Adopt an environmentally sound transport strategy.
- Aim to include environmental and ethical consideration in investment decisions where appropriate.
- Assist in developing solutions to environmental problems.
- Continually assess the environmental impact of all our operation.

M/s. Esveegee Breweries (P) limited have developed a series of action plans to supplement each of our environmental policy objectives.

Rajesh Kumar Jalan
Managing Director
09/01/2012

Factory : Manpur, South Sikkim - 737128

ANNEXURE – XIII

LIST OF FLORA IN THE STUDY AREA

TREES OF THE STUDY AREA

FAMILY & SCIENTIFIC NAME
ANGIOSPERM
ACERACEAE
Acer caudatum wall
Acer oblongum wall
Acer sp.
ANNONACEAE
Miliusaglobossa (D.C)
Miliusamacrocarpa hook
ALANGIACEAE
Alangiumalpinium
Alangiumsalviifolium (L.F.) Wangerm
ANNACARIDACEAE
Lanneacoromandeliea (Houtt)
Mangifera indica L.
*Magniferasylvatia*Roxb.
Semecarpusanacardium L.
APOCYNACEAE
Alstonianeriifolia D. Das
Alstoniascholoris L. R.
*Plumeriaarubra*L.
Thevetiaperuvianna (pers) Schum
*Wrightiaarborea*Mabberly
*Wrightiacoccinea*Roxb.
Anacardiaceae
Mangifera indica L.
BIGNONIACEAE
Jacaranda mimosifolia D. Das.
Oroxylumindicum L.
BOMBACACEAE
Bambaxceiba L
Ceibapentandra L.
BURSERACEAE
Garuga floribunda Decne
Garugapinnataroxb.
CAPPARACEAE
*Cratevareligosaf*orster
Capparismultiflorahook
CLUSIACEAE
Calophyllumpolyanthumwall
Garciniaanomalaplanch
*Graciniastipuata*T
COMBRETACEAE
Anogeissusacuminata (D.C.) Guilt &Pern
Terminaliaalata
Terminaliabellirica(Gaertn) Roxb.
Terminaliacatappa L.
Terminaliachebularetz
DIPTEROCARPACEAE
*Shorearobusta*Gaertn
DILLENIACEAE
Dillenia indica L.
*Dilleniapentagyna*Roxb

FAMILY & SCIENTIFIC NAME
EBENACEAE
DiospyroslonceifoliaRoxb.
ELAEOCARPACEAE
Elaeocarpus sp.
ERICACEAE
Rhododendrom arboretum
Rhododendrom sp.
Fabaceae
Acacia auriculiformis L
Acacia catechu L.Willd
Acacia farnesina wild
Adenantherapavonia L.
Albiziachinensis (Merr)
Albiziaprocera(Roxb.) Beneth
Bauhinia purpurea L.
Buteamonosperama Lam. Kuntze
Cassia fistula
Albizialebbeckbenth.
Dalbergialatifoliaroxb.
Dalbergiarimosaroxb
Dalbergiasissoo dc
Delonixregia (hook.)
Erythrinastrictaroxb.
Erythrina variegate roxb.
Pongamiapinnata L.
SamaneasamanMerr.
Tamarindusindicus L.
FLACOURTIACEAE
*Casearia**glomerata*Roxb.
CasearietomentesaRoxb.
LECYTHIDACEAE
*Careyaarborea*roxb.
*Careyaherbaceae*roxb.
LYTHRACEAE
Largerstroemiaparviflora
MANGOLIACEAE
*Mangollaglobosah*ook
*Mangoliaplerocarpa*roxb.
*Mangollahodgsonii*hook
Michellachampala L.
Michelladoltsopa
Michellaglabre
MALVACEAE
*Kydiacalycina*roxb.
Thespesia lampas (Gav.) Dalzell
MELIACEAE
Agaliaperviridishiem
Azadirachta indica
*Meliaazedarch*L.
MORIGACEAE
Moringaoleiferalam

ANNEXURE – XIII (CONT.)

FAMILY & SCIENTIFIC NAME
MORACEE
Ficusaltisimablume
Ficusbengalensis
Ficusbenjamina L.
Ficusdrupaceae
Ficushirtavahl
Ficusracemosa L.
Ficasreligiosa L.
Ficasvirens
MYRTACEAE
*Cailoistemoncitrinus (*Curtis skeel)
SyzygiumcuminiL. Skeel
Syzygium spp.
OLEACEACE
Nycanthesarber –Tristil
RUBIACEAE
Mitragynarotundifolia(Roxb.) kuntza
*Neolamarckiacadamba(*Roxb). Bosse
RUTACEAE
Aeglemarmeols L. Correa
Citrus reticulatablanco
*MurrayaKoenigii*L. Spreng
*Zanthoxylumacanthopodium*D.C.
*Zanthoxylumaramatum*D.C.
SIMAROUBACEAE
*Ailanthus intergrifollia*Lam.
SAPOTACEAE
Mimusopselengi L.
*Sacrospermaarboreum*hook
STERCULIACEAE

FAMILY & SCIENTIFIC NAME
Eriolaena sp.
Sterculia kingie Pram
*Sterculiavillosa*Roxb.
SONNERATIACEAE
Duabangagrandiflora (D.C.) wall
THEACEAE
Gordonia excels Blume
TILIACEAE
*Grewiaoptiva*Burret
*Grewiasepiaria*G. Das
Verbenaceae
Tectonagrandis
GmelinaarboreaRoxb.
GYMNOSPERM
PINACEAE
*Ablesdensa*Griff.
*Pinuskesiya*Gorton
Pinusroxburghii say
MONOCOTYLEDONS
Arecaceaea
Areca catachu L.
Phoenix sp.
PANDANACEAE
PandansfurcatesRoxb.
POACEAE
Bambusabambos L. vass
BambusabalcooaRoxb.
Dendrocalamushookeri
*Dendrocalamussikkensis*Gamble

HERBS OF THE STUDY AREA

FAMILY & SCIENTIFIC NAME
Agavaceae
Agavaamericana L.
Asclepiadaceae
Rosa macrophyla
Solanaceae
Solanumincanum L
Daturametel L
Theaceae
Camellia sinensis var. assamica
Verbenaceae
Clerodendrummultiflorum (Burm.f.) O.Ktze
Clerodendruminerme (L.) Gaertn.
Lantana camaraL.var.aculeata (L.) Mold.
Vitexnegundo
Vitexpinnata

ANNEXURE – XIV

LIST OF FAUNA IN THE STUDY AREA

BIRDS

FAMILY/SCIENTIFIC NAME	COMMON NAME
Family: Phasianidae	
Arborophilatorqueola	Hill Partridge
Arborophilamandellii	Chestnut-breasted Partridge
Gallus gallus	Red Junglefowl
Pavocristatus	Indian Peafowl
Family :Picidae	
Celeusbrachyurus	Rufous Woodpecker
Family: Megalaimidae	
Megalaimaasiatica	Blue-throated Barbet
Megalaimavirens	Great Barbet
Family : Upupidae	
Upupaepops	Common Hoopoe
Family: Coraciidae	
Coraciasbenghalensis	Indian Roller
Family: Alcedinidae	
Alcedoatthis	Common Kingfisher
Family: Meropidae	
Nyctyornisathertoni	Blue-bearded Bee-eater
Meropsleschenaulti	Chestnut-headed Bee-eater
Family: Cuculidae	
Clamatorjacobinus	Pied Cuckoo
Cuculusmicropterus	Indian Cuckoo
Family: Centropodidae	
Centropussinensis	Greater Coucal
Centropusbengalensis	Lesser Coucal
Family: Psittacidae	
Psittaculaalexandri	Red-breasted Parakeet
Psittaculahimalayana	Slaty-headed Parakeet
Family: Charadriidae	
Charadriusdubius	Little Ringed Plover
Vanellusleucurus	White-tailed Lapwing
Vanellusindicus	Red-wattled Lapwing
Family: Accipitridae	
Accipiter nisus	Eurasian Sparrowhawk
Family: Ardeidae	
Ardea goliath	Goliath Heron
Bubulcus ibis	Cattle Egret
Butoridesstriatus	Little Heron
Family: Corvidae	
Dendrocittavagabunda	RufousTreepie
Corvussplendens	House Crow
Corvusmacrorhynchos	Large-billed Crow
Corvuscorax	Corvusmacrorhynchos
Oriolusoriolus	Eurasian Golden Oriole
Coracinamacei	Large Cuckooshrike
Pericrocotussolaris	Grey-chinned Minivet
Pericrocotusflammeus	Scarlet Minivet
Hemipuspicatus	Bar-winged Flycatcher-shrike
Dicrurusmacrocercus	Black Drongo
Dicrurusremifer	Lesser Racket-tailed Drongo
Tephrodornisgularis	Large Woodshrike
Family: Muscicapidae	
Monticolarufiventris	Chestnut-bellied Rock Thrush
Copsychussaularis	Oriental Magpie Robin
Saxicolacaprata	Pied Bushchat
Family: Sturnidae	
Acridotherestristis	Common Myna*
Gracularegigiosa	Hill Myna
Family:Pycnonotidae	
Pycnonotusstriatus	Striated Bulbul
Pycnonotusjocosus	Red-whiskered Bulbul
Pycnonotuscafer	Red-vented Bulbul
Hypsipetesleucocephalus	Black Bulbul
Family:Sylviidae	
Seicercusaffinis	White-spectacled Warble
Family: Nectariniidae	
Dicaeum agile	Thick-billed Flowerpecker
Dicaeumignipectus	Fire-breasted Flowerpecker
Nectariniaasiatica	Purple sunbird
Aethopygasiparaja	Crimson sunbird
Family: Passeridae	
Passer domesticus	House Sparrow
Dendronanthusindicus	Forest Wagtail
Motacilla alba	White Wagtail
Motacillaflava	Yellow Wagtail
Lonchurastriata	White-rumpedMunia
Lonchuramalacca	Black-headed Munia

ANNEXURE – XIV (CONT.)

BUTTERFLY IN THE STUDY AREA

SCIENTIFIC NAME & FAMILY	COMMON NAME
Family Papilionidae	
Papiliopolytes	Common Mormon
Pachlioptaaristolochiae	Common rose
Graphiumdoson	Common jay
Graphiumagamemmnon	Tailed jay
Papiliopolymnestor	Common marmon
Family Pieridae	
Euremahecabe	Common Grass yellow
Catopsilia Pomona	Common Emigrant
Delias eucharis	Common Jezebel
Ixias Marianne	White orange tip
Ixias pyrene	Yellow Orangetip
Pieriscanidia	Indian Cabbage White

SCIENTIFIC NAME & FAMILY	COMMON NAME
Family: Nymphalidae	
*Junonialemonias*Linnaaeus	Lemon pancy
*Junoniaorithya*Linnaaeus	Blue pancy
Junonia almanac Linnaaeus	Peacock pancy
Danauschrysippus	Plain Tiger
*Danausgenutia*Cramer	Stripped Tiger
Hypolimanasmisippus	Danaid egg fly
Mycalesisperseus	Common bush brown
Cyrestisthyodamas	Common Sailer
Acraeaviolae	TwanyCoster
Euploeacore	Common Indian Crow
Family: Lycaenidae	
Spindasisvulcanus	Common silverline

REPTILES IN THE STUDY AREA

#	COMMON NAME	SCIENTIFIC NAME
Family : Agamidae		
1	Common garden lizard	*Calotesversicolor (*Daudin*)*
Family: Scincidae		
2	Sink	Mabuyacarinata
3	-	Asymblepharussikimmensis
Family: Varanidae		
4	Common Indian monitor●	*Varanusbengalensis* (Daudin)
Family: Colubridae		
5	Common rat snake●	*Ptyasmucosus*(Linn.)

#	COMMON NAME	SCIENTIFIC NAME
Family: Gekkonidae		
6	House Gecko	*Hemidactylusflaviviridis* (Ruppell)
Family: Elapidae		
7	Spectacled Cobra ●	Najakaouthia (Linn.)
Family:Viperidae		
8	Russell's Viper ●	*Daboiarusselii* (Shaw and Nodder)
9	Common Indian Krait ●	*Bungaruscaeruleus* (Schneider)

● Note sighted included Based on the information provided by the villagers during the interaction with them with the help of pictorial representation (Secondary information)

MAMMALS IN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
Order: Scandentia	
Family: Tupaiidae	
Suncusmurinussoccatus	House Shrew
Order: Chiroptera	
Sub-Order: Megachiroptera	
Family: Pteropodidae	
Indian Fulvous Fruit Bat	*Rousettusleschenaulti* (Desmarest)
Indian Flying Fox	*Pteropusgiganteus*brünnich
Family: Vespertilionidae	
Indian Pipistrelle	*Pipistrelluscoromandra* (Gray)
Order: Primates	
Family: Cercopithecidae	
Assamese Macaque	*Macacaassamensispelops* (Hodgson)

COMMON NAME	SCIENTIFIC NAME
Rhesus Macaque	*Macacamulattazimmermann*
Order: Carnivora	
Family: Canidae	
Asiatic Jackal	*Canisaureus* linnaeus
Family: Viverridae	
✶Large Indian Civet	*Viverrazibetha* linnaeus
Family: Felidae	
Jungle Cat	*Felischaus*schreber
✶ Leopard	*Pantherapardus* (Linnaeus)
Order: Rodentia	
Family: Muridae	
✶Himalayan Rat	R. nitidusnitidus (Hodgson)
House Mouse	*M. musculuscastaneus* Waterhouse
Large bandicoot Rat	*Bandicotaindicanemorivaga* (Hodgson)
Family: SCIURIDAE	
✶Orange-bellied Himalayan Squirrel	Dremomyslokriahlokriah (Hodgson)

ANNEXURE – XV

A COPY OF SUMMONS

In the Court of THE LD. JUDICIAL MAGISTRATE, (SOUTH) AT NAMCHI, SOUTH SIKKIM.

[illegible] LUTION REPORT CASE NO. 01/2013.

of

[illegible] Pollution Control Board,
Through its Member Secretary
[illegible] C.S. Pradhan, Govt of Sikkim *Versus* –
[illegible] Secretary-Deorali Gangtok.
East Sikkim.

Shri Rajesh Kumar Jalan,
Managing Director,
ESVEEGEE Breweries (Pvt, Ltd)
Manpur, P.O. & P.S. Jorethang,
South Sikkim.

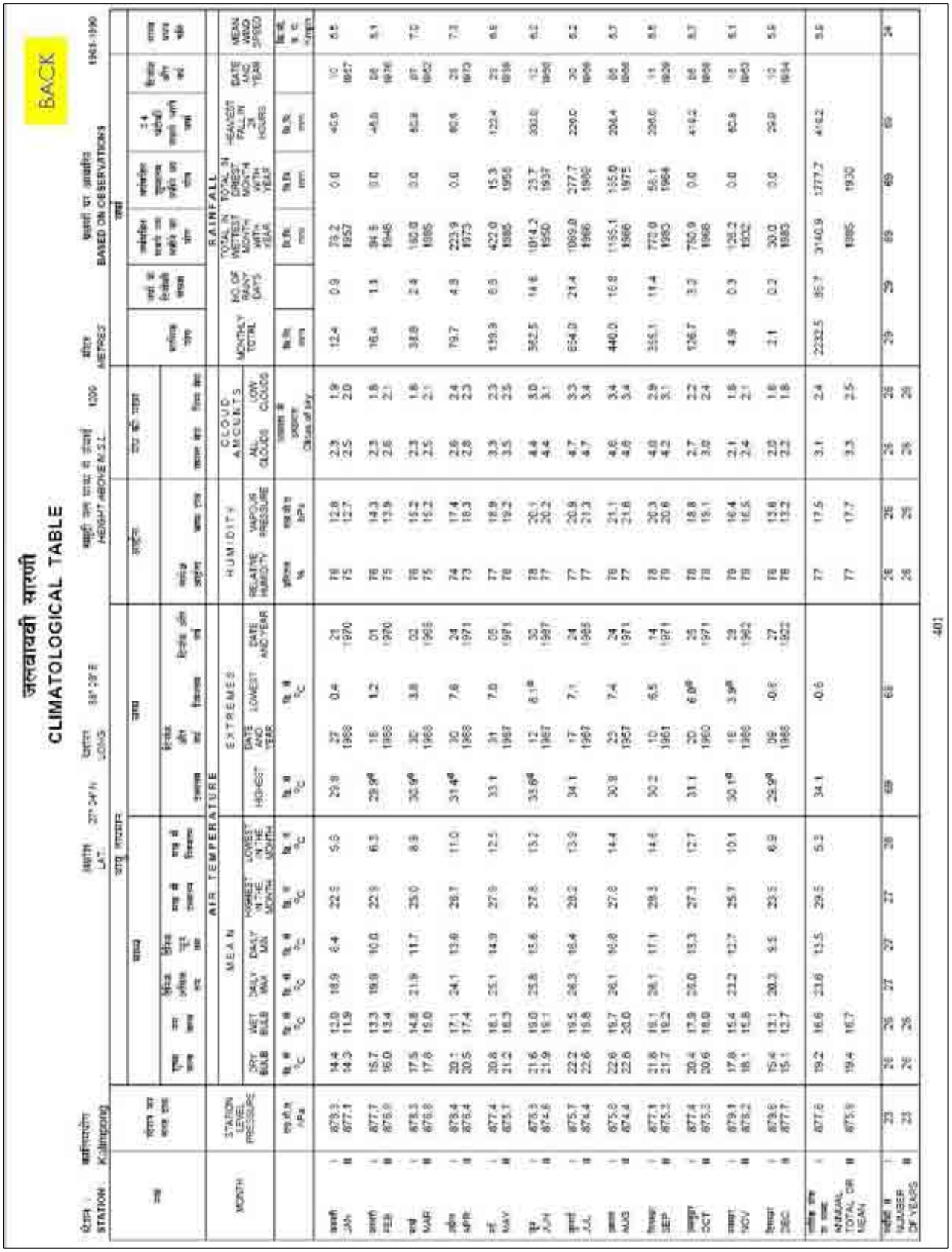
Serial No.	Date	Orders with signature of the Presiding Officer	Office notes as to action taken on order (*if any*) and date
01.	23.02.2013	Seen the application filed by Ld. P.P., Shri J. B. Rai for the Forest Department under Section 200(a) of the Cr.P.C., 1973. Register it as Prosecution Report case. Issue summons to the accused person/Respondent returnable by 28.03.2013. To:- 28.03.2013. For:- Appearance. Sd/- 23.2.13 *(SONAM D. WANGDI)* *Judicial Magistrate, (South),* *At Namchi, S. Sikkim.*	Issued on 23.2.2013

STATE POLLUTION CONTROL BOARD ★ GOVT. OF SIKKIM, GANGTOK ★

S.C.P.G. [illegible] Com.3/ 10,000 Cps / 12.10.2011

ANNEXURE – XVI

CLIMATOLOGICAL TABLE



ANNEXURE – XVI (CONT.)

जलवायवी सारणी
CLIMATOLOGICAL TABLE