DRAFT REPORT

MAY, 2022

M/s Saraogi Shellac Overseas Corp.

ENVIRONMENTAL IMPACT ASSESSMENT

For

Proposed 24 TPA GREEN FIELD Ambrettolide manufacturing unit

At

Dankuni Industrial Complex at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni - 712702, Dist : Hooghly, West Bengal

Envirotech

Envirotech East Pvt. Limited

An ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 Certified Company

Inhouse Laboratory Recognised by Ministry of Environment, Forest & Climate Change, Govt. of India

Accreditated by NABET, Quality Council of India as an EIA Consultant

NABET Certificate No.: NABET/EIA/2124/SA 0125

Baseline Monitoring Period: 1st December, 2020 – 28th February, 2021

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Envirotech East Pvt. Limited

An ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 Certified Company

- **Laboratory Recognized by MoEF&CC, Govt. of India**
- **Laboratory Recognized by West Bengal Pollution Control Board**
- **Accredited EIA Consultant by QCI-NABET**

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CIN NO : U74210WB1989PTC047403

Date: 12th May, 2022

TO WHOM IT MAY CONCERN

Subject: Proposed 24 TPA GREEN FIELD Ambrettolide manufacturing unit in Dankuni Industrial Complex at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal by M/s Saraogi Shellac Overseas Corp.

Refer: File No. 238/EN/T-II-1/061/2021
Proposal No. SIA/WB/IND2/61329/2021

We do hereby declare that we, M/s Envirotech East Pvt. Ltd. have undertaken the Environmental Impact Assessment Study for the subject job, as per the EIA Notification, 2006 and in compliance with the finalized Terms of Reference, issued by State Level Expert Appraisal Committee (SEAC), Govt. of West Bengal vide its letter (Ref. File No. J-11011/28/2008-IA-II(I)) dated 16th February, 2022. The prescribed TORs have been complied with and that the data submitted is factually correct.

For **Envirotech East Pvt. Ltd.**

(Asoke Kumar Banerjee)
Director

SARAOGI SHELLAC OVERSEAS CORP

Date: 16th May, 2022

TO WHOM IT MAY CONCERN

Subject: **Proposed 24 TPA GREEN FIELD Ambrettolide manufacturing unit in Dankuni Industrial Complex at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal by M/s Saraogi Shellac Overseas Corp.**

Refer: **File No. 238/EN/T-II-1/061/2021 dated 16-02-2022**
Proposal No. SIA/WB/IND2/61329/2021

This is to certify that we, **M/s Saraogi Shellac Overseas Corp.** have gone through the entire Environmental Impact Assessment report, prepared by M/s Envirotech East Pvt. Ltd., Kolkata as per the EIA Notification, 2006 and in compliance with the finalized Terms of Reference, issued by State Level Expert Appraisal Committee (SEAC), Govt. of West Bengal vide its letter (Ref. File No. **238/EN/T-II-1/061/2021** dated 16th February, 2022 for the above-mentioned project. The Information/data as given in the EIA report has been checked at our end and is found to be factually correct in all respect.

Thanking you,

Yours Sincerely,
for **Saraogi Shellac Overseas Corp**

SARAOGI SHELLAC OVERSEAS CORP.

.....
Dinesh Saraogi
Proprietor

Proprietor

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www.lacenshellac.com / www.ambrettolide.com

DECLARATION

Declaration by Experts contributing to the EIA report for Proposed 24 TPA GREEN FIELD Ambrettolide manufacturing unit in Dankuni Industrial Complex at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal by M/s **Saraogi Shellac Overseas Corp.**

This project falls under Sl. No. 5(f) of Synthetic Organic Chemical Industries under Category "**B**" of the list of the projects of the schedule shall require prior Environmental Clearance from Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt.of India.

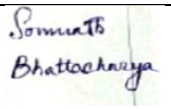
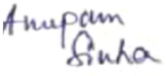
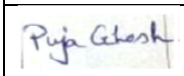
We, hereby, certify that we were part of the EIA team in the following capacity that developed the above EIA.

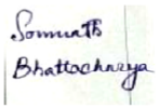
EIA Co-ordinator : Synthetic Organic Chemical

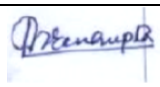
Name : Mr. Asoke Kumar Banerjee

DECLARATION BY EIA CO-ORDINATORS / FUNCTIONAL AREA EXPERTS INVOLVED IN THE PREPARATION OF EIA REPORT

Discipline	Name of Expert	Key Qualifications indicating area of specialization relevant to the respective discipline	Involvement (Period & Task)	Signature
EIA Coordinator : Mr. Asoke Kumar Banerjee		M.Sc. (Chem.)	November, 2021 to till date Assessment & identification of the overall project, co-ordination with respective functional area experts, finalisation of action plans for the overall preparation of EIA report	
Functional Area Experts involved:				
Air Pollution	Mr. A K. Sinha	P.G. Diploma in Environmental Science and Technology	November, 2021 to till date Finalization of monitoring locations for Ambient Air Quality Monitoring, evaluation of Ambient Air Quality results, suggestions & finalization of air pollution control measures, with client and contribution to overall EIA report preparation.	
Meteorology	Mr. T. Kundu	Bachelor of Technology (Chemical Engineering)	November, 2021 to till date Identification of air emission sources and their inventorisation, prediction of cumulative impacts on ambient air quality due to all identified point & mobile sources, suggestions & finalization of mitigation measures with	

			project proponent and contribution to overall EIA report preparation.	
Water Pollution Control	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Finalization of sampling locations for surface water and ground water quality monitoring, evaluation of water quality results, analysis of water balance, identification of sources for wastewater generation and give suggestions on suitable water pollution control, exploring the ways for conservation of water, identification & assessment of impacts, finalization of mitigation measures with project proponent and contribution to overall EIA report preparation.	
Geology Hydrology	Dr. Somenath Bhattacharyya	Ph.D in Geology	November, 2021 to till date Assessment of existing Geology and hydrology of the area, Understanding and representing groundwater conditions, finalization of groundwater sampling locations, finalization of survey findings, identification of probable impact due to proposed industrial activity, suggestion of mitigation measures and contribution to overall EIA report preparation.	
Ecology & Bio-diversity	Dr. (Mrs.) Anupam Sinha	Ph.D in Botany	November, 2021 to till date Assessment of the existing Ecology & Bio-diversity with proper emphasis on eco-sensitive locations, assessment of possible impacts to the biological and ecological environment of the	
	Ms. Puja Ghosh (TM)	M.Sc in Environmental Science		

			area due to the proposed industrial activity and EIA report preparation.	
Noise & Vibration	Mr. R.K. Dasgupta	Bachelor of Engineering (Mechanical)	November, 2021 to till date Finalization of noise sampling location and analysis of data, identification of impacts, suggestions & finalization of suitable mitigation measures with client and contribution to overall EIA report preparation.	
Land Use	Dr. Somenath Bhattacharyya	Ph.D in Geology	November, 2021 to till date Site visit, supervising development of land use maps of study area using GIS tools, finalization of landuse maps, based on ground truth verification, identification of any probable changes due to the proposed industrial activity and contribution to EIA report preparation.	
Solid & Hazardous Waste	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Identification of potential solid & hazardous waste generating sources and their inventorisation, finalization of waste management strategies, identification of impacts, finalization of mitigation measures with project proponent and contribution to overall EIA report preparation.	

Soil Conservation	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Finalization of soil sampling locations, identification of potential sources of impacts due to project, finalization of suitable mitigation measures with project proponent and contribution to overall EIA report preparation.	
Risk & Hazard	Mr. T. Kundu	Bachelor of Technology (Chemical Engineering)	November, 2021 to till date Identification of major hazards, assessment of risks associated with the proposed project, quantification of the identified risks with the help of the standard software. preparation of on-site and off-site emergency plan and contribution to overall EIA report preparation.	
Socio-economics	Prof. Pabitra Sengupta	M.Sc. (Economics)	November, 2021 to till date Field survey, assessment of the existing socio-economic scenario of the area, assessment of possible changes to socio-economics of the area due to the proposed project and contribution to overall EIA report preparation.	

CONTENT

Annexures:

ANNEXURE	DESCRIPTION
I	Standard TOR from MoEF&CC, Govt. of India
IIA & B	Land Documents
III	Documents on Water Permission
IV	Documents on Power Agreement
VA & B	Ambient Air Quality Data
VI	Corporate Environmental Policy
VII	Relevant Indian Standards
VIII A,B,C,D,E & F	MSDS Data Sheets

CHAPTER 1.0 INTRODUCTION

1.1 PREAMBLE

Ambrettolide is one of the few top quality musks synthesized commercially owing to gradual increase in demand in domestic and global market. Ambrettolide with its strong fragrant properties has become favourite in several consumer products like perfumery, food items and cosmetics. Its strong diffusive character makes it stay for a longer period.
Aleuritic acid is the starting material for synthesis of Ambrettolide. One of the most commonly used method of production of aleuritic acid, is by hydrolysis of lac, particularly of seed lac, shell lac and other lac products.

Considering the progressive demand of Ambrettolide, **M/s Saraogi Shellac Overseas Corp.** (herein after called as SSOC, a company with adequate experience in trading of shellac based products for different personal usages) is proposing a green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product. The unit will be coming up at Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed project will be installed on the available 0.54 acres/ 2240.82 Sqm of vacant land within the industrial area of Dankuni, Hooghly, West Bengal. No additional land will be acquired for the proposed project.

In the above context, SSOC had made an online application which was submitted to the State Environment Impact Assessment Authority (SEIAA), West Bengal, vide **online proposal no. SIA/WB/IND2/61329/2021 dated 27-02-2021** along with the application in prescribed format (Form-I), copy of pre-feasibility report, proposed ToRs and authenticated land documents for undertaking detailed EIA study as per deemed requirement of the EIA Notification, 2006 vide date 14th September and Gazette notification S.O. 1533 (E).

Upon reviewing the application along with the associated documents the State Expert Appraisal Committee (SEAC) vide **File no. 238/EN/T-II-1/061/2021 dated 16-02-2022** has granted ToR for the proposed project dated 16.02.2022 to conduct the EIA study **(Annexure-I).**

The proposed project activity is listed in Sl. No. 5(f) of Synthetic Organic Chemical Industries under Category "B" in the EIA Notification, 2006.

The Environmental Impact Assessment (EIA) report preparation and the corresponding work have been entrusted to the Environmental Consultant **M/s. Envirotech East Pvt. Ltd, Kolkata (copy of the NABET monthly circular in the QCI website enclosed).**

The EIA was prepared by using the baseline data collected during Winter season i.e. from December 2020 to February 2021.

The proposed project will be located on the available vacant land of 0.54 acres/ 2240.82 Sqm within the industrial area of Dankuni, Hooghly, West Bengal. No additional land will be acquired for the proposed project. The land is generally flat and does not come under flood hazard zone.

1.2 INDENTIFICATION OF THE PROJECT

Based on the felt need **M/s Saraogi Shellac Overseas Corporation** has proposed the green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product **(Table 1.1)** within the industrial area of Dankuni at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni, Hooghly, West Bengal, Pin Code- 712702.

Aleuritic acid is refluxed with TMOF in Reactor A for 2 days and then the condensate (distillate A) is removed followed by reaction with Acetic Anhydride in the 4th day. After removal of 2nd condensate (distillate B) the substrate is treated with Catalyst 1 (Potassium Hydroxide & Mono Ethylene Glycol) in the 6th day. The 3rd condensate is collected after few hours of reflux as distillate C.On 7th day the charge is treated with Catalyst 2 (Sodium methoxide & IPA). After few hours reflux, the condensate is collected as distillate D. In the 5th stage, the resultant charge is treated with glycerin in Reactor B (**R_1A**). The charging is co-distilled in part by part in Reactor C (**R_2**) with glycerin in the next 2 days where the heavier glycerin settles at the bottom and the crude Ambrettolide is collected separately. In the 6th stage, crude Ambrettolide is subjected to fractional distillation in Reactor D (**R_3**) which continues for the next 4 days and finally the pure Ambrettolide is treated with steam for stabilization in Reactor E (**R_4**). The final Ambrettolide is drained in new food grade aluminum drums which is packed for export.

Table-1.1
Proposed Project Configuration

*Complete reaction cycle will take a span of 15 days time.

Reactor No.	Substrate	Products	Quantity generated (kg)	End use	Utility
Reactor A	Aleuritic Acid (1800Kg) + Tri Methyl Orthoformate (1600Kg)	Distillate - A	1400Kg	Sold in the local market	Used by fragrance and flavor manufacturing companies
		Mixture - I	-	-	Used in the next stage of reaction
	Mixture-I + Acetic Anhydride (1130Kg)	Distillate - B	1100Kg	Sold in the local market	Used by fragrance and flavor manufacturing companies
		Mixture - II	-	-	Used in the next stage of reaction
	Mixture-II + Catalyst-I (KOH 41.1Kg + MEG 162.0Kg)	Distillate - C	165Kg	Sold in the local market	Used by fragrance and flavor manufacturing companies
		Mixture - III	-	-	Used in the next stage of reaction
	Mixture-III + Catalyst-II (Sodium Methoxide 35.8Kg + IPA 155.8Kg)	Distillate - D	220Kg	Sold in the local market	Used by fragrance and flavor manufacturing companies
		Final Mixture	-	-	Used in the next stage of treatment
Reactor B (R_1A) & then transferred to Reactor C (R_2) in portions	Final Mixture + Glycerine (2240Kg)	Glycerine recovered	1200Kg	Sold in the market	-
		Gummy mass, TBR, Bad crude, R3 residue & processed residuals	Gummy mass (1500 Kg), TBR (120 Kg), Bad crude (160 Kg), R3 residue (50 Kg), processed residuals (100 Kg)	Sold in the local market	Used by fragrance and flavor manufacturing companies
		Crude Ambrettolide	-	-	Used in the next stage of fractional distillation
Reactor D (R_3)	Crude Ambrettolide subjected to fractional distillation	Pure Ambrettolide	1150Kg	-	Used for the subsequent treatment with steam
Reactor E (R_4) *	Pure Ambrettolide treated with steam	Water	-	Used for non-critical purposes	-
		Stabilized Ambrettolide	1150Kg	Exported Globally	Used in consumer products like perfumery, food items & cosmetics and pharmaceutical product industries

1.3 PROJECT PROPONENT

The **Saraogi Shellac Overseas Corp.** (herein after called SSOC) was established in the year 1994 under Companies Act, 1956 and by now has

gained expertise in export, manufacture, import, supply, distribution, wholesaling and supplying shellac and lac based products. The company is already ISO 9001:2008 certified organization and manufactures lac based products for use in perfumery, cosmetic and food processing industries across pan India and the world.

Backed by a state-of-the-art infrastructure facility and having all the required units to produce quality products by an efficient team of professionals and machinery, the company is able to provide satisfaction to its customers.

Under the guidance of Mr. Dinesh Saraogi, owner, the company has gained more than 28 years' of experience in trading and exporting (globally) Lac & Shellac based products. The SSOC's export markets are located in different countries such as Haiti, Turkey, Germany, Morocco, Libya, Saudi Arabia, Italy, Taiwan, Kenya, Indonesia, Mexico, Chile, Peru, South Korea, Argentina, etc. SSOC has been awarded by the Govt. of India, Export Excellence recognition for Several Consecutive years.

1.4 BRIEF DESCRIPTION OF THE PROJECT

1.4.1 NATURE OF THE PROJECT:

M/s Saraogi Shellac Overseas Corp. bestowed with adequate experience in trading shellac based products for different personal usages is now proposing to establish a manufacturing unit to produce Ambrettolide from Aleuritic Acid. They have proposed to set up the manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product at Chanditala-Serampore Road. opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The product will be used by different units engaged in the manufacturing of consumer products like perfumery, food items and cosmetic products.

Synthetic organic chemical industry located in a notified industrial area/estate will be appraised by SEIAA at the State level and listed in Sr. No. 5(f) of Category "B" of the Schedule of the EIA Notification, dated 14th September, 2006.

1.4.2 SIZE OF THE PROJECT:

M/s. Saraogi Shellac Overseas Corp. is proposing an Ambrettolide manufacturing unit for the production of 24 TPA of high quality Ambrettolide

as the main product at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed project is an independent project in nature. Ambrettolide will be manufactured through 6 distinct steps of treatment of Aleuritic acid (1800Kg) with TMOF followed by acetylation with Acetic Anhydride and finally fractional distillation of crude Ambrettolide to separate from remaining glycerin to generate 1150Kg of pure product. Four types of distillate generated in intermediate steps, reaction recovered glycerine (1200Kg) and gummy mass (1500 kg), TBR (120 Kg), bad crude (160 Kg), R3 residue (50 Kg) & processed residuals (100 Kg) will be duly collected in drums in course of reactions and sold in the local market. Pure Ambrettolide after stabilization with steam will be stored in new food grade aluminum drums and is packed for export.

1.4.3 THE PROJECT SITE:

The proposed green field Ambrettolide manufacturing plant will be set up in Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The geographical co-ordinates of the overall project site are varying between Latitude: 22°41'39.08"N to 22°41'41.06"N and Longitude: 88°15'9.85"E to 88°15'12.45"E with average elevation of 5 m (16.4 ft) above Mean Sea Level (MSL). The project location in respect to Indian Map, the Google Map of the project site location and the Google Earth showing the project site and its surroundings have been shown in **Figure-1.1, 1.2 & 1.3** respectively.

Co-ordinates of all six corners of overall Project Site:

Corners	Latitude	Longitude
Corner - a	22°41'39.34"N	88°15'9.85"E
Corner - b	22°41'39.08"N	88°15'11.08"E
Corner - c	22°41'40.20"N	88°15'11.39"E
Corner - d	22°41'40.10"N	88°15'12.35"E
Corner - e	22°41'40.60"N	88°15'12.45"E
Corner - f	22°41'41.06"N	88°15'10.15"E

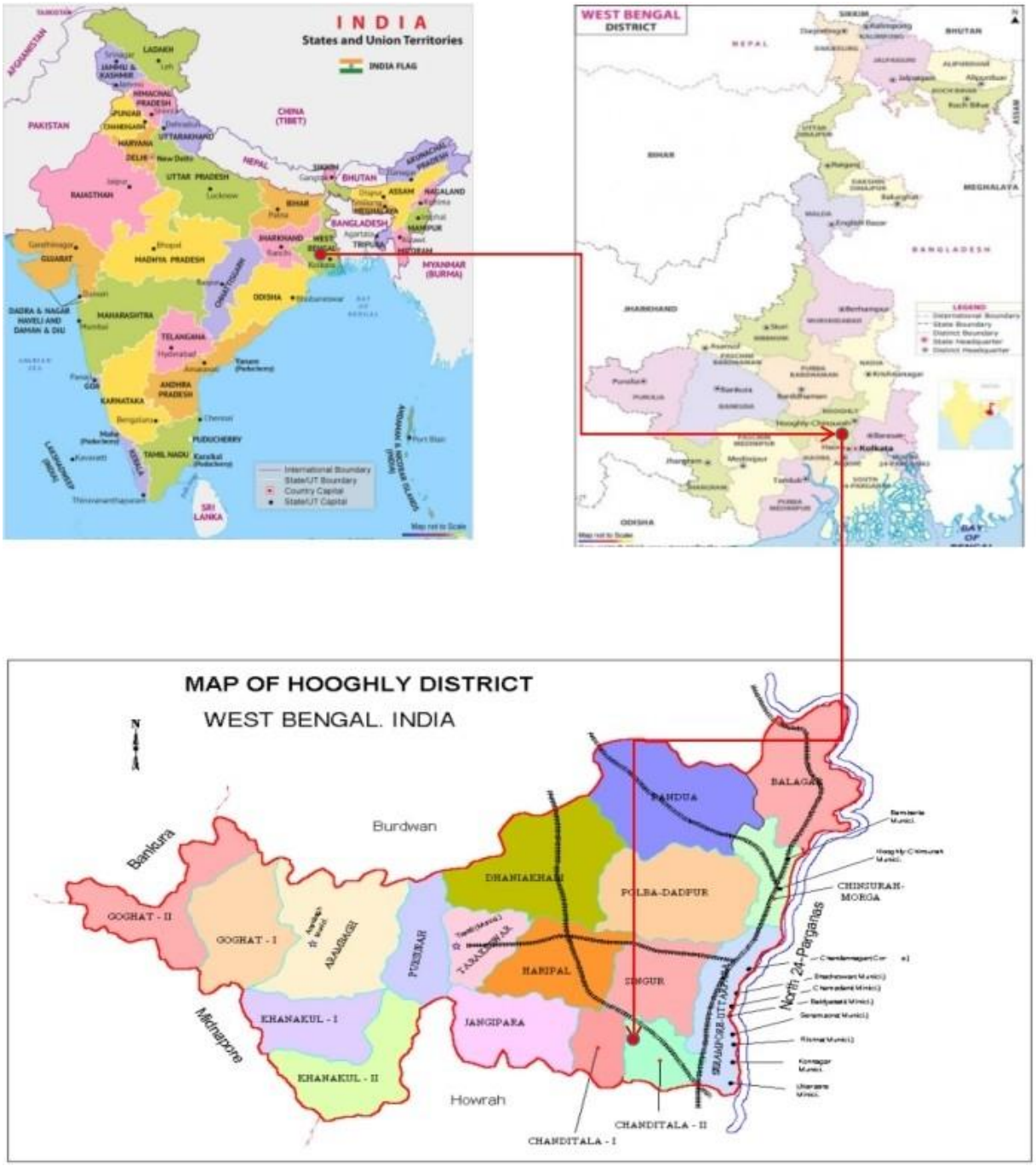


Figure: 1.1 : Project Site with respect to District/State/Country

Figure - 1.2 A : Project Site on Google Earth

Address:

Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal.

Co-ordinates:

Latitude: between 22°41'39.08"N to 22°41'41.06"N and Longitude: between 88°15'9.85"E to 88°15'12.45"E with average elevation of 5 m (16.4 ft) above Mean Sea Level (MSL).

Figure - 1.2 B : Site Location Map

Co-ordinates:

a (22°41'39.34"N, 88°15'9.85"E), b (22°41'39.08"N, 88°15'11.08"E), c (22°41'40.20"N, 88°15'11.39"E), d (22°41'40.10"N, 88°15'12.35"E), e (22°41'40.60"N, 88°15'12.45"E) & f (22°41'41.06"N, 88°15'10.15"E).

Figure - 1.3 : 10 KM Radius of the Project Site on Google Earth

EXISTING CONNECTIVITY

The National Highway-2 is passing at a distance of about 4 Kms from the Project site. Eastern Railway network is available within a short distance from the project site. All machinery and equipment can be transported by rail/road linkage during construction phase. Existing road and rail linkages will be utilized for this project and as such, no additional road and rail linkage will be needed to create for the project. Bulk of the raw materials shall be transported from outside to the plant inside and the finished product and by-products of the project will be transported to outside destination from the plant by road/ rail. The finished product of pure Ambrettolide will be stored in food grade aluminum drums and transported to its destination via road/ rail network.

a) Delhi - Kolkata National Highway - 2 (NH-2):

National Highway - 2 (NH-2) is passing within 4 kms distance in the East direction with respect to the Project site. Delhi - Kolkata National Highway -

2 is a six lane road (3 lane for each up & down) with approx. 24 m (12m for each up & down) width and can well accommodate existing traffic load. This Highway originates from New Delhi and connects Kolkata at the end.

The Road & Rail connectivity map on Google Earth is presented in **Figure-1.4.**

The nearest important Railway Station is Dankuni Junction, which is located about 4.2 kms in South-east direction from the project site. The nearest Airport - Netaji Subash Chandra Bose International Airport, Dum Dam, is located about 20 Kms in SE direction w.r.t. the site. The project site has good connectivity with the port of Kolkata. River Hooghly is passing about 11.2 kms distance in East direction w.r.t the site.

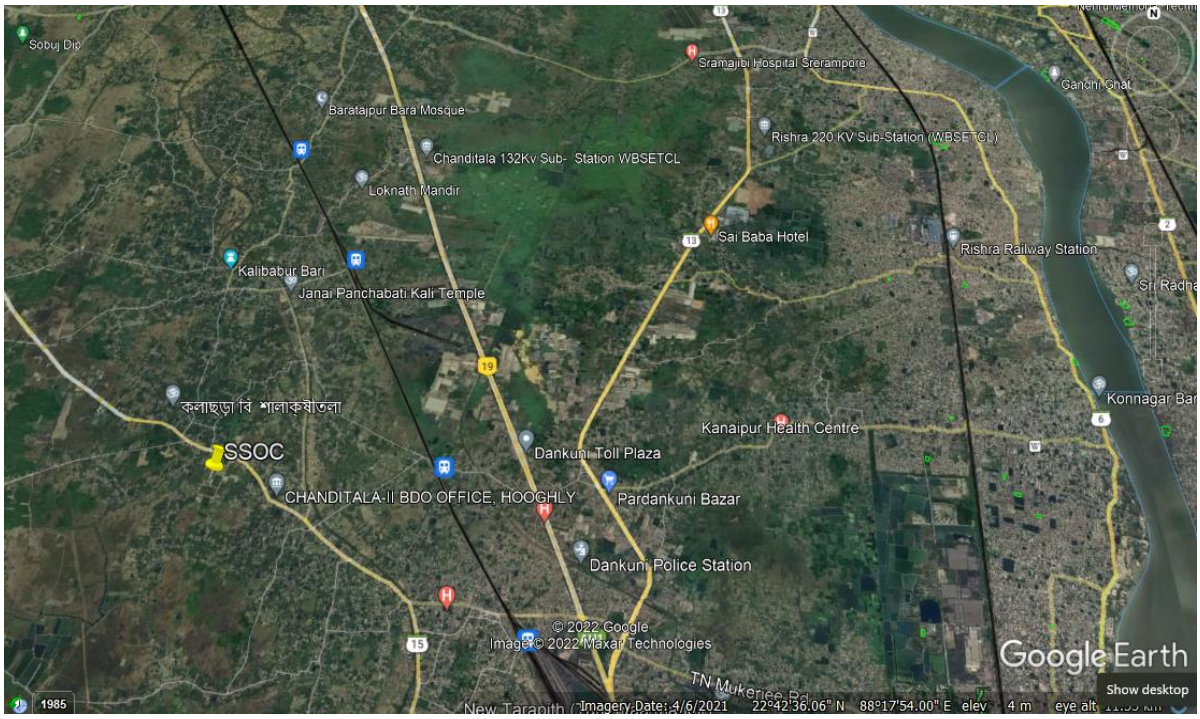


Figure -1.4 :
Road & Rail Connectivity Map

1.4.4 IMPORTANCE TO COUNTRY AND REGION

<u>Need for the project and its importance to the Country and Region</u>

The basic raw material (Aleuritic acid) is derived from Seedlac which is produced as a plant product in Chota Nagpur Plateau of West Bengal,

Jharkhand, Chattisgarh & Orissa and Maharashtra. SeedLac is the least processed shellac. The insect (lac bug) feeds on the sap of the tree and secretes the Lac as a protective shell in which the female bug lay their eggs. Since India is a major lac growing Country and manufacturer of Seedlac and Aleuritic acid (the raw materials for Ambrettolide), SSOC is already enjoying an edge in selling Ambrettolide in the global market in comparison to other manufacturers worldwide.

Ambrettolide is a high value product and has till now been manufactured only in Europe & India. Moreover, the cost of production is quite high for the Ambrettolide manufacturers in Europe which is again considered to be an advantage for Indian company like SSOC. Clients like International Flavors and Fragrances and Firmenich prefer to import Ambrettolide directly from India rather than manufacturing or buying from European manufacturers. The reason is cost.

The demand for Ambrettolide is more than the current production and SSOC with a long presence in Shellac Global market, will be always at an advantage in selling high quality Ambrettolide to the global consumers.

The Indian consumer product manufacturing industry is one of the world's largest industry by volume. The growth of population is increasing in India and the current growth rate is around 2 crores per annum. This trend is extremely encouraging. It is felt that the perfumery, cosmetic and food processing industry in India will lead the consumer market in the coming years. In this back-drop the establishment of one Ambrettolide manufacturing industry in India may bring relief to many manufacturers and users in the above three sectors. Again multinational fragrance and flavor manufacturing companies are enhancing their presence in India. Thus the long-term prospects of the fragrances and flavors industry seems to be very bright. Thus a gap is expected between the current production of Ambrettolide vis a vis its growing demand to cater to the needs of the user industries. Moreover, the distillates produced during the intermediate stages of production have good demand in the market. Thus in the existing scenario, the current proposal of M/s SSOC appears to be very prudent and market savvy.

1.5 BRIEF LEGAL FRAMEWORK FOR EIA STUDY

1.5.1 Procedure for Environmental Clearance

Environmental clearance of any new project or expansion of existing projects is now done as per the notification of the Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India dated 14th September 2006. The notification requires prior environmental clearance of all projects from competent central govt. or state govt. authorities, as may be the case. The projects are now classified into Category "A" or Category "B" projects based on spatial extent of potential impacts on human health and natural & man-made resources. The Category "A" projects require prior environmental clearance from the MoEF&CC, Govt. of India while the Category "B" projects have to get clearance from the State level Environment Impact Assessment Authority (SEIAA), constituted by the Central Government for this purpose.

The environment clearance procedure for new projects will require maximum of four stages all of which may not be applicable to all the projects. These four stages in sequential order are as follows:

Stage 1 - Screening: It refers to the definite assignment of environmental category to projects or activities where the same is not completely specified. In case of Category 'B' projects, scrutiny of application at State level to categorize project to 'B1' or 'B2' is done. The B2 projects do not require EIA Reports.

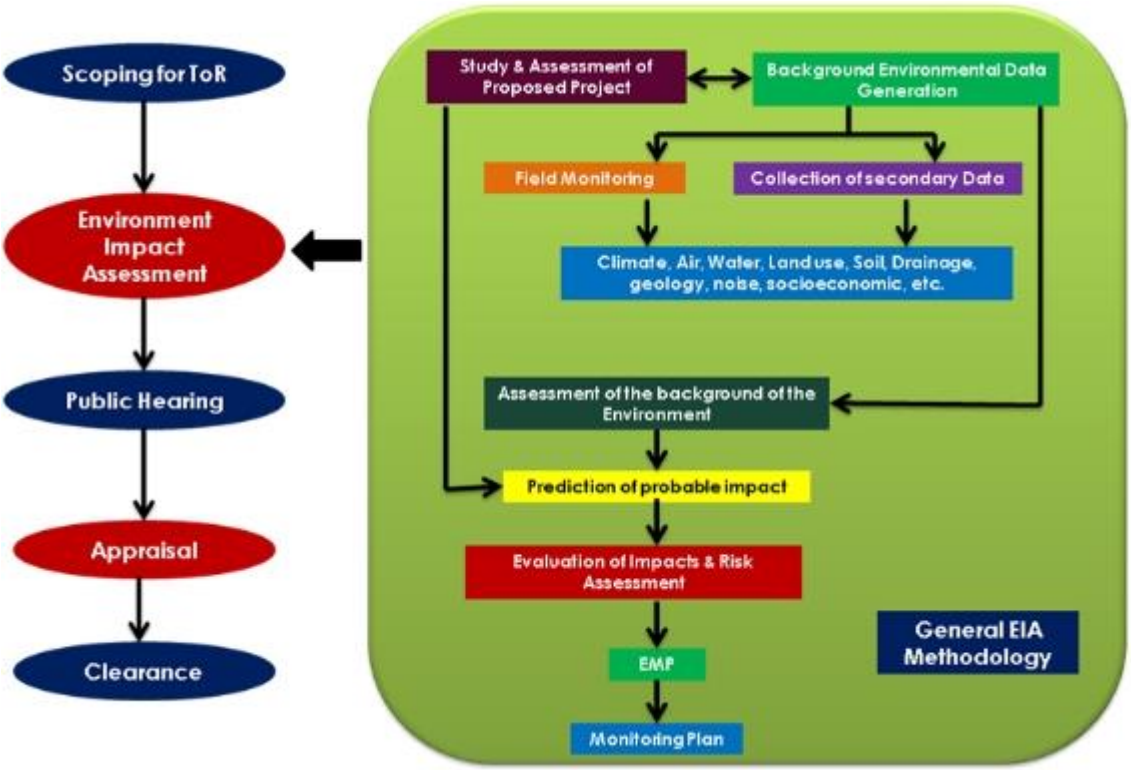
Stage 2 - Scoping: It refers to the process by which the Expert Appraisal Committee in the case of Category 'A' project and State- level Expert Appraisal Committee in the case of Category 'B1' project determine detailed and comprehensive Terms of Reference (ToR) addressing all relevant environmental concerns for the preparation of an EIA report in respect of the project for which prior environmental clearance is sought. The ToR for this project was granted on 16th February, 2022.

Stage 3 - Public Consultation: It refers to the process by which concern of local people and other stakeholders are ascertained and their views taken regarding the project. The Public Consultation takes place in two steps: Public hearing and written responses. The public hearing will be conducted under the supervision of State Pollution Control Board close to the site of the project.

Stage 4 - Appraisal: This refers to the detailed scrutiny by the Expert Appraisal Committee or State Level Expert Appraisal Committee of the application and other documents like the final EIA report. All documents relating to public hearing along with the corrective actions proposed for the issues raised in the public hearing are presented in Chapter-7.

The steps of Environmental Clearance for proposed project is shown in **Figure-1.5**.

Figure 1.5 : Steps of Environmental Clearance for Proposed Project



1.5.2 Important Environment Legislation

The environmental regulations, legislation and policy guidelines and control that may impact the project are the responsibility of a variety of Government agencies. The principal environmental regulatory agency in India is the Ministry of Environment, Forest and Climate Change (MoEF&CC), New Delhi. MoEF&CC formulates environmental policies and also accords environmental clearances for different projects.

Many State and Central legislation have a bearing on environment but laws on environment protection have been notified recently. These legal enactments can be broadly classified in the terms of focus areas, viz. pollution, natural resources and linkages between pollution and natural resources. The important environmental legislation related to environmental clearance for new projects are briefly described in the **Table-1.2**.

The MoEF&CC is the nodal agency to set up policy and standards for the protection of environment, along with Central Pollution Control Board (CPCB). This includes air, noise, water and hazardous waste standards. The relevant standards, which are of significance to the proposed project, may be discussed in the section below:

Table: 1.2: Key Environmental Legislation

Name	Scope and Objective	Key areas	Operational Agencies/ Key Players
Water (Prevention and Control of Pollution) Act 1974	To provide for prevention & control of water pollution and enhancing water quality	Control of sewage and industrial effluent discharges	Central and State Pollution Control Boards
Air (Prevention and Control of Pollution) Act 1981	To provide for the prevention and control of air pollution	Controls emission and air pollutants	Central and State Pollution Control Boards
Forest Conservation Act 1980	To halt rapid deforestation & resulting environment degradation	Restriction on de-reservation & use of forest for non-forest purpose	Central Government

Name	Scope and Objective	Key areas	Operational Agencies/ Key Players
Environment Protection Act 1986; Environment Protection Rules 1989.	To provide for the protection and improvement of environment	An umbrella Legislation; supplements pollution laws	Central Govt. MoEF&CC, can delegate power to Dept. of Environment
EIA Notification, New Delhi 14th September, 2006	To provide Guideline for EIA Study	EIA Study	Central Government, nodal agencies MoEF&CC, State governments
Noise Pollution (Prevention & Control) Rules 2000	To control and take measures for abatement of noise and ensure that level does not cross standard	Noise in urban area and around industrial sites	Central Government, nodal agencies MoEF&CC, State governments
Solid Waste Management Rules, 2016	To prescribe procedures for handling and disposal of solid waste	Any facility producing hazardous waste	Central Government, nodal agencies MoEF&CC, State governments
Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016	To impose restrictions and prescribe procedures for management, handling and disposal of hazardous waste	Any facility producing hazardous waste	Central and State Pollution Control Boards
Public Liability Insurance Act, 1991	To provide for public liability- insurance for the purpose of providing immediate relief to the persons affected by accident occurring while	To provide public liability insurance during risk material handling	Central Government, Nodal Agencies MoEF&CC, State Govt.

Name	Scope and Objective	Key areas	Operational Agencies/ Key Players
	handling any hazardous substance and for matters connected therewith or incidental thereto		
E-Waste (Management) Rules, 2016	To prescribe procedures for handling and disposal of E-Waste	Any facility producing E-Waste	Central and State Pollution Control Boards

***Source*: Central Pollution Control Board, New Delhi**

1.5.3 Pollution Standards

The Environment (Protection) Rules 1986 and its subsequent amendments have set certain pollution standards. These standards are generally applicable to air environment, water environment and noise environment. The ambient quality of air, water & wastewater and noise standard are provided as **Annexure -IX**.

1.6 SCOPE OF STUDY- DETAILS OF REGULATORY SCOPING CARRIED OUT AS PER TERMS OF REFERENCE

The Environmental Impact Assessment and Environment Management Plan for the proposed Green field project addressing the environment related issues have been prepared in accordance with the requirements of terms of reference (TOR) prescribed by SEIAA, West Bengal vide **File no. 238/EN/T-II-1/061/2021 dated 16-02-2022.**

The study evaluates the prevailing environmental conditions. The adverse impacts of the project have been identified and possible mitigation measures have been proposed in order to protect the environment facilitating sustainability of the environment with the growth of industrial activity. In order to carry out the study, the baseline environmental scenario has been established for the Winter season (December, 2020 to February, 2021).

The main objectives of the present EIA/EMP study have been briefly summarized below:

- To establish the baseline environmental scenario.
- To identify, predict and assess the impacts of proposed future project on the environment.
- To prepare a detailed action plan for implementation of mitigative measures.
- To suggest preventive measures to minimize adverse impacts and to maximize beneficial impacts.
- To suggest a monitoring programme to evaluate the effectiveness of mitigative measures.
- To suggest the formation of a core group responsible for implementation of the EMP.
- To prepare a capital cost estimate for environment management plan.
- To address the concerns of disaster management, and points raised in public hearing of SSOC as per Corporate Environment Health & Safety Policy (CEHSP).

The scope of the present study is to conduct EIA covering all the disciplines of environment and field monitoring in relevant areas over one full season of 3 (three) months (excluding monsoon months). The Final EIA report is prepared as per the MoEF&CC Notification dated 14.09.2006. After completion of the Public Consultation, all the environmental concerns expressed during the Public Hearing will be addressed and appropriate changes in the EIA Report will be made for submission of the Final Report.

Secondary and primary data collection were done comprising of, but not restricted to the following:

- Long Term Climatic data from Indian Meteorological Department (IMD) available for previous decades.
- Geo-hydrological aspects based on available data from various sources.
- Identification of water bodies, hills, roads etc. within 10 km radius.
- Details of fauna, flora, information in forests, major habitats, sanctuaries, sensitive places within a distance of 10 km from the project site (including forest details).
- Major industries within 10 km radius.
- Historical monuments and sanctuaries within 10 km radius.
- Land use pattern within core zone and buffer zone (10 km radius around the core zone), Cropping pattern.

- Demography and Socio-economy based on last available Census data for entire study area. There has been also a physical survey.

The preparation of EIA/EMP has been done as per the generic structure prescribed in EIA Notification dated 14th September 2006.

In line with the TOR, baseline environmental data was generated as shown below:

Description	No. of Locations
Air Ambient air monitoring (24 hourly samples), twice a week for 3 months for one season Parameters : PM_{10}, $PM_{2.5}$, SO_2, NO_2 & CO.	8
Meteorological parameters measured at hourly duration simultaneously at one air monitoring station for 3 months for Wind speed, direction, Relative humidity, Temperature etc.	1
Water Water sample from various surface and ground water in the study area and tested for physical, chemical & biological parameters.	10 (Surface Water) & 9 (Ground Water)
Soil	4
Noise Hourly readings taken for 24 hours (Leq.)	10

1.7 STATUS OF LITIGATIONS

There are no instigation/ court cases pending against the project and the proponent for this proposed green field Ambrettolide manufacturing unit.

As advised, the Final EIA/EMP Report is prepared, accommodating all the components, based on finalized TOR for submission to West Bengal Pollution Control Board for the conduct of Public Hearing/Consultation.
This EIA Report has been prepared on the basis of the available secondary data/ literature along with the on-site data during the period (1st December, 2020 to 28th February, 2021) representing the Winter season, generated through on-site monitoring of relevant environmental components and parameters.

TABLE-1.3
FINALIZED STANDARD TERMS OF REFERENCE (TOR) IN RESPECT OF INDUSTRY SECTOR & THEIR REFERENCE IN EIA REPORT

STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR AMBRETTOLIDE MANUFACTURING PROJECT AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

Sl. No.	A. STANDARD TERMS OF REFERENCE (TOR)	Reference in EIA Report
1	Executive Summary	Prepared
2	**Introduction**	
	i. Details of the EIA Consultant including NABET accreditation	Chapter-12.0
	ii. Information about the project proponent	Chapter-1.0 Section-1.2, 1.4.1 & 1.4.2
	iii. Importance and benefits of the project	Chapter-1.0 Section-1.4.4 & Chapter-8.0
3	**Project Description**	
	i. Cost of project and time of completion	Chapter-2.0 Section-2.1.2
	ii. Products with capacities for the proposed project.	Chapter-2.0 Section-2.1.1
	iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	Chapter-2.0 Section-2.1.3
	iv. List of raw materials required and their source along with mode of transportation.	Chapter-2.0 Section-2.10
	v. Other chemicals and materials required with quantities and storage capacities	Chapter-2.0 Section-2.10.1
	vi. Details of Emission, effluents, hazardous waste generation and their management.	Chpater-2.0

		Section-2.16 Chapter-4.0 Section-4.3.1
	vii. Requirement of water, power with source of supply, status of approval, man-power requirement (regular and contract).	Chapter-2.0 Section-2.15, 2.13, 2.14 **Annexure-III & IV**
	viii. Process description along with major equipments and machineries, process flow sheet (quantitative) from raw material to products to be provided.	Chapter-2.0 Section-2.11
	ix. Hazard identification and details of proposed safety systems.	Chapter-7.0
	x. Expansion/modernization proposals: a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MoEF&CC/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIA-EMP report. b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	**NA**.
4	**Site Details**	

	i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	Chapter-2.0 Section-2.3, Figure-2.1 Chapter-5.0
	ii. A Toposheet of the study area of radius of 10 Km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places).	Chapter-2.0, Section-2.3.1 Figure-2.3B Chapter-3.0 Section-3.1-3.1.3 Figure-3.1.1 - 3.1.4
	iii. Details w.r.t. option analysis for selection of site.	Chapter-5
	iv. Co-ordinates (lat.-long) of all four corners of the site.	Chapter-1.0, Section-1.4.3, Figure-1.2C; Chapter-2.0, Section-2.3.1 Figure-2.2B Chapter-3 Section-3.1.3 Figure-3.1.2
	v. Google map – Earth downloaded of the project site.	Chapter-1.0 Section-1.4.3 Figure-1.2
	vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	Chapter-2.0 Section-2.3.2 Figure-2.4
	vii. Photographs of the proposed and existing (if applicable) plant site. If existing show photographs of plantation/greenbelt, in particular.	Chapter-5.0 Section-5.1 Figure-5.1
	viii. Land use break-up of total land of the project sited (identified and acquired), government/private-agricultural, forest, wasteland, water bodies, settlements, etc. shall be included (not required for industrial area).	Chapter-2.0 Section-2.4.1

	ix.	A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area.	Chapter-2.0 Section-2.5 Chapter-3.0 Section-3.5
	x.	Geological features and Geo-hydrological status of the study area shall be included.	Chapter-3.0 Section-3.2
	xi.	Details of Drainage of the project upto 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided (mega green field projects).	Chapter-3.0 Section-3.2.2.2
	xii.	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	The proposed project site has already been acquired on a long term lease at Dankuni Industrial Complex; **Annexure-II**
	xiii.	R&R details in respect of land in line with state Government policy.	N.A. as the proposed project will be located in a plot of Dankuni Industrial Complex
5	**Forest and wildlife related issues (if applicable):**		
	i.	Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)	
	ii.	Land-use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forest land (in case of projects involving forest land more than 40 ha).	
	iii.	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	N.A.
	iv.	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory	

	Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon. v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule 1 fauna, if any exists in the study area. vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.	
6	**Environmental Status**	
	i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	Chapter-4.0 Section-4.3.1
	ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	Chapter-3.0 Section-3.9
	iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with min., max, average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	**Annexure-V A & B**
	iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.	Chapter-3.0 Section-3.10.1
	v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC.	N.A.
	vi. Ground water monitoring at minimum at 8 locations shall be included.	Chapter-3.0 Section-3.11.1

	vii. Noise levels monitoring at 8 locations within the study area.	Chapter-3.0 Section-3.12
	viii. Soil Characteristic as per CPCB guidelines.	Chapter-3.0 Section-3.7
	ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	Chapter-4.0 Section-4.3.1.6 & 4.3.2
	x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-1 fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	Chapter-3.0 Section-3.13
	xi. Socio-economic status of the study area.	Chapter-3.0 Section-3.14
7	**Impact Assessment and Environmental Management Plan**	
	i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	Chapter-4.0 Section-4.3.1
	ii. Water Quality modelling - in case of discharge in water body.	NA (As the unit is designed as a ZLD Unit)

	iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	Chapter-4.0 Section-4.3.1.6
	iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.	Chapter-2.0 Section-2.16.1
	v. Details of stack emission and action plan for control of emissions to meet standards.	Chapter-4.0 Section-4.3.1
	vi. Measures for fugitive emission control.	Chapter-2.0 Section-2.16.3.2
	vii. Details of hazardous waste generation and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation	Chapter-2.0 Section-2.16.2 Chapter-10.0 Section-10.9
	viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	N.A.
	ix. Action plan for the green belt development plan in 33% area i.e. land with not less than 2,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	Chapter-10.0 Section-10.4
	x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the	Chapter-2.0 Section-2.15.1

	project site to conserve fresh water and reduce the water requirement from other sources.	
	xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	Chapter-10.0 Section-10.15
	xii. Action plan for post-project environmental monitoring shall be submitted.	Chapter-6.0 Section-6.2
	xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.	Chapter-7.0 Section-7.2
8	**Occupational Health** i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers. ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise. iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved, iv. Annual report of health status of workers with special reference to Occupational Health and Safety.	Chapter-10.0 Section-10.13 NA NA NA
9	**Corporate Environment Health & Safety Policy** i. 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. ii. Does the Environment Policy prescribe for standard operating process/ procedures to bring into focus any infringement/deviation/violation of the environmental	Chapter-10.0 Section 10.3 NA

	or forest norms / conditions? If so, it may be detailed in the EIA. iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given. iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.	Chapter-10.0 Section 10.2 Chapter-10.0 10.2.1 Figure 10.1
10	Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	Chapter-10.0 Section-10.6
11	Enterprise Social Commitment (ESC) i. Adequate funds (at least 2.5% of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.	As per the MoEF &CC OM vide F.No. 22-65/2017-IA.III dated 30th Sep, 2020, Shall be worked based on the Public Hearing commitments. Hence this will be included in detail after completion of PH in the Final EIA report.
12	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ ATR to the notice(s) and present status of the case.	N.A.
SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR SYNTHETIC ORGANIC CHEMICALS INDUSTRY		

Sl. No.	B. STANDARD TERMS OF REFERENCE (TOR)	Reference in EIA Report
1	Details of solvents to be used, measures of solvent recovery and for emissions control	MEG, IPA and glycerin are stored following standard safety protocol. These are used in the process, recovered, stored properly and sold in the local market.
2	Details of process emissions from the proposed unit and its arrangement to control	Only 100 liters of diesel per day will be burnt on regular basis. Insignificant emission will occur ref. in Chapter 4.
3	Ambient air quality data should include VOC, other process-specific pollutants like NH3, Chlorine, HCl, HBr, H2S, HF etc. (as applicable)	There will be no such emission from the process or from the storage yard for discharge to ambient air.
4	Work zone monitoring arrangements for hazardous chemicals	Sensor bases detectors will be installed in both the plant, storage yard to monitor the fugitive emission and other emission.
5	Detailed effluent treatment scheme including segregation of effluent streams for units adopting 'Zero' liquid discharge	The plant is operated with 'No Generation of Effluent' for outside disposal. The entire distillate is recovered and sold to outside market immediately.
6	Action plan for odour control to be submitted.	Sensor based leak detectors will be used. Material

		transfer and handling will take place through sealed pipeline under vacuum.
7	A copy of the Memorandum of Understanding signed with cement manufacturers indicating clearly that they co-process organic solid/hazardous wste generated.	NA
8	Authorization/Membership for the disposal of liquid effluent in CETP and solid/hazardous waste in TSDF, if any.	No liquid effluent, no solid and hazardous waste will be generated for disposal. Entire distillates & chemical residues recovered under extreme safe condition will be stored with proper safety for immediate sale to outside authorized agency.
9	Action plan for utilization of MEE/dryers salts.	NA
10	Material Safety Data Sheet for all the Chemicals are being used/will be used.	Attached in Annexure VIII
11	Authorization/Membership for the disposal of solid/hazardous waste in TSDF.	NA
12	Details of incinerator if to be installed.	NA
13	Risk assessment for storage and handling of hazardous chemicals/solvents. Action plan for handling & safety system to be incorporated.	Ref. Chapter 7.
14	Arrangements for ensuring health and safety of workers engaged in handling to toxic materials.	Ref. Chapter 10, Section 10.13
ADDITIONAL CONDITIONS:		
i	The project proponent must obtain land conversion certificate before application for EC. The West Bengal Pollution Control Board shall arrange public hearing as per EIA Notification, 2006 on submission of draft EIA/EMP prepared by the Project Proponent as per the above mentioned ToRs. All the issues mentioned in the 'Public Hearing Report' and public consultation must also	To be complied Public hearing awaited

	be addressed and incorporated in the Final EIA/EMP report. The project proponent is requested to pursue the matter with the WBPCB for organizing the public hearing/consultation on submission of the draft EIA/EMP report as per the provision of EIA notification 2006 & its amendments. The project proponent is requested to submit the final EIA/EMP prepared as per the above mentioned TOR and incorporating all the issues raised during Public Hearing/ Public Consultation for further consideration of the proposal for environmental clearance. The ToR is valid for a period of 3 (three) years from the date of issue.	

CHAPTER-2.0
PROJECT DESCRIPTION

2.1. TYPE OF THE PROJECT

M/s Saraogi Shellac Overseas Corp. is proposing a green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product. The unit will be coming up at Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed project will be installed on the available 0.54 acres/ 2240.82 Sqm of vacant land within the industrial area of Dankuni, Hooghly, West Bengal. The Overall unit with targeted capacity per annum are presented in Table-2.1. All reactions to synthesize Ambrettolide will take place under high vacuum and completely sealed channels and thus no gaseous emission during the manufacturing process is expected to occur.

Thermic Fluid Heater (TFH) will be used to heat up the reactors (distillation vessels) in the manufacturing process. In one boiler diesel will be burnt throughout the day to heat the TF Oil which runs through the pipelines and heats the reactors. In another boiler, steam will be generated through burning of diesel. Here the emission will be negligible as the steam is required only once in a span of 15 days to stabilize the pure Ambrettolide. Emission from both the boilers will be discharged to a common duct through a stack of appropriate height. Since diesel will be burnt in less quantity (approximately 100 litre/day), emission of pollutants to air from diesel burning will be insignificant.

No chances of any chemical spillage/discharge of chemicals into the environment will occur as all recovered distillates will be collected in closed containers and sold to the market. There will be no generation of solid waste from the processing units as the recovered gummy sludge will be collected in closed containers and also sold to the local market. Considering the above mentioned facts the proposed project is observed to have very insignificant environmental foot- print.

2.1.1 Products with Capacities for the proposed Project

The proposed green field plant will manufacture Ambrettolide as the main product and 4 types of distillates in course of sequential reactions as by products. There will be also a small amount of product of Gummy

mass (1500 Kg), TBR (120 Kg), Bad crude (160 Kg), R3 residue (50 Kg), processed residuals (100 Kg) as by products.Glycerin will also be recovered in the processing of Ambrettolide in the final stage of reaction. The entire configuration of the proposed project has been presented in Table 2.1.

Table-2.1
Products with capacities for the proposed green field project - Scenario (units & its target production capacity)

Reaction Vessel	Substrate	Product	Quantity of product (TPA)	Utility	Sale outlet
Reactor A	Aleuritic Acid (1800Kg) + Tri Methyl Orthoformate (1600Kg)	Distillate - A	33.6	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - I	-	Used in the next stage of reaction	-
	Mixture-I + Acetic Anhydride (1130Kg)	Distillate - B	26.4	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - II	-	Used in the next stage of reaction	-
	Mixture-II + Catalyst-I (KOH 41.1Kg + MEG 162.0Kg)	Distillate - C	3.96	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - III	-	Used in the next stage of reaction	-
	Mixture-III + Catalyst-II (Sodium Methoxide 35.8Kg + IPA 155.8Kg)	Distillate - D	5.28	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Final Mixture	-	Used in the next stage of treatment	-
Reactor B (R_1A) & then transferred to Reactor C (R_2) in portions	Final Mixture + Glycerine (2240Kg)	Glycerine recovered	28.8	-	Sold in the market
		Gummy mass, TBR, Bad crude, R3 residue & processed residuals	Gummy mass (36 TPA), TBR (2.88 TPA), Bad crude (3.84 TPA), R3 residue (1.2 TPA), processed residuals (2.4 TPA)	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Crude Ambrettolite	-	Used in the next stage of fractional distillation	-
Reactor D (R_3)	Crude Ambrettolide subjected to fractional distillation	Pure Ambrettolite	24	Used for the subsequent treatment with steam	-

Reactor E (R_4) *	Pure Ambrettolide treated with steam	Water	-	-	Used for non-critical purposes
		Stabilized Ambrettolide	24	Used in consumer products like perfumery, food items & cosmetics and pharmaceutical product industries	Exported Globally

*Complete reaction cycle will take a span of 15 days time.

2.1.2 Cost of project and time of completion

The cost of the installation of proposed green field project i.e., Ambrettolide manufacturing unit is Rs 4,45,00,000/-. The cost has included the land development, civil construction, plant & machinery and electrical fittings. Other pre-operative expense and contingency cost of the project have been estimated to be Rs 25,00,000/- & Rs 4,20,000/- respectively.

The cost break up for the proposed project (Total) is presented in tabular form vide **Table 2.2**

Table-2.2

Cost breakup of the proposed Ambrettolide manufacturing unit

Sl No.	Particulars	Total Value (Rs)
1	Land & land development	105,00,000
2	Civil construction	76,20,000
3	Plant & machinery	162,00,000
4	Miscellaneous fixed assets	42,60,000
5	Electrical fittings & others	30,00,000
	Hard Cost	415,80,000
6	Preoperative expenses	25,00,000
7	Contingencies @ 5%	4,20,000
	Soft Cost	29,20,000
	Total	445,00,000

Likely date of start of construction and likely date of completion.

The total time of implementation for the project shall be 6 months from the zero date. However the activities will be expedited to complete the project within 4 months from zero date so that the trial for the plant can be initiated in the last 3 months time. The zero date for the project has been considered as the date when civil works

start. Machinery Ordering Phase followed by commissioning will also take place simultaneously as per feasibility.

Project Implementation: It will be imperative to complete many of the project activities before the zero date and soon afterwards. These include:

- Receipt of EC and NOC for the project from appropriate authority
- Basic engineering
- Preparation & issue of tender documents for major technical units
- Placement of orders
- Financial tie ups if any
- Finalization with overseas agencies if any requirement as per felt need.
- Clearance from statutory authorities for commercial operation.

Table 2.3
Time chart of the projected schedule

Implementation Schedule	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6
Land Preparation						
Civil Works						
Ordering of Plant						
Supply of Plant						
Plant Erection						
Trial Run						

2.1.3 If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any

Being encouraged by the tremendous potential for the requirement of Ambrettolite used by fragrance and flavor manufacturing companies in pan India and global level, SSOC has decided to set up a green field manufacturing plant at Chanditala-Serampore Road. opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. This is a green field project and not in any way can be treated as an activity for expansion.

The project under consideration is a green field project and hence no EC has so far been received for the same. M/s. SSOC has already selected a land of 0.54 acres (2240.82 sqm) in Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal for the above purpose.

2.1.4 Salient features of the proposed project

The salient features or highlights of the proposed green field project of **M/s. Saraogi Shellac Overseas Corp.**, under study are as follows **Table 2.4.**

Table 2.4
Salient features/highlights of the proposed green field project - Ambrettolide Manufacturing Unit

Company Name	**M/s. Saraogi Shellac Overseas Corp.**
Project Name	Proposed 24 TPA Ambrettolide Synthesis Plant for production of pure Ambrettolide along with other byproducts from Aleuritic Acid as starting material
Location	Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal.
Land requirement	The proposed plant will be installed on the available vacant land of 0.54 acres (2240.82 sqm) in Dankuni Industrial Complex of District Hooghly.
Nearest Town	Dankuni is located aerially approximately at 4.6 KMs. SE from the project site.
Nearest City	Kolkata is located aerially approximately at 17 KMs. SE from the project site.
Nearest National/ State Highway	National Highway - 2 (NH-2) is passing within 4 Kms distance in E direction w.r.t. the Project site.
Nearest Railway station	Dankuni Junction Railway Station – 4.2 Kms in SE direction from the project site.
Airport	Netaji Subhash Chandra Bose International Airport, Dum Dum, Kolkata – 20.0 Kms in SE direction from the project site.
National Parks, Wildlife Sanctuaries, Biosphere Reserves, within 10 km radius	N. A.
Reserved Forests	A.

(RF)/ Protected Forests (PF) within 10 km radius	
Water Bodies (within 10 km radius)	Hoogly River - 11 Kms in East direction w.r.t. the Project site.
Seismic Zone	Seismic Zone - III
Toposheet No.	79 B/6, 79 B/1, 79 B/2 & 79 B/5
Geographical Co-ordinates	Latitude: 22°41'39.08"N to 22°41'41.06"N, Longitude: 88°15'9.85"E to 88°15'12.45"E Elevation: 5 m Above Mean Sea Level (AMSL)
Raw water requirement & source	Water requirement for steam generation in boiler is 1 Kilo litre initially followed by make up of 100 litre per month. The above water will be supplied by near by Bislery company. Water for domestic purpose (i.e., 200 ltrs/day) will be met from borewell water. An application has been submitted to the local panchayat for sanction of creating one borewell inside the plant premise. Source: Bislery company & one borewell inside the plant.
Power requirement	Power Requirement for the project will be 125 KVA. Source: The Power requirement of 125 KVA will be met from the supply of WBSEDCL. Application has already been made to get the sanction **(Annex VII)**. Two number of DG set units having 160 KVA capacity each will be installed as a standby source of power.
Effluent generation & disposal	➢ The proposed plant is small and will be configured for the production of 24 TPA production of Ambrettolide. The plant proposes to adopt Zero Liquid Discharge (ZLD). ➢ All industrial processing wastes (by products) will be sold to the local market and no residual waste will be disposed outside. All types of distillates will be sold in the local market. ➢ Domestic waste water generated from office, toilets, & canteen will be treated in septic tank followed by soak pit system.
Air pollution control	➢ Diesel will be burnt to heat the TF Oil on regular basis (everyday) & to generate steam in an interval of 15 days in two separate boilers. There will be little emission from the burning of fuel and the same is discharged through a common duct to a stack of appropriate height. The steam is required only once in a span of 15 days.

	➢ No chances of any chemical spillage/discharge of chemicals into the environment is expected as all recovered distillates will be collected in closed containers and sold to the market. ➢ It is a small factory which will handle small quantity of both raw materials and finished goods. So emissions will be insignificant.
Solid Waste Management	➢ No chances of generation of solid waste (from processing units) is expected as the recovered gummy sludge will be collected in closed containers and sold to the local market. ➢ There will be no solid waste (hazardous waste) generated in the plant which will be discharged for disposal. ➢ Sewage sludge will be disposed to the local Municipality.
Manpower	Manpower, to the extent 12 personnel will be required during construction which will be temporary in nature and 10 personnel during operation.
Project cost	Approx. Rs. 4,45,00,000/- (including Contingencies @ 5%)

2.2 NEED FOR THE PROJECT

Saraogi Shellac Overseas Corp will manufacture Ambrettolide of high quality which is mainly manufactured by European and American companies for use in perfumery. The basic raw material for Ambrettolide is Aleuritic acid. Since India is the major lac growing Country and manufacturer of Seedlac and Aleuritic acid (the raw materials for Ambrettolide), SSOC already have an advantage in selling Ambrettolide in the global market in competition to other manufacturers worldwide.

The basic raw material for Ambrettolide is lac which is cultivated in certain districts of West Bengal, Jharkhand, Chattisgarh, Orissa and Maharashtra in India. Seedlac is obtained from Lac during cleaning operation and is further process to get Aleuritic Acid. Since SSOC has already gained more than 28 years experience in trading and exporting (globally) lac & shellac based products, the company has an established edge in selling Ambrettolide in the global market. Moreover, the cost of production of Ambrettolide is quite high in Europe which is again another advantage for SSOC. Clients like International Flavors and Fragrances and Firmenich prefer to import Ambrettolide directly from India rather than manufacturing or buying from European manufacturers. The reason is cost.

In India, consumer product manufacturing industry is one of the world's largest industries by volume. The growth of population in India is around 2 crores per annum. This trend is encouraging if industrial activity is managed properly. It is felt that the perfumery, cosmetic and food processing industry in India will lead the consumer market in the coming years. In this back-drop the establishment of one Ambrettolide manufacturing industry in India may bring relief to many manufacturers and users in the above three sectors. With the enhanced activities of multinational flavor and fragrance manufacturing companies in India, the long-term prospects in above sector has been observed to be very bright. Even a gap is expected between the current production of Ambrettolide vis a vis its growing demand to cater the needs of the user industry. Again, the distillates produced during the intermediate stages have a good demand in the market. Thus the current proposal of M/s SSOC appears to be very much prudent and market prospective.

The plant will be based on Advanced Process Technology with the most efficient auxiliary sub systems and material handling facilities. The production process will follow a 5 stages of distillation process. The distillate from each distillation unit will be sold in the market. The Final product Ambrettolide will be exported globally. The entire process of manufacturing will be designed in such a way that there will be no liquid discharge (zero liquid discharge) from the manufacturing unit. All the residue leftovers in various stages will be sold to the outside parties. These products are recyclable and have demand in the market. There will be no solid waste that needs to be treated for disposal. No harmful waste or chemical will be generated. Ambrettolide is used in the Flavor & Fragrance industry and is used widely for body contact application and thus has no harmful effects even if applied on skin or inhaled. It is also FDA approved and may be further processed to food grade quality.

2.3 LOCATION (maps showing general location, specific location, project boundary & project site layout)

The proposed site for this green field project i.e., Ambrettolide manufacturing unit, for production of 24 TPA of Ambrettolide is located in Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The company has a long experience in trading and exporting (globally) lac & shellac based products and basic raw material for synthesis of Ambrettolide i.e., lac (from where Aleuritic Acid is

generated), is also produced in India. Thus SSOC has an advantage to manufacture Ambrettolide in India. The raw material is usually collected from indigenous supplier located in West Bengal and sometimes imported from China based on requirement. Road & rail network will facilitate the procurement process of raw material. Finished product (Ambrettolide) may be exported through nearest International Airport located in Dum Dum, Kolkata and as per the felt need by utilizing the port facility at Kolkata, Haldia, Paradeep and Vishakhapatnam.

The geographical co-ordinates of the overall project site are varying between Latitude: 22°41'39.08"N to 22°41'41.06"N and Longitude: 88°15'9.85"E to 88°15'12.45"E with average elevation of 5 m above Mean Sea Level (MSL). The site location of the proposed plant of **M/s SSOC** at Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, WB is shown in **Figure-2.1**.

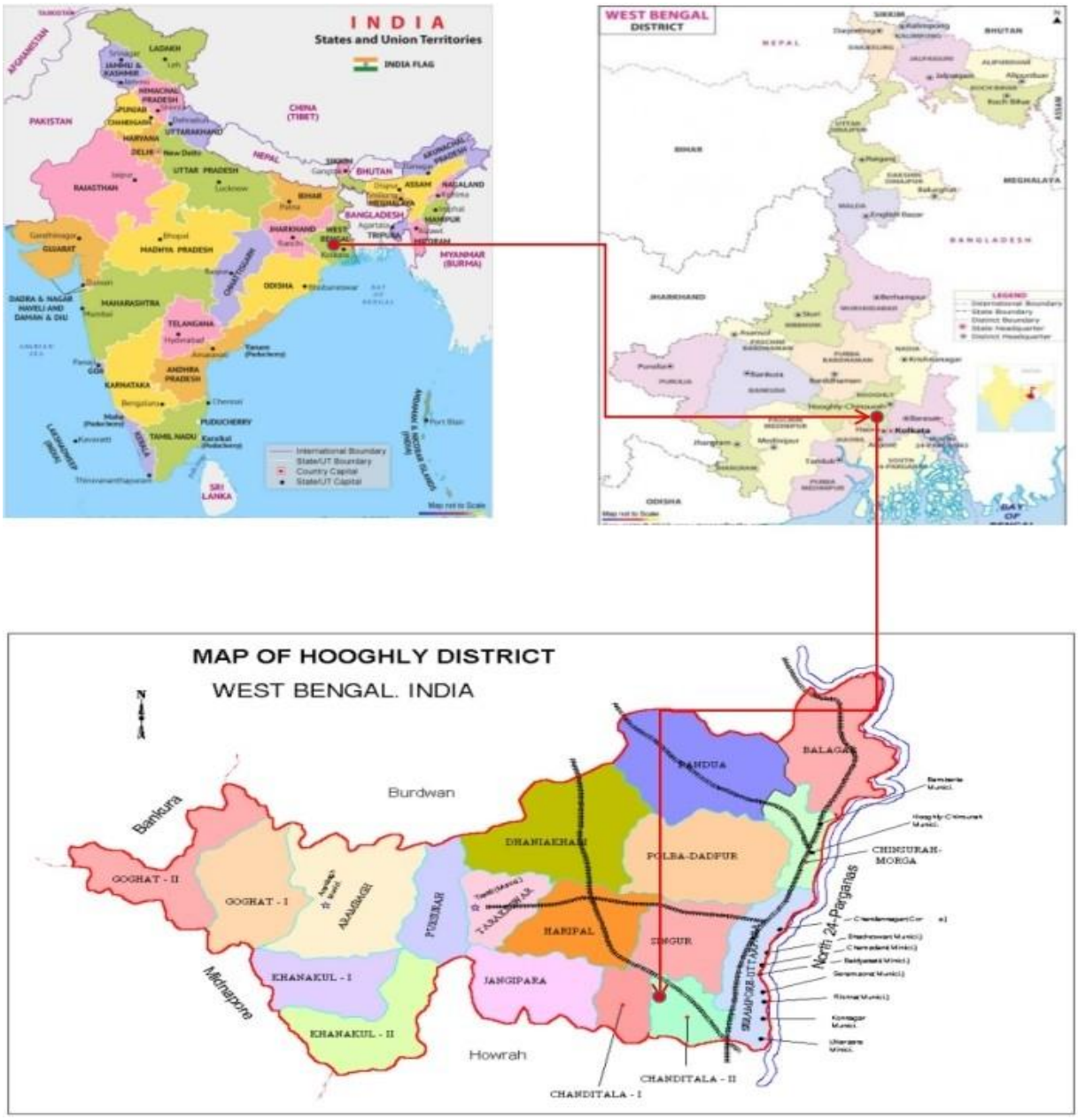


Figure: 2.1 : Project Site with respect to District/State/Country

Address:

Dankuni Industrial Complex of District Hooghly, at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal.

Co-ordinates:

Latitude: between 22°41'39.08"N to 22°41'41.06"N and Longitude: between 88°15'9.85"E to 88°15'12.45"E with average elevation of 5 m (16.4 ft) above Mean Sea Level (MSL)

2.3.1 SURROUNDINGS OF THE PROJECT SITE:

The project site already has proper road linkage for transport of materials and equipment. The nearest Railway Station is Dankuni Junction Railway Station, which is located about 4.2 Kms in the South-east direction. The Grand Trunk Road (National Highway - 2) is passing

within 4 Kms in East direction from the Project site. Kolkata is located aerially approximately at 17 Kms South-east from the project site.

The nearest Airport - Netaji Subash Chandra Bose International Airport, Dum Dam, is located about 20 Kms in South-east direction w.r.t. the site. The project site has good connectivity with the port of Kolkata, Haldia, Paradip and Vishakhapatnam. River Hooghly is passing about 11.2 kms distance in East direction w.r.t the site.

The specific location of the project site on Google Earth is shown in **Figure-2.2 (A)** and **Figure-2.2 (B)** shows six (6) corners of the project site on Google Earth map. The Google Earth and Toposheet Map showing the project site and its surrounding have been presented in **Figure-2.3 A and 2.3 B,** respectively.

Figure - 2.2. (A) : Project site on Google Map

Figure - 2.2 (B) : Geographical Co-ordinates of 06 corners of the project site

Co-ordinates:

a (22°41'39.34"N, 88°15'9.85"E), b (22°41'39.08"N, 88°15'11.08"E), c (22°41'40.20"N, 88°15'11.39"E), d (22°41'40.10"N, 88°15'12.35"E), e (22°41'40.60"N, 88°15'12.45"E) & f (22°41'41.06"N, 88°15'10.15"E).

Figure-2.3 A

Project Site & its 10Km Surrounding Area on Google Earth

<u>Geographical Co-ordinates</u> : Latitude: 22°41'39.08"N to 22°41'41.06"N, Longitude: 88°15'9.85"E to 88°15'12.45"E,

<u>Elevation</u>: 5 m (16.4 ft) above Mean Sea Level (MSL)

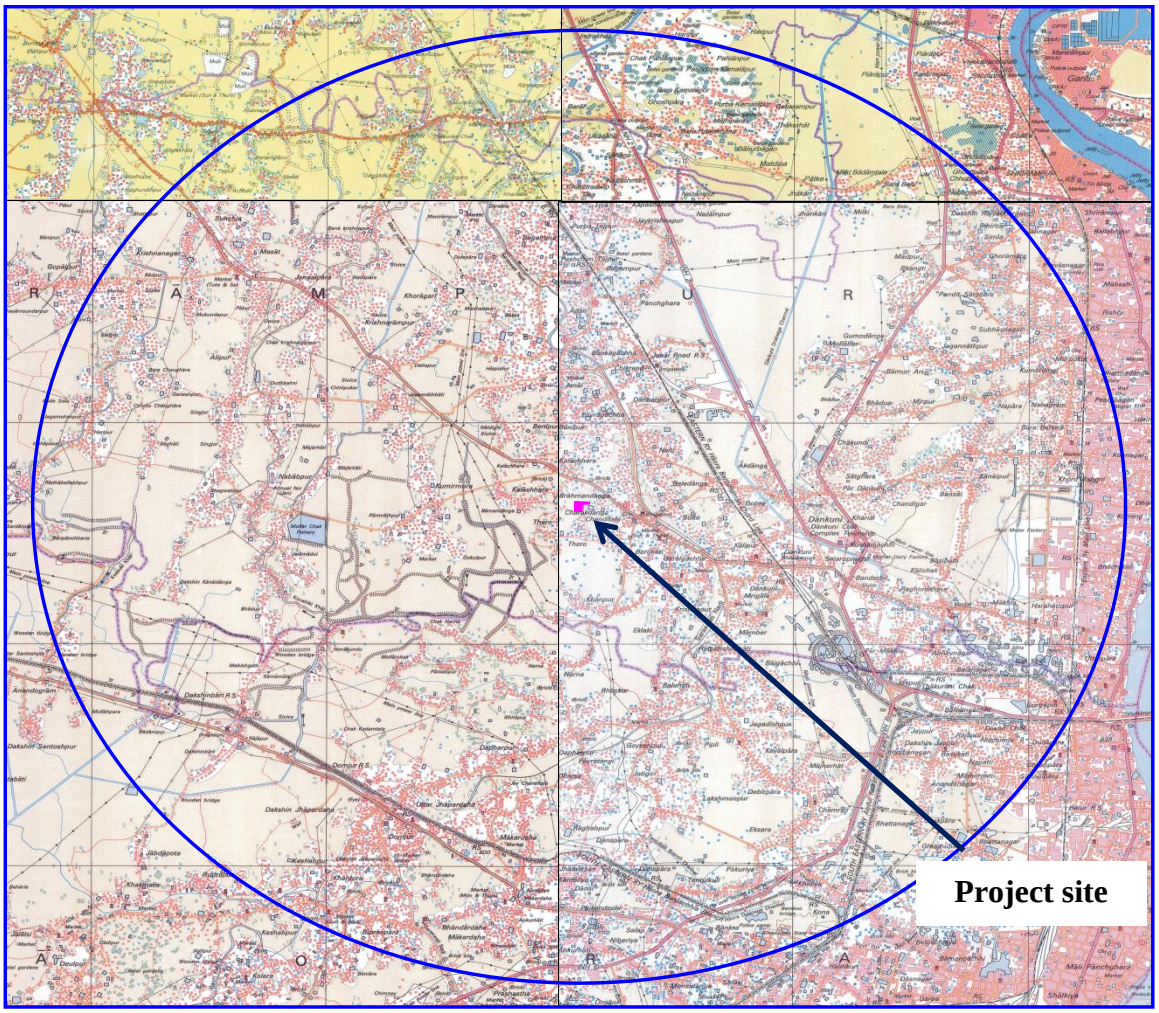


Figure-2.3 B
Project Site & its Surrounding Area On Toposheet Map (79 B/6, 79 B/1, 79 B/2 & 79 B/5)

2.3.2 PLANT LAYOUT

The plant layout showing the proposed facilities with 30.08% Greenbelt area has been shown as **Figure-2.4**. The plant layout is virtually the heart of the project as the successful operation, management & sustainability of the project is dependent on it. Environmentally also, the plant layout is very much sensitive as it influences the successful implementation of production, raw material and finished goods inventory, movement of raw materials and finished products, risk and hazard management, operation of DMP, and comfort of labour force in work zone, transport management inside and outside the plant and last but not the least total management of environment for sustainability. Based on this concept the plant layout and its engineering drawing has been drawn and shown in the figure. While designing the plant layout

M/s SSOC has put emphasis on the following environmentally sensitive issues viz:

- Work zone for total safety and security to ensure smooth production management.
- Vacant space all through the plant area to ensure free movement of transport system reducing the idle time and environmental pollution from transport, free movement of work force ensuring workers to work in an environment friendly atmosphere.
- Space provision for installation of pollution control equipment and establishment of various environmental pollution mitigation measures ensuring sustainable environment inside and outside the plat premise due to the project.
- Provision of good drainage system prohibiting water logging inside the plant at any point of time of operation across the season. **M/s SSOC** understands the need of conservation of water and accordingly land has been provided to develop a rain water harvesting pond which will harvest water that will be used for miscellaneous purposes thus ensuring the conservation of water. In short **M/s SSOC** will return the water during harvesting operation what they will draw to run the project.
- Care has been taken and accordingly space provided for installation of different machinery along with the electrical connectivity ensuring safe work culture inside the plant during commercial operation.
- To make the plant layout of the proposed green field Ambrettolide manufacturing unit of M/s Saraogi Shellac Overseas Corp. inside industrial complex, Dankuni, a separate Map has been provided for the unit.
- Last but not the least **M/s SSOC** is well aware of the need for green belt which acts as a sink for pollution control arising from sources like air, water, soil, noise etc. The management has kept a good amount of the land vacant for gradual development of a systemic and sustainable green belt.

The proposed Plant Layout has been presented in **Figure - 2.4.**

Figure-2.4 : Plant Layout

2.4 SIZE OR MAGNITUDE OF OPERATION & LAND USE BREAK-UP OF TOTAL LAND

M/s. SSOC is proposing an independent green field Ambrettolide manufacturing plant with gross manufacturing capacity of 24 TPA in Dankuni industrial complex. The production will follow a sequence of 5 stages of distillation process. Ambrettolide will be manufactured through treatment of Aleuritic acid (1800Kg) with TMOF followed by acetylation with Acetic Anhydride and finally fractional distillation of crude Ambrettolide to separate from remaining glycerin to generate 1150Kg of pure product. Four types of distillate generated in intermediate steps, reaction recovered glycerine (1200Kg) and gummy mass (1500 kg), TBR (120 Kg), bad crude (160 Kg), R3 residue (50 Kg) & processed residuals (100 Kg) will be collected in drums in course of reactions and sold in the local market. The production configuration of finished product and handling of raw material have been demonstrated in **Table - 2.1**.

The unit will come up on the available 0.54 acres (2240.82 Sqm) of vacant land within the industrial area of Dankuni, Hooghly, West Bengal. The plot is situated on Chanditala-Sreerampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702. The land is more or less flat and does not come under flood hazard zone.

The plot is surrounded by several industries such as Biswas Cottage Industry, IFB Agro Industries Ltd., Lux Industries Ltd., Century industrial Products Pvt. Ltd., Tirupti Plasto industries, Sun Pharmaceutical Industries Ltd., Dankuni G.S. Metals etc withing 6 KM of the proposed project site. There are few patches of residential buildings and vegetation coverage surrounding the project site.

2.4.1 Land Use Break-Up as per Layout

The total land for the project of M/s Saraogi Shellac Overseas Corp. at Dankuni Industrial Complex is 0.54 acres (2240.82 Sqm) and is in compliance to the requirement of Vastu. Thus by installation of Ambrettolide manufacturing plant in the said plot of land, the land character does not change. The break-up for land use in the overall project site as per plant layout - Engineering drawing has been presented in tabular form below in **Table-2.5.**

Table -2.5
Land use break up of the overall project site
(as per plant layout - engineering drawing)

Sl.No	Description	Area (m²)	Percent (%)
1	Shed	485.43	21.66%
2	2nd Shed	337.36	15.06%
3	TMOF and Acetic Andydride Ware House	83.52	3.73%
4	Office Lab & other utilities	153.00	6.83%
5	Plant Road	319.78	14.27%
6	Green Belt	739.47	33.00%
7	Open Land	78.98	3.52%
8	Rain Water Harvesting	43.28	1.93%
	Total Land Area	**2240.82**	**100%**

2.5 LIST OF MAJOR INDUSTRIES IN AND AROUND 10 KM. RADIUS OF THE PLANT SITE

Dankuni is a city and a municipality of Hooghly district in the Indian state of West Bengal. Dankuni is one of the important industrial hubs of West Bengal and situated in the west bank of river Hooghly. Important industrial activities like Diesel Locomotive Component Factory of the Indian Railways, Electric Loco Assembly and Ancillary Unit of Chittaranjan Locomotive Works, Mother Dairy, Dankuni Coal Complex, Bhusan Power and Steel etc. are located in Dankuni. M/s Saraogi Shellac Overseas Corp. has proposed to set-up an Ambrettolide manufacturing unit in Dankuni Industrial Complex on Chanditala-Sreerampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702. Several large and important industries located in and around the proposed site, covering radius of 10 Km have been described in **Table-2.6**.

Table-2.6
Important Industries and Utilities in and around 10 km radius of the proposed Ambrettolide manufacturing unit, Dankuni

Sl. No.	Name of Industry	Type of Industry	Distance (km)	Direction
1	Biswas Cottage Industry	Handicrafts	2.54	NNE
2	IFB Agro Industries Ltd.	Agro products	3.93	NE
3	Lux Industries Ltd.	Cosmetics	3.83	NE
4	Century Industrial Products Pvt. Ltd.	Rubber products	4.27	ENE
5	Tirupti Plasto Industries	Flexible Plumbing Pipes	2.73	ENE
6	Sun Pharmaceutical Industries Ltd.	Pharmaceuticals	4.81	ESE
7	Dankuni G. S Metals	Metal products	4.31	SE

2.6 DETAILS OF DRAINAGE OF THE PROJECT UPTO 5 KM. RADIUS OF STUDY AREA

The proposed green field project will come up at Dankuni Industrial Complex. The plot is located inside an industrial area where several factories are already operating which will not in any way damage the objective of the Company. Hence the location is very much developed. The area has well drainage facility and it is located in a plane piece of land which is 5 m Above Mean Sea Level (AMSL). Hooghly river is 11 Km away from the project site. The land is flat and well maintained. There is no flood history for the area for long time and the same is true for water logging also.

2.7 STATUS OF AQUISITION OF LAND FOR THE PROJECT

M/s Saraogi Shellac Overseas Corp. will install their green field project in Dankuni Industrial Complex which is located at Chanditala-Serampore Road. opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. To this effect M/s SSOC has already purchased a land measuring 0.54 acres (2240.82 Sqm.) from a private land owner. The land is industrial in

character and is free from any encumbrances. The company is already in possession of the land and as such there is no planning of any other acquisition of land what so ever. The plot is in compliant to the requirement of Vastu.

2.8 R&R DETAILS IN RESPECT OF LAND IN LINE WITH STATE GOVT. POLICY

M/s Saraogi Shellac Overseas Corp. has already purchased a piece of land measuring 0.54 acres (2240.82 Sqm.) in Dankuni Industrial Complex from a private owner for setting up the green field project. There is no question of any further acquisition of land or purchase of land from private parties. The land is free from all encumbrances and is industrial in character. As such there is no requirement of R&R plan since no evacuation/ ejection of habitation took place.

2.9 PROPOSED SCHEDULE FOR APPROVAL & IMPLEMENTATION

The total time of implementation for the project shall be 6 months from the zero date. However the activities will be expedited to complete the project as soon as possible so that the project can commercially take off subsequently. The zero date for project has been considered as the date when civil works start. Machinery Ordering Phase followed by commissioning will also take place simultaneously as per feasibility.

Project Implementation: It will be pertinent and imperative to complete many of the project activities before the zero date and soon afterwards. Such activities include:

- Receipt of EC and NOC for the project from appropriate authority.
- Basic engineering
- Preparation & issue of tender documents for major technical units
- Placement of orders
- Financial tie ups as applicable
- Finalization with overseas agencies as may be applicable or based on felt need
- Clearance from statutory authorities for commercial operation.

2.10 RAW MATERIALS

The raw materials required for the proposed project along with the supplier of raw material and mode of transportation have been shown in **Table 2.7** below:

Table - 2.7
Raw Material Requirement for the Proposed Project

Raw materials	Quantity (Kg per Annum)	Source	Mode of transport
Aleuritic Acid	43200	Jaiswal Shellac Industries (Balarampur, Purulia, West Bengal); Natural Product manufactures (Madyamgram, Kolkata, West Bengal); Sova Chemicals (Kolkata) & Hebei Chenzing (China)	Rail/ Road/ Air
TMOF	38400	-	Rail/ Road
Acetic Anhydride	25200	-	Rail/ Road
Glycerine	51000	-	Rail/ Road
Monoethylene Glycol	3880	-	Rail/ Road
Pottasiom Hydroxide	912	-	Rail/ Road
Industrial Solvent	3840	-	Rail/ Road
Sodium methoxide	996	-	Rail/ Road

Raw material requirement can be met from many sources which exist in the country and abroad. However, considering the safety and feasibility for procurement **M/s SSOC** will prioritize their requirement norms. It appears prudent to procure the raw material from domestic market. The basic raw material is derived from Seedlac which is harvested by the tribal people in West Bengal, Jharkhand, Chattisgarh and Maharashtra.

2.10.1 OTHER CHEMICALS AND MATERIALS REQUIRED WITH QUANTITIES AND STORAGE CAPACITIES

It has already been mentioned elsewhere in the report that **M/s. SSOC** has proposed an independent green field project of Ambrettolide with gross manufacturing capacity of 24 TPA in Dankuni industrial complex. Ambrettolide will be manufactured through treatment of Aleuritic acid (1800Kg) with TMOF followed by acetylation with Acetic Anhydride and finally fractional distillation of crude Ambrettolide to separate from remaining glycerin to generate 1150Kg of pure product. Four types of distillate generated in intermediate steps, reaction

recovered glycerine (1200Kg) and gummy mass (1500 kg), TBR (120 Kg), bad crude (160 Kg), R3 residue (50 Kg) & processed residuals (100 Kg) will be collected in drums in course of reactions and sold in the local market.

Distillates will be collected in new PVC drums of 200 Kg capacity whereas steam stabilized pure Ambrettolide will be stored in new food grade aluminum drums. Other by-products will also be stored in separate 200 Kg drums. The company will follow stringent protocol in handling and storage of the raw materials. Following will be the protocol to be followed for the storage and handling of the raw & finished materials:

Storage Instruction:

- To be Stored in Designated Warehouse – away from the work area
- To be stored in well-ventilated areas and in closed drums always to avoid evaporation and exposure. Drums to be opened only in the pipeline for charging, directly to the reactor in closed pipe lines
- The Diesel will be stored separately in closed drums, (maximum quantity stored is 600 litters). The drums will be stored in designated place
- New barrels will be purchased for the purpose of collecting and storing the distillates which are then sold in the local market.

Handling instruction:

- The drums will be opened very carefully only in closed pipelines.
- PPE protection will be worn while handling the raw material as applicable.
- Hazardous chemical will be handled following appropriate protocol for handling and management

2.11 TECHNOLOGY AND PROCESS DESCRIPTION

Synthesis of Ambrettolide from Aleuritic acid is conducted through six distinct steps. Aleuritic acid is first refluxed with TMOF followed by acetic anhydride in 2nd step, then refluxed with potassium hydroxide & mono ethylene glycol in the 3rd step and then refluxed with sodium methoxide & IPA in the 4th step. In all the above 4 stages, distillates are separated & sold in the local market. The material obtained from the 4th step is mixed with glycerin and distilled in small portions to produce crude Ambrettolide which is further purified by the partial & fractional distillation in the ultimate stage (6th step). In 5th step, glycerin is separated and taken out in drums of 200 Kg capacity.

Remaining materials in the reactor of 5th step such as Gummy mass (1500 kg), TBR (120 Kg), Bad crude (160 Kg), R3 residue (50 Kg), processed residuals (100 Kg) are also collected in separate drums and sold in the domestic market. Finally the pure Ambrettolide is steam stabilized and packed in new food grade aluminum drums. The process flow chart of the above reaction sequence has been explained in **Figure 2.5**.

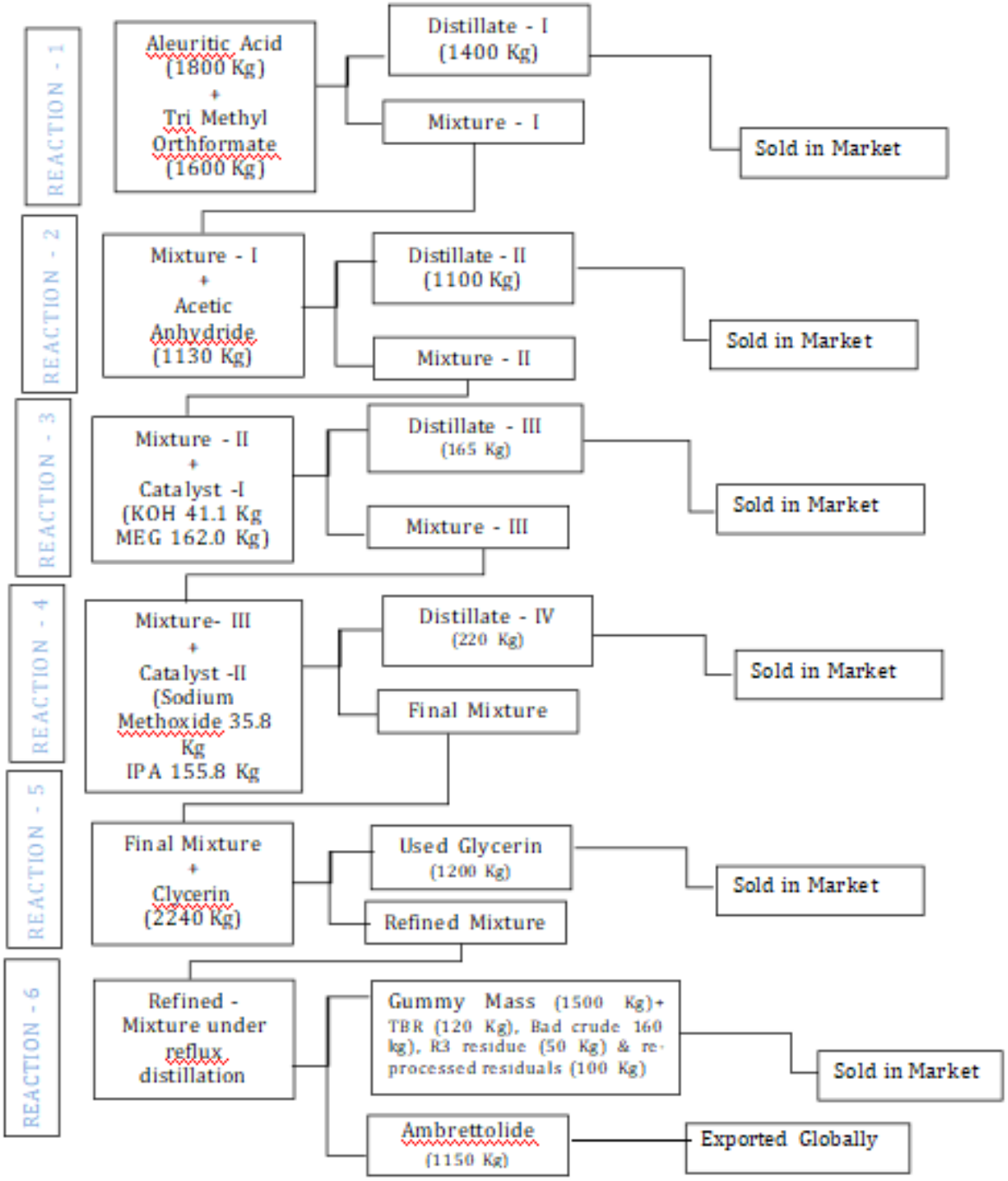


Figure - 2.5 : Process flow Chart for manufacturing of Ambrettolide

There will be 5 distinct reactors where entire trend of reactions will be performed sequentially. There will be one inlet valve below each reactor and charging will be done through pipeline under high vacuum. First 4 steps will be conducted in Reactor A, 5th step in Reactor B(R_1A) & C(R_2) and 6th step in Reactor D(R_3). Steam stabilization of pure Ambrettolide will be performed in Reactor E(R_4).

2.11.1 MANUFACTURE OF AMBRETTOLIDE

There will be 5 distinct reactors where entire trend of reactions will be performed sequentially. There will be one inlet valve below each reactor and charging will be done through pipeline under high vacuum. First 4 steps will be conducted in Reactor A, 5th step in Reactor B(R_1A) & C(R_2) and 6th step in Reactor D(R_3). Steam stabilization of pure Ambrettolide will be performed in Reactor E(R_4). All reactions will take place under high vacuum and completely sealed reactors and thus no gaseous emission during the manufacturing process is expected to occur. **Table 2.8** describes the list of equipment required for the proposed project.

Table - 2.8
List of Equipment

Sl. No.	Plant & Machinery
1	Reactor 1 – 3.5 Kl. Cap. SS304 (MS Limpet)/350 NB SS 304 Column/ SS distributor/350 SS extender with Bend/20 m^2 HTA SS 304 Condenser/300 Ltr. SS receiver
2	Reactor 1A – 1.5 KL . Cap. SS 304 Reactor(MS Jktd)
3	Reactor 2 – 500 Ltrs. Cap. SS 304 Reactor with SS 316 Heating Calendria/300 NB SS 304 Column with 200NB Distance Piece/10 m^2 HTA U tube Type Condenser/25 Ltrs. SS 304 Receiver/200 NB sch. 10. SS 304
4	Reactor 3- Fractional Distillation Unit-600 Ltrs. SS 304 Reactor (MS jacketed)/350 NB SS 304 Column / 5 m^2 HTA U tube type Condenser/ 2 m^2 HTA Product Cooler
5	MS Heat Exchangers- 13 m^2 HTA – 2 Nos. / 10 m2 HTA
6	Reactor 4 – 200 Ltrs. SS 304 Reactor (MS jacketed)/ 100 NB SS 304 Column with bend/ 2 m2 HTA condenser
7	Thermic Fluid Heater (Vertical, Coil Type) Model : FLUIDTHERM- 200
8	Steam Boiler (Non-IBR Vertical, Coil Type) Model No: e-STEAM – 100 Water Softener
9	Expansion Cum De-Aerator Tanks In 1000 Ltrs & 500 Ltrs Capacity.
10	Mechanical Vacuum Booster – Model No. EVB – 05 (with Attachments)
11	VFD with Panel for EVB – 05
12	Mechanical Vacuum Booster – Model No. EVB –15 (with Attachments) X 2
13	VFD with Panel for EVB –15

14	Mechanical Vacuum Booster – Model No. EVB –30 (with Attachments)
15	VFD with Panel for EVB –30
16	Water Jet Ejector – J4 Special & Centrifugal Pump both in S.S. X 2
17	Water Jet Ejector Motor 20HP 3000 RPM X 2
18	Glass Vessels – 20Ltr Vessel X 2 / 10Ltr Vessel /100Ltr Vessel with all necessary attachment/Glass Coil Condenser
19	Glass Product Cooler 150DN/1.0 m2 / SS316 Sight Glass- PTFE Bush Type Size 40DN X3
20	Vacuum Pump – Model FD – 20 X 2
21	Control Valve Size 2.5 Inches X 2
22	Column Packing
23	Variable Frequency Drive for Motors
24	Cooling Towers
25	Air Compressor Systems
26	Valve Controllers
27	Platform & pipe Fittings Including Valves & Flanges
28	Platform & pipe Fittings Installation

2.12 UTILITIES

2.12.1 AUXILIARY INFRASTRUCTURAL FACILITIES

To render necessary repair & maintenance, inventory, quality control related and administrative services for the proposed plant, following auxiliary facilities have been considered inside the plant boundary.

Repair and maintenance shop:

The company proposes to set up a local repair shop equipped with facilities for machining, fabrication, assembly, electrical repairs, instrument calibration/repair etc.

Stores:

A store will be maintained to keep equipment spares, hardware, wearing parts and consumables. A strong room for keeping valuable item, offices for inventory control, material receipt section, toilet etc will be suitably provided.

Plant office:

An office building will be constructed inside plant premises. The office building will be completed with separate toilet, conference rooms, computer room, separate executives' room and other facilities like record maintenance, printing, scanning etc.

Ancillary buildings:

Besides the auxiliary facilities other ancillary buildings with necessary facilities such as canteen, time office & security offices etc. will also be provided.

2.12.2 FIRE FIGHTING FACILITIES

To protect the working personnel, equipment and machinery, fire fighting measures have been planned for the proposed project.

The Fire protection system of the plant shall consist of following components:

Fire Hydrant System for all the fire hazard sensitive areas of the plant : A fire hydrant network system has been envisaged for the proposed project. Internal hydrants will be provided at suitable locations and different hydrants will be provided along the road and in the close vicinity of the units to meet the additional requirement of water for extinguishing fire.

Automatic system : For machine control rooms and computer rooms, automatic fire extinguishing system has been envisaged.

In addition to the yard fire hydrant system, the fire protection systems envisaged for the plant are as follows:

- Internal fire hydrant for office building to be tapped-off from the outdoor fire water header.
- Fire detection and alarm system for electrical rooms, cable tunnels etc.
- Portable fire extinguishers such as CO_2, foam and dry chemical powder in all areas of the plant with fire hazard.

Portable fire extinguishers : All plant units will be provided with adequate number of portable fire extinguishers to be used as first aid fire appliances. The distribution and election of extinguishers will be done in accordance with the requirement of IS: 2190-91.

2.13 POWER REQUIREMENT & SUPPLY / SOURCE

The firm has submitted a proposal to WBESDCL for supply of 125 KVA of power to operate the Amberettolide manufacturing plant.

Source of Power

The Power requirement of 125 KVA will be met from the supply of WBSEDCL. Application has already been made to get the sanction.
Two DG sets of 160 KVA each will be installed as a standby source of power.

2.14 MANPOWER REQUIREMENT

SSOC will meet the requirement of human resources both during construction and commercial operation locally as much as possible. Sourcing of human resource for the project will be envisaged from outside only when the human resource with appropriate skill is not available locally.

The proposed plant will generate both direct & indirect employment. Approx. 12 persons will be provided employment during construction phase of proposed project which is of temporary in nature and will be sourced exclusively locally. During commercial operation the total manpower requirement would be as envisaged 10 nos. and provided in **Table 2.9** below.

Table - 2.9
Manpower Requirement

Particulars	Construction Phase	Operation Phase	Remarks
Regular	-	10	Locally sourced
Contractual	12	-	Locally sourced
TOTAL	12	10	

2.15 WATER SOURCE AND SUPPLY FACILITIES

There will be no water requirement in the production processes. Water will be pumped in rotating cooling tower and will be recirculated continuously. A minimum fraction of the water might get evaporated out at hot temperature. Water from borewell will be only used for domestic purposes and occasionally filling up the tanks of cooling tower and fire fighting equipment. To meet the above requirement a deep boring well with a submersible pump will be installed in the plant premise for domestic usages and to occasionally fill up the cooling tower and the firefighting equipment and the permission for the same

has been applied (dated 31/12/2020) to the Chanditala Gram Panchayat for the withdrawal of 300 liters/day to meet the requirements for daily washing and other needs.

Domestic water - The domestic water requirement for the plant will be met from the borewell water supply system and will be stored in the drinking water overhead tank on the top of the admin building. For the proposed project around 200 liters of water will be required for domestic purposes per day.

Fire water system: The emergency water pipelines will be led in and around the Ambrettolide manufacturing plant for fire fighting and around 1.5 KLD of water will be allocated for the same. In addition to the fire fighting pipelines, adequate numbers of fire hydrants will also be provided at suitable locations.

Water for green belt development and dust suppression: As part of the company's approach towards environmental sustainability **M/s SSOC** proposes adequate plantation area around the plant premise as shown in the Plant Layout map in **Figure-2.4.**

Further, it is prudent that every industry is associated with dust generation either in terms of fugitive or stack emission or both.

In order to maintain the the proposed green belt and suppressing the fugitive dust emission (inside the plant premises) **M/s SSOC** proposes to sprinkle around 2 KL of fresh water every day.

Rain Water Harvesting: M/s SSOC understands the need of conservation of water and accordingly rain water harvesting will be implemented on site. Rain water from sheds will be collected in storage tank and will be treated appropriately for use in non critical purposes.

Accordingly 67 m^2 of land (i.e., **2.99% of the total project area**) will be allotted to develop a rain water harvesting pond which will harvest water that will be used for miscellaneous purposes, thus ensuring the conservation of water. In short **M/s SSOC** will harvest rain water to the extent of around 0.0002 mcm (201 cu.m). This harvested water will be used for different purposes in the no critical areas inside the plant.

2.15.1 RAIN WATER HARVESTING: DETAIL

The surface water run-off from the project area would be directed to rain water harvesting tank for further uses in the project area to optimize the raw water requirement. The entire land of the plant area has to be leveled in such a way so that Rain Water flows down to the

RCC tank as Rain Water storage tank. Water will enter into the storage tank through filter bed. Filter bed will be made with different size of gravels and coarse sand. The filtrate will be stored in the tank. The residue of the filter bed will be removed manually from time to time.

Rain Water harvesting potential:

Total Project Area – 0.54 acres (0.224 hectare)
Average annual rain fall in the project area - 1400 mm
Average annual monsoon rain fall - 80% of 1400 mm = 1120 mm (say)
Volume of surface run off in the plant campus = 0.224 x 1.12 x 0.4 ham,

= 0.1003 ham say;
= 0.1/100 mcm
= 0.001 mcm

Therefore the rain water harvesting potential of the plant campus = 0.001 mcm.

80% run off may be allowed to be drained through natural drainage system. For its sustenance remaining 20% may be harvested and stored suitably. Around 0.0002 mcm (201 cu.m) of water therefore will be conserved within the project site. Considering the average depth of 3 m in storage tanks, area for surface storage involves around 0.0067 hectare (0.016 acres) **which is around 2.99% of the project area**.

2.16 DETAILS OF EMISSION, EFFLUENT, HAZARDOUS WASTE GENERATION AND THEIR MANAGEMENT

The production process involves in different stages of chemical reactions has already been explained in Flow Chart diagram (Figure-2.5). Several residual leftovers are generated in various stages of the manufacturing process. These are 100% saleable product and has demand in the local market. Such chemicals are recycled.
No harmful waste or chemical will be generated. There will be no discharge of liquid waste or effluent.

2.16.1 Water Pollution Prevention and Control

Being an environmentally aware company, M/s SSOC proposes a “Zero Liquid Discharge” (ZLD) mode of operation by judicially using the raw water in its various operational units. As such there will be no water requirement in the production processes. Water will only be pumped in rotating cooling tower and will be recirculated continuously. A minimum fraction of the water might get evaporated out at hot

temperature. Water from borewell will be only used for domestic purposes and occasionally filling up the tanks of cooling tower and fire fighting equipment.

Water required for steam stabilization of finished Ambrettolide will be met through purchase of mineral water from Biselery unit located in nearby place. Water condensate from the above process will be collected and reused for various non critical purposes.

Wastewater Generation

Domestic

As the proposed project is very small in configuration and the manpower required is also very less (approx. 10 persons), the wastewater generated from the domestic sources viz. toilets, floor cleaning, canteen is expected to be much less (around 0.2 KLD).

2.16.2 Solid & Hazardous Waste Management

There will be no solid waste that needs to be treated for disposal. No chances of generation of solid waste (from processing units) is expected as the recovered gummy sludge will be collected in closed containers which will be sold to the market.

No debris or scrap will be generated during construction of shed and fabrication. All steel items will be carefully ordered in required quantities and no scrap will be there. Everything will be utilized. During civil work, there will be minimal amount of debris and all will be used in the land filling. Nothing will be thrown/ disposed off as waste neither during construction nor during operation.

2.16.3 Air Pollution Control Measures

2.16.3.1 Control of air pollution from stack

No fossil fuel is burned to heat up the distillation vessels as Thermic Fluid Heater (TFH) will be used for this purpose. Diesel is burned to produce the steam in boiler and also to heat the fluid of TFH. There will be little emission and the same will be discharged through stack of appropriate height. This steam is required only once in a span of 15 days. Thus emission of pollutants to air from diesel burning is not significant.

No chances of any chemical spillage/discharge of chemicals into the environment is expected as all recovered distillates will be collected in closed containers and sold to the market.

All reactions take place under high vacuum and completely sealed channels and thus no gaseous emission during the manufacturing process is expected to occur.

2.16.3.2 Control of fugitive air pollution

Fugitive emission is a very common phenomena in any process under operation. For this project also the specific instances of fugitive dust generation may include dust blown by wind from vehicular movement inside the plant and raw material handling in the storage yard. Traces of VOCs might also be released from the raw material storage and handling units, byproduct and final product storage unit etc. All reactions will take place under high vacuum and completely sealed channels and thus no gaseous emission during the manufacturing process is expected to occur. However, considering the scale of the project the fugitive emission of the proposed project is expected to be insignificant. **M/s SSOC** proposes the following control measures to minimize the release of fugitive emission inside the plant premises :

- Raw material handling and storage will be properly earmarked.
- Regular water sprinkling on haulage road and transportation of material will be done by covered container.
- The roads inside the plant will be paved and regular sweeping/water sprinkling will be done.
- Proper maintenance of vehicles will be done regularly.
- All transfer points shall be fully enclosed
- Adequate Greenbelt will be developed inside the plant premises to arrest the PMs.
- Workshops for proper Operation & Maintenance of plants to achieve best possible stable performance shall be established.
- Regular training shall be given to the personnel operating and maintaining fugitive emissions control systems.

Besides the above, the company will avail the services of a mobile vacuum cleaning van which operates for 24 hours every day to clean the flying dust settling inside the plant roads, thus keeping the roads free from dust.

With the implementation of all the above control measures, the gaseous and fugitive emissions shall be contained within the acceptable limits, thus ensuring the full compliance to National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009.

2.17 STORM WATER MANAGEMENT

The effectiveness of the drainage system depends on proper cleaning of all drainage pipes/channels. Regular checking will be done to see that none of the drains are clogged due to accumulation of sludge/sediments. The clogged drains will be cleaned as soon as possible, preferably on the same day. The catch-pits linked to the storm water drainage system from the raw material handling areas will be regularly checked and cleaned to ensure their effectiveness. This checking and cleaning will be rigorous during the monsoon season, especially at the time of heavy rains forecast.

2.18 LAND & GREENBELT DEVELOPMENT

The green belt development and its correct management will be a big help for the project management authority to keep the effect of fugitive and other emissions inside the plant well under control. The green belt is a good sink for gaseous pollution and liquid pollution as well.

With this view M/s SSOC will develop green belt for the proposed project inside the plant in an area amounting to 0.183 Acre/0.074 Hectare of land. The total land are for the project is 0.54 Acre/0.224 Hectare. Thus 33.00% of the total land area has been proposed under green belt. The details of the plants and trees that will be planted to compensate the green belt development requirement has been provided in the table below (**Table-2.10)**.

TABLE - 2.10
List of Plant Species to be Planted for Green Belt Development

Sl. No.	TREE SPECIES	COMMON NAME
1	*Pongamia Pinnate*	Karanj
2	*Mimusops Elengi*	Bakul
3	*Butea Monosperma*	Palash
4	*Cassea Fistula*	Amaltas
5	*Dalbergia Sissoo*	Sissoo
6	*Neolamarckia Cadamba*	Kadam
7	*Ficus Bengalensis*	Banyan
8	*Ficus Religiosa*	Peepal
9	*Madhuca Latifolia*	Mahua
10	*Purging Cassia*	Sonajhuri
11	*Moringa Oleifera*	Drumstick
12	*Terminalia Arjuna*	Arjun
13	*Azadirachta Indica*	Neem

14	*Tectona Grandis*	Teak
15	*Mangifera Indica*	Mango
16	*Albizzia Lebbeck*	Siris
17	*Artocarpus Heterophyllium*	Jackfruit
18	*Cocos Nucifera*	Coconut
19	*Polyalthia Longifolia*	Ashoka
20	*Dendrocalamus Strictus*	Bamboo

Land use break up for the proposed unit has been demonstrated in **Table- 2.11** below.

Table - 2.11

Land Use Break Up of The Overall Project Site as per Plant Layout (Engineering Drawing)

Sl.No	Description	Area (m²)	Percent (%)
1	Shed	485.43	21.66%
2	2nd Shed	337.36	15.06%
3	TMOF and Acetic Anhydride Ware House	83.52	3.73%
4	Office Lab & other utilities	153.00	6.83%
5	Plant Road	319.78	14.27%
6	Green Belt	739.47	33.00%
7	Open Land	78.98	3.52%
8	Rain Water Harvesting	43.28	1.93%
	Total Land Area	**2240.82**	**100%**

2.19 CHARTER ON CORPORATE RESPONSIBILITY FOR ENVIRONMENTAL PROTECTION (CREP): AMBRETTOLIDE MANUFACTURING UNIT

The Charter on Corporate Responsibility for environmental protection (CREP) as laid down by Central Pollution Control Board (CPCB) for Industries and their activities will act as a guideline for M/s SSOC to implement their planning to protect the environment.

Management Initiatives on Charter of Corporate Responsibility in Ambrettolide manufacturing unit may be stated as follows:

SN	Unit / Item	Responsibilities	Extent of fulfillment
1.	Stack & AAQ	Installation of stack monitoring system.	Effort will be made

2.	APCS	To operate the pollution control equipment efficiently and to keep proper record of run hours, failure time and efficiency with immediate effect.	Will be complied

2.20 MANPOWER PLANNING

The employment potential created by this project will be met by absorbing the people from the surrounding localities and thus there well be scope for slight improvement of the socio-economic life of the region which will contribute to the increase in GDP as a whole. Several other indirect employment opportunities will be created in the surrounding areas in the form of supporting services, daily need requirements and amenities.

Factory human resources

It is estimated that the total requirement of manpower for the whole organization will be 10 persons. There will be few more indirect employment in transport, ancillary, support facilities and growth in local small business.

2.21 PROJECT COST

The Total cost of the Project will be around Rs. 4.45 Crores. The details of cost are given below in Table 2.2 presented earlier :

Table-2.2

Cost breakup of the proposed project (mention earlier)

Sl No.	Particulars	Total Value (Rs)
1	Land & land development	105,00,000
2	Civil construction	76,20,000
3	Plant & machinery	162,00,000
4	Miscellaneous fixed assets	42,60,000
5	Electrical fittings & others	30,00,000
	Hard Cost	415,80,000
6	Pre -operative expenses	25,00,000
7	Contingencies @ 5%	4,20,000
	Soft Cost	29,20,000
	Total	445,00,000

2.22 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF THE TECHNOLOGICAL FAILURE

Manufacturing technologies of the proposed green field Ambrettolide production unit of M/s. SSOC will adopt latest state of the art technology with proven track record. Thus no risk of technological failure exists at all.

2.23 CONCLUSION

The proposed green field Ambrettolide Manufacturing project of **M/s SSOC** will be set up on a vacant plot of land of 0.54 acre (0.224 hectare) on long term lease basis at Dankuni Industrial Complex located on Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed green field project will adopt Zero liquid discharge concept. As such there will be no water requirement in the production processes of Ambrettolide from Aleuritic acid. There will be no solid waste that needs to be treated for disposal. All residual leftovers generated in course of reactions along with gummy sludge will be collected in closed containers which will be sold to the market. Since all reaction will take place under high vacuum and completely sealed channels, chances of fugitive emission will be insignificant.Diesel will be burnt only to produce the steam in boiler once in a fortnight and to heat the fluid of TFH. As a result, chances of soil pollution, pollution to surface and ground water and pollution from fugitive emission will be negligible. Existing land use pattern will also remain same. M/s SSOC management has taken utmost care to keep the Ambrettolide manufacturing plant as much pollution free and environment friendly as possible. It may be concluded that with the adoption of latest state of the art technology for production with minimal pollution, M/s SSOC will be successful to install the above plant in Dankuni Industrial Complex, in an environmentally sustainable manner.

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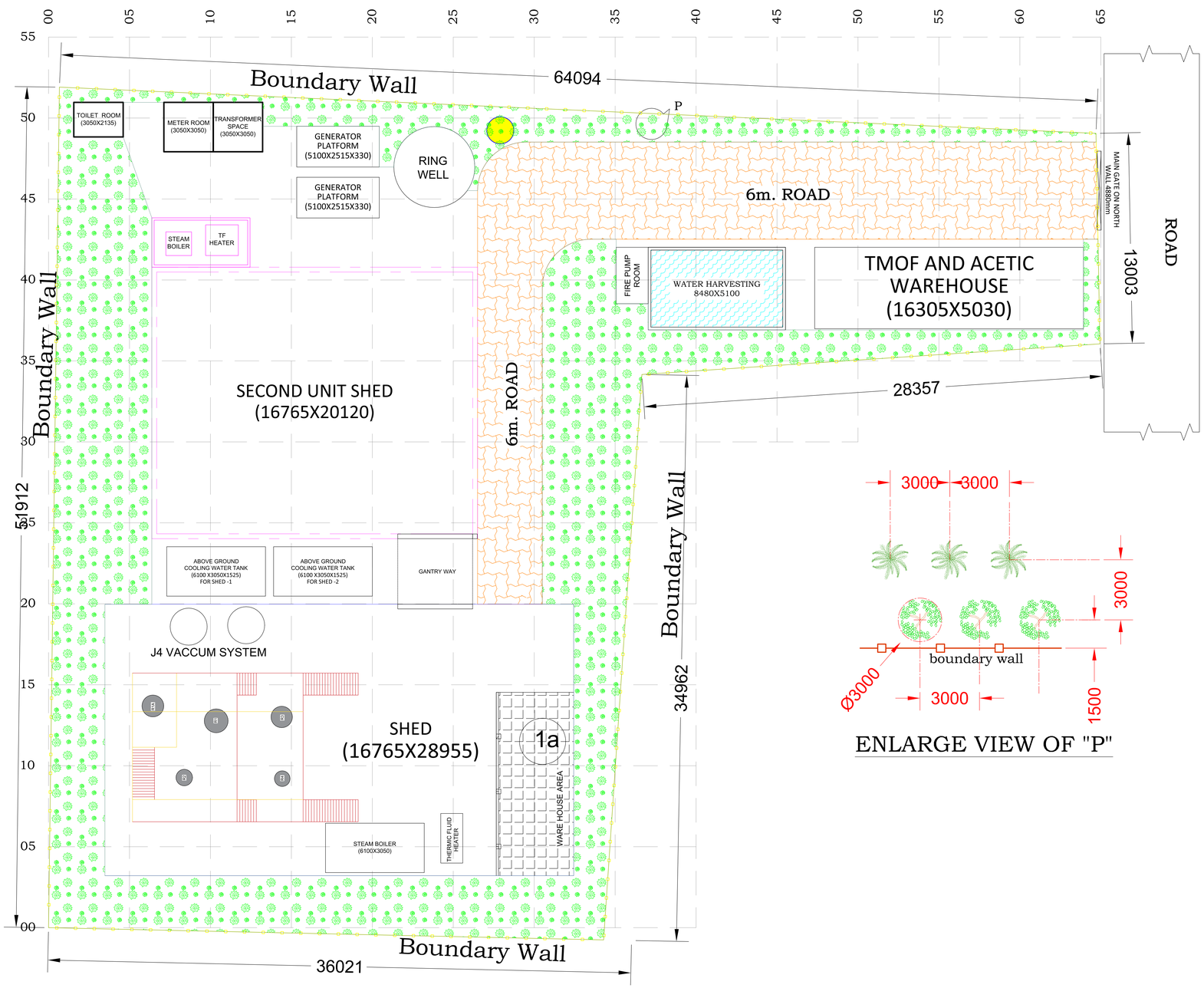
Print Date:- 27 February 2021



ENLARGE VIEW OF "P"

LAYOUT PLANT

NOTES

1). ALL DIMENSIONS ARE IN MM.

2). ALL GRID SPACING ARE @ 5.0 METERS BOTHWAYS.

3) ASSEMBLY POINT

LEGEND:-

SL. NO.	DESCRIPTION
01	Main shed (16765X28955 mm)
02	Second shed (16765X20120)
03	TMOF Godown (16305X5030)
04	Ring Well Ø5mtr.
05	Cooling Tower Tank (6100 X3050) -2 Nos
06	Boiler Room (6100 X 3050)
07	Transformer (3050 X 3050)
08	Meter Room (3050 X 3050)
09	Toilet (3050 X 2135)
10	Generator (5080X2515) - 02 Nos.
11	Fire pump room (3350 X 3050)
12	Water Harvesting tank (8480X5100)

LAND USE OF PROJECT SITE

LEGEND:-

SL. NO.	DESCRIPTION	SYMBOL	AREA (IN METER)	PERC. (%)
01	SHED		485.43	21.66 %
02	2nd. SHED		337.36	15.06 %
03	TMOF & ACETIC WARE HOUSE		83.52	3.73 %
04	OFFICE LAB & OTHER UTILITY		153.00	6.83 %
05	PLANT ROAD		319.78	14.27 %
06	GREEN BELT		674.00	30.08 %
07	OPEN LAND		144.45	6.45 %
08	RAIN WATER HARVESTING		43.28	1.93 %
	TOTAL LAND FACTORY BOUNDARY AREA		2240.82	100%

Scale- 1:300

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference

Drawn by	Checked by - date	Approved by - date	Filename	Date	Page
Partha Bag	Priyaz Saraogi			21.01.2021	A3

SARAOGI SHELLAC OVERSEAS CORP.

CHANDITALA, DANKUNI, DISTRICT
HOOGLY, WEST BENGAL

LAYOUT PLANT OF AMBRETTOLIDE MANUFACTURING UNIT

SSOC/LAYOUT/001 | REV. 0 | Sheet 1 OF 1

CHAPTER-3.0
DESCRIPTION OF THE ENVIRONMENT

3.1 GENERAL DESCRIPTION

3.1.1 INTRODUCTION

M/s. Saraogi Shellac Overseas Corp. is proposing a green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product. The product has both national and global market sale outlets. The unit will be coming up at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. Geographical coordinates of the Project Site of proposed expansion Project are Latitude: 22°41'41.06"N to 22°41'39.34"N and Longitude: 88°15'10.15"E to 88°15'9.85"E with elevation is about 65 m to 5 m. (16.4 ft). The map showing the location of the project site is presented in **Figure-3.1.1**; Google map and the toposheet map of the project site & its surroundings is shown in **Figure-3.1.2** and **Figure-3.1.3** respectively.

3.1.2 TRANSPORTATION & SURROUNDINGS

The project site already has proper road linkage for transport of materials and equipment. Nearest Railway Station is Dankuni Junction Railway Station which is located about 4.2 Kms. distance in East direction from the Project Site. National Highway - 2 (NH-2) is passing within 4 kms distance in East direction w.r.t. the Project site. Dankuni municipal town is located aerially approximately at 4.6 kms. South-East direction from the project site.

The Major River Hooghly is passing at around 11.2 Kms. distance in East direction w.r.t the project. The nearest Airport - Netaji Subhas Chandra Bose International (NSCBI) Airport, Kolkata is located around 20 Kms. In East direction w.r.t. the project site. Kolkata is located aerially approximately 17 kms. SE from the project site.

3.1.3 COVERAGE OF THE STUDY AREA

The EIA is aimed for determining the environmental impacts on the "Study Area", which encompasses all areas falling within a radius of 10 Kms around the project site. The entire study area is located within

Bardhaman and Bankura districts. There are no eco-sensitive areas like National Park/ Wildlife Sanctuary/ Bird Sanctuary etc. within 10 km radius around the proposed project site. The 10 Km radius study area around the project site on Google map and Toposheet Map has been presented in **Figure-3.1.1** and **Figure-3.1.4**.

The major environmental disciplines studied in this EIA report include soil, land use, meteorology, air quality, surface and ground water quality, noise, ecology, demography and socio-economics.

The following chapter present the detailed discussion on the field data, generated for soil, meteorology, air quality, water quality, noise, ecology and socio-economics during three months' period **(1st December, 2020 – 28th February, 2021)** along with the relevant secondary data, collected from various agencies on the relevant disciplines.

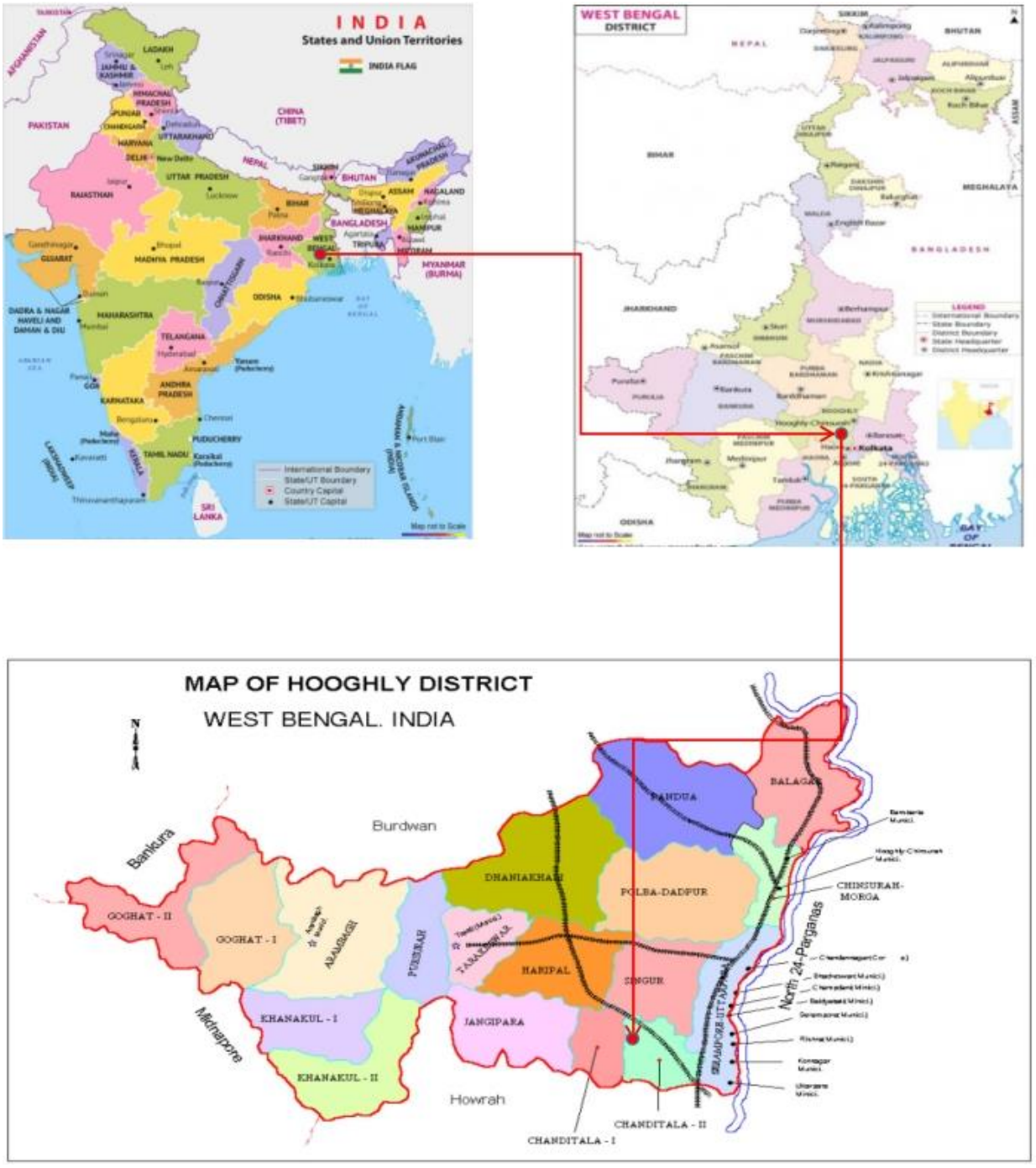


FIGURE-3.1.1 : LOCATION MAP

- **Project Site: Chanditala-Sreerampore Road. Opp. Of MBW & Bhagardhar, Dankuni - 712702, West Bengal**
- **Geographical Co-ordinates:**
  Latitude: 22°41'41.06"N to 22°41'39.34"N
  and Longitude: 88°15'10.15"E to 88°15'9.85"E
- **Elevation: 5 m (16.4 ft.) Above Mean Sea Level (AMSL)**

FIGURE-3.1.2 : GOOGLE VIEW POINT
PROJECT SITE & ITS SURROUNDING AREA

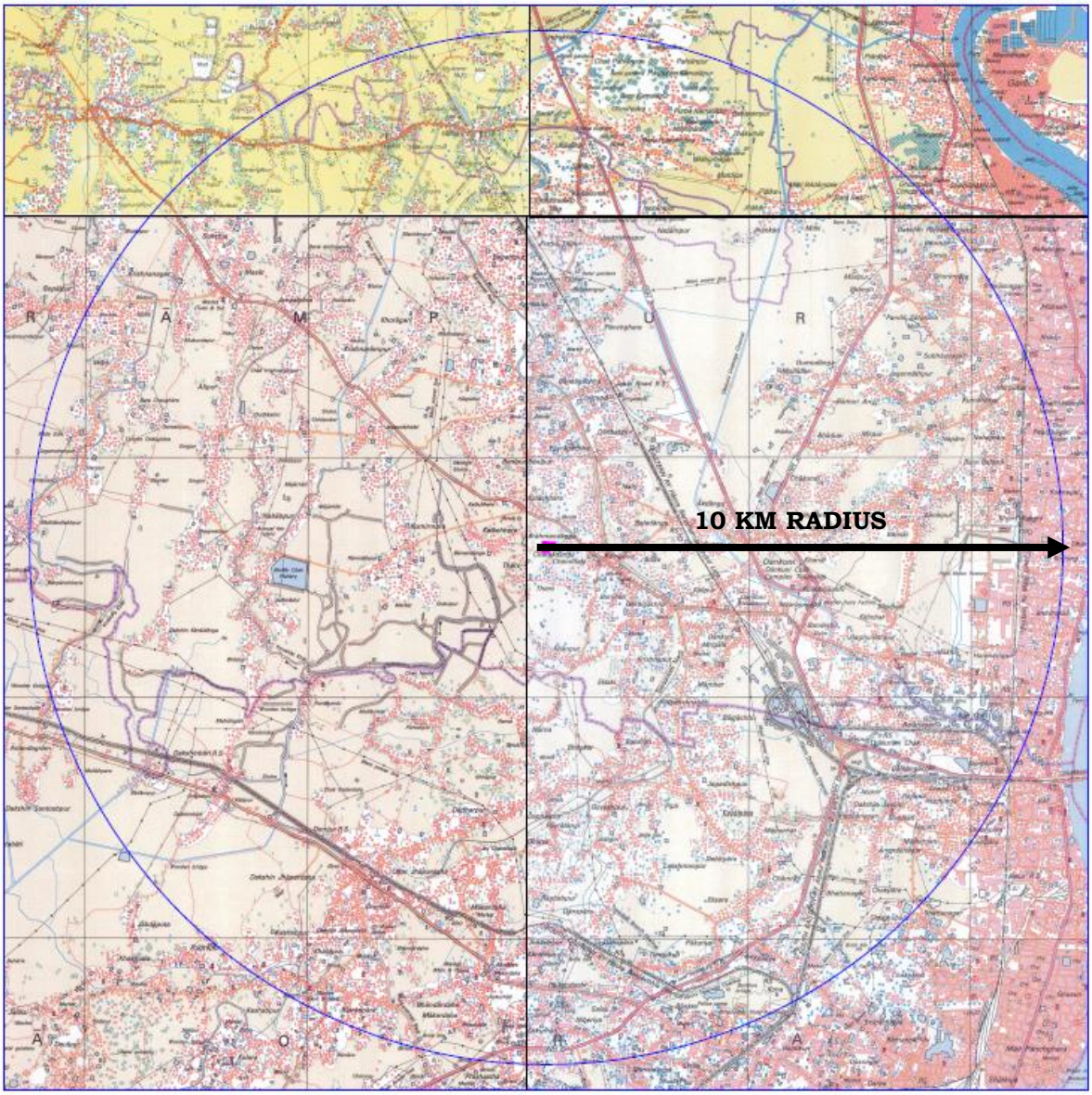


FIGURE-3.1.3 : TOPOSHEET MAP
PROJECT SITE & ITS SURROUNDING AREA

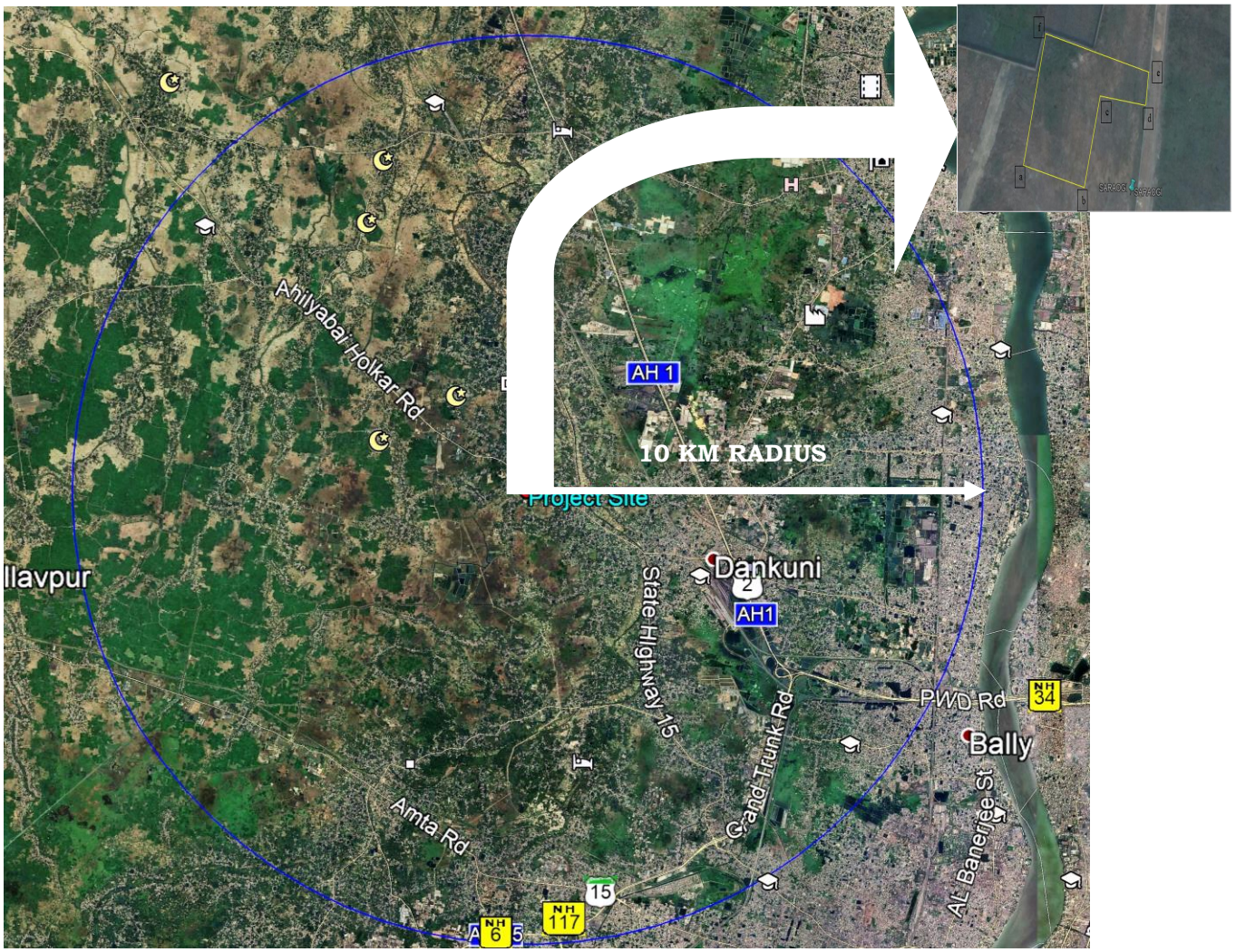


FIGURE-3.1.4
10 KM RADIUS STUDY AREA ON GOOGLE MAP

3.1.4 STUDY METHODOLOGY

The baseline environmental quality for winter season has been assessed based on primary data generated during field survey and secondary data available for the project site.

Table-3.1

Baseline data generation Matrix

Attribute	Parameters	Locations/Source
Land Environment	Physiography & Drainage	Primary & Secondary information
	Geology & Geo-Hydrology	Primary & Secondary data
	Land use	Primary & secondary data
	Soil Quality	4 Locations/ Primary & Secondary data
Meteorology	Temperature, Humidity, Atmospheric Pressure, Wind speed & Direction etc.	1 Location/ Primary & Secondary data
Air Environment	PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), and Carbon Monoxide (CO)	8 Locations / Primary & Secondary data
Noise	Noise Level (dB Leq)	10 Locations/Primary data
Surface water	Physical, Chemical & Biological Parameters	10 Locations/Primary data
Ground water	Physical, Chemical & Biological Parameters	9 Locations/Primary data
Ecology	Terrestrial & Aquatic	Core and Buffer Zone, Primary & Secondary data
Demography & Socio-economy	Demography & Socio-economy	Core and Buffer Zone, Primary & Secondary data

3.2 GEOLOGY & GEOHYDROLOGY OF THE STUDY AREA

3.2.1 GEOLOGY OF THE STUDY AREA

The whole study area has spread along the east bank of the River Hooghly in Hooghly district. The whole study area is in the Ganges Delta and is monotonously plain. As with most of the Indo-Gangetic Plain, the soil and water are predominantly alluvial in origin.

The master slope of the land is towards south. Younger levee, deltaic plain, inter-dis-tributary marsh, paleo-channels and younger levee adjacent to river Hooghly are the important geomorphological units present in the area. The area is covered with younger alluvial soil mainly of silty & clayey loams.

Geological Formations:

The study area is located over the "Bengal basin", a pericratonic tertiary basin with enormous thickness of fluvio-marine sediments. The basin can be divided into three structural units:

1) The westernmost shelf or platform,
2) Central hinge or shelf/slope break; and
3) Deep Basinal part in the east and southeast that open in the present bay of Bengal.

The study area is located atop the western part of the hinge zone across which sediment thickness and facies significantly varies for shelf area in the west to deep basin area in the east. The hinge zone and the shelf area are traversed by many faults; some of them are reported to be tectonically active at present. The hinge zone is about 25 km (16 mi) wide at a depth of about 45,000 m (148,000 ft) below the surface. Total thickness of sediments below the land is nearly 7,500 m (24,600 ft) above the crystalline basement; in which:

a) the top 350 – 450 m (1,150 – 1,480 ft) is quaternary,
b) followed by 4,500 – 5,500 m (14,760 – 18,040 ft) of tertiary sediments,
c) 500 – 700 m (1,640 – 2,300 ft) trap wash of cretaceous trap, and
d) 600 – 800 m (1,970 – 2,620 ft) permian-carboniferous Gondwana rocks.

The Quaternary sediments consist of clay, silt, and several grades of sand and gravel. These sediments are sandwiched between two clay beds: the lower one at a depth of 250–650 m (820–2,130 ft); the upper one 10–40 m (30–130 ft) in thickness. The Quaternary alluvium comprising several cycles of sand, silt and clay and shows facies variation in both vertical as well as in horizontal sections.

A fill layer of varying thickness is observed at the top and its thickness naturally increases to a maximum value of 4m probably due to developing land of low-lying areas. However below this layer a thin layer of light brown silty clay layer exists with varying thickness and extends over all these sections. Below this layer a very weak layer of blackish Grey silty clay/clayey silt with decayed wood exists over a consolidated thickness of 8 to10 m over most of the places.

However the thickness and extent of the layer is also widely varying over different sections. Below this layer bluish grey silty clay exists in most of the section with typical variation in their thickness and extent. Below the above layer, a layer of brown laminated silt with fine sand and dense brown silty fine sand exists in all boreholes over the sections indicating again typical variation in their thickness and extent.

The detail soil profiles along various sections in N-S and E-W direction over a depth of 30 m bgl have been shown in **Figure-3.2.1**.

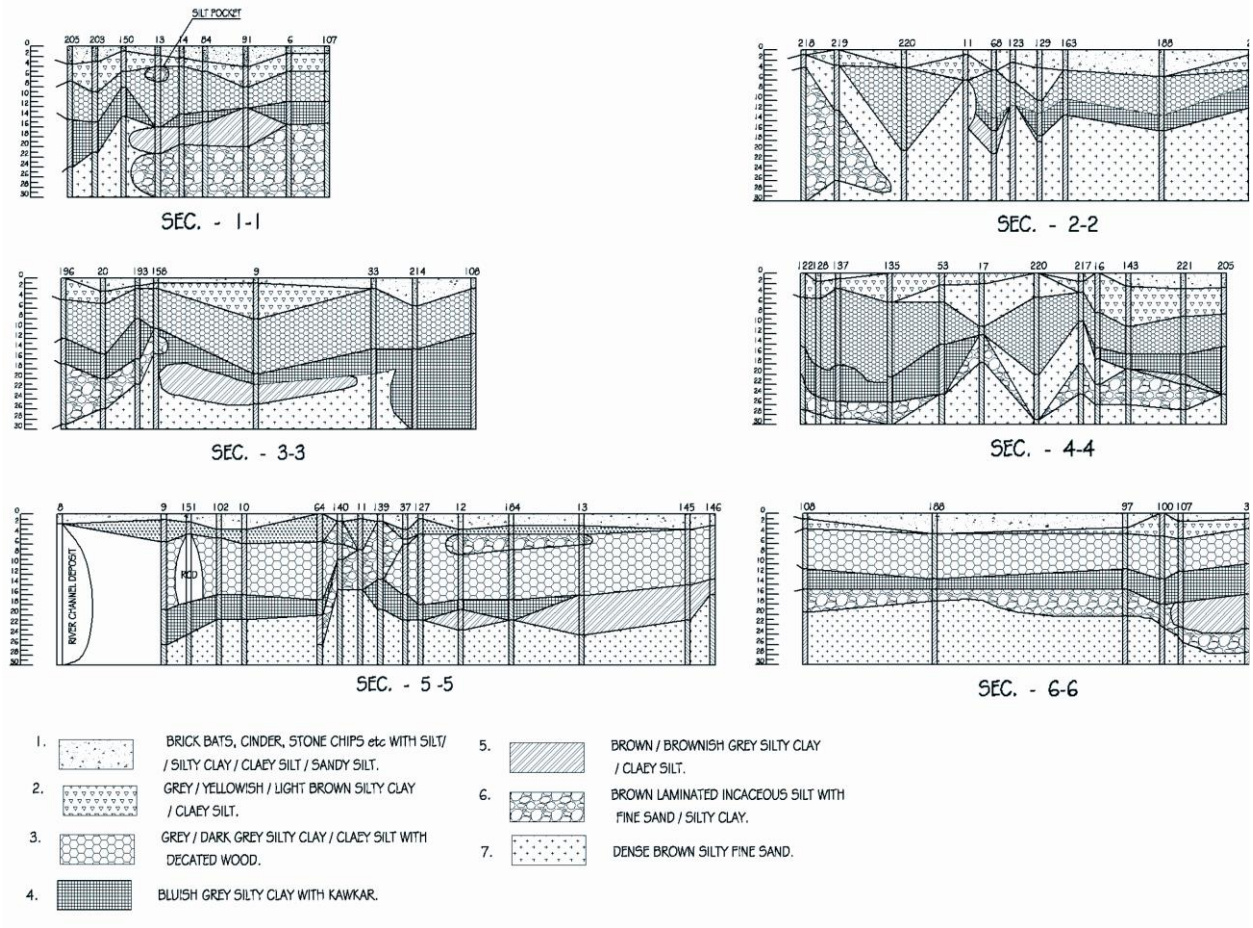


FIGURE – 3.2.1
Soil Profiles in N-S & E-W Direction

3.2.2 GEOHYDROLOGY OF THE STUDY AREA

3.2.2.1 GROUND WATER GEOHYDROLOGY

Ground-water in the study area occurs both under water-table condition and confined condition. Ground-water in the near surface aquifers occur under water-table condition and in deep aquifers, under confined or sub-artesian condition in favourable terrain. The primary source of ground-water is rainfall, a part of which is lost as evaporation and transpiration and another part moves as surface run-off and remaining part percolates into the ground from direct rainfall or by lateral infiltration from surface water-bodies to form saturated ground-water zone.

The subsurface lithology consists of sediments of Quaternary age. Occurrence of groundwater in the study area is controlled by geological set-up. There are two regionally extensive clay beds throughout the study area within the depth of 400mbgl. The depth of occurrence of the basal clay bed varies from place to place but in general it occurs from

300 to 450m bgl and the depth gradually decreases southward. The top clay bed of 10 to more than 60m thick occurs above the entire alluvium sequence from the ground surface in the study area. The thickness of this clay bed varies from place to place. Both top and bottom clays are dark grey in colour, sticky, plastic and often found to contain strings of silt and fine sand. The upper clay bed often contains peaty matter within the depth of 10m bgl indicating earlier land subsidence in recent past. Sands of various grades with occasional gravel occur between these two clay beds form the main aquifer system in study area. Presence of several clay layers and lenses at various depths at different places divides the above mentioned sand zones into several layers.

Nature and depth of aquifer system:

The sub-surface disposition of the aquifers indicates that the blanket of clay (10 to 60m thick) at the top of the sedimentary sequence imparts confined to semi confined nature to the groundwater occurring in the aquifers below this clay blanket. The aquifers below this clay bed consist of fine to coarse sand, which are occasionally mixed with gravel. The sediments show facies variation at a few places, which is characteristic of typical deltaic deposition and the top claybed shows a transition from aquiclude to aquitard. The thickness of the individual aquifer varies from place to place with the frequent occurrence of clay lens within them. The principal productive fresh water aquifer occurs within the depth span of 60-180m below ground level (bgl) in the major part of the area except in the western part.

It has been seen that the depth of water level varies from 6m bgl to 18m bgl during the pre-monsoon season in the study area.

3.2.2.2 SURFACE WATER HYDROLOGY

The drainage basin is a fundamental geomorphic unit and the watershed acts as a source area for precipitation that eventually provide to the stream channels by various path. The drainage basin morphology being an important aspect of geomorphic analysis has been undertaken in the present context to determine the various properties of form elements, their distributional variation, interrelationship, determination of correlation coefficients etc. Geo-hydrology and groundwater exploration means to identify and to locate the zone of recharge of groundwater in a particular river basin or a catchment. Geological set up is established for knowing about surface and subsurface nature of terrain. Topographic and surface features are mapped in order to determine from highest to lowest area, where water from different higher places can move and

accumulate. These particular zones are present in various terrains. The identification of such places from the entire area, are thus selected for groundwater exploration.

Drainage Network: Drainage network analysis is important for geo-hydrological studies. Drainage pattern reflects the characteristic of surface as well as subsurface formation. Drainage density indicates closeness of spacing of channels as well as the nature of surface material. More the drainage density, higher would be runoff. Thus, the drainage density characterizes the runoff in the area or in other words, the quantum of relative rainwater that could have infiltrated. Hence lesser the drainage density, higher is the probability of recharge or potential groundwater zone. Hence, drainage density is an important index in geo-hydrological studies, and can be evaluated from the satellite images or others.

River Basin: A river basin is the portion of land drained by a river and its tributaries. It encompasses the land surface dissected and drained by many streams and creeks that flow downhill into one another. A river basin collects all water from an area then moves it through the water system, where it eventually empties into an ocean or sea. A river basin is generally composed of many areas called watersheds.

In hydrology, the River basin is a logical unit of focus for studying the movement of water within the hydrological cycle, because the majority of water that discharges from the basin outlet originated as precipitation falling on the basin. A portion of the water that enters the groundwater system beneath the river basin may flow towards the outlet of another drainage basin because groundwater flow directions do not always match those of their overlying drainage network. Measurement of the discharge of water from a basin may be made by a stream gauge located at the basin's outlet.

Drainage Density: The drainage density (D) is an important indicator of the linear Scale of land-form elements in stream-eroded topography. It is the ratio of total channel segment lengths cumulated for all orders within a basin to the basin area, which is expressed in terms of km/sq. km. The drainage density indicates the closeness of spacing of channels, providing a quantitative measure of the average length of stream channel for the whole basin. It has been observed from drainage density measurements made over a wide range of geologic and climatic types that a low drainage density is more likely to occur in regions of highly

resistant of highly permeable subsoil material under dense vegetative cover, and where relief is low. High drainage density is the resultant of weak or impermeable subsurface material, sparse vegetation and mountainous relief. Low drainage density leads to coarse drainage texture while high drainage density leads to fine drainage texture.

RIVER HOOGHLY:

Ganges enters West Bengal near Rajmahal and then flows in a southeasterly direction. It divides into two near north of Dhulian in Murshidabad district. One branch enters Bangladesh as the Padma while the other flows through West Bengal as the Bhagirathi River and Hooghly River in a southern direction. Hooghly River or the Bhagirathi-Hooghly is an approximately 260 kilometres long distributary of the Ganges River in West Bengal. The Bhagirathi is the main river in West Bengal which flows past some of the important cities like Murshidabad, Baharampur, Nabadwip, Chinsura, Chandannagar, Srirampur, Howrah, Kolkata, Diamond Harbour and Haldia. It releases its water into Bay of Bengal near Sagar Island in the South 24 Parganas. The drainage network and river basin of Hooghly River has been shown in **Figure-3.2.2**.

The Mayurakshi, Ajay, Damodar, Kangsabati, Rupnarayan and their tributaries which rise in the Western plateau and high lands flow eastwards through the different districts of West Bengal and joins the Bhagirathi on the right bank.

The Major River Hooghly is passing at around 11.2 Kms. distance in East direction w.r.t the project.

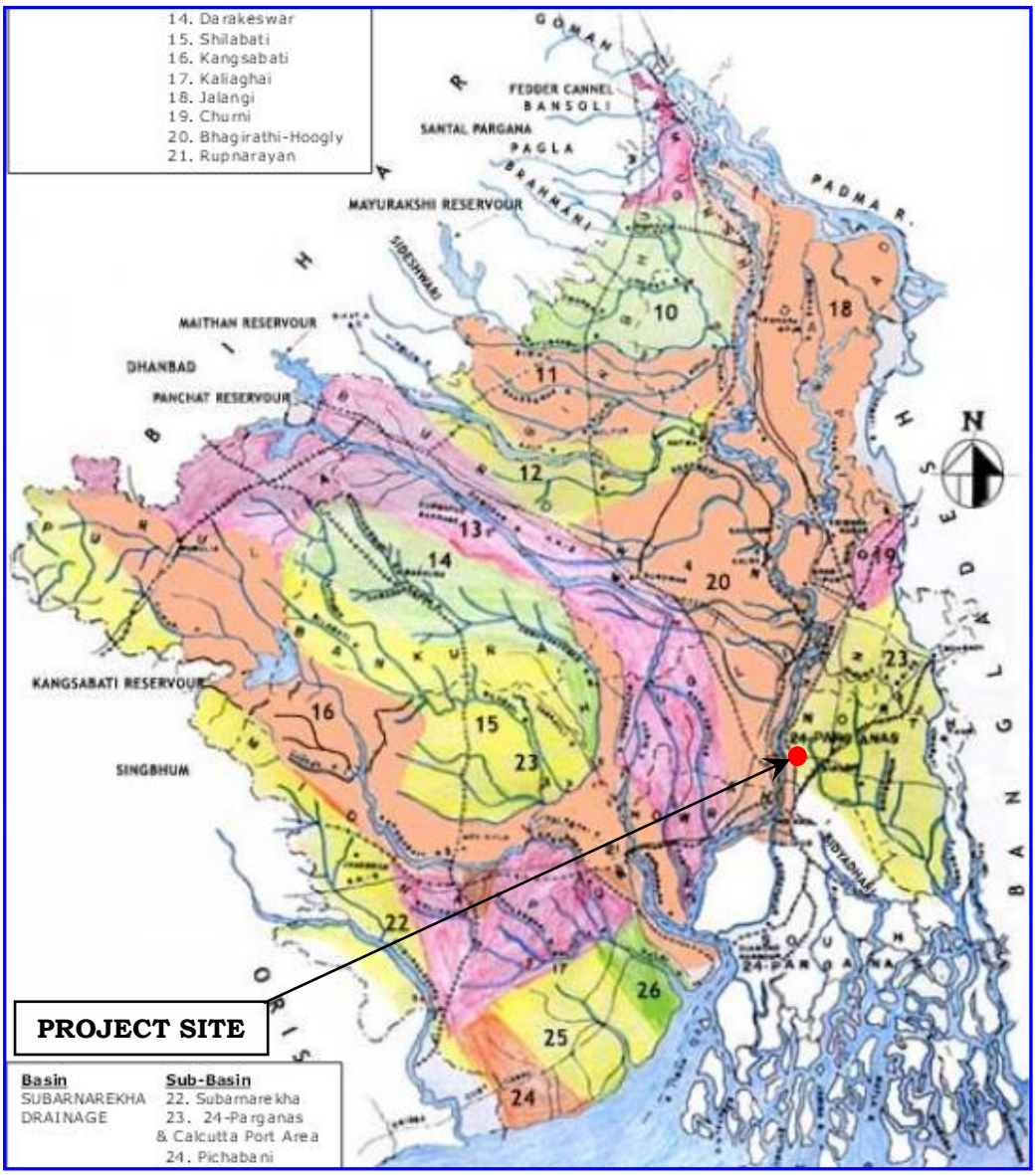


FIGURE - 3.2.2

The Drainage network of the Hooghly River

Other Surface water bodies:

Besides, there are many small & medium ponds, several canals, many jheels, beels, ditches, wetlands, road side burrows etc. found within the study area, which form the surface hydrological system of the study area.

3.3 FLOOD HAZARD ZONATION MAPPING

Flood hazard zonation mapping as depicted in **Figure-3.3.1** has been prepared following an integration of overall assessment throughout West Bengal. Basically five districts of West Bengal have been identified to have the probability to be affected by flood. These districts are (1) North 24 Parganas, (2) Nadia, (3) Mursidabad, (4) South 24 Parganas, and (5) Medinipur. Cluster analysis of Flood Hazard Zones has been shown in **Table-3.3.1.**

The study area falls in the flood hazard zone of the West Bengal. Flood Hazard Zonation Mapping of West Bengal with indicating of the study area has been presented in **Figure-3.3.1.**

Table-3.3.1
Cluster Analysis of Flood Hazard Zones

Districts	No. of Sub-Divisions	Vulnerable Sub-Divisions	Major Rivers
North 24 Parganas	05	- Barrackpore - Bashirhat	Jamuna Bhagirathi Ichhamati
Nadia	03	- Nadia Sadar	Jalangi Hugli Ganga
Murshidabad	05	- Lalbagh - Kandi - Jangipur	Bhagirathi Ganga
South 24 Parganas	02	- Diamond Harbor	Rupnarayan Hugli Damodar
Medinipur (East + West)	4+4=8	- Haldia - Kanthi - Tamluk - Ghatal	Kasai Hugli Subarnarekha Rupnarayan

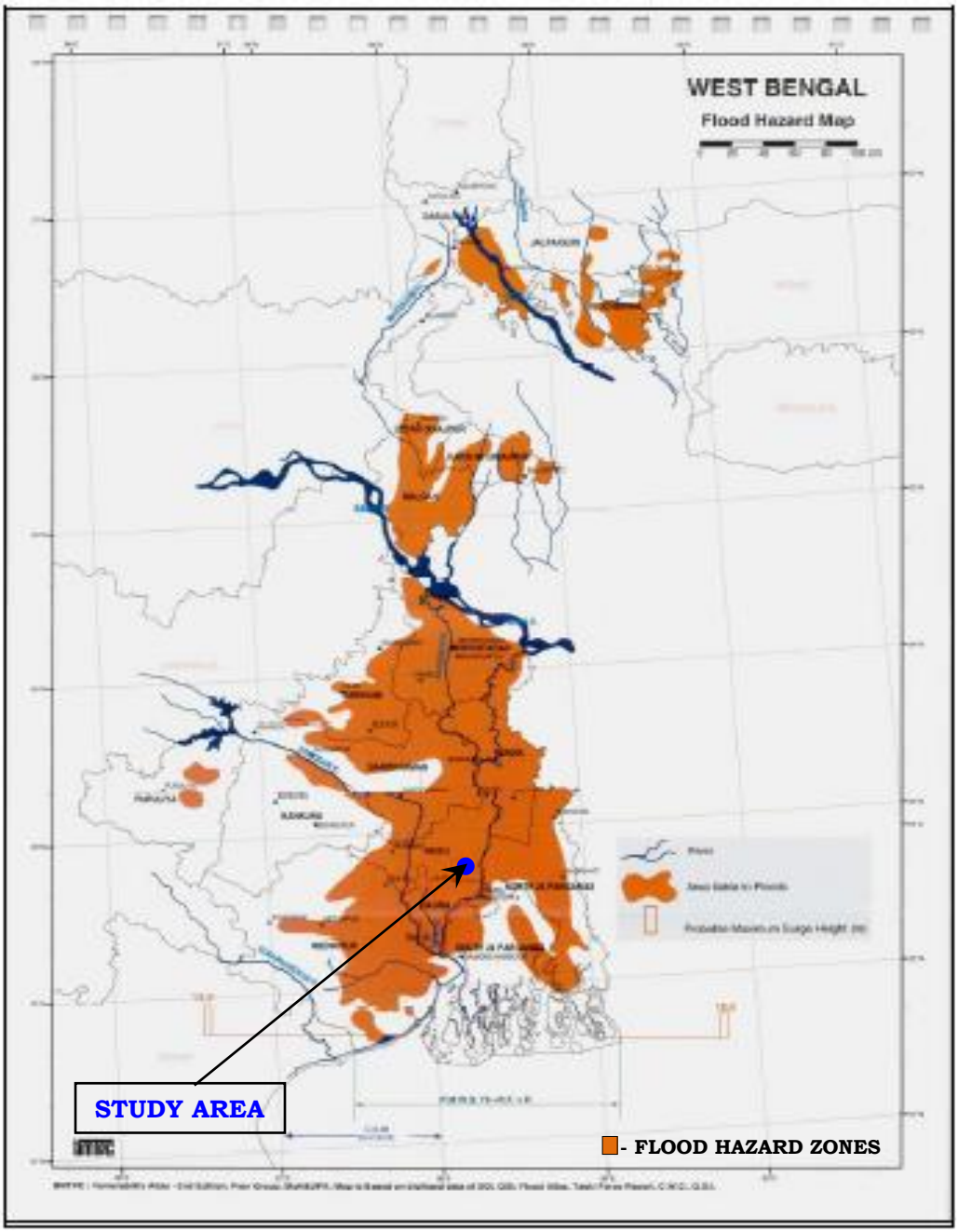


FIGURE-3.3.1:

FLOOD HAZARD ZONATION MAPPING OF WEST BENGAL

3.4 SEISMICITY

The Indian subcontinent has a history of devastating earthquakes. The major reason for the high frequency and intensity of the earthquakes is that the Indian plate is driving into Asia at a rate of approximately 47 mm/year. Geographical statistics of India show that almost 54% of the land is vulnerable to earthquakes. A World Bank and United Nations report shows estimates that around 200 million city dwellers in India will be exposed to storms and earthquakes by 2050. The latest version of seismic zoning map of India given in the earthquake resistant design code of India [IS 1893 (Part 1) 2002] assigns four levels of seismicity for India in terms of zone factors. In other words, the earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5) unlike its previous version, which consisted of five or six zones for the country. According to the present zoning map, Zone 5 expects the highest level of seismicity whereas Zone 2 is associated with the lowest level of seismicity.

According to IS: 1893 – 1984, the Project Site falls under Zone – III. It means that the earthquake shock in the area is minor. There is no major earthquake episode recorded in the study area till date. Seismic Zoning Map of India with mentioning of the project site has been presented in **Figure-3.4.1**.

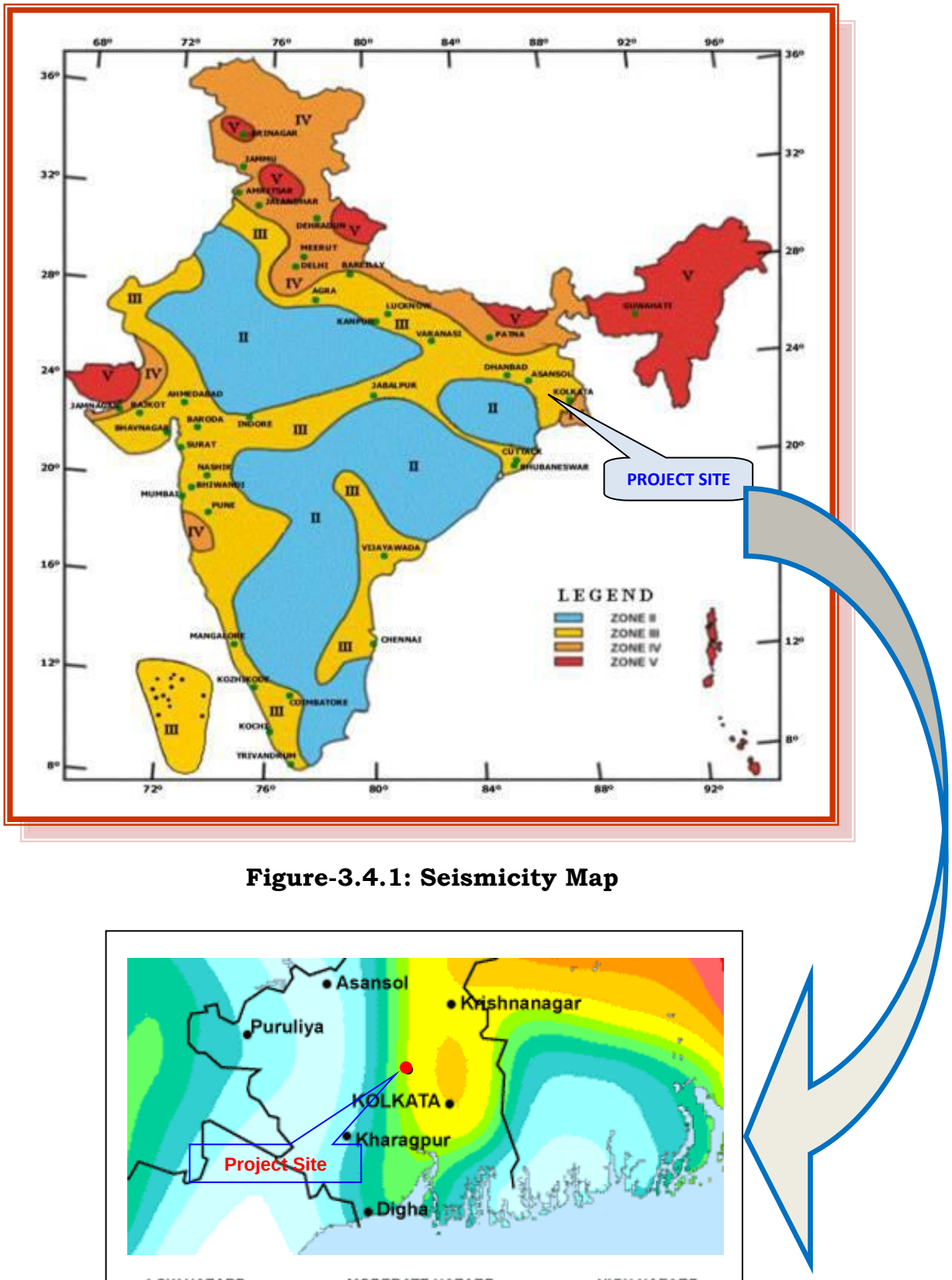


Figure-3.4.1: Seismicity Map

3.5 INDUSTRIAL ENVIRONMENT

The project site is situated in an industrial pocket, where a few industries are already in operation and a few others are coming up. Such industries include sponge iron plants, cement plant etc.

Major industries like Thermal Power Plant, Coke Oven and related units, Integrated Steel Plant, Chemical industries etc. are located within 10 km of the project site.

Major Industries in 10 km Radius area around the Project Site

Major industries, within 10 km radius area around the project site are as follows:

Sl. No.	Name of Industry	Type of Industry
1	Sarat Industries Ltd.	Fabric Division
2	Kohinoor Saree Pvt Ltd.	Fabric Division
3	Tirupati Plasto Industry	Plasto Industry
4	CDR Bearing Industries Pvt. Ltd.	Bearing Industry
5	Kalipur Wire Industries	Wire Drawing Machine Manufacturer
6	Unique Refractories & Engineering Industries	Refractories Division
7	Uday Industries	Metullergy
8	Anmol Industries Ltd.	Biscuit Industry
9	India Metal Industries	Metullergy

3.6 LAND USE

3.6.1 INTRODUCTION

The unit will be coming up at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni-712702, West Bengal. Geographical coordinates of the Project Site of proposed expansion Project are Latitude: 22°41'41.06"N to 22°41'39.34"N and Longitude: 88°15'10.15"E to 88°15'9.85"E with elevation is about 65 m to 5 m. (16.4 ft).

3.6.2 METHODOLOGY

The sensitivity of the environment i.e., existing land use is studied through Geographical Information System (GIS). Geographic Information System (GIS) is a scientific technique, which has revolutionized the way that land is inventoried, managed, planned and studied. GIS provides the theories and methods for organization and analysis of original measurements of location and secondary spatial data as well as topography. As an information system GIS provides the theories and methods for organization, storage, analysis, modeling, mapping and display of physical and biological data, as well as the distribution of cultural or socio-economic data. GIS applications are diverse. They include determining the suitability of land for different uses, planning future land uses for different objectives, analyzing land and land-cover properties for both resource inventories and scientific studies, and sitting of developmental activities.

3.6.3 DATA ANALYSIS

Remote Sensing Data

To study and map the land use pattern of the area, LANDSAT TM-1 multispectral imagery has been used as input data. The spatial resolution of the satellite data is 30 m. The bands used as input data for the current study have the following features:

Band 2: 0.52 - 0.59 μm (green): This band corresponds to the green reflectance of healthy vegetation and is spanning the region between the blue and red chlorophyll absorption bands.

Band 3: 0.62 - 0.68 µm (red): This red chlorophyll absorption band of healthy green vegetation is one of the most important bands for vegetation discrimination. In addition, it is useful for soil-boundary and geological boundary mapping. Band 3 may exhibit more contrast than bands 1 and 2 because the effect of the atmosphere is reduced. The 0.69 m cut-off represents the beginning of a spectral region from 0.68 to 0.75 m where vegetation reflectance crossovers occur that can reduce the accuracy of vegetation studies.

Step - I	Layer stacking of three distinct file into a single file and create FCC
Step - II	Select an appropriate band used throughout the analysis. An examination of the three bands shows that the one visible band (2) provides less evidence of the various water surfaces across the image. Band 4, the near infrared band, clearly separates water bodies from other surfaces. Band 3 help to distinguish vegetation cover.
Step - III	Digital classification: Un-supervised ISO data classification carried out considering green, red, NIR bands with 5 iteration and expected number of classes 50
Step - IV	Aggregation of classes obtain through this classification session into classes having significance on the physical world was then carried out based on DN value.
Step - V	Visual interpretation is also done since digital classification only consider pixel values not the geographic location, association, shape, etc.
Step -VI	Area Calculation of each Land Use/Land Cover Classes
Step- VII	Comparison with some reference data and sample ground validation
Step - VIII	Final Map and Report

Band 4: 0.77 - 0.86 µm (near infrared): For reasons discussed above, the lower cut-off for this band was placed above 0.75 m. This band is especially responsive to the amount of vegetation biomass present in a scene. It is useful for identification of vegetation types, and emphasizes soil-crop and land-water contrasts.

3.6.4 OTHER SECONDARY DATA

The secondary database considered for validation and geo-referencing of the image is as follows:

- Topographical map in 1inch: 1mile of Survey of India: 73M/1 and M/2
- District Planning Series Map, NATMO, 1998;

3.6.5 DIGITAL IMAGE PROCESSING

The digital image processing includes image rectification; image enhancement; visual interpretation and land use mapping.

Image Rectification

The satellite images are given in BSQ (Band Sequential) format. These are imported to Erdas environment. Then geometric correction applied to the images to correct the distorted image data to create a more faithful representation of original scene. Image rectification procedures are often termed 'pre- processing' operations because they normally precede further manipulation and analysis of the image data to extract specific information.

Image Enhancement

This procedure is applied to the images in order to more effectively display or record the data for subsequent visual interpretation. High pass filter used to visualize more correctly the linear features such as, roads, rail, canal, river etc. Histogram Equalization was used to distinguished area of the same tone.

Visual Interpretation and Land use Mapping

Satellite imagery contains detail records of features on the ground at the time of satellite overpass. An image interpreter systematically examines the images for generating the information required by him. Other supporting materials such as published maps and reports from various sources will increase the accuracy of the interpretation. The chain of process in visual interpretation of the shape and pattern in an image begins with detection. There are certain fundamental characteristics seen on images which aid in the visual interpretation of satellite imagery. These are tone/ color, size, shape, texture, pattern, location, association, resolution and season. Visual interpretation is subjective and differs from person to person and also upon the season, scale, spectral bands, spatial resolution, overall image contrast & quality of the data.

The procedure for mapping for land use from satellite imagery of different season & on different scale is well established. Several parameters like terrain, climatic conditions, socio-economic trends, and environmental influences etc. play vital role in the existence of various land use categories.

Study limitation

Some limitations for the interpretation of the satellite data are:

- One season data sometimes give same spectral response of different objects creates confusion in image analysis and sub classification.
- One time data is unable to show sub-classification in the study area.
- Area of the line features like road; rail etc. is not been included since GIS does not give any calculation.

The topography of the Study Area does not show much variation in the land use/land cover pattern. The region is mostly covered by agricultural land with some forest land and patches of green vegetations either planted by local inhabitants or are the natural vegetations within the study area.

The land use / land cover pattern of the Study Area have been framed from the Satellite Imagery and Toposheet and authenticated by field visit. The land use / land cover pattern of the Study Area, may be divided into following 9 categories: (i) Agricultural Land (ii) Forestland (iii) Grasses and scrub (iv) Open Area (v) Vegetation within settlement (vi) Sand / Shallow water (vii) Settlement; (viii) Water bodies (ix) River.

The above categories of land use and land cover pattern cover an area of about 314 sq km. The percentage of land area covered in figures is mentioned in the Table and has been illustrated through the pie diagram.

The area under different land use/ land cover of Study Area is presented in the following Land use and Land cover Map.

3.6.6 LAND UTILIZATION PATTERN

The land use describes the change in pattern of land features due to the human activity whereas the land cover refers to the existing surface features on the earth. Thus it describes the pattern of development of the area. The pattern of land use and land cover is less variable as the land is alluvial plain. So the fertile land of the study area is mostly covered by green vegetation or agricultural crops and grasslands. The study area is spread over 314 sq km area. The green natural vegetation surrounding the settlements, forests open area, sand / shallow water, river and water-bodies are the land cover in the study area and the agricultural land or open crops and grasslands and the built-up area is the type of land use. The pattern of land use and land cover is described below: Classification of Land Use Land Cover (LULC) in the study area is

tabulated in **Table-3.6.1**. **Figure-3.6.1** shows the Pie diagram of LULC in the study area.

Table-3.6.1
Classification of Land Use Land Cover (LULC) in the study area

Categories of Land-use units	Area in sq. km.	Area in Hectare	Area in percentage
Agricultural Land	51.18	5118	16.29
Brick kiln	2.75	275	0.88
Built up area	180.06	18006	57.30
Settlement with vegetation	12.07	1207	3.85
Industrial area	21.28	2128	6.77
Marshy area	2.68	268	0.85
Open/ Vacant land	1.50	150	0.48
Pond/ Tank	13.14	1314	4.18
River	15.04	1504	4.79
Road	4.06	406	1.29
Structure other than Industry	4.10	410	1.30
Vegetation other than agriculture	6.36	636	2.02
Total	**314.22**	**31422**	**100.00**

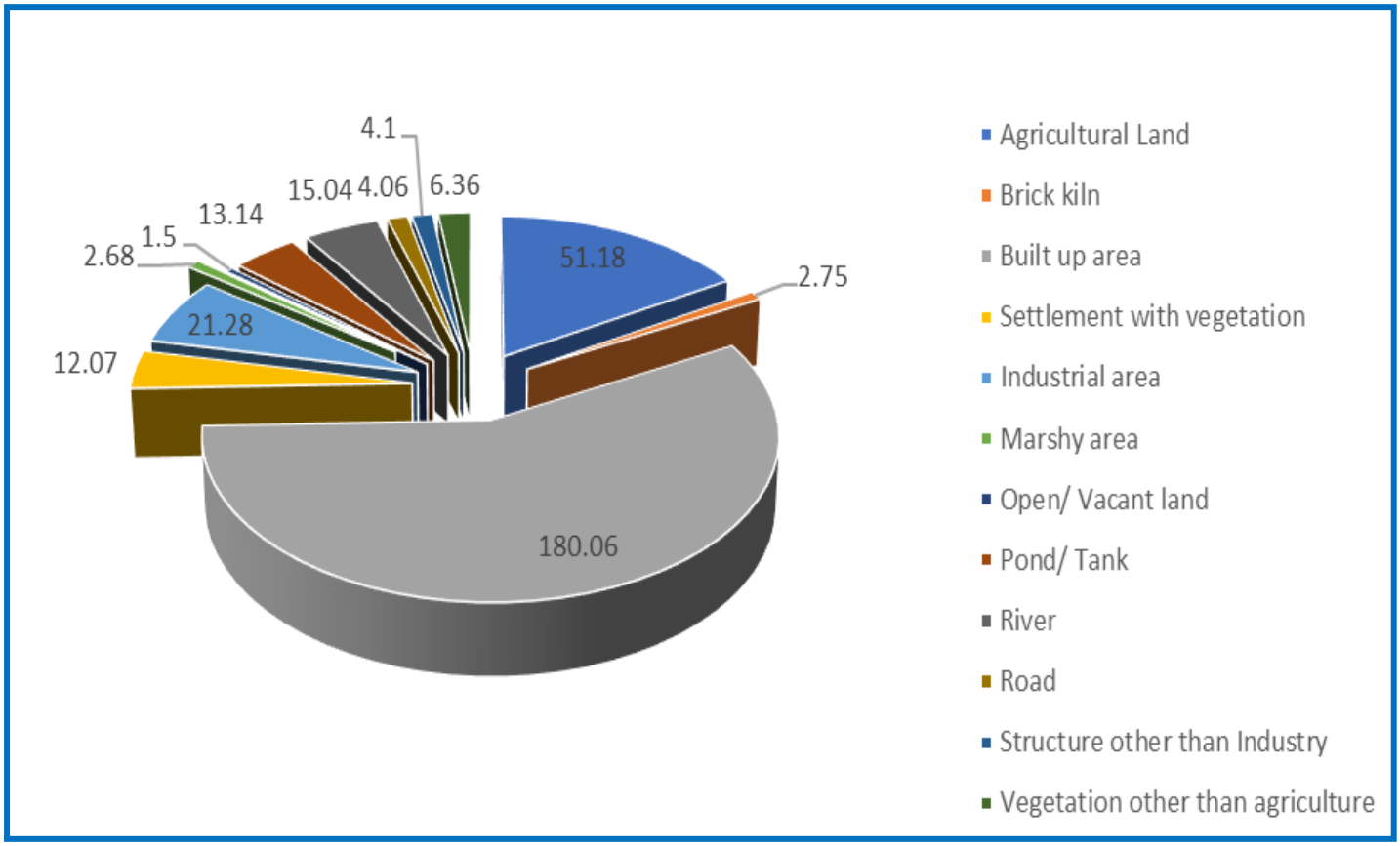
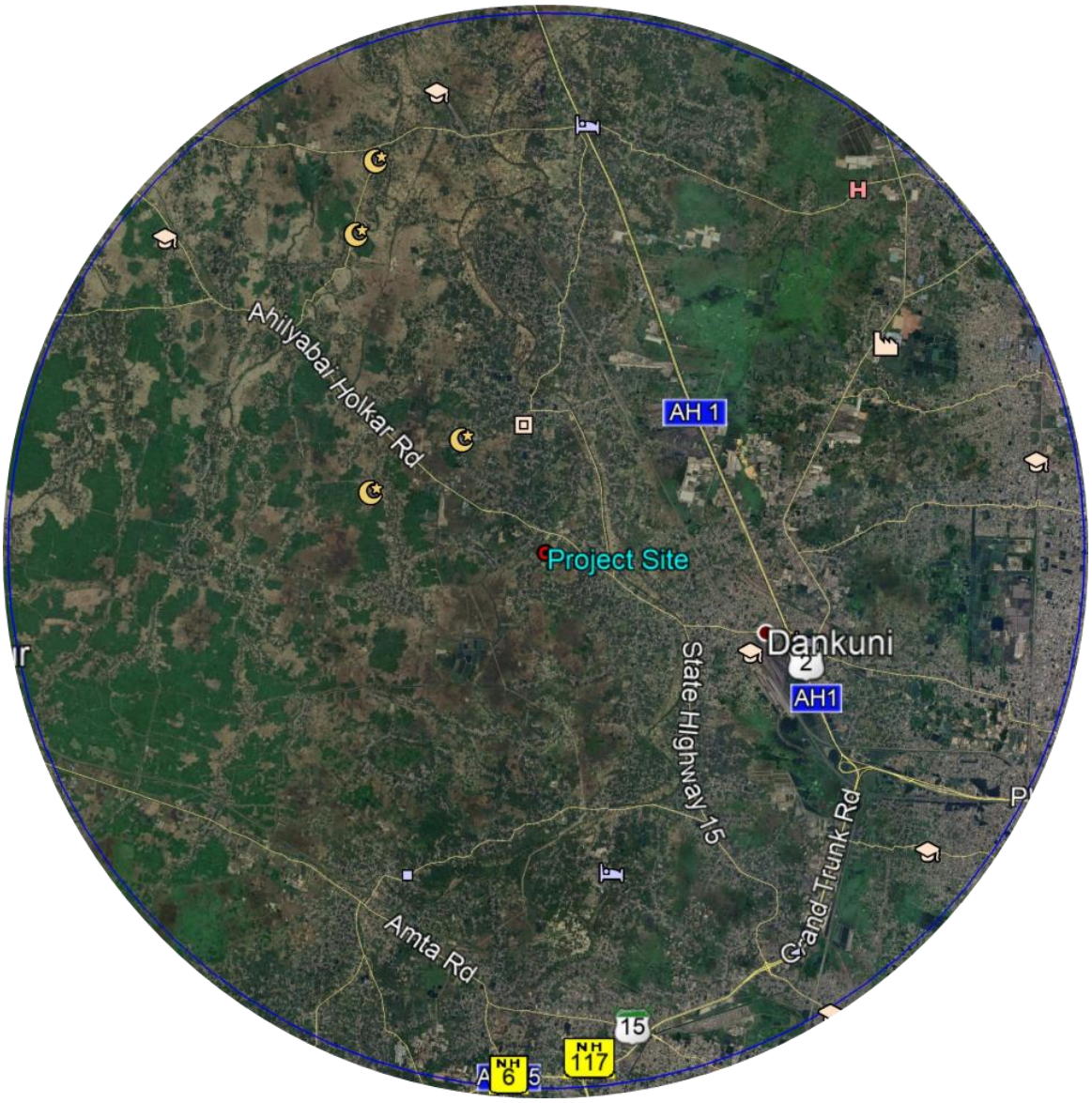


Figure-3.6.1
Pie Diagram of Land Use Land Cover (LULC) in the study area



a) Built Up land / Urban settlement:

This is the most dominant land use / cover class present within 10 km radius of the proposed site near Dankuni. About 56.05% of the total area is occupied by this unit.

b) Agriculture land:

This is the next dominant land use class present within the 10 km radius of the proposed site of Dankuni. Nearly 16.29 % of study area is

under this category. The agriculture is mostly mixed type i.e. both single crop as well as double crop pattern is available in the surround area.

c) Industrial Area:

Industrial area occupies about 6.77% of the total land i.e. the 10 km surrounding area of proposed site. Industrial units are concentrated mainly in the vicinity of the river Hooghly. There is a scope for development of Industry in open/vacant land as well since the region is already equipped with other infrastructure facilities which are required for further development of this unit.

c) Water body / Tank:

This is the next dominant land-use class. About 4.18% of the total area comes under this component. Besides water from river Hooghly, this is the main source of surface water in the locality of the proposed site.

d) Other Infrastructure:

This class clubs the infrastructure like airport which include 2.61% of the total land area and structure other than Industrial set up. The later unit has occupied 1.30% of the total extent around the proposed site.

e) Vegetation other than agriculture:

Mainly terrestrial vegetation other than agriculture comes under this class. It occupies 2.02% of the total area.

f) Settlement with Vegetation:

This is another dominant unit of land-use present within the 10 km radius of the proposed site. Nearly 1.23% of study area is under habitation with vegetation category.

Although other land-use classes are present as insignificant percentage but needs to be considered for environmental degradation of the area which includes open/ vacant land, i.e., the land which are available for development or it may be set aside by the government or private owner to remain vacant, marshy area, brick kiln on both sides of the river Hooghly.

3.7 SOIL

Soil may be defined as a thin layer of earth's crust that serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to and influenced by genetic and environmental factors such as parent materials, climate, organisms and physico-chemical action of wind, water and sunlight, all acting over a period of time. Soil differs from the parent materials in the morphological, physical, chemical and biological properties. Also soil differs among themselves in some or all the genetic or environmental factors, therefore, some soils are yellow, some are black, some are reddish, some are coarse textured. They serve as a reservoir of nutrients for plants and crop and also provide mechanical anchorage and favorable tilth.

3.7.1 FIELD STUDY, SAMPLING & ANALYSIS

To assess the impacts of the proposed expansion project activities on the soil in the study area, the physico-chemical characteristics of soils within the study area have been examined by obtaining soil samples from selected points and analysis of the same. Four (4) sampling stations in the nearby villages were selected for studying soil characteristics, which have been shown in **Table-3.7.1**. Stations have been selected, keeping in view the vegetative cover, soil types and possible maximum deposition of pollutants emitted through stacks, which would accord an overall idea of the soil characteristics within the study area.

The Soil Quality Monitoring locations have been presented in **Figure-3.7.1**.

The samples were collected during February, 2021. A number of parameters were determined which are indicative of physical, chemical and fertility characteristics. The physico-chemical characteristics of the soils in the study area, as obtained from the analysis of the soil samples, are presented in **Table-3.7.2**.

3.7.2 CHARACTERISTICS OF SOIL IN THE STUDY AREA

The soil in the study area is basically "Clay Loamy soil". Clay Loam is a soil mixture that contains more clay that other types of rock or minerals. A loam is a soil mixtures that iis named for the type of soil that is present in the greatest amount. The particles of clay are very small, which is one of the most important characteristics of clay loam soil.

Locations of soil sampling with code number are shown in **Table-3.7.1** and soil characteristics of these soil samples have been summarized in **Table-3.7.2**.

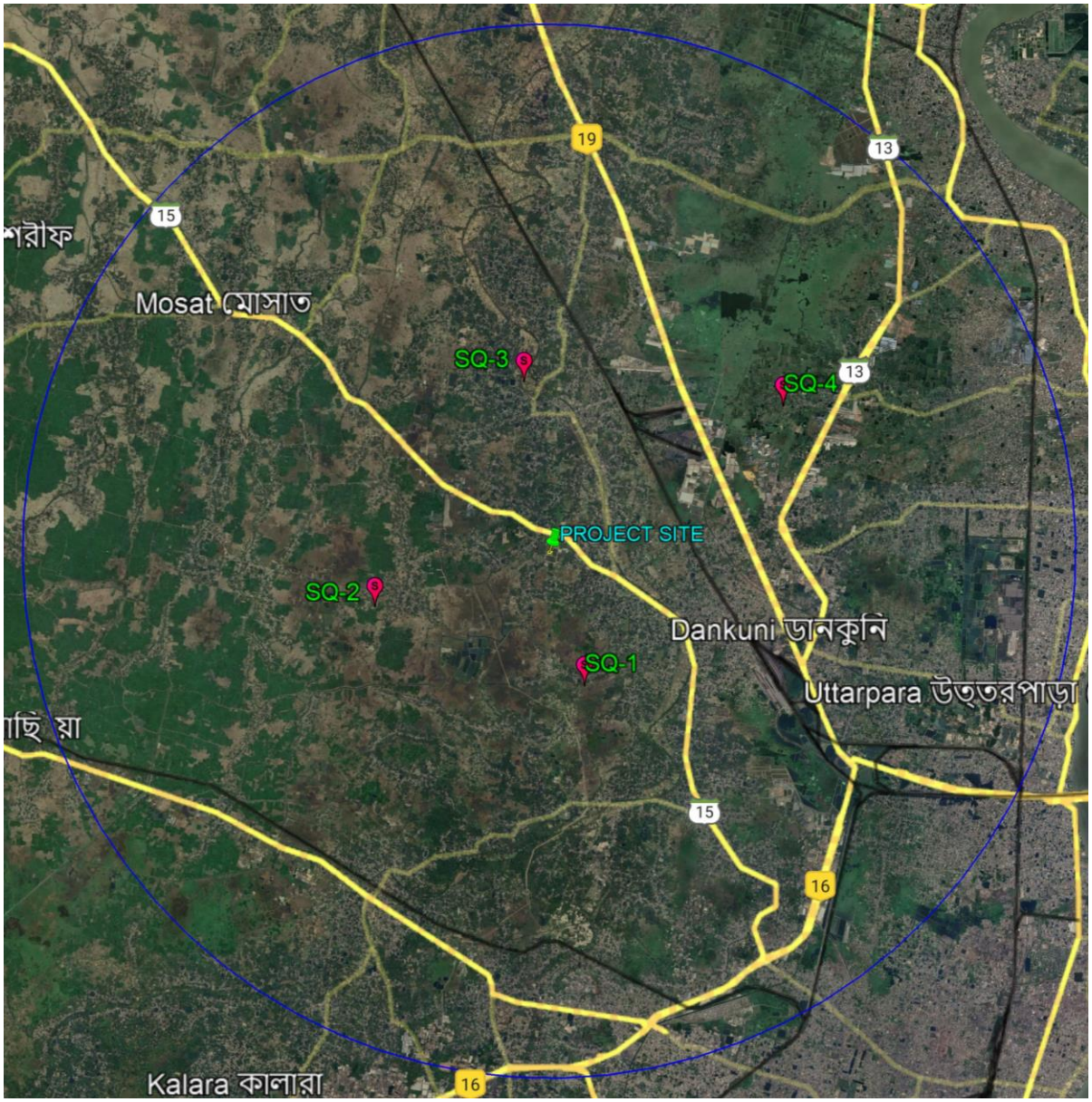


FIGURE-3.7.1
SOIL SAMPLING LOCATIONS

TABLE-3.7.1
CODE NO. & NAME OF LOCATIONS

Code	Sampling Location	Sampling Season	Distance & Direction from the Project Site	Latitude	Longitude
SQ-1	Near Khanpur Shibtala	February, 2021	2.6 km, SSE	2°40'17.36"N	88°15'34.02"E
SQ-2	Near Ramnathpur		3.5 km, WSW	22°41'6.26"N	88°13'13.67"E
SQ-3	Near Janai		3.3 km, N	22°43'25.31"N	88°14'53.83"E
SQ-4	Near Mollarber		5.2 km, NE	22°43'10.01"N	88°17'47.54"E

3.7.2.1 PHYSICAL CHARACTERISTICS

The physical properties examined include colour, texture, bulk density, porosity and water holding capacity. Colour of soils was observed generally as reddish brown. It is well documented that reddish brown soil are slightly acidic in nature with sufficient amount of nitrogen, calcium, phosphate and other plant nutrients.

Soils having larger particles usually have higher bulk density than those of smaller particles. Bulk density of soils in the study area varied between (1.25 - 1.461) gm/cm^3 which is in normal range for such soils. Water Holding Capacity of these soils ranged between (32.7 – 36.5)%.

3.7.2.2 CHEMICAL CHARACTERISTICS

The soils were almost neutral pH range (6.5 - 6.9). Electrical conductivity (EC) was found varying between (251 - 336) µmhos/cm. In soil samples, calcium content of the soils varied between (316 - 401) mg/kg. Ranges of sodium in the soils varied between (166 - 234) mg/kg. In soils, sodium generally occurs as NaCl, Na_2SO_4 and sometimes, as Na_2CO_3 and other soluble salts. In comparison to sodium, potassium levels were slightly low. Range of potassium varied between (115 - 137) mg/kg. In the study area, Nitrogen level varied between (66 - 91) mg/kg. Most of the nitrogen is available in form of nitrates, nitrites, NH_4^+ and organic nitrogen. The Phosphorous content ranged between (24.8 - 27.9) mg/kg. Cation Exchange Capacity (CEC) varied between (20.2 – 22.9) meq/100 gm. Ranges of Magnesium and Sulphur were varied between (171 - 212) mg/kg and (24.2 - 30.5) mg/kg. Organic Matter in the soils was observed to be ranging between (1.3 – 1.9)%.

TABLE-3.7.2
SOIL QUALITY IN THE STUDY AREA

Sl. No	PARAMETERS	UNIT	SAMPLING LOCATIONS			
			SQ-1	SQ-2	SQ-3	SQ-4
PHYSICAL CHARACTERESTICS						
1	**TEXTURE**	-	**Clay Loam**	**Clay Loam**	**Clay Loam**	**Clay Loam**
a)	Sand	%	42	39	46	49
b)	Silt	%	23	28	20	25
c)	Clay	%	35	33	34	26
2	BULK DENSITY	gm/cm^3	1.32	1.25	1.39	1.46
3	POROSITY	%	32.2	33.9	32.5	36.4
4	WATER HOLDING CAPACITY	%	36.5	35.8	36.1	32.7
CHEMICAL CHARACTERESTICS						
1	pH (1:5 extraction)	-	6.5	6.7	6.9	6.6
2	EC (1:5 extraction)	µmhos/cm	336	275	251	297
3	Calcium (as Ca)	mg/kg	401	364	316	378
4	Magnessium (as Mg)	mg/kg	212	171	179	196
5	Sodium (as Na)	mg/kg	225	166	180	234
6	Potasium (as K)	mg/kg	128	115	121	137
7	Sulphur (as S)	mg/kg	30.5	24.2	28.4	29.2
8	Nitrogen (as N)	mg/kg	75	91	85	66
9	Phosphorous (as P)	mg/kg	27.9	24.8	25.6	26.6
10	CEC	meq/100 gm	21.5	22.2	22.9	20.2
11	Organic Matter	%	1.5	1.8	1.9	1.3
12	Copper (as Cu)	mg/kg	7.2	8.5	8.9	6.4
13	Chromium (as Cr)	mg/kg	18.5	15.4	16.8	14.6
14	Zinc (as Zn)	mg/kg	12.4	10.1	12.8	13.9
15	Lead (as Pb)	mg/kg	3.4	2.7	2.3	3.8
16	SAR	-	2.3	1.8	2.0	2.4

3.7.3 OBSERVATION & CONCLUSION

Observation on soil characteristics:

1) The pH of the soil was found to be slightly acidic, which will favour the growth of biota.
2) Texture was found to be clayey loam with good water holding capacity
3) Plant nutrient like phosphorus, nitrogen, potassium and organic matter were found to be moderate level as per ICAR Handbook.
4) Trace metals and non metals also were found to be sufficient for Plant growth.

Conclusion:

Results of the collected soil sample showed that the soil in this area is suitable for cultivation of paddy, wheat and seasonal vegetables. As per FAO-UNESCO soil classification, this soil is of Ultisols and is suitable for paddy rice, sesame, ground nut, chillies, mango, rose etc. It is also home for many beneficial biological organisms like bacteria, fungi, lichen, etc. The nutrient status and pH of the soil certainly produces the food and fodder to the end user and retain the sustainability of top soil. No impact of surrounding industry has been found.

3.8 METEOROLOGY

3.8.1 SEASONS

The climate of the project area is humid and tropical. It is characterised by a hot and dry summer from March to May, a south-west monsoon or rainy season from June to September, a pleasant post-monsoon or retreating monsoon from October to November and a cool winter from December to February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

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

3.8.2 PAST RECORDS OF IMD, BAGHATI, HOOGHLY

3.8.2.1 Data Collected

The meteorological data described in this section have been collected from the IMD Station located at Baghati, which is around 8 km from the project site and deemed to be representative of the study area. Available meteorological data for the past 30 years' period (1971-2000) have been collected and have been summarized. The climatic features of this station are presented in **Tables 3.8.1**.

3.8.2.2 Temperature

At Baghati,(Hooghly), the overall mean dry bulb temperature for the past 30 years' period (1971 – 2000) was recorded 25.1^{o}C in night time and 28.2^{o}C in day time while the overall mean wet bulb temperature for the past 30 years' period (1971 – 2000) was recorded 22.8^{o}C in night time and 24.4^{o}C in day time **(Table-3.8.1)**.

3.8.2.3 Relative Humidity

Humidity was fairly high through the major part of the year at Bagati, (Hooghly). In day time the overall mean relatively humidity was 81% while in night time it was 72% **(Table-3.8.1)**. The mean relative humidity of Monsoon and Post monsoon seasons was ranging between 79% - 87% in day time and 69% - 84% in night tine. The mean relative humidity of summer seasons was ranging between 75% - 80% day time and 63% - 70% in the night time and winter seasons was ranging between 75% - 79% in day time and 60% - 62% in night time. From these 30 years' IMD

data it was found that the relative humidity was fairly very high in Monsoon season (June, July, August, and September).

3.8.2.4 Rainfall and Rainy Days

The total annual mean rainfall received is about 1546.5 mm at Bagati,(Hooghly) **(Table-3.8.1)**. Rainfall was peaked during the month of July (mean monthly rainfall in July was 329.7 mm). The lowest rainfall was occurred during the month of December (mean monthly rainfall in January was 10.5 mm). Total annual mean number of rainy days was about 75.4 at Bagati,(Hooghly).

3.8.2.5 Cloud Cover

The mean monthly data revealed that the cloud cover in day time ranged between 0.6 Oktas (at month of December) to 5.9 Oktas (at month of August) and in night time it ranged between 0.4 Oktas (at month of December) to 5.2 Oktas (at month of August). The overall annual mean cloud cover was found 3.0 Oktas in day and 2.3 Oktas night time **(Table-3.8.1)**.

3.8.2.6 Wind Speed and Direction

The annual mean wind speed is around 2.2 km/hr at Bagati,(Hooghly). with the mean monthly wind speed was ranged between 1.4 km/hr (during December) and 4.1 km/hr (during May) at Bagati,(Hooghly). **(Table-3.8.1).** The predominant wind direction was observed South-West, followed by North and South.

3.8.3 ON-SITE METEOROLOGICAL OBSERVATORY

Air Pollutants upon discharge to atmosphere pass through a number of mechanisms, which include diffusion and transportation leading to dispersion. These mechanisms are governed by the local atmospheric conditions. All these results in the necessity to collect the meteorological parameters like ambient temperature, wind speed, wind direction, and other weather conditions (relative humidity, atmospheric pressure etc.), which will be ultimately used for the prediction of the ground level concentrations of the air pollutants through mathematical modelling.

For this purpose as also to corroborate and supplement the long term meteorological data availed from IMD, Bagati,(Hooghly). a sophisticated on-site meteorological observatory was established close to the project site and operated continuously for three months period (**December, 2020 – February, 2021**).

The observatory was located about 10 m above the ground level and ensured to be free from any obstruction to wind. Besides, this location was found to be most suitable one being close to the project site. The summary of the on-site data generated in respect of the above parameters for the period mentioned above are presented in **Table-3.8.2**. The Wind rose diagram for the entire period is shown in **Figure-3.8.1** to **Figure-3.8.4**.

3.8.4 ON-SITE METEOROLOGICAL DATA

3.8.4.1 TEMPERATURE

The monthly maximum and minimum temperatures recorded on-site during the aforesaid Study period **(December, 2020 – February, 2021)** varied between (28.0 - 30.5)°C and (9.5 - 12.5)°C respectively with overall maximum and minimum temperatures being 30.5°C and 9.5°C respectively **(Table-3.8.1)**. It could be observed that, the pattern of data recorded on-site generally matches with the past data of IMD data.

3.8.4.2 RELATIVE HUMIDITY

The monthly maximum and minimum relative humidity recorded on-site during the said Study period varied between (71 - 77)% and (50 - 53)% respectively, the overall maximum and minimum being 77% and 50% respectively **(Table-3.8.1)**.

3.8.4.3 ATMOSPHERIC PRESSURE

The overall maximum and minimum atmospheric pressures recorded on-site during the said monitoring period were 762.2 mmHg and 754.6 mmHg respectively **(Table-3.8.1)**.

3.8.4.4 WIND SPEED & DIRECTION

The maximum wind speed 3.8 Km/hr was recorded in the month of February, 2021 while the overall mean wind speed during the whole monitoring period was 3.3 Km/hr. **(Table-3.8.1)**. The predominant wind direction was observed as North, North-East,North-West.

Table 3.8.1

Mean Monthly Summary of Climatological Data Collected from IMD, Bagati,(Hooghly) (1971-2000)

जलवायवी सारणी

CLIMATOLOGICAL TABLE

BACK

स्टेशन : बागाती STATION : Bagati | अक्षांश LAT. 22°59' | देशांतर LONG. 88°22' | समुद्री तल माला से ऊँचाई HEIGHT ABOVE M.S.L. 12 METRES | वर्षों BASED ON OBSERVATIONS 1971-2000

माह MONTH		स्टेशन का भार दाब STATION LEVEL PRESSURE	वायु तापमान AIR TEMPERATURE										आर्द्रता HUMIDITY		मेघ की मात्रा CLOUD AMOUNTS		वर्षा RAINFALL					
			माध्य MEAN						चरम EXTREMES													
			शुष्क बल्ब DRY BULB	नम बल्ब WET BULB	दैनिक अधिक मान DAILY MAX	दैनिक न्यून मान DAILY MIN	माह में उच्चतम HIGHEST IN THE MONTH	माह में निम्नतम LOWEST IN THE MONTH	उच्चतम HIGHEST	दिनांक और वर्ष DATE AND YEAR	निम्नतम LOWEST	दिनांक और वर्ष DATE AND YEAR	सापेक्ष आर्द्रता RELATIVE HUMIDITY	वाष्प दाब VAPOUR PRESSURE	सकल मेघ ALL CLOUDS	निम्न मेघ LOW CLOUDS	मासिक योग MONTHLY TOTAL	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	सर्वाधिक वर्षा वाले माह का योग TOTAL IN WETTEST MONTH WITH YEAR	सर्वाधिक शुष्कता माह का योग TOTAL IN DRIEST MONTH WITH YEAR	24 घंटों में सर्वाधिक वर्षा HEAVIEST FALL IN 24 HOURS	दिनांक और वर्ष DATE AND YEAR	माध्य पवन गति MEAN WIND SPEED
		hPa	°C	°C	°C	°C	°C	°C	°C		°C		%	hPa	Oktas of sky		mm		mm	mm	mm		Kmph
जनवरी JAN	I	1014.9	16.8	14.7	26.1	12.3	29.2	8.6	33.3	30 1973	4.8	17 1983	79	15.2	0.7	0.4	12.2	1.0	89.0 1998	0.0	31.0	16 1992	1.5
	II		21.6	16.9									60	15.6	0.5	0.3							
फरवरी FEB	I	1012.8	20.0	17.3	28.8	15.3	32.8	10.9	36.3	25 1974	5.5	11 1974	75	17.8	1.3	0.7	38.9	1.9	128.5 1972	0.0	60.1	24 1977	1.5
	II		25.0	19.8									60	19.1	0.7	0.5							
मार्च MAR	I	1009.5	24.9	21.9	33.3	20.0	37.3	15.0	39.8	6 1975	11.0	11 1979	75	24.0	1.4	0.8	34.3	1.8	142.1 1981	0.0	125.0	26 1981	2.3
	II		29.8	24.5									63	26.7	0.7	0.5							
अप्रैल APR	I	1005.5	28.0	25.2	36.2	23.5	39.6	18.8	44.5	22 1974	15.1	1 1968	79	29.8	2.3	1.4	64.5	3.5	260.1 1981	0.0	90.0	19 1981	3.3
	II		32.0	27.1									67	31.8	1.5	1.0							
मई MAY	I	1002.6	29.4	26.7	36.3	24.7	40.0	20.3	45.5	9 1974	14.5	2 1973	80	32.8	3.5	2.1	148.2	7.4	347.2 2000	11.0 1979	90.0	20 1994	4.1
	II		32.2	27.8									70	33.6	2.3	1.7							
जून JUN	I	998.5	29.3	27.1	34.6	25.4	38.9	21.9	46.2	3 1974	14.2	24 1971	83	34.0	5.1	3.1	263.6	11.1	657.2 1977	66.3 1981	171.0	27 1988	2.8
	II		31.1	27.9									78	34.8	3.9	2.9							
जुलाई JUL	I	997.9	28.6	26.9	32.9	25.5	35.7	23.2	42.3	4 1975	12.8	4 1971	87	34.0	5.8	3.6	329.7	15.6	563.9 1974	80.2 1982	235.3	9 1988	2.8
	II		29.7	27.6									84	35.0	5.0	3.7							
अगस्त AUG	I	999.2	28.6	26.9	32.6	25.6	34.9	23.3	37.3	20 1973	20.8	1 1984	87	34.1	5.9	3.7	295.9	16.0	635.6 1971	132.9 1977	174.2	30 1971	2.2
	II		29.8	27.6									84	35.1	5.2	3.8							
सितम्बर SEP	I	1003.6	28.4	26.7	32.7	25.3	35.2	22.5	37.9	15 1995	16.7	30 1971	86	33.4	5.0	3.2	229.1	10.6	774.6 1978	40.0 1994	280.2	28 1978	2.1
	II		29.7	27.3									83	34.4	4.4	3.3							
अक्टूबर OCT	I	1008.9	27.1	25.0	32.6	23.3	34.7	19.5	38.4	30 1973	16.6	1 1971	83	29.9	2.9	1.8	95.2	5.0	341.8 1970	0.0	106.4	23 1970	1.8
	II		29.1	26.2									78	31.7	2.4	1.8							
नवम्बर NOV	I	1012.4	22.9	20.4	30.5	18.2	33.1	13.9	38.5	6 1976	10.0	30 1982	79	22.2	1.3	0.7	24.5	0.9	139.8 1998	0.0	109.0	9 1985	1.3
	II		26.5	22.6									69	24.4	0.8	0.6							
दिसम्बर DEC	I	1015.1	17.9	15.7	27.3	12.9	30.1	9.8	36.5	30 1984	6.4	30 1968	78	16.2	0.6	0.3	10.5	0.5	102.6 1977	0.0	80.6	29 1977	1.4
	II		22.6	18.1									62	17.2	0.4	0.2							
वार्षिक योग का माध्य ANNUAL TOTAL OR MEAN	I	1006.8	25.1	22.8	32.0	21.0	40.7	8.3	46.2	3	4.8	17	81	26.9	3.0	1.8	1546.5	75.4	2082.9	592.1	280.2	28	2.2
	II		28.2	24.4					6	1974	1	1983	72	28.2	2.3	1.7			1970	1982	9	1978	
वर्षों की संख्या NUMBER OF YEARS	I	27	30	30	30	30	30	30	32		32		30	30	30	30	28	28	30	30	32		27
	II																						

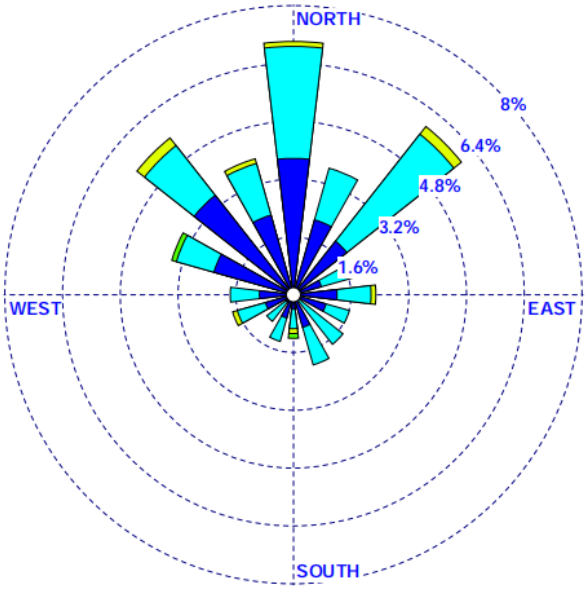
जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : बागती
STATION : Bagati

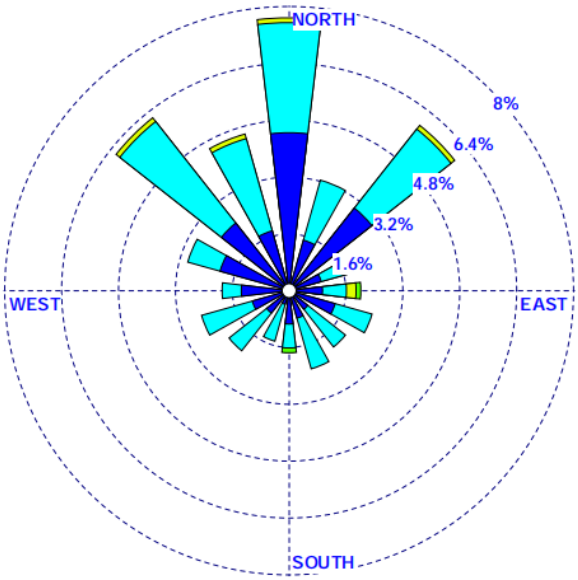
		मौसम परिघटना						पवन													मेघ						दृश्यता				
		के घटना दिनों की संख्या						पवन की गति के घटना दिनों की संख्या (कि. मी. प्र. घं.)				पवन की दिशा के दिनों की संख्या का प्रतिशत									मेघ घटना (सभी मेघ) सहित दिनों की संख्या – अष्टमांश					निम्न मेघों मेघ घटना सहित दिनों की संख्या – अष्टमांश						दृश्यता सहित दिनों की संख्या				
माह		0.3 मि.मि.या अधिक	ओलों	गर्जन	तूफान	धूल भरी आंधी	धौंद घटना	64 या अधिक	28-63	1-27	0	उ	उप	पू	दप	द	दद	प	पउ	CALM	0	1-2	3-5	6-7	8	0	1-2	3-5	6-7	8	धूमा क	1 कि.मी. या	1-4 कि.मी.	4-10 कि.मी.	10-20 कि.मी.	20 कि.मी. से अधिक
		WEATHER PHENOMENA						WIND													CLOUD										
		No. OF DAYS WITH						No. OF DAYS WITH WIND SPEED (Km. p. h.)				PERCENTAGE No. OF DAYS WIND FROM									No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) O K T A S					No. OF DAYS WITH LOW CLOUD AMOUNT O K T A S						No. OF DAYS WITH VISIBILITY				
MONTH		PPT 0.3 mm Or more	HAIL	THUNDER	FOG	DUST STORM	SQUALL	50 Or more	29-63	1-28	0	N	NE	E	SE	S	SW	W	NW	CALM	0	1-2	3-6	7-7	8	0	1-2	3-5	6-7	8	FOG	UPTO 1Km.	1-4 Kms.	4-10 Kms.	10-20 Kms.	OVER 20 Kms.
जनवरी	I	1.2	0.0	0.1	0.1	0.0	0.0	0	0	24	7	54	6	1	1	2	4	6	4	22	26	1	2	2	0	27	1	3	0	0	0	0.4	3.1	8.1	16.1	3.4
JAN	II							0	0	25	6	61	3	0	0	4	5	1	7	19	28	1	1	1	0	28	1	2	0	0	0	0.0	4.1	6.4	11.8	8.7
फरवरी	I	2.5	0.0	0.7	0.0	0.0	0.0	0	0	23	5	40	11	1	2	4	14	7	3	18	23	0	2	3	0	22	1	5	0	0	0	0.1	3.5	8.8	11.5	4.2
FEB	II							0	0	24	4	45	3	1	2	12	11	4	7	15	24	0	2	2	0	24	1	3	0	0	0	0.0	2.2	5.7	12.7	7.4
मार्च	I	2.2	0.0	1.1	0.1	0.0	0.0	0	0	28	3	13	3	2	1	13	42	12	2	12	25	0	3	3	0	24	1	6	0	0	0	0.0	3.0	10.5	12.1	5.4
MAR	II							0	0	28	3	10	2	0	5	45	21	2	4	11	27	1	2	1	0	27	1	3	0	0	0	0.0	1.6	6.1	10.6	12.7
अप्रैल	I	3.9	0.0	2.3	0.0	0.0	0.0	0	0	28	2	4	3	2	5	19	54	5	1	7	17	1	6	6	0	19	1	10	0	0	0	0.0	3.9	11.7	8.1	6.3
APR	II							0	0	29	1	2	2	1	6	61	22	1	1	4	21	1	4	3	1	22	1	7	0	0	0	0.1	1.8	6.4	10.6	11.2
मई	I	7.9	0.1	4.1	0.0	0.0	0.0	0	0	29	2	1	7	5	11	21	43	5	0	7	12	0	10	8	1	12	2	16	1	0	0	0.0	6.3	11.5	7.9	5.3
MAY	II							0	0	30	1	1	1	2	11	60	21	1	1	2	17	1	7	4	2	18	1	11	1	0	0	0.0	2.0	7.9	10.1	11.0
जून	I	12.8	0.0	2.6	0.0	0.0	0.0	0	0	27	3	1	8	7	17	20	33	5	0	9	5	0	8	14	3	6	1	21	2	0	0	0.0	9.1	9.8	7.1	4.1
JUN	II							0	0	29	1	1	2	3	14	62	12	1	1	4	9	1	10	7	3	10	1	17	2	0	0	0.0	4.8	7.7	10.3	7.2
जुलाई	I	17.9	0.0	1.8	0.0	0.0	0.0	0	0	28	3	0	9	9	15	23	27	7	0	10	2	0	9	17	3	3	1	25	2	0	0	0.0	9.2	11.3	6.9	3.6
JUL	II							0	0	29	2	1	2	5	17	56	11	1	0	7	4	0	12	11	4	4	1	23	3	0	0	0.0	6.5	8.3	11.0	5.1
अगस्त	I	18.0	0.0	1.6	0.0	0.0	0.0	0	0	27	4	2	12	12	15	23	17	5	1	13	2	0	8	18	3	2	1	25	3	0	0	0.0	9.3	11.3	6.7	3.7
AUG	II							0	0	28	3	1	1	9	19	54	7	1	0	8	3	1	12	11	4	3	1	24	3	0	0	0.0	7.6	8.9	8.1	6.4
सितम्बर	I	13.1	0.0	1.4	0.0	0.0	0.0	0	0	26	4	5	9	9	17	18	22	7	1	12	5	0	9	13	3	5	2	21	2	0	0	0.0	6.9	10.8	8.1	4.2
SEP	II							0	0	26	4	2	3	4	17	50	11	1	0	12	6	0	13	8	3	6	1	21	2	0	0	0.0	5.3	6.9	9.9	7.9
अक्तूबर	I	6.3	0.0	1.1	0.0	0.0	0.0	0	0	27	4	31	9	4	7	7	16	9	3	14	15	1	7	7	1	16	1	13	1	0	0	0.0	3.5	9.1	13.3	5.1
OCT	II							0	0	27	4	20	3	1	7	31	15	2	6	15	17	1	7	5	1	17	1	12	1	0	0	0.0	4.1	6.0	12.6	8.4
नवम्बर	I	0.8	0.0	0.0	0.1	0.0	0.0	0	0	27	3	63	7	2	0	1	6	5	4	12	24	0	3	3	0	24	1	5	0	0	0	0.1	1.9	6.8	15.0	6.2
NOV	II							0	0	24	6	53	5	0	2	6	6	1	6	21	25	0	3	2	0	26	0	4	0	0	0	0.0	3.7	5.1	12.5	8.7
दिसम्बर	I	0.7	0.0	0.0	0.5	0.0	0.0	0	0	27	4	70	3	1	1	1	2	4	5	13	28	0	2	1	0	28	1	2	0	0	0	0.0	3.0	6.5	16.4	5.1
DEC	II							0	0	27	4	72	2	0	0	3	3	1	6	13	28	0	2	1	0	29	0	2	0	0	0	0.0	4.0	5.4	11.9	9.7
वार्षिक योग का मध्यक	I	87.3	0.1	16.8	0.8	0.0	0.0	0	0	321	44	23	7	5	8	13	23	7	2	12	182	5	69	93	16	191	12	150	12	0	0	0.5	62.6	112.9	132.5	56.5
ANNUAL TOTAL OR MEAN	II							0	0	326	39	22	2	2	8	39	12	1	3	11	210	5	73	57	20	216	9	127	13	0	0	0.1	47.6	80.3	134.4	102.7
वर्षों की NUMBER OF YEARS	I II	30						30				30									30					30						30				

TABLE-3.8.1
ON-SITE METEOROLOGICAL DATA
(December, 2020 – February, 2021)

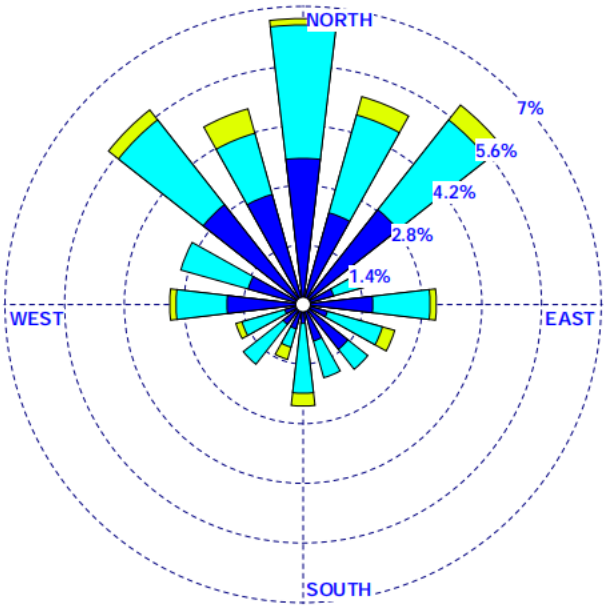
Month	Temperature (°C)		Relative Humidity (%)		Barometric Pressure (mm Hg)		Average Velocity (Km/hr)
	Max.	Min.	08:30 hrs.	17:30 hrs.	08:30 hrs.	17:30 hrs.	
DECEMBER, 2020	30.5	10	77	53	760.5	754.8	2.8
JANUARY, 2021	28	9.5	76	50	762.2	756.4	3.2
FEBRUARY, 2021	30.5	12.5	71	52	759.6	754.6	3.8
OVERALL	**30.5**	**9.5**	**77.0**	**50.0**	**762.2**	**754.6**	**3.3**



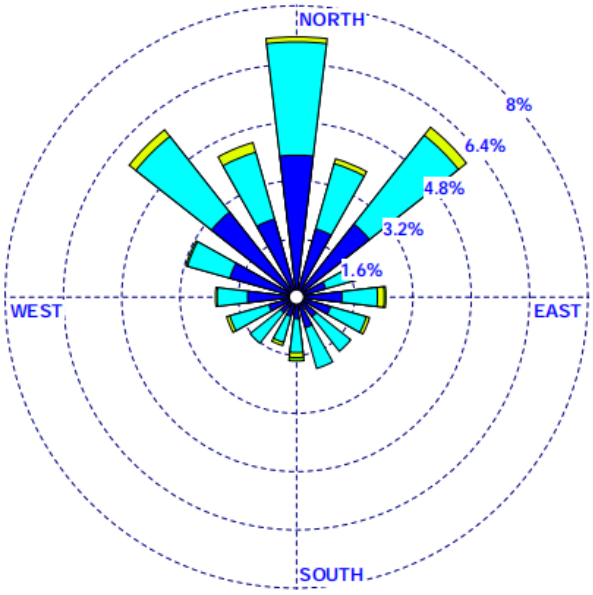
December, 2020
Calm Value: 54.03%



January, 2021
Calm Value: 48.92%



February, 2021
Calm Value: 47.62%



December, 2020 to February, 2021
Calm Value: 50.28%

FIGURE-3.8.1

WIND ROSE DIAGRAM FOR THE PERIOD OF DECEMBER, 2020 TO FEBRUARY, 2021

3.9 AIR QUALITY

3.9.1 SELECTION OF MONITORING STATIONS

The sources of air pollution in the region are industrial emissions, vehicular traffic, dust arising from unpaved village roads and domestic fuel burning. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the area. This will be useful for assessing the conformity to standards of the ambient air quality during the operation of the proposed expansion project.

The monitoring locations for establishing the baseline status of ambient air quality has been identified on the basis of the following considerations:

1. Meteorological conditions
2. Topography of the study area
3. Category of the area like habitat, forest etc.
4. Representative of likely affected area

Further, due consideration were also given to the likely affected zones during construction and operation of the plant. The location of human habitation and other sensitive areas within the study area were also considered in selection of ambient air quality monitoring locations.

Eight (8) numbers of monitoring stations were set up to assess the existing air quality of the study area. The locations of the monitoring stations were based on the frequent wind directions in order to site the stations as close as feasible to the anticipated maximum pollutant deposition areas, moreover, duly considering human habitation and proximity to sensitive zones within the study area. Logistic considerations as ready accessibility, security, availability of reliable power supply etc. were examined while finalizing the monitoring locations.

The Ambient Air Quality Monitoring locations have been presented in **Figure-3.9.1**. The relative direction, distance, latitude and longitude of these locations with respect to the project site have been tabulated in **Table-3.9.1**.

3.9.2 PARAMETERS & FREQUENCY OF MONITORING

Ambient Air Quality Monitoring has been conducted for the period **(December, 2020 – February, 2021)** at a frequency of twice a week at each station adopting a continuous 24 hours schedule in respect of the following parameters:

- Particulate Matter-10 (PM_{10})
- Particulate Matter-2.5 ($PM_{2.5}$)
- Sulphur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)

Carbon Monoxide (CO) monitoring has been conducted for the same period at a frequency of twice a week at each station adopting a continuous 8 hours schedule.

Description of Monitoring Stations

1) **Near Project Site (AQ1)**: The monitoring station (Latitude - 22°41'32.22"N & Longitude - 88°15'8.22"E) is located close to the project site. This station is located in the industrial and urban area and the data collected represents the background air quality of the project site area. There are many industrial area, located at Chanditala, which are comprised of a number of Brick Plants as well as Others Industries. AQ1 is located within 1.5 km range from Chanditala-Sreerampore Roa. All these factors may be attributed to the higher level of PM10 concentration.

2) **Baksha Kalitala (AQ2)**: Baksha Kalitala is a village. The monitoring station (Latitude - 22°43'28.12"N & Longitude - 88°14'47.54"E) is located at a distance of around 3.4 km in N direction from the project site. This location represents the most Pre-dominant upwind direction. Air quality monitoring instruments were placed on the roof top of a building in this village. There are agricultural lands all around this village. There is human population around this monitoring station and electricity is available in this location.

3) **Mollarber (AQ3)**: Mollarber is an Industrial cum residential area. The monitoring station (Latitude- 22°43'18.07"N & Longitude- 88°17'53.53"E) is located at a distance of 5.6 km in NE direction w.r.t. the project site. This location represents the 2nd most pre-dominant upwind direction. The station is located in settlement

area. There are agriculture lands and Industries all around this Area. Air quality monitoring instruments were placed on the rooftop of a village building. All necessary infrastructures like accessible road, electricity etc. are available in the vicinity.

4) **Near Kharial High school, Kharial (AQ4)**: Near Kharial High school, Kharial is a Industrial and residential area, located at a distance of 5.5 km in E direction w.r.t. the project site. The monitoring station (Latitude - 22°41'48.50"N & Longitude - 88°18'25.37"E) is located in the settlement area. This village is surrounded by agricultural and Industrials area . Air quality monitoring instruments were placed on the rooftop of a residential building. Electricity & all other infrastructure facilities are available in the village.

5) **Narna Village (AQ5)**: Narna Village is a small village. The monitoring station (Latitude - 22°39'45.15"N & Longitude - 88°15'14.18"E) in the village is located at a distance of around 3.5 km in S direction w.r.t. the project site. This location represents the most pre-dominant Downwind direction. Air quality monitoring instruments were placed on the rooftop of a village building and the monitoring station is surrounded by the human settlement. Electricity & all other infrastructures are available in this village.

6) **Mahadev Bidya mandir, Nonakundu (AQ6)**: Mahadev Bidya mandir, Nonakundu is a small settlement area. The monitoring station (Latitude - 22°40'5.51"N & Longitude - 88°12'38.50"E) in this settlement area is located at a distance of 5.5 km in SW direction w.r.t. the project site. This location represents the 2nd most pre-dominant downwind direction. This village is surrounded by agricultural and Settlement area. Air quality monitoring instruments were placed on the rooftop of a building in the settlement area. All types of infrastructure are available in this area.

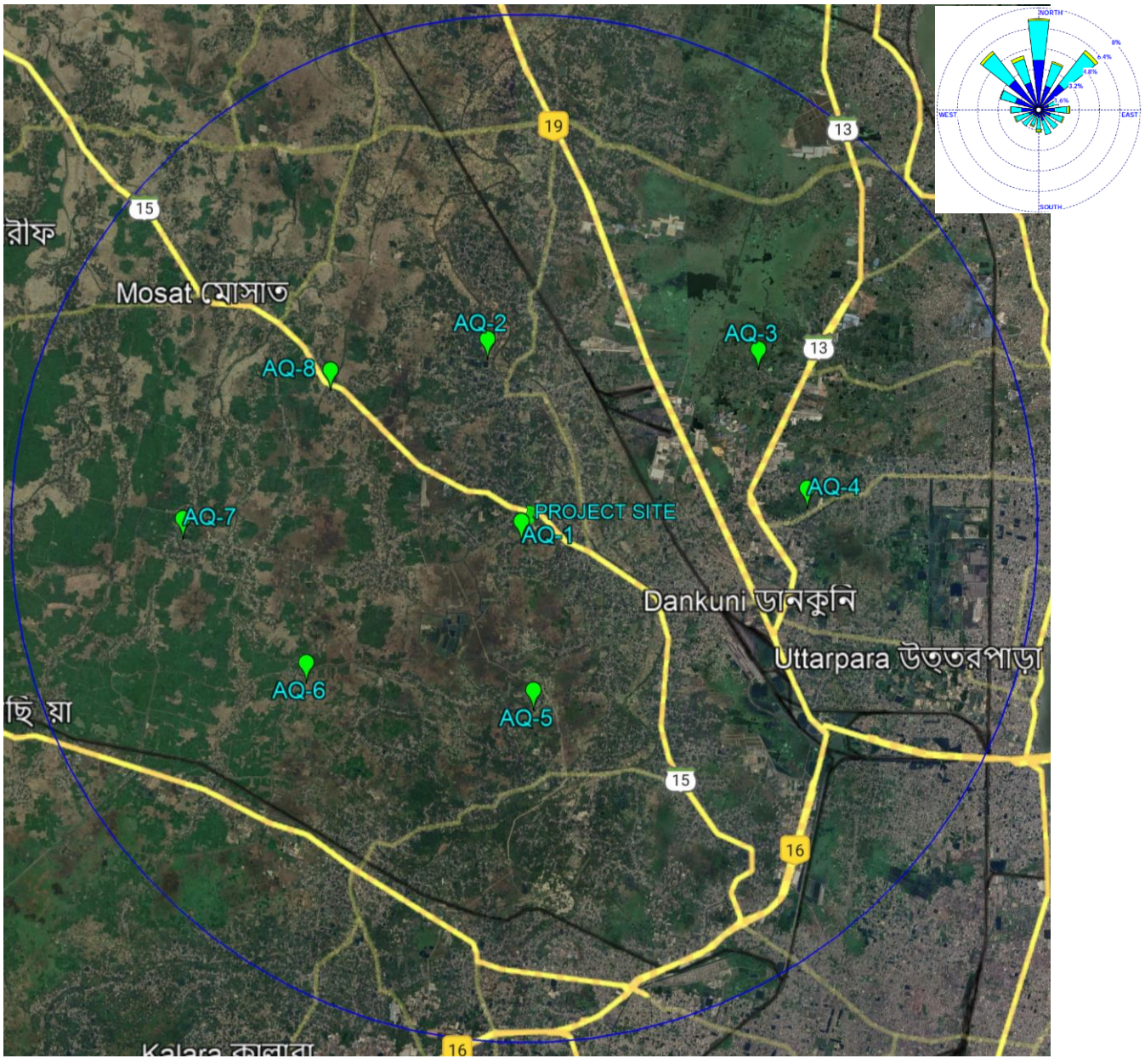
7) **Bhagawatipur**: Bhagawatipur is a large village. The monitoring station (Latitude -22°41'38.26"N & Longitude - 88°11'15.69"E) is located at a distance of 6.7 km in W direction w.r.t. the project site. This village is surrounded by agricultural and settlement area. Air quality monitoring instruments were placed on the rooftop of a village building. Electricity & all other infrastructures are available in this area.

8) **Krishnarampur Primary School (AQ8)**: krishnarampur primary school is a Medium size village, located at a distance of 4.7 km in

NW direction w.r.t. the project site. The monitoring station (Latitude - 22°43'6.64"N & Longitude - 88°12'55.43"E) was set up on the rooftop of a building in this village. This station is located just beside the Ahilyabai Holkar Road. This village is surrounded by agricultural and settlement area. Air quality monitoring instruments were placed on the rooftop of a village building. Electricity is available in this village.

Table - 3.9.1
Ambient Air Quality Monitoring Locations

Sl. No.	Location Code	Location	Aerial Distance w.r.t. Project site (km)	Direction w.r.t. Project site	Co-ordinates	Criteria for Selection
1	**AQ1**	Near Project Site	0.3	S	22°41'32.22"N 88°15'8.22"E	Representation of the Project Site.
2	**AQ2**	Baksha Kalitala	3.4	N	22°43'28.12"N 88°14'47.54"E	Located in the settlement area and Pre-dominant upwind direction
3	**AQ3**	Mollarber	5.6	NE	88°14'47.54"E 88°17'53.53"E	Located in the settlement area and representing the 2nd predominant upwind direction.
4	**AQ4**	Near Kharial High school, Kharial	5.5	E	22°41'48.50"N 88°18'25.37"E	Located in the Settlement and agriculture & Industrial area
5	**AQ5**	Narna Village	3.5	S	22°39'45.15"N 88°15'14.18"E	Location Representation the most pre-dominant down wind direction
6	**AQ6**	Mahadev Bidya mandir, Nonakundu	5.5	SW	22°40'5.51"N 88°12'38.50"E	Located in the settlement area represents the 2nd most pre-dominant down wind direction
7	**AQ7**	Bhagawatipur	6.7	W	22°41'38.26"N 88°11'15.69"E	Located near the settlement area and Agriculture area
8	**AQ8**	Krishnarampur Primary School	4.7	NW	88°11'15.69"E 88°12'55.43"E	Located in the village and Settlement area



Location Code	Location Name	Distance	Direction
AQ1	Near Project Site	0.3 km	S
AQ2	Baksha Kalitala	3.4 km	N
AQ3	Mollarber	5.6 km	NE
AQ4	Near Kharial High school, Kharial	5.5 km	E
AQ5	Narna Village	3.5 km	S
AQ6	Mahadev Bidya mandir, Nonakundu	5.5 km	SW
AQ7	Bhagawatipur	6.7 km	W
AQ8	krishnarampur primary school	4.7 km	NW

FIGURE-3.9.1
AMBIENT AIR QUALITY MONITORING STATIONS

TABLE-3.9.2

Statistical Analysis Results of Air Pollutants

(Period: December, 2020 - February, 2021)

POLLUTANTS	LOCATIONS	MES	MIN	MAX	A.M.	P - 98
PM10 ($\mu g/m^3$)	Near Project Site	25	64	83	72.2	82.5
	Baksha Kalitala	25	60	79	69.4	79.0
	Mollarber	25	67	88	75.2	85.6
	Near Kharial High school, Kharial	25	65	85	71.8	84.5
	Narna Village	25	62	80	69.4	79.0
	Mahadev Bidya mandir, Nonakundu	25	57	74	65.9	74.0
	Bhagawatipur	25	59	78	66.5	76.6
	krishnarampur primary school	25	55	72	63.6	72.0
	Overall	**200**	**55**	**88**	**69.3**	-
PM2.5 ($\mu g/m^3$)	Near Project Site	25	22	40	32.1	39.6
	Baksha Kalitala	25	21	37	29.2	36.8
	Mollarber	25	28	42	32.7	40.7
	Near Kharial High school, Kharial	25	24	41	32.2	41.0
	Narna Village	25	22	38	28.3	36.1
	Mahadev Bidya mandir, Nonakundu	25	19	35	27.1	34.8
	Bhagawatipur	25	20	37	28.1	36.0
	krishnarampur primary school	25	19	32	25.6	31.1
	Overall	**200**	**19**	**42**	**29.4**	-
SO2 ($\mu g/m^3$)	Near Project Site	25	6	12	8.9	12.0
	Baksha Kalitala	25	5	10	7.0	9.5
	Mollarber	25	6	12	8.5	12.0
	Near Kharial High school, Kharial	25	8	15	10.1	14.5
	Narna Village	25	4	10	6.9	10.0
	Mahadev Bidya mandir, Nonakundu	25	5	11	7.3	11.0
	Bhagawatipur	25	6	13	8.6	13.0
	krishnarampur primary school	25	4	9	6.6	9.0
	Overall	**200**	**4**	**15**	**8.0**	-
NO2 ($\mu g/m^3$)	Near Project Site	25	19	34	26.2	33.5
	Baksha Kalitala	25	17	29	22.8	28.0
	Mollarber	25	20	40	27.3	37.1
	Near Kharial High school, Kharial	25	21	42	28.5	40.6
	Narna Village	25	16	29	21.7	28.5
	Mahadev Bidya mandir, Nonakundu	25	14	25	19.8	25.0
	Bhagawatipur	25	17	30	22.0	28.6
	krishnarampur primary school	25	15	28	20.3	28.0
	Overall	**200**	**14**	**42**	**23.6**	-

TABLE-3.9.2 (Contd...)
Statistical Analysis Results of Air Pollutants
(Period: December, 2020 – February, 2021)

POLLUTANTS	LOCATIONS	MES	MIN	MAX	A.M.	P -98
CO (mg/m^3)	Near Project Site	75	0.181	0.623	0.346	0.588
	Baksha Kalitala	75	0.121	0.597	0.360	0.584
	Mollarber	75	0.179	0.657	0.394	0.644
	Near Kharial High school, Kharial	75	0.146	0.657	0.385	0.620
	Narna Village	75	0.189	0.591	0.393	0.582
	Mahadev Bidya mandir, Nonakundu	75	0.165	0.548	0.317	0.538
	Bhagawatipur	75	0.160	0.577	0.365	0.568
	krishnarampur primary school	75	0.138	0.552	0.338	0.536
	OVERALL	**600**	**0.184**	**1.345**	**0.667**	-

N.B.: **MES** - No. of measurements, **MIN** - Minimum, **MAX** - Maximum, **A.M.** - Arithmetic Mean, **P-98** - 98 Percentile.

3.9.3 RESULTS & DISCUSSIONS

Statistical analysis (minimum, maximum, arithmetic mean) of the ambient air quality in the study area for the entire three months monitoring period are shown in **Table-3.9.2**.

The following implications can be made on the basis of the obtained results:

3.9.3.1 Particulate Matter-10 (PM_{10})

Arithmetic Mean of the 24-hourly average values of PM_{10} varied station-wise between 63.6 μg/m^3 (at krishnarampur primary school) to 75.2 μg/m^3 (at Mollarber) with overall mean of all 8 stations being 69.3 μg/m^3.

Arithmetic Mean of the 24-hourly average values of PM_{10} at all locations is under the limit of (100 μg/m^3) National Ambient Air Quality Standards, 2009.

3.9.3.2 Particulate Matter - 2.5 ($PM_{2.5}$)

Arithmetic Mean of the 24-hourly average values of $PM_{2.5}$ varied station-wise between 25.6 μg/m^3 (at krishnarampur primary school) to 32.7 μg/m3 (at Mollarber) with overall mean of all 8 stations being 29.4 μg/m^3.

Arithmetic Mean of the 24-hourly average values of $PM_{2.5}$ at all locations is under the limit of (60 μg/m^3) National Ambient Air Quality Standards, 2009.

3.9.3.3 Sulphur Dioxide (SO_2)

Arithmetic mean of 24-hourly average values of SO_2 varied station wise between 6.6 μg/m^3 (at krishnarampur primary school) to 10.1 μg/m^3 (Near Kharial High school, Kharial) with overall mean of all 8 stations being 8.0 μg/m^3.

Arithmetic Mean of the 24-hourly average values of SO_2 at all locations is under the limit of (80 μg/m^3) National Ambient Air Quality Standards, 2009.

3.9.3.4 Nitrogen Dioxide (NO_2)

The overall arithmetic mean of 24-hourly average values of NO_2 over the entire study area was 23.6 μg/m^3 while individual arithmetic mean levels computed at 8 stations ranged between 19.8μg/m^3 (Mahadev Bidya mandir, Nonakundu) to 28.5 μg/m^3 (Kharial High school, Kharial).

Arithmetic Mean of the 24-hourly average values of NO_2 at all locations is under the limit of (80 μg/m^3) National Ambient Air Quality Standards, 2009.

3.9.3.5 Carbon Monoxide (CO)

The overall arithmetic mean of 8-hourly average values of CO over the entire study area was 0.362 mg/m^3 while individual arithmetic mean levels computed at 8 stations ranged between 0.317 mg/m^3 (Mahadev Bidya mandir, Nonakundu) to 0.394 mg/m^3 (at Mollarber).

Arithmetic Mean of the 24-hourly average values of CO at all locations is under the limit of (2 mg/m^3) National Ambient Air Quality Standards, 2009.

The graphical analyses of the concentrations of all pollutants have been shown in **Figure-3.9.2** to **Figure-3.9.6**.

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/m^3	Annual*	50	20	- Improved West and Gaeke
		24 hours**	80	80	-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m^3	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM_{10} µg/m^3	Annual*	60	60	- Gravimetric - TOEM
		24 hours**	100	100	- Beta attenuation
4	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ µg/m^3	Annual*	40	40	- Gravimetric - TOEM
		24 hours**	60	60	- Beta attenuation
5	Ozone (O_3) µg/m^3	8 hours**	100	100	- UV photometric - Chemilminescence
		1 hour**	180	180	- Chemical Method
6	Lead (Pb) µg/m^3	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/m^3	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour**	04	04	
8	Ammonia (NH_3) µg/m^3	Annual*	100	100	-Chemiluminescence
		24 hours**	400	400	-Indophenol blue method

(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.

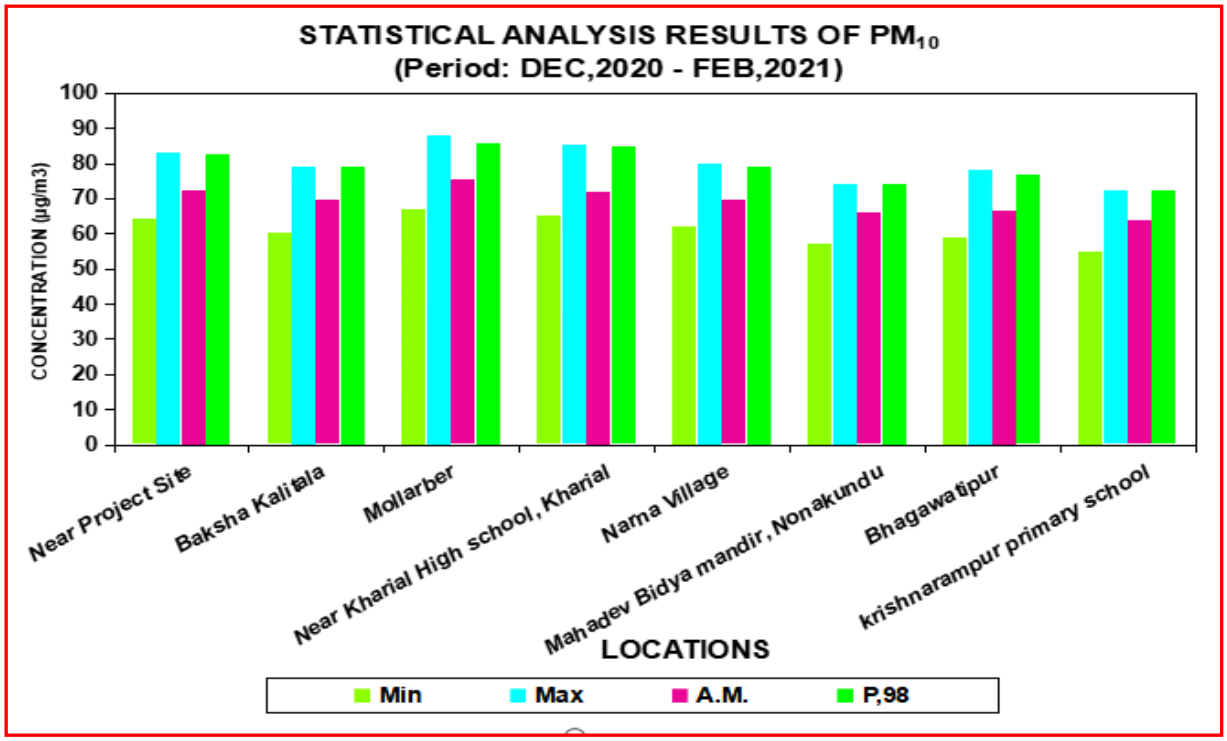


FIGURE-3.9.2: DIAGRAM OF PM_{10} OF ALL AAQM STATIONS

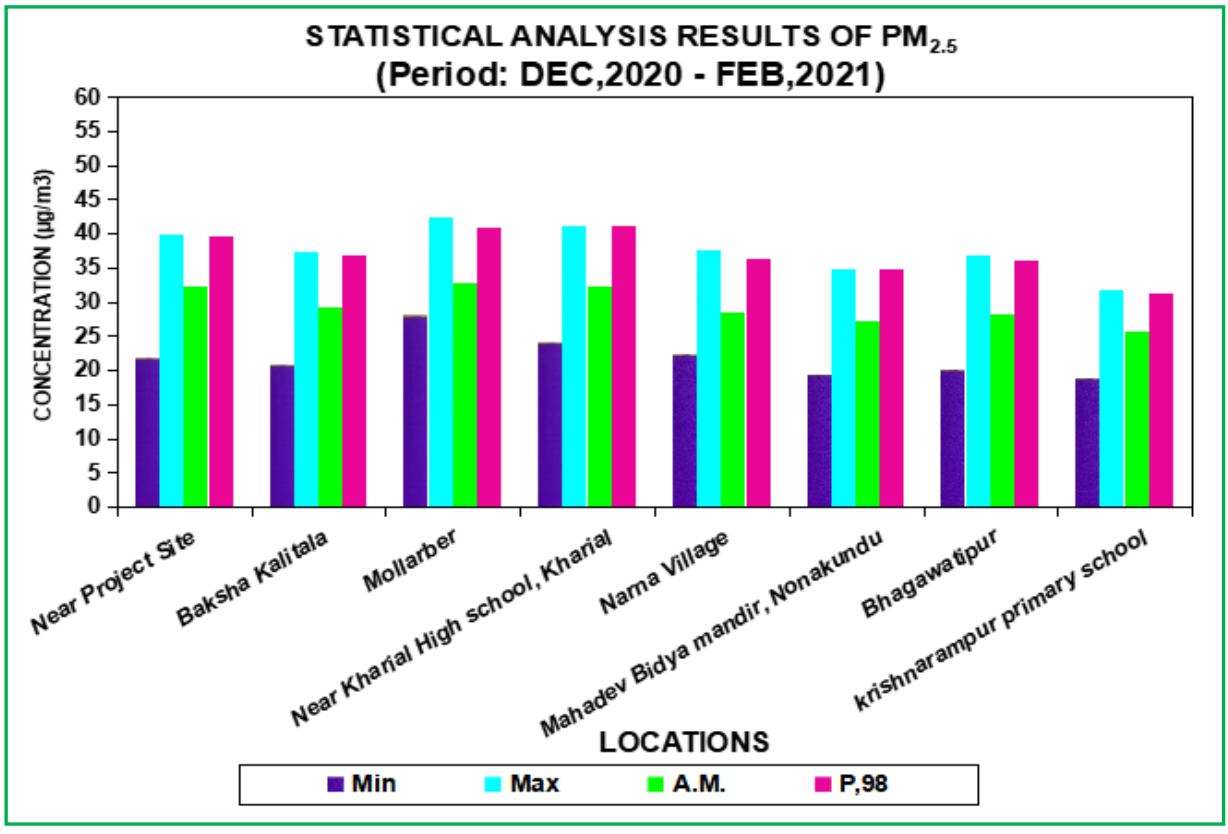


FIGURE-3.9.3: DIAGRAM OF $PM_{2.5}$ OF ALL AAQM STATIONS

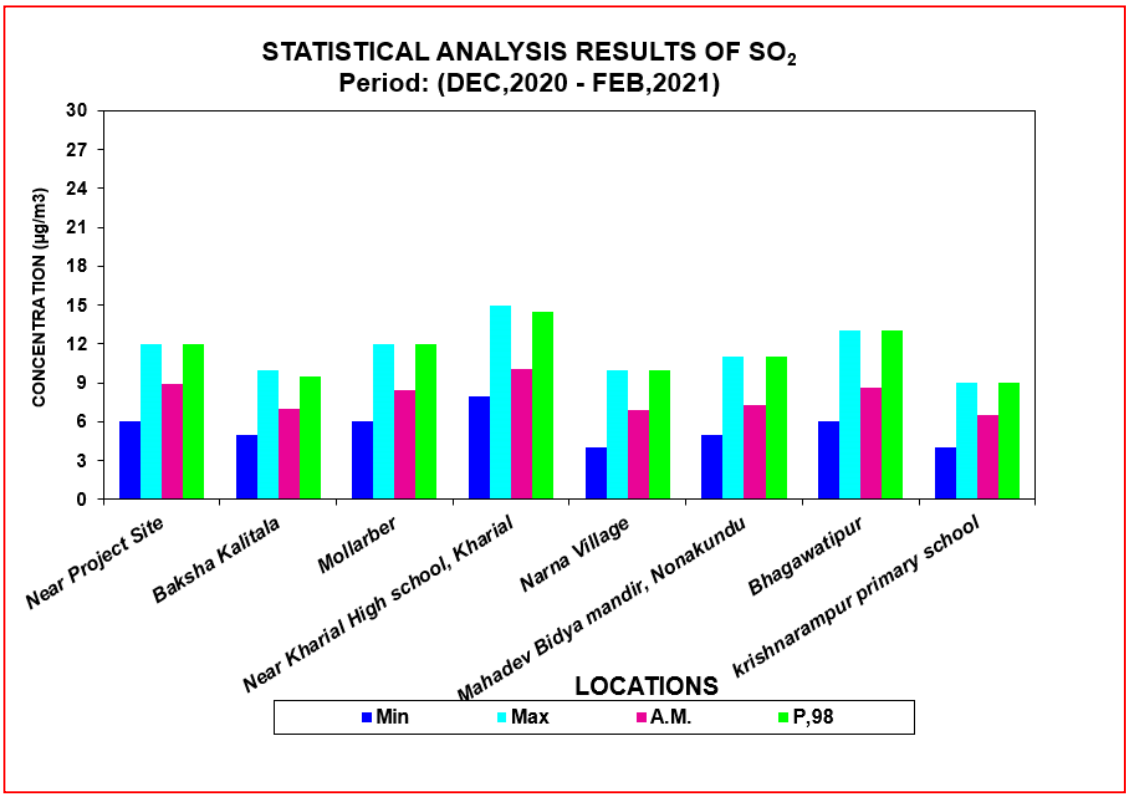


FIGURE-3.9.4: DIAGRAM OF SO_2 OF ALL AAQM STATIONS

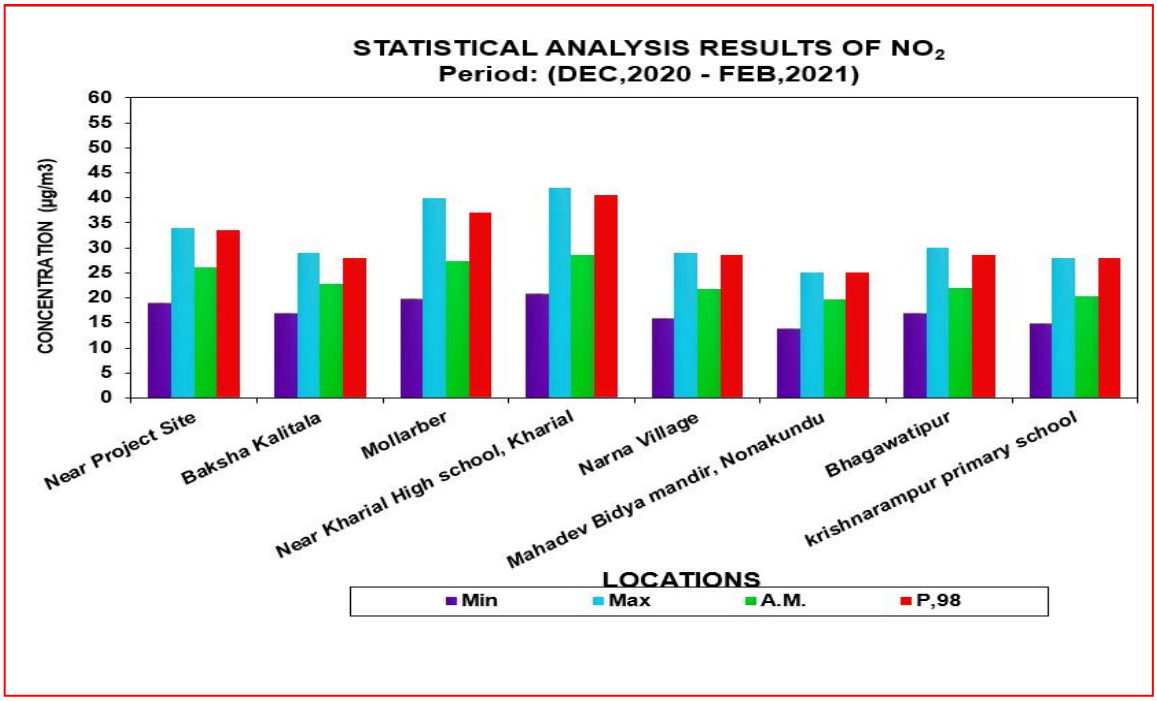


FIGURE-3.9.5: DIAGRAM OF NO_2 OF ALL AAQM STATIONS

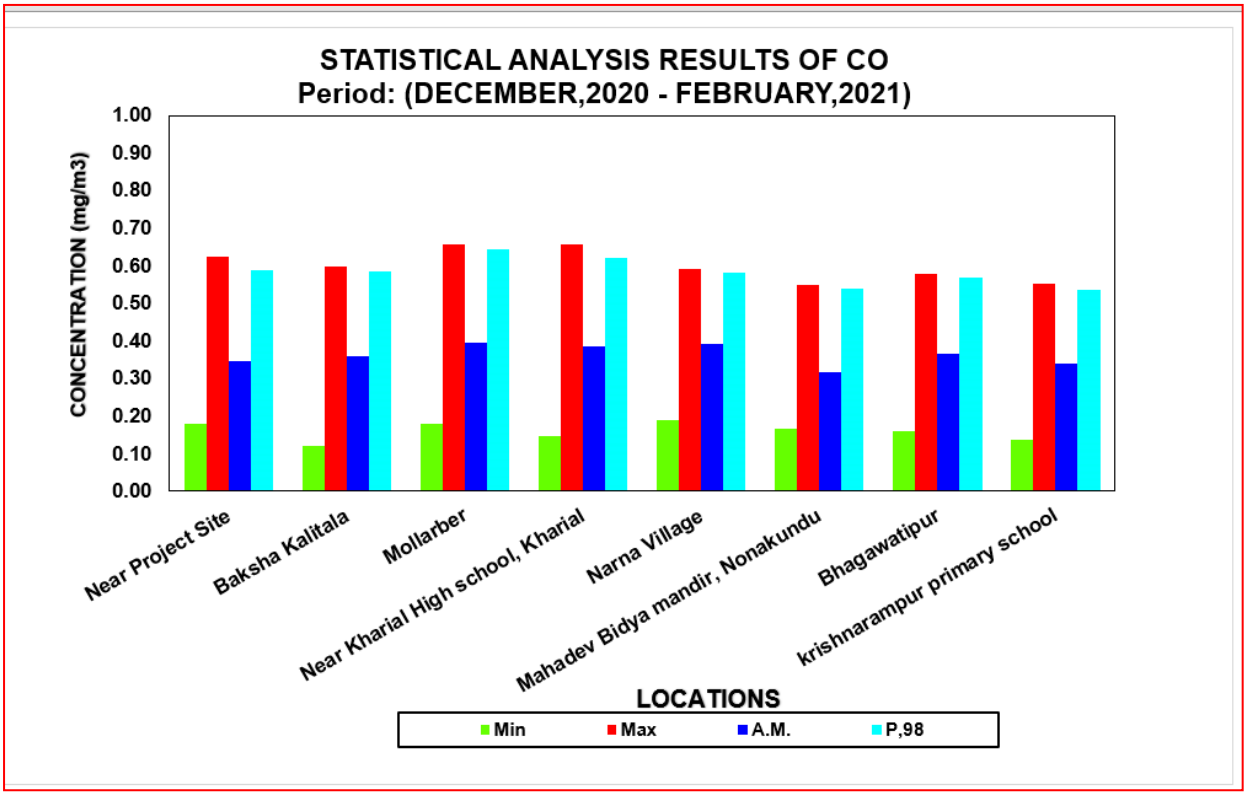


FIGURE-3.9.6: DIAGRAM OF CO OF ALL AAQM STATIONS

Ambient Air Quality Monitoring also has been done on 4th and 5th January 2021 at Bhagawatipur and Krishnarampur Primary School for the following parameters:

- Lead
- Nickel
- Arsenic
- C_6H_6
- BaP

The results obtained are presented in the table below :

TABLE : 3.9.3
Other Chemical Composition including Heavy Metals in respirable particulate matter (PM_{10})

TABLE : 3.9.3A
Location :Near Project Site
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
04.01.21	0.15	<5	<0.5	0.4	<0.25

TABLE : 3.9.3B
Location :Baksha Kalitala
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
04.01.21	0.08	<5	<0.5	0.2	<0.25

TABLE : 3.9.3C
Location :Mollarber
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
04.01.21	0.06	<5	<0.5	<0.1	<0.25

TABLE : 3.9.3D
Location Near Kharial High school, Kharial
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
04.01.21	0.11	<5	<0.5	0.2	<0.25

TABLE : 3.9.3E
Location Narna
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
05.01.21	0.07	<5	<0.5	0.1	<0.25

TABLE : 3.9.3F
Location
Mahadev Bidya mandir, Nonakundu
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
05.01.21	<0.05	<5	<0.5	<0.1	<0.25

TABLE: - 3.9.3G
Location : Bhagawatipur
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
05.01.21	0.09	<5	<0.5	<0.1	<0.25

TABLE: - 3.9.3H
Location : Krishnarampur primary school
(Period: December' 2020 - February,2021)

DATE	Pb	Ni	As	C_6H_6	BaP
	($\mu g/m^3$)	(ng/m^3)	(ng/m^3)	($\mu g/m^3$)	(ng/m^3)
05.01.21	0.16	<5	<0.5	0.4	<0.25

Note: Date of Sampling for the 1st four AAQM Station is 4th January, 2021
Date of Sampling for the last four AAQM Station is 5th January, 2021.

3.9.4 Conclusion

The above tables reveals that the ambient air quality monitoring stations like near (AQ1), (AQ2), (AQ3), (AQ4) and (AQ5) are likely to be affected by pollution arising due to brick field, industries and transportation of materials during the operational phase of the project.

The values of all the ambient air parameters i.e., PM_{10}, $PM_{2.5}$, SO_2, NO_2 and CO at the respective 8 monitoring locations are within the stipulated limits on all the occasions as per NAAQ Standard. The maximum value of PM_{10} was observed at Mollarber i.e., 75.2 $\mu g/m^3$, which is considerably on higher side, but is still within the standard. This may be attributed to the wind blown dust due to the unpaved roads and the vehicular emissions in the area.

The values of Ni, As and BaP are well within the limit.

3.10 TRAFFIC STUDY ANALYSIS

A Traffic density was monitored at one point near Dankuni Automart at Champadanga-Dankuni Road. The data were recorded under three different vehicle categories i.e., Heavy, Medium and Light. The heavy vehicles included trucks, buses, cranes etc. The medium vehicles included mini buses, matadors etc. while cars, jeeps, two wheelers and auto rickshaws were considered under the light vehicles category.

The data were recorded once for a day in the month of February, 2021 for continuous 24 hours in a day. The relevant account has been gathered in **Tables-3.10.1**.

TABLE-3.10.1
NAME OF THE LOCATION: Near Dankuni Automart, Champadanga-Dankuni Road
DATE OF SAMPLING: 20.02.2021

HOUR	HEAVY	MEDIUM	TWO WHEELERS	TOTAL
0700 - 0800	58	22	50	**167**
0800 - 0900	76	40	68	**248**
0900 - 1000	57	21	49	**206**
1000 - 1100	65	38	70	**225**
1100 - 1200	92	56	84	**295**
1200 - 1300	54	18	59	**179**
1300 - 1400	67	33	65	**202**
1400 - 1500	49	13	41	**122**
1500 - 1600	89	53	82	**283**
1600 - 1700	47	12	94	**234**
1700 - 1800	90	54	87	**291**
1800 - 1900	56	20	48	**200**
1900 - 2000	93	57	76	**289**
2000 - 2100	59	23	51	**162**
2100 - 2200	34	20	60	**151**
2200 - 2300	9	12	27	**64**
2300 - 0000	13	0	5	**21**
0000 - 0100	11	2	3	**25**
0100 - 0200	16	1	2	**19**
0200 - 0300	28	0	0	**30**
0300 - 0400	19	7	0	**37**
0400 - 0500	23	13	17	**58**
0500 - 0600	40	9	30	**114**
0600 - 0700	58	22	39	**148**
TOTAL	**1203**	**546**	**1107**	**3770**

3.11 WATER ENVIRONMENT

3.11.1 WATER BODIES IN THE STUDY AREA

A number of confined water bodies, viz. canals, Tanks, Ponds, Jheels, road side burrows etc. which form a part of surface hydrological system, exist within the study area. As the River Hooghly is the main drainage channel of the region, this river receives pollution loads of industrial and domestic waste water and also agricultural run-off. Ground water sources are mainly bore wells, tube wells and dug wells which are scattered in the whole study area.

3.11.2 WATER SAMPLING

As surface water, water samples were collected and analyzed from total ten (10) locations, including two (2) different locations from the Canal water and lake water, from eight (8) different ponds of different locations , Ground water samples were collected and analyzed from total nine (9) different locations from tube wells /bore wells to assess the baseline status of the whole water quality in the study area.

Out of two water (Canal & lake) samples, one was collected near Nonakundu Village and the other near (Near Badyi Matar Mandir), Janai.

All the samples were analyzed with respect to physical, chemical and biological parameters including toxic organics and metals, adopting Standard methods. The locations of the sampling points for both surface and ground water are tabulated in **Table-3.11.1**. Surface water and Ground water sampling locations have been presented in **Figure-3.11.1** and **Figure-3.11.2** respectively.

3.11.3 SURFACE WATER QUALITY

All the samples were analyzed with respect to physical, chemical and biological parameters including toxic organics and metals, adopting Standard methods. Sampling and analysis of surface water were carried out following the analysis techniques and methodology described in relevant Indian Standards and as per 23rd edition of "Standard Methods for the Examination of Water and Waste Water" published by American Public Health Association (APHA), 2017. Analysis results of all surface water samples were compared with CPCB Water Quality Criteria for Surface Water.

3.11.3.1 RESULTS OF SURFACE WATER QUALITY MONITORING:

Results of Water Quality from the Canal Water:

The water quality monitoring results of canal water samples (**SW6)** have been compiled in **Table-3.11.3**.

The pH values of the collected two water samples (**SW6**) from the Canal water were found pH 7.18. Value of Dissolved Oxygen were observed 6.5 mg/lit. Total Dissolved Solids were found 428 mg/lit while value of total Hardness (as $CaCO_3$) & total Alkalinity (as $CaCO_3$) were found 155 mg/lit & 149 mg/lit respectively. Calcium (as Ca) & Magnesium (as Mg) were found 49 mg/lit and 8 mg/lit respectively. Oil and grease was below detection limit (<1.4 mg/lit) in these sample. Sulphate (as SO_4), Nitrate (as NO_3) and Chloride (as Cl) were observed 36 mg/lit, 2.8 mg/lit and 137 mg/lit respectively. Iron (as Fe) contents were found 0.18 mg/lit and BOD were found 4 mg/lit respectively.

Heavy metals like Copper (as Cu), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Manganese (as Mn), Arsenic (as As) and Mercury (as Hg) in these Canal water sample (**SW6**) were below their respective detection limits.

Results of Water Quality from the Lake Water:

The water quality monitoring results of Lake water samples (**SW3)** have been compiled in **Table-3.11.3**.

The pH values of the collected two water samples (**SW3**) from the Lake water were found pH 7.21. Value of Dissolved Oxygen were observed 6.9 mg/lit. Total Dissolved Solids were found 235 mg/lit while value of total Hardness (as $CaCO_3$) & total Alkalinity (as $CaCO_3$) were found 112 mg/lit & 106 mg/lit respectively. Calcium (as Ca) & Magnesium (as Mg) were found 32 mg/lit and 8 mg/lit respectively. Oil and grease was below detection limit (<1.4 mg/lit) in these sample. Sulphate (as SO_4), Nitrate (as NO_3) and Chloride (as Cl) were observed 7 mg/lit, 4.2 mg/lit and 77 mg/lit respectively. Iron (as Fe) contents were found 0.11 mg/lit and BOD were found 2 mg/lit respectively.

Heavy metals like Copper (as Cu), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Manganese (as Mn), Arsenic (as As) and Mercury (as Hg) in these Canal water sample (**SW3**) were below their respective detection limits.

Results of Pond Water Quality:

The water quality monitoring results of eight (8) pond water samples (**SW1, SW2, SW4, SW5, SW7** to **SW10**) have been compiled in **Table-3.10.2**.

The pH values of the collected pond water samples were found in the range of (7.14 – 7.42). Dissolved Oxygen was observed in the ranges of (6.2 – 6.7) mg/lit. Total Dissolved Solids were found in the ranges of (297 – 415) mg/lit while total Hardness (as $CaCO_3$) & total Alkalinity (as $CaCO_3$) were found (120 - 174) mg/lit & (117 - 160) mg/lit respectively. Calcium (as Ca) & Magnesium (as Mg) were found varying in the ranges of (35 – 51) mg/lit and (7 – 14) mg/lit respectively. Oil and grease was below detection limit (<1.4 mg/lit) in these samples. Sulphate (as SO_4), Nitrate (as NO_3) and Chloride (as Cl) were observed varying in the ranges of (8 – 41) mg/lit, (2.6 – 5.8) mg/lit and (90 – 135) mg/lit respectively. Values of Iron (as Fe) were found in the ranges of (0.13 – 0.23) mg/lit .

Heavy metals like Copper (as Cu), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Manganese (as Mn), Arsenic (as As) and Mercury (as Hg) of these pond water samples (**SW1,SW2,SW4,SW5,SW7** to **SW10**) were below their respective detection limits.

3.11.1 GROUND WATER QUALITY

Ground Water samples (from bore-well and Tube well) were collected from 9 locations (GW1 to GW9). Locations of ground water sampling have been shown in **Table-3.11.1**. The ground water quality monitoring results have been presented in **Table-3.11.2**.

Sampling and analysis of ground water were carried out following the analysis techniques and methodology described in relevant Indian Standards. The ground water quality monitoring results have been tabulated in **Table-3.11.2**.

3.11.1.1 RESULTS OF GROUND WATER QUALITY MONITORING:

The pH values of collected ground water samples were found in the range of (6.87 – 7.54) with an average of 7.21. Total Dissolved Solids (TDS) was found in the range of (312 – 654) mg/lit with an average of 479.33 mg/l, while Total Hardness (as $CaCO_3$) was found in the ranges of (155 – 269) mg/lit with an average of 205.56 mg/l. Alkalinity (as $CaCO_3$) was found in the ranges of (166 – 294) mg/lit with an average

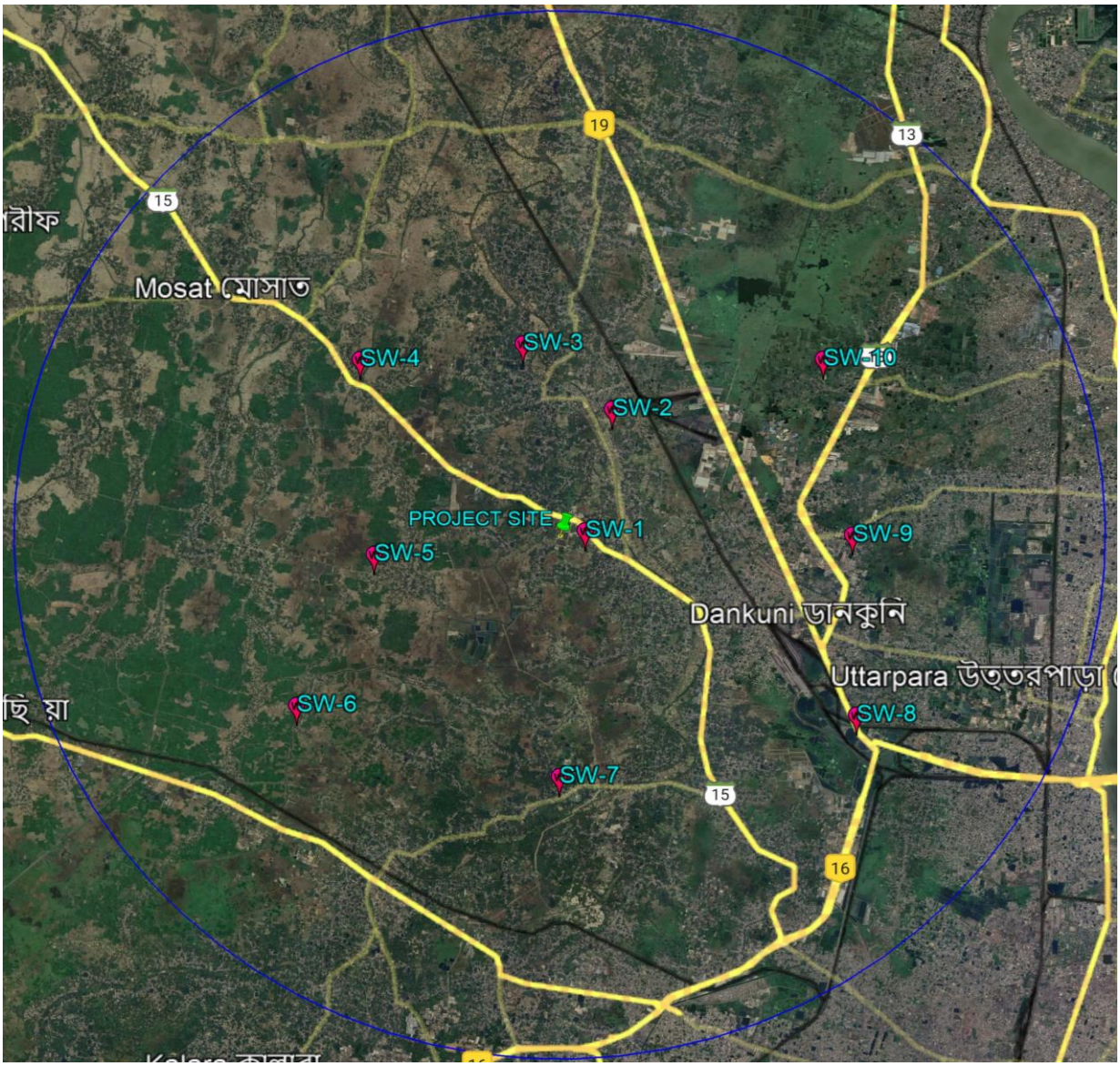
of 216.22 mg/l. Calcium (as Ca) and Magnesium (as Mg) were found varying in the ranges of (41 – 70) mg/lit and (9 – 27) mg/lit respectively. Sulphate (as SO_4), Nitrate (as NO_3) and Chloride (as Cl) were observed in the ranges of (14 – 54) mg/lit, (2.8 – 6.5) mg/lit and (73 – 188) mg/lit respectively. Iron (as Fe) content was found in the range of (0.19 – 0.42) mg/lit with an average of 0.29 mg/l and Zinc (as Zn) content was found (0.08 – 0.12) mg/lit.

Other heavy metals like Copper (as Cu), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Manganese (as Mn), Arsenic (as As) and Mercury (as Hg) were below their respective detection limits.

TABLE-3.11.1

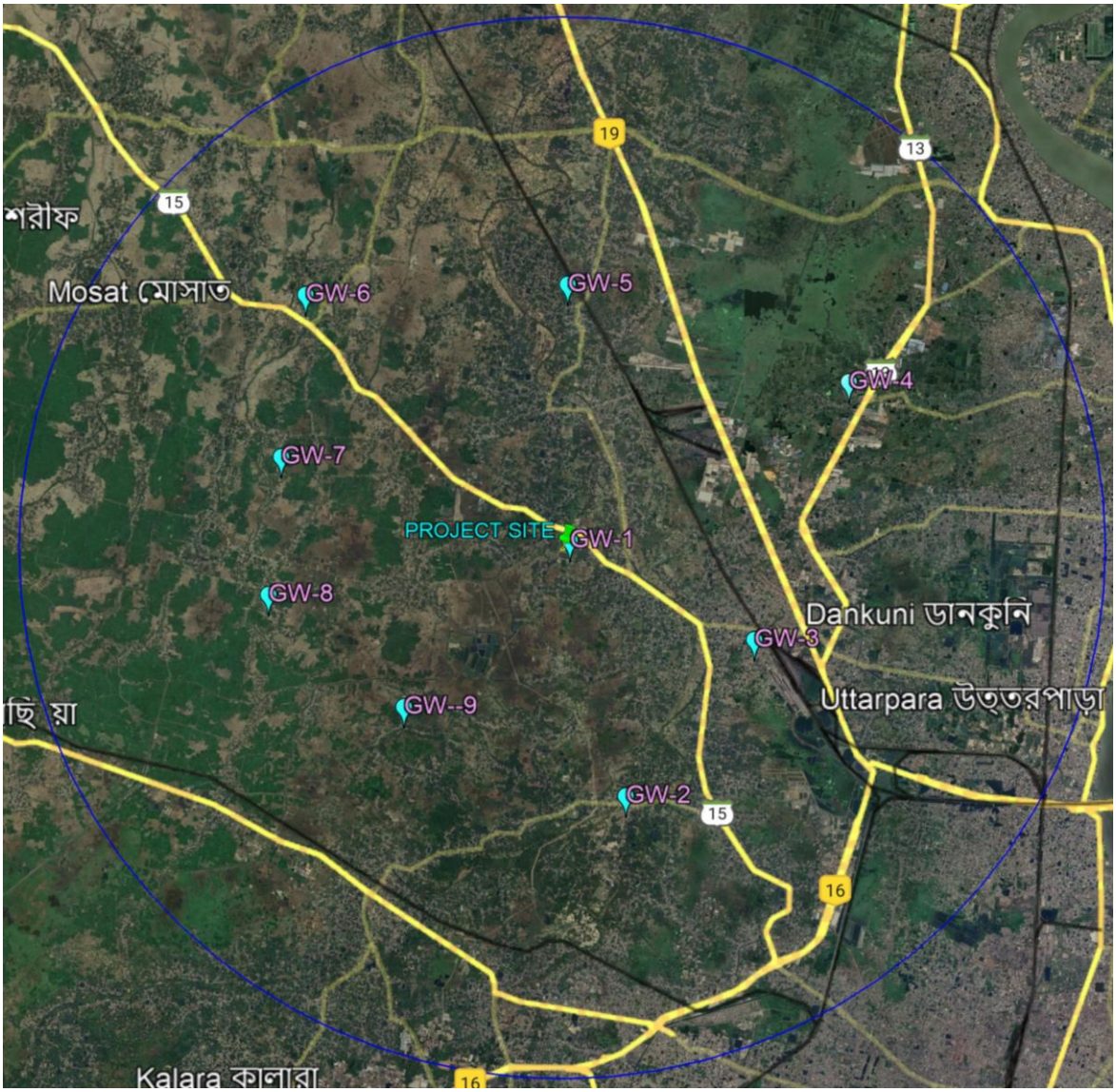
WATER QUALITY MONITORING LOCATIONS IN THE STUDY AREA

Sample Code	Locations	Latitude	Longitude
SURFACE WATER:			
SW1	Pond water at near Project site	22°41'30.77"N	88°15'27.05"E
SW2	Pond water at Pairagachha	22°42'46.27"N	88°15'44.53"E
SW3	Lake water (Near Badyi Matar Mandir), Janai	22°43'26.84"N	88°14'46.82"E
SW4	Pond water at Palit Para	22°43'17.10"N	88°13'1.47"E
SW5	Pond water at Ramnathpur	22°41'16.10"N	88°13'10.51"E
SW6	Canal water at Nonakundu	22°39'42.24"N	88°12'20.44"E
SW7	Pond water at Moira Para	22°38'58.01"N	88°15'10.29"E
SW8	Pond water at Jaypur Bil	22°39'36.17"N	88°18'22.42"E
SW9	Pond water at Kharial	22°41'28.05"N	88°18'19.89"E
SW10	Pond water at mollarber	22°43'17.34"N	88°18'0.97"E
GROUND WATER:			
GW1	Borewell water near Project Site	22°41'32.00"N	88°15'15.64"E
GW2	Tubewell water at Gayespur	22°38'55.89"N	88°15'55.02"E
GW3	Borewell water at Tantipara	22°40'33.13"N	88°17'16.65"E
GW4	Borewell at Jagannathpur	22°43'12.23"N	88°18'15.02"E
GW5	Tubewell water at Chak Nanra	22°44'8.98"N	88°15'11.12"E
GW6	Borewell at Jangalpara	22°43'59.84"N	88°12'20.90"E
GW7	Tubewell water at Chak Nanra	22°42'20.26"N	88°12'6.42"E
GW8	Borewell at Metekhal	22°40'55.46"N	88°12'0.44"E
GW9	Tubewell water at Chak Nanra	22°39'48.15"N	88°13'29.87"E



Sample Code	Location	Direction & Distance from centre of project site (km)	Date of Sampling
SW1	Pond water at near Project site	0.53 km, ESE	24.02.2021
SW2	Pond water at Pairagachha	2.5 km, NNE	24.02.2021
SW3	Lake water (Near Badyi Matar Mandir), Janai	3.4 km, N	24.02.2021
SW4	Pond water at Palit Para	4.8 km, NW	24.02.2021
SW5	Pond water at Ramnathpur	3.5 km, WSW	24.02.2021
SW6	Canal water at Nonakundu	6.0 km, SW	24.02.2021
SW7	Pond water at Moira Para	5.0 km, S	24.02.2021
SW8	Pond water at Jaypur Bil	6.7 km, ESE	24.02.2021
SW9	Pond water at Kharial	5.4 km, E	24.02.2021
SW10	Pond water at Mollarber	5.7 km, NE	24.02.2021

FIGURE-3.11.1
SURFACE WATER SAMPLING LOCATIONS



Sample Code	Location	Direction & Distance from centre of project site (km)	Date of Sampling
GW1	Borewell water near Project Site	0.26 km, SE	24.02.2021
GW2	Tubewell water at Gayespur	5.2 km, SSE	24.02.2021
GW3	Borewell water at Tantipara	4.1 km, ESE	24.02.2021
GW4	Borewell at Jagannathpur	6.0 km, ENE	24.02.2021
GW5	Tubewell water at Chak Nanra	4.6 km, N	24.02.2021
GW6	Borewell at Jangalpara	6.5 km, NW	24.02.2021
GW7	Tubewell water at Chak Nanra	5.3 km, W	24.02.2021
GW8	Borewell at Metekhal	5.6 km, WSW	24.02.2021
GW9	Tubewell water at Chak Nanra	4.5 km, SW	24.02.2021

FIGURE-3.11.2
SURFACE WATER SAMPLING LOCATIONS

TABLE-3.11.2
GROUND WATER QUALITY

Sl.NO	Parameter	Unit	Concentrations (Code : GW_1 to GW_5)				
			GW_1	GW_2	GW_3	GW_4	GW_5
1	Colour	Hazen unit	<5	<5	<5	<5	<5
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.	Unobj.
3	Taste		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	<1	<1	<1	<1	<1
5	pH	-	7.27	7.15	6.91	7.35	7.54
6	Temperature	^{0} C	22.2	22.8	23.5	23.1	23.6
7	Conductivity	µS/cm	681	725	575	987	1096
8	Free Residual Chlorine (mg/L)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
9	Total Dissolved Solids	mg/L	403	449	343	581	651
10	Phenol (as C_6H_5OH)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
11	Total Hardness (as $CaCO_3$)	mg/L	174	182	165	231	269
12	Total Alkalinity (as $CaCO_3$)	mg/L	170	181	166	256	294
13	Chloride (as Cl)	mg/L	115	113	83	144	177
14	Sulphate (as SO_4)	mg/L	26	41	20	54	36
15	Nitrate (as NO_3)	mg/L	5.6	3.5	2.8	6.5	4.5
16	Fluoride (as F)	mg/L	0.27	0.42	0.21	0.18	0.24
17	Calcium (as Ca)	mg/L	52	58	45	69	64
18	Magnesium (as Mg)	mg/L	11	9	13	14	27
19	Ammonia (as Total NH_3-N)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
20	Boron (as B)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
21	Chromium (as Cr)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
22	Copper (as Cu)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
23	Manganese (as Mn)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
24	Zinc (as Zn)	mg/L	<0.05	0.08	0.12	<0.05	0.09
25	Cadmium (as Cd)	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
26	Iron (as Fe)	mg/L	0.24	0.27	0.23	0.23	0.19
27	Lead (as Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
28	Silver (as Ag)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
29	Nickel (as Ni)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
30	Arsenic (as As)	ppb	<2	<2	<2	<2	<2
31	Mercury (as Hg)	ppb	<1	<1	<1	<1	<1
32	Total Coliforms	MPN/100	N.D.	N.D.	N.D.	N.D.	N.D.

Unobj. – Unobjectional

CODE	LOCATION NAME
GW1	Pond water at near Project site
GW2	Pond water at Pairagachha
GW3	Lake water (Near Badyi Matar Mandir), Janai
GW4	Pond water at Palit Para
GW5	Pond water at Ramnathpur

TABLE-3.11.2 (Continued**)**
GROUND WATER QUALITY

Sl.NO	Parameter	Unit	Concentrations (Code : GW_6 to GW_9)			
			GW_6	GW_7	GW_8	GW_9
1	Colour	Hazen unit	<5	<5	<5	<5
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.
3	Taste		Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	<1	<1	<1	<1
5	pH	-	6.87	7.23	7.08	7.51
6	Temperature	^{0} C	22.5	21.7	23.2	21.7
7	Conductivity	µS/cm	864	687	529	1115
8	Free Residual Chlorine (mg/L)	mg/L	<0.1	<0.1	<0.1	<0.1
9	Total Dissolved Solids	mg/L	520	401	312	654
10	Phenol (as C_6H_5OH)	mg/L	<0.001	<0.001	<0.001	<0.001
11	Total Hardness (as $CaCO_3$)	mg/L	231	178	155	265
12	Total Alkalinity (as $CaCO_3$)	mg/L	238	192	170	279
13	Chloride (as Cl)	mg/L	146	106	73	188
14	Sulphate (as SO_4)	mg/L	29	18	14	36
15	Nitrate (as NO_3)	mg/L	5.6	3.5	2.9	4.5
16	Fluoride (as F)	mg/L	0.19	0.23	0.19	0.37
17	Calcium (as Ca)	mg/L	67	48	41	70
18	Magnesium (as Mg)	mg/L	16	14	13	22
19	Ammonia (as Total NH_3-N)	mg/L	<0.05	<0.05	<0.05	<0.05
20	Boron (as B)	mg/L	<0.02	<0.02	<0.02	<0.02
21	Chromium (as Cr)	mg/L	<0.05	<0.05	<0.05	<0.05
22	Copper (as Cu)	mg/L	<0.05	<0.05	<0.05	<0.05
23	Manganese (as Mn)	mg/L	<0.05	<0.05	<0.05	<0.05
24	Zinc (as Zn)	mg/L	<0.05	<0.05	0.09	0.08
25	Cadmium (as Cd)	mg/L	<0.003	<0.003	<0.003	<0.003
26	Iron (as Fe)	mg/L	0.35	0.24	0.42	0.42
27	Lead (as Pb)	mg/L	<0.01	<0.01	<0.01	<0.01
28	Silver (as Ag)	mg/L	<0.05	<0.05	<0.05	<0.05
29	Nickel (as Ni)	mg/L	<0.01	<0.01	<0.01	<0.01
30	Arsenic (as As)	ppb	<2	<2	<2	<2
31	Mercury (as Hg)	ppb	<1	<1	<1	<1
32	Total Coliforms	MPN/100	N.D.	N.D.	N.D.	N.D.

Unobj. – Unobjectional

CODE	LOCATION NAME
GW6	Borewell at Jangalpara
GW7	Tubewell water at Chak Nanra
GW8	Borewell at Metekhal
GW9	Tubewell water at Chak Nanra

TABLE-3.11.3
SURFACE WATER QUALITY

Sl.No.	Parameter	Unit	Concentrations (Code : SW_1 to SW_5)				
			SW_1	SW_2	SW_3	SW_4	SW_5
1	Colour	Hazen Unit	<5	<5	<5	<5	<5
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.	Unobj.
3	pH		7.16	7.29	7.21	7.36	7.32
4	Temperature	^{0} C	23.4	22.6	20.5	21.4	23.0
5	Conductivity	µS/cm	525	614	413	719	636
6	Dissolved Oxygen	mg/L	6.7	6.5	6.9	6.4	6.2
7	Chemical Oxygen Demand	mg/L	14	17	12	18	20
8	Biochemical Oxygen Demand (3 days at 27^0C)	mg/L	3	4	2	5	6
9	Total Coliforms	MPN/100 ml	730	920	550	1290	1480
10	Total Dissolved Solids	mg/L	304	360	235	415	389
11	Oil & Grease	mg/L	<1.4	<1.4	<1.4	<1.4	<1.4
12	Total Hardness (as $CaCO_3$)	mg/L	141	129	112	174	163
13	Total Alkalinity (as $CaCO_3$)	mg/L	149	136	106	160	156
14	Chloride (as Cl)	mg/L	90	135	77	129	123
15	Sulphate (as SO_4)	mg/L	8	10	7	31	21
16	Nitrate (as NO_3)	mg/L	3.5	5.8	4.2	3.9	4.5
17	Fluoride (as F)	mg/L	0.32	0.45	0.27	0.31	0.32
18	Calcium (as Ca)	mg/L	39	35	32	46	51
19	Magnessium (as Mg)	mg/L	10	10	8	14	9
20	Phenol (as C_6H_5OH)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
21	Copper (as Cu)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
22	Iron (as Fe)	mg/L	0.15	0.23	0.11	0.16	0.17
23	Manganese (as Mn)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
24	Zinc (as Zn)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
25	Boron (as B)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
26	Lead (as Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
27	Cadmium (as Cd)	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
28	Hexavalent Chromium (as Cr^{+6})	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
29	Arsenic (as As)	ppb	<2	<2	<2	<2	<2
30	Mercury (as Hg)	ppb	<1	<1	<1	<1	<1
31	Ammonia (as NH_3-N)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
32	Sodium Absorbance Ratio	-	10	16.9	8.9	14.6	13.7

Unobj. – Unobjectionable

CODE	LOCATION NAME
SW1	Pond water at near Project site
SW2	Pond water at Pairagachha
SW3	Lake water (Near Badyi Matar Mandir), Janai
SW4	Pond water at Palit Para
SW5	Pond water at Ramnathpur

TABLE-3.11.3 (Continued)
SURFACE WATER QUALITY

Sl.No.	Parameter	Unit	Concentrations (Code : SW_6 to SW_10)				
			SW_6	SW_7	SW_8	SW_9	SW_10
1	Colour	Hazen Unit	<5	<5	<5	<5	<5
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.	Unobj.
3	pH		7.18	7.42	7.23	7.21	7.14
4	Temperature	^{0} C	23.1	20.5	22.4	22.7	23.3
5	Conductivity	µS/cm	745	660	580	678	512
6	Dissolved Oxygen	mg/L	6.5	6.2	6.5	6.3	6.7
7	Chemical Oxygen Demand	mg/L	16	24	12	20	11
8	Biochemical Oxygen Demand(3 days at 27^{0}C	mg/L	4	7	3	4	2
9	Total Coliforms	MPN/100 ml	940	1690	740	990	600
10	Total Dissolved Solids	mg/L	428	381	328	395	297
11	Oil & Grease	mg/L	<1.4	<1.4	<1.4	<1.4	<1.4
12	Total Hardness (as $CaCO_3$)	mg/L	155	149	131	165	120
13	Total Alkalinity (as $CaCO_3$)	mg/L	149	134	126	155	117
14	Chloride (as Cl)	mg/L	137	112	102	131	96
15	Sulphate (as SO_4)	mg/L	36	41	22	17	14
16	Nitrate (as NO_3)	mg/L	2.8	4.5	3.6	2.9	2.6
17	Fluoride (as F)	mg/L	0.32	0.27	0.41	0.36	0.32
18	Calcium (as Ca)	mg/L	49	42	35	48	36
19	Magnessium (as Mg)	mg/L	8	11	10	11	7
20	Phenol (as C_6H_5OH)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
21	Copper (as Cu)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
22	Iron (as Fe)	mg/L	0.18	0.23	0.21	0.18	0.13
23	Manganese (as Mn)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
24	Zinc (as Zn)	mg/L	0.1	<0.05	<0.05	0.08	<0.05
25	Boron (as B)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
26	Lead (as Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
27	Cadmium (as Cd)	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003
28	Hexavalent Chromium (as Cr^{+6})	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
29	Arsenic (as As)	ppb	<2	<2	<2	<2	<2
30	Mercury (as Hg)	ppb	<1	<1	<1	<1	<1
31	Ammonia (as NH_3-N)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
32	Sodium Absorbance Ratio	-	16.9	15.7	13.6	13.8	12.9

Unobj. – Unobjectionable

CODE	LOCATION NAME
SW6	Canal water at Nonakundu
SW7	Pond water at Moira Para
SW8	Pond water at Jaypur Bil
SW9	Pond water at Kharial
SW10	Pond water at Mollarber

TABLE-3.11.4
SURFACE WATER QUALITY CRITERIA AS PER CPCB

Sl. No.	Parameters	Class A	Class B	Class C	Class D	Class E
1	pH	6.5–8.5	6.5–8.5	6.0–9.0	6.5–8.5	6.0–8.5
2	Dissolved Oxygen (as O_2), mg/l, min	6	5	4	4	-
3	BOD, 5 days at 20°C, max	2	3	3	-	-
4	Total Coliform organism, MPN/100 ml, max	50	500	5000	-	-
5	Free ammonia (as N), mg/l, max	-	-	-	1.2	-
6	Electrical Conductivity, µmhos/cm, max	-	-	-	-	2250
7	Sodium Absorption Ratio, max	-	-	-	-	26
8	Boron (as B), mg/l, max	-	-	-	-	2

Class A: Drinking water source without conventional treatment but after disinfection.
Class B: Outdoor bathing (organized).
Class C: Drinking water source after conventional treatment and after disinfection.
Class D: Propagation of Wild life and Fisheries.
Class E: Irrigation, Industrial Cooling, and Controlled Waste Disposal.
Below E: Not meeting A, B, C, D & E Criteria.

Designated Best Use Water Quality Criteria

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH betwwn 6.0 to 8.5 Electrical Conductivity at 25C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l

[Source: https://cpcb.nic.in/wqm/Designated_Best_Use_Water_Quality_Criteria.pdf]

CONCLUSION FROM SURFACE WATER ANALYSIS

As per CPCB norms of classification of surface water,

The Pond water quality (SW1, SW8 & SW10) parameters are within the standard for Class C except for BOD levels in case of SW2, SW4, SW5, SW7 and SW9 where the values are 4 mg/l, 5 mg/l, 6 mg/l, 7 mg/l and 4 mg/l respectively, which is more than the standard (3 mg/l). Hence, this water is suitable for "Propagation of Wildlife & Fisheries" (i.e., Class D) and "Irrigation, Industrial Cooling, and Controlled Waste Disposal" (i.e., Class E).

TABLE-3.11.5
IS 10500:2012 LIMITS

Sl. No.	Parameter	Unit	Acceptable Limit of IS:10500:2012	Permissible limit of IS:10500:2012
1	Colour	Hazen unit	5	15
2	Odour		Agreeable	Agreeable
3	Taste		Agreeable	Agreeable
4	Turbidity	NTU	1	5
5	pH	-	6.5 – 8.5	No relaxation
6	Temperature	^{0} C	-	-
7	Conductivity	µS/cm	-	-
8	Free Residual Chlorine	mg/L	0.2	1
9	Total Dissolved Solids	mg/L	500	2000
10	Phenol (as C_6H_5OH)	mg/L	0.001	No relaxation
11	Total Hardness (as $CaCO_3$)	mg/L	200	600
12	Total Alkalinity (as $CaCO_3$)	mg/L	200	600
13	Chloride (as Cl)	mg/L	250	1000
14	Sulphate (as SO_4)	mg/L	200	400
15	Nitrate (as NO_3)	mg/L	45	No relaxation
16	Fluoride (as F)	mg/L	1	1.5
17	Calcium (as Ca)	mg/L	75	200
18	Magnesium (as Mg)	mg/L	30	100
19	Ammonia (as Total NH_3-N)	mg/L	0.5	No relaxation
20	Boron (as B)	mg/L	0.5	2.4
21	Chromium (as Cr)	mg/L	0.05	No relaxation
22	Copper (as Cu)	mg/L	0.05	1.5
23	Manganese (as Mn)	mg/L	0.1	0.3
24	Zinc (as Zn)	mg/L	5	15
25	Cadmium (as Cd)	mg/L	0.003	No relaxation
26	Iron (as Fe)	mg/L	1	No relaxation
27	Lead (as Pb)	mg/L	0.01	No relaxation
28	Silver (as Ag)	mg/L	0.1	No relaxation
29	Nickel (as Ni)	mg/L	0.02	No relaxation
30	Arsenic (as As)	ppb	10	No relaxation
31	Mercury (as Hg)	ppb	1	No relaxation
32	Total Coliforms	MPN/	Shall not be	Shall not be

		100 ml	detectable in any 100 ml sample	detectable in any 100 ml sample

CONCLUSION FROM GROUND WATER SAMPLE ANALYSIS

Ground water physico-chemical properties in the study area showed that the water strata mainly from Bicarbonate buffer system has appreciable amount of alkalinity & Hardness. Calcium & Magnesium which are beneficial for human health are found satisfactory. The other parameters (i.e. Sulphate, Chloride etc.) fall within satisfactory level. While comparing with IS 10500:2012, it can be concluded that all ground water samples are within permissible limit & can be used as drinking water source.

The plant will be based on Zero Liquid Discharge (ZLD) Concept. Therefore, there will be no impact on any surface or ground water quality of the area.

3.12 NOISE

A total of Ten (10) locations within an area of 10 km radius around the project site have been selected for measurement of ambient noise levels. These locations have been displayed in **Table-3.12.1**.

3.12.1 MAJOR SOURCES OF NOISE IN THE STUDY AREA

The study area is of both industrial & residential in nature. Vehicular movement on the roads is a source of noise in those residential & industrial areas. This increases the ambient noise levels. There are also a number of other domestic noise sources such as television, radio, loud speakers, etc.

3.12.2 AMBIENT NOISE MONITORING

In the present study, a sound level meter has measured sound pressure levels. Since loudness of sound is important for its effects on people, the dependence of loudness on frequency must be taken into account in environmental noise assessment. This has been achieved by using A-weighting filters in the noise measuring instrument which gives a direct reading of approximate loudness. Moreover, A-weighted equivalent continuous sound pressure level (L_{eq}) values have been computed from the values of A-weighted sound pressure level (SPL) measured with the help of a noise meter.

A preliminary reconnaissance survey was undertaken to identify the major noise sources in the area. The sampling location in the area was identified considering location of industry, commercial shopping complex activities, residential areas with various traffic activity and sensitive areas like hospital, court, temple, schools etc.

At each location, readings were taken at uniform interval over a twenty-four hours period, divided into day and night shifts. For a particular location daytime L_{eq} has been computed from the SPL values measured between 6.00 A.M to 10.00 P.M and night time L_{eq} from the SPL values measured between 10.00 P.M to 6.00 A.M, such that comparison could be made with the National Ambient Noise Standards. Name of the locations with their latitude and longitude have been tabulated in **Table-3.12.1**. These locations are presented in **Figure-3.12.1**.

3.12.3 NOISE LEVELS IN THE STUDY AREA

The noise levels were monitored at 10 (Ten) locations. Monitoring was done, covering both day and night time. Noise levels in L_{eq} at the respective locations separately for Day and Night times have been presented in **Table-3.12.2**.

During the day time, the equivalent noise levels were found to vary in the range of (56.1 - 68.3) dB (A) while in the night time, the equivalent noise levels were observed to be varying in the range of (43.9 - 53.3) dB (A). The variation of noise level in day & night time is presented in **Figure-3.12.2**.

As usual, the day time noise levels were found to be higher than those, observed at night level.

TABLE-3.12.1
NOISE LEVEL MONITORING LOCATIONS

SL. NO.	CODE	LOCATIONS	LATITUDE	LONGITUDE	DISTANCE & DIRECTION FROM THE PROJECT SITE
1.	N-1	Project Site	22°41'38.22"N	88°15'10.83"E	-
2.	N-2	Kalpena Industrie's Dankuni	22°42'9.00"N	88°16'51.00"E	3.0 km, ENE
3.	N-3	India Dairy Products Limited	22°42'19.81"N	88°14'7.48"E	2.2 km, NW
4.	N-4	Kalachhara High School	22°42'0.08"N	88°14'50.09"E	0.86 km, NW
5.	N-5	Garalgacha Girls High School	22°40'47.86"N	88°16'8.20"E	2.3 km, SE
6.	N-6	Khanpur Sibtala (Shiv mandir)	22°40'21.94"N	88°15'34.98"E	2.5 km, SSE
7.	N-7	Janai Bazar	22°43'5.24"N	88°15'1.40"E	2.6 km, N
8.	N-8	Ramnathpur Village	22°41'5.44"N	88°13'58.12"E	2.3 km, WSW
9.	N-9	Pairagachha Village	22°42'31.85"N	88°15'38.32"E	1.8 km, NNE
10.	N-10	Naiti Village	22°41'51.71"N	88°16'2.70"E	1.5 km, ENE

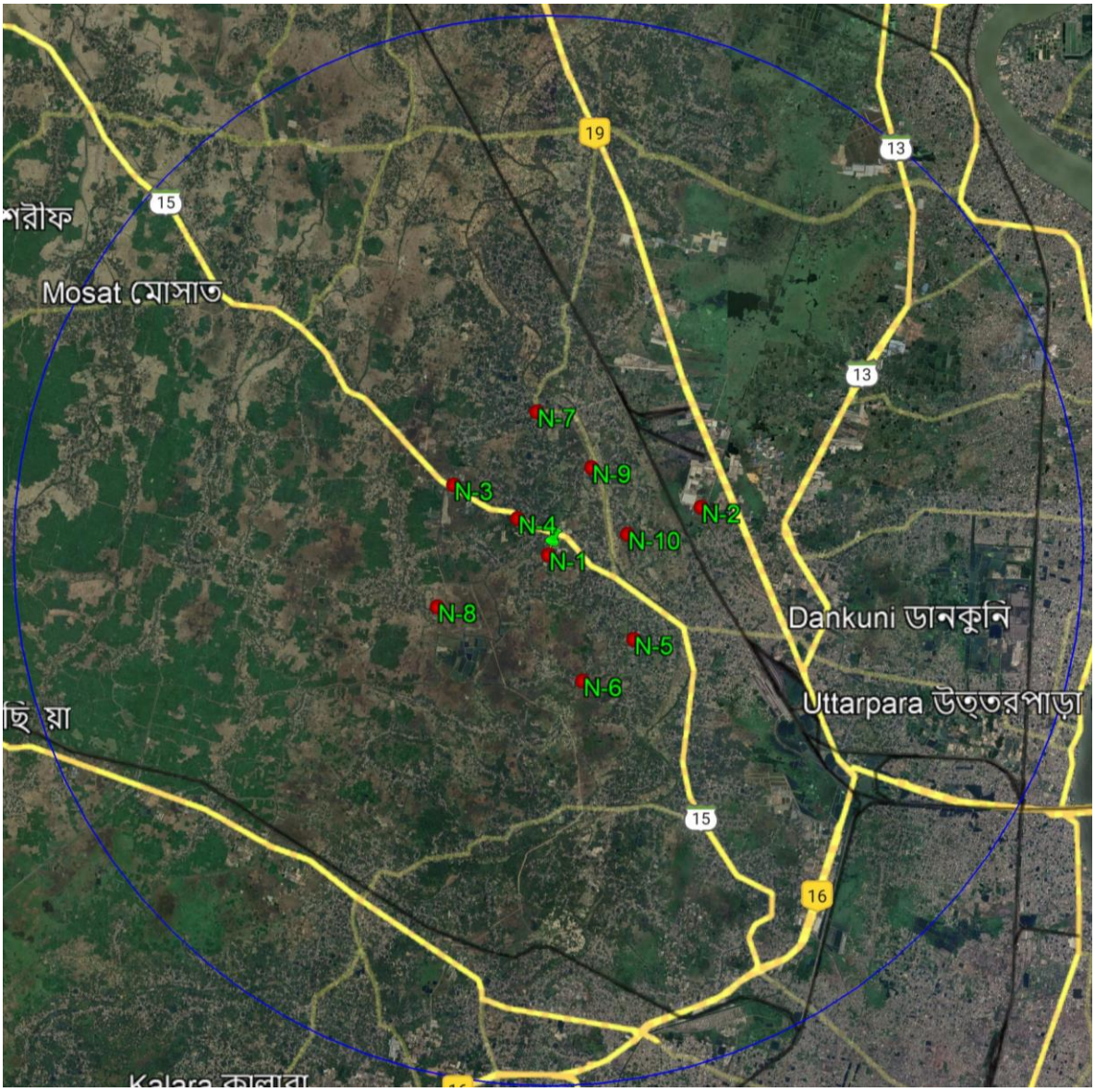


FIGURE-3.12.1
NOISE LEVEL MONITORING LOCATIONS IN THE STUDY AREA

CODE	LOCATIONS
N-1	Project Site
N-2	Kalpena Industrie's Dankuni
N-3	India Dairy Products Limited
N-4	Kalachhara High School
N-5	Garalgacha Girls High School
N-6	Khanpur Sibtala (Shiv mandir)
N-7	Janai Bazar

N-8	Ramnathpur Village
N-9	Pairagachha Village
N-10	Naiti Village

TABLE-3.12.2
EQUIVALENT NOISE LEVEL IN THE STUDY AREA, Leq in dB(A)

SL. NO.	LOCATIONS	EQUIVALENT NOISE LEVEL, L_{eq} in dB(A)		SECTOR
		DAY	NIGHT	
1.	Project Site	65.8	53.6	Industrial
2.	Kalpena Industrie's Dankuni	68.3	56.3	Industrial
3.	India Dairy Products Limited	65.1	54.7	Industrial
4.	Kalachhara High School	56.1	44.9	Silence
5.	Garalgacha Girls High School	57.8	43.9	Silence
6.	Khanpur Sibtala (Shiv mandir)	58.9	47.2	Silence
7.	Janai Bazar	65.5	48.7	Commercial
8.	Ramnathpur Village	62.3	45.8	Residential
9.	Pairagachha Village	61.6	46.3	Residential
10.	Naiti Village	63.1	45.4	Residential

N.B. Day time is reckoned between 0600 HOURS TO 2200 HOURS
Night Time is reckoned between 2200 HOURS TO 0600 HOURS

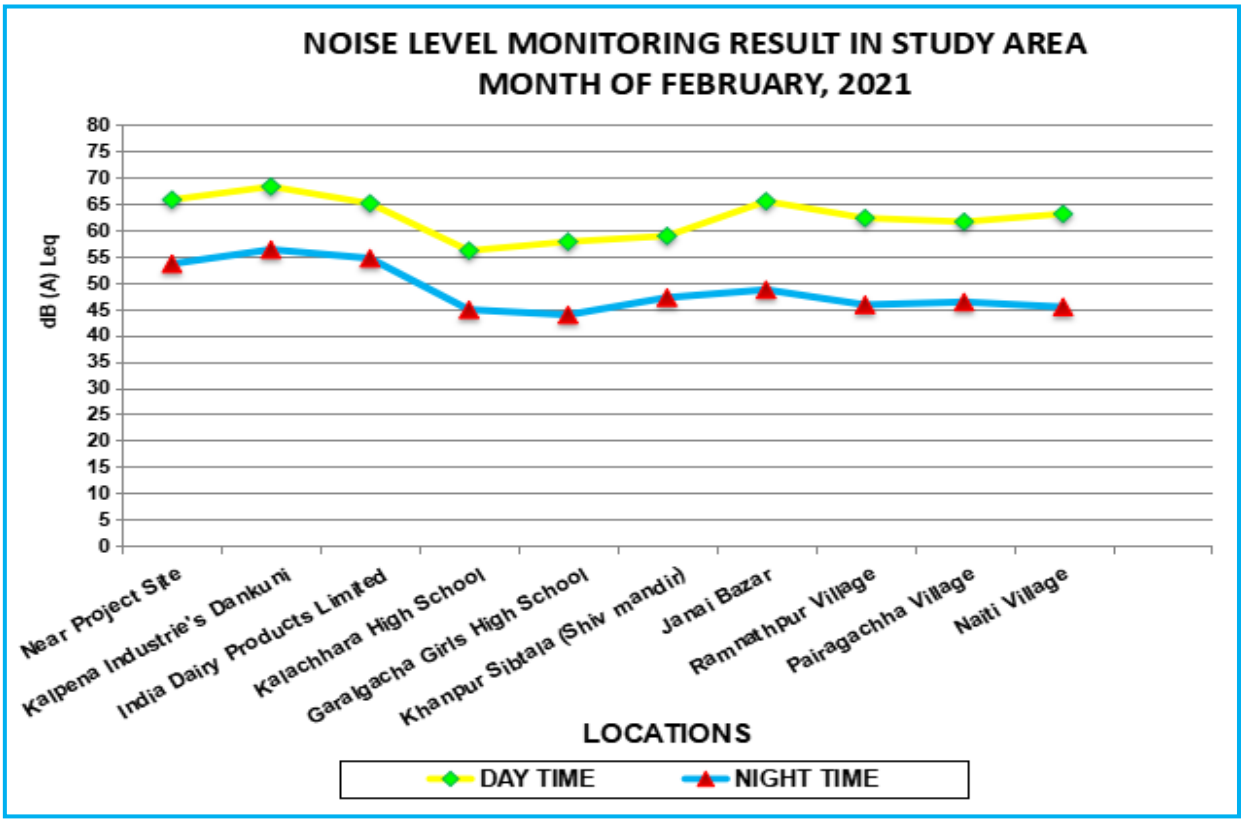


FIGURE: 3.12.2
GRAPHICAL REPRESENTATION OF THE NOISE LEVEL MONITORING RESULTS IN THE STUDY AREA

CONCLUSION OF NOISE LEVEL MONITORING:

The Equivalent Noise Levels in the Industrial locations are within permissible limits. However, the noise level has exceeded the permissible limits for Residential, Commercial and Sensitive locations in the study area. Such high noise levels may be attributed mainly to the noise, generated due to the vehicular traffic.

Trees and shurbs can make a contribution to noise reduction. The attenuation of sound by vegetation is commonly attributed to the processes of reflection, scattering and absorption. Reflection and scattering from the surfaces of leaves, branches, trunks and the ground can alter the phase of sound, which can cause interference in the sound waves and a reduction in noise level. The study area is rich in floral composition with much concentration of large and medium size trees which can effectively reduce noise level in the study area.

3.13 ECOLOGY

Field study was carried out during one season along with literature reviews / desk research to understand the ecological (both terrestrial and aquatic) condition of the study area. Biological environment assessment plays a significant role in environmental impact assessment for any development project. This type of assessment includes evaluation of both the terrestrial & aquatic ecology.

3.13.1 STUDY METHODOLOGY

Biological environment is a good bio-indicator of changing environmental quality. Reconnaissance survey was undertaken around the proposed project site. In the present survey 10 km radius area around the project site was considered as study area. Both terrestrial and aquatic ecological analysis was carried out in the field and in the laboratory. Assessment of flora and fauna was undertaken in the study area. The field study was undertaken during the month of January, 2019.

In addition to the field study, literature review/desk research was carried out to determine the existing conditions within the study area and to identify habitats and species of potential importance that may be affected by the Project.

The following parameters were primarily considered in the study.

- Assessment of present state of vegetation, flora and fauna in the study area.
- Collection of data from literature about the floral and faunal accounts
- Identification of rare endangered plants and animal species (if any).
- Identification of important plants/animal species having diverse economic values.

3.13.2 DESCRIPTION OF THE STUDY AREA

Ecological study was carried out considering the 10 km radius of the proposed project site. Sampling was done on random basis. Trees, shrubs, herbs and climbers, amphibians, reptiles, birds, mammals, fish etc. were considered separately and their distribution in the above mentioned study area was represented separately.

3.13.2.1 TERRESTRIAL ECOLOGY

The natural trees are combination of both deciduous and evergreen plants mixed with some exotic species.

TERRESTRIAL FLORA:

The natural vegetation of the area has been broadly noted with few natural vegetation and roadside social plantation and avenue trees in the villages. The bio-diversity of such naturally growing plant species would indicate environmental quality.

Vegetation of a particular area depends upon the interaction of various natural factors including plants, animals, micro-organisms of that particular area in which they live and influence one another.

Natural Trees:

The most common natural tree species found within the study area are Akashmoni (*Acacia auriculiformis*), Siris (*Albizia lebbeck*), Kadam (*Anthocephalus cadamba*), Kathal (*Artocarpus heterophyllus*), Neem (*Azadirachta indica*), Palm Tree (*Borassus flabellifer*), Amaltas (*Cassia fistula*), Radhachura (*Peltophorum pterocarpum*), Mahua (*Madhuca indica*), Devdaru (*Polyalthia longifolia*), Arjun (*Terminalia arjuna*), Eucalyptus (*Eucalyptus globules*), Mango (*Mangifera indica*) etc. Natural tree species was analyzed and calculated by Quadrat method at different places in the study area like inside and outside of the patchy area, just beside of the project site, roadside land, domestic land, small patchy area etc.

Natural tree species were analyzed and calculated by Quadrat method at different places in the study area like just beside of the project site, roadside land, domestic land, small patchy area, etc.

A checklist of natural tree species has been given in **Table-3.13.1** and composite Quadrat analysis & Biodiversity Index of those species have been calculated and tabulated in **Table-3.13.1 (A)** and **Table-3.13.1 (B)** respectively.

The following survey was undertaken in the study area during field trips:

(I) Forest/Vegetation composition analysis: Recording and its detail phyto-sociological analysis was done by the following quadrat (10m x 10 m) method.

The following parameters were primarily considered in the study and computed in the following way:

Frequency: The degree of dispersion of individual species in an area is called frequency. It is express as percentage occurrence.

$$\text{Frequency (f)} = \frac{\text{Number of quadrates in which a species occurs}}{\text{Total number of quadrates sampled}} \times 100$$

Abundance: This is the study of number of individual of different species in community per unit area.

$$\text{Abundance (A)} = \frac{\text{Total No. of individuals of a species in all quadrate}}{\text{Total number of quadrates in which the species occurs}}$$

Relative Abundance: It is the determination of the percentage of individual of one genera in composition to the total of all individual as a given area.

$$\text{Relative Abundance (A)} = \frac{\text{Total No. of individuals species in the sample}}{\text{Number of quadrat in which a species occurs}}$$

Density: It is the numerical strength of a species.

$$\text{Density (D)} = \frac{\text{Total No. of individuals of a species in all quadrates}}{\text{Total No. of quadrat sampled}}$$

(II) Species Diversity Index: species diversity in a biological community is based on presence of a wide variety of species.It is in expressed by **Shannon-Weiner Index** (1948) in the following way:

$$H = \sum_{i=1}^{s} -(Pi \times \ln Pi)$$

Where,

H = Species diversity index

S = the number of species in a sample

Pi = (ni/N)

N = the total number of individuals of all the species in a sample

ni = the number of individuals of a species.

Table-3.13.1
Checklist of most common terrestrial plants species in the study area

A. TREES :

Sl. No.	Scientific Name	Common Name	Family
1	*Acacia auriculiformis*	Akashmoni	Mimosaceae
2	*Acacia nilotica*	Babool	Mimosaceae
3	*Adina cordifolia*	Haldu	Rubiaceae
4	*Aegle marmelos*	Bel	Rutaceae
5	*Albizia lebbeck*	Siris	Mimosaceae
6	*Albizia procera*	White Siris	Mimosaceae
7	*Alstonia scholaris*	Chhatim	Apocynaceae
8	*Anthocephalus cadamba*	Kadam	Rubiaceae
9	*Annona reticulata*	Nona Aata	Annonaceae
10	*Areca catechu*	Supari	Arecaceae
11	*Artocarpus heterophyllus*	Kathal	Moraceae
12	*Azadirachta indica*	Neem	Meliaceae
13	*Bomax ceiba*	Simul	Bombacaceae
14	*Borassus flabellifer*	Palm Tree/ Taal	Arecaceae
15	*Butea monosperma*	Palash	Fabaceae
16	*Carica papaya*	Papaya/ Pepe	Caricaceae
17	*Cassia fistula*	Amaltas	Caesalpiniaceae
18	*Ceiba pentandra*	White silk cotton	Malvaceae
19	*Dalbergia sissoo*	Sissu	Fabaceae
20	*Delonix regia*	Gulmohor	Fabaceae
21	*Erythrina stricta var. suberosa*	Raktamandar	Fabaceae

22	*Eucalyptus globulus*	Eucalyptus	Myrtaceae
23	*Eugenia jambolana*	Kalajam	Myrtaceae
24	*Ficus benghalensis*	Banyan/ Bat	Moraceae
25	*Ficus hispida*	Fig/ Dumur	Moraceae
26	*Ficus religiosa*	Aswatha	Moraceae
27	*Gmelina arborea*	Gamhar	Verbenaceae
28	*Holarrhena antidysenterica*	Kurchi	Apocynaceae
29	*Lagerstroemia speciosa*	Jarul	Lythraceae
30	*Leucaena leucocephala*	Subabul	Fabaceae
31	*Madhuca Indica*	Mahua	Sapotaceae
32	*Mangifera indica*	Aam(Mango)	Anacardiaceae
33	*Moringa pterygosperma*	Sajina	Moringaceae
34	*Peltophorum pterocarpum*	Radhachura	Fabaceae
35	*Phoenix sylvestris*	Date Palm/ Khejur	Arecaceae
36	*Polyalthia longifolia*	Devdaru	Annonaceae
37	*Psidium guajava*	Guava/ Peara	Myrtaceae
38	*Schleichera oleosa*	Kusum	Sapindaceae
39	*Shorea robusta*	Sal	Dipterocarpaceae
40	*Spondias pinnata*	Amra	Anacardiaceae
41	*Swietenia mahagoni*	Indian Mahogany	Meliaceae
42	*Tamarindus indica*	Tamarind/ Tentul	Fabaceae
43	*Terminalia arjuna*	Arjun	Combretaceae
44	*Ziziphus mauritiana*	Jujube/ Kul	Rhamnaceae

TABLE - 3.13.1 (A)
QUANTITATIVE ASSESSMENT (BY QUADRAT METHOD) OF TREE SPECIES
(Note: Each column of Quadrat Number represents 1 Quadrat of 25m × 25mSize)

Sl. No.	Name of Natural Trees	Quadrat Number										Total	Freq-uency	Density	Abun-dance
		1	2	3	4	5	6	7	8	9	10				
1	*Acacia auriculiformis*	2		1								3	20	0.3	150.00
2	*Acacia nilotica*		1		1							2	20	0.2	100.00
3	*Adina cordifolia*	1		2								3	20	0.3	150.00
4	*Aegle marmelos*				2							2	10	0.2	200.00
5	*Albizia lebbeck*	1	2									3	20	0.3	150.00
6	*Albizia procera*	2		1								3	20	0.3	150.00
7	*Alstonia scholaris*		1		1							2	20	0.2	100.00
8	*Anthocephalus cadamba*		2		1							3	20	0.3	150.00
9	*Annona reticulata*			2								2	10	0.2	200.00
10	*Areca catechu*						2			2		4	20	0.4	200.00
11	*Artocarpus heterophyllus*					2	2					4	20	0.4	200.00
12	*Azadirachta indica*							1	2			3	20	0.3	150.00
13	*Bomax ceiba*					1		1				2	20	0.2	100.00
14	*Borassus flabellifer*							3	1			4	20	0.4	200.00
15	*Butea monosperma*	2				1						3	20	0.3	150.00
16	*Carica papaya*								2	2		4	20	0.4	200.00
17	*Cassia fistula*					1	3					4	20	0.4	200.00
18	*Ceiba pentandra*					2	1					3	20	0.3	150.00
19	*Dalbergia sissoo*	1	3									4	20	0.4	200.00
20	*Delonix regia*			2	1							3	20	0.3	150.00
21	*Erythrina stricta var. suberosa*	2			1							3	20	0.3	150.00
22	*Eucalyptus globulus*						3	2				5	20	0.5	250.00
23	*Eugenia jambolana*									1	2	3	20	0.3	150.00
24	*Ficus benghalensis*								2			2	10	0.2	200.00
25	*Ficus hispida*				1			1				2	20	0.2	100.00
26	*Ficus religiosa*				1	1						2	20	0.2	100.00
27	*Gmelina arborea*	1		2								3	20	0.3	150.00
28	*Holarrhena antidysenterica*		1		1							2	20	0.2	100.00
29	*Lagerstroemia speciosa*					2	1					3	20	0.3	150.00
30	*Leucaena leucocephala*	1					2					3	20	0.3	150.00
31	*Madhuca Indica*		2	1								3	20	0.3	150.00
32	*Mangifera indica*	1								3	2	6	30	0.6	200.00
33	*Moringa pterygosperma*									1	3	4	20	0.4	200.00
34	*Peltophorum pterocarpum*						1	3				4	20	0.4	200.00
35	*Phoenix sylvestris*				2				2			4	20	0.4	200.00
36	*Polyalthia longifolia*	2	1									3	20	0.3	150.00
37	*Psidium guajava*								1	2		3	20	0.3	150.00
38	*Schleichera oleosa*		1	2		1						4	30	0.4	133.33
39	*Shorea robusta*		1	1		1						3	30	0.3	100.00
40	*Spondias pinnata*	1			1							2	20	0.2	100.00
41	*Swietenia mahagoni*				2				1			3	20	0.3	150.00
42	*Tamarindus indica*								2		2	4	20	0.4	200.00
43	*Terminalia arjuna*		1			2						3	20	0.3	150.00
44	*Ziziphus mauritiana*							1			1	2	20	0.2	100.00
Total		**17**	**16**	**14**	**15**	**14**	**15**	**12**	**13**	**11**	**10**	**137**	**880**	**16.3**	**6933.3**

TABLE – 3.13.1 (B)
BIODIVERSITY INDEX OF TREE SPECIES

Sl. No.	Name of Species	Total No. (ni)	Pi = (ni/N)	Shannon Index (Pi×lnPi)
1	*Acacia auriculiformis*	3	0.02	0.08
2	*Acacia nilotica*	2	0.01	0.06
3	*Adina cordifolia*	3	0.02	0.08
4	*Aegle marmelos*	2	0.01	0.06
5	*Albizia lebbeck*	3	0.02	0.08
6	*Albizia procera*	3	0.02	0.08
7	*Alstonia scholaris*	2	0.01	0.06
8	*Anthocephalus cadamba*	3	0.02	0.08
9	*Annona reticulata*	2	0.01	0.06
10	*Areca catechu*	4	0.03	0.10
11	*Artocarpus heterophyllus*	4	0.03	0.10
12	*Azadirachta indica*	3	0.02	0.08
13	*Bomax ceiba*	2	0.01	0.06
14	*Borassus flabellifer*	4	0.03	0.10
15	*Butea monosperma*	3	0.02	0.08
16	*Carica papaya*	4	0.03	0.10
17	*Cassia fistula*	4	0.03	0.10
18	*Ceiba pentandra*	3	0.02	0.08
19	*Dalbergia sissoo*	4	0.03	0.10
20	*Delonix regia*	3	0.02	0.08
21	*Erythrina stricta var. suberosa*	3	0.02	0.08
22	*Eucalyptus globulus*	5	0.04	0.12
23	*Eugenia jambolana*	3	0.02	0.08
24	*Ficus benghalensis*	2	0.01	0.06
25	*Ficus hispida*	2	0.01	0.06
26	*Ficus religiosa*	2	0.01	0.06
27	*Gmelina arborea*	3	0.02	0.08
28	*Holarrhena antidysenterica*	2	0.01	0.06
29	*Lagerstroemia speciosa*	3	0.02	0.08
30	*Leucaena leucocephala*	3	0.02	0.08
31	*Madhuca Indica*	3	0.02	0.08
32	*Mangifera indica*	6	0.04	0.14
33	*Moringa pterygosperma*	4	0.03	0.10
34	*Peltophorum pterocarpum*	4	0.03	0.10
35	*Phoenix sylvestris*	4	0.03	0.10
36	*Polyalthia longifolia*	3	0.02	0.08
37	*Psidium guajava*	3	0.02	0.08
38	*Schleichera oleosa*	4	0.03	0.10
39	*Shorea robusta*	3	0.02	0.08
40	*Spondias pinnata*	2	0.01	0.06
41	*Swietenia mahagoni*	3	0.02	0.08
42	*Tamarindus indica*	4	0.03	0.10
43	*Terminalia arjuna*	3	0.02	0.08
44	*Ziziphus mauritiana*	2	0.01	0.06
Total (N)		**137**	**1.00**	**3.75**
BIODIVERSITY INDEX: Shannon-Weiner Index = 3.75				

The biodiversity value of the studied ecosystem obtained was 3.75. This signifies positive ecological health of the site.

Shrubs, Herbs & Climbers:

The shrubs like Adhatoda vasica, Blumea lacera, Grewia hirsuta, Mimosa pudica etc. dominate this area.

Some of the species of shrubs, herbs, climbers and ferns recorded during field investigation have been listed in **Tables-3.13.2.**

Table-3.13.2
Checklist of Shrubs, herbs and climbers in the study area

Sl. No.	Scientific Name	Common Name	Family
SHRUBS & HERBS			
1	*Abutilon indicum*	Potari	Malvaceae
2	*Achyranthes aspera*	Latjira	Amaranthaceae
3	*Adhatoda vasica*	Basak	Acanthaceae
4	*Ageratum conyzoides*	Uchunti	Asteraceae
5	*Amaranthus viridis*	Kata Note	Amaranthaceae
6	*Amorphophallus paeoniifolius*	Oal/Gandira	Araceae
7	*Andrographis paniculata*	Kalmegh	Acanthaceae
8	*Bambusa bambos*	Bamboo/ Baans	Poaceae
9	*Blumea lacera*	Kukurmuta/ Kakronda	Asteraceae
10	*Bryophyllum pinnatum*	Patharkuchi	Crassulaceae
11	*Calotropis gigantea*	Akanda	Apocynaceae
12	*Catharanthus roseus*	Nayantara	Apocynaceae
13	*Centella asiatica*	Thankuni	Apiaceae
14	*Cestrum diurnum*	Day jasmine	Solanaceae
15	*Clerodendrum infortunatum*	Ghentu	Verbenaceae
16	*Clitoria ternatea*	Aparajita	Fabaceae
17	*Coccinia grandis*	Telakucha	Cucurbitaceae
18	*Commelina benghalensis*	Bengal Dayflower/ Kanchira	Commelinaceae
19	*Cynodon dactylon*	Doobghas	Poaceae
20	*Datura metel*	Dhutura	Solanaceae
21	*Dentella repens*	Creeping Dentella	Rubiaceae
22	*Dryopteris filixmas*	Fern	Dryopteridaceae
23	*Euphorbia neriifolia*	Mansa	Euphorbiaceae
24	*Grangea maderaspatana*	Namuti	Asteraceae
25	*Grewia hirsuta*	Kukurbicha	Tiliaceae
26	*Hibiscus rosa sinensis*	Joba	Malvaceae
27	*Leucas aspera*	Swet Dron/ Ghal ghase	Lamiaceae
28	*Mikania scandens*	Climbing Hempweed	Asteraceae
29	*Mimosa pudica*	Lajjabati	Fabaceae
30	*Musa paradisiaca*	Kachkola	Musaceae
31	*Nerium oleander*	Raktakarabi	Apocynaceae
32	*Ocimum basilicum*	Bantulsi	Lamiaceae
33	*Ocimum sanctum*	Tulshi	Lamiaceae
34	*Parthenium hysterophorus*	Parthenium	Asteraceae
35	*Solanum surattense*	Kanta Begun	Solanaceae
36	*Tragia involucrata*	Bichuti	Euphorbiaceae
37	*Vitex negundo*	Nishinda	Verbenaceae
CLIMBERS			
1	*Abrus precatorius*	Gunch	Fabaceae

2	*Asparagus racemosus*	Shatamuli	Asparagaceae
3	*Bougainvillea spectabilis*	Baganbilas	Nyctaginaceae
4	*Gymnema sylvestre*	Gurmar/ Chhota-dudhilata	Asclepiadaceae
5	*Ichnocarpus frutescens*	Kalidudhi	Apocynaceae
6	*Luffa aegyptiaca*	Purul gach	Cucurbitaceae
7	*Paederia scandens*	Gandal	Rubiaceae
8	*Tinospora cordifolia*	Nimgilo/ Gulancha	Menispermaceae

TABLE-3.13.3
LIST OF AGRICULTURAL SPECIES IN THE STUDY AREA

Sl. No.	Common Name	scientific Name
CEREALS		
1	Rice	*Oryza sativa*
2	Wheat	*Triticum* aestivum
3	Maize	*Zea mays*
PULSES		
1	Pea	*Pisum sativum*
2	Mung bean/ Greengram	*Vigna radiata*
3	Groundnut	*Arachis hypogaea*
4	Cowpea/ Badbati	*Vigna unguiculata*
5	Pigeon pea	*Cajanus cajan*
OILSEEDS		
1	Mustard Seed	*Brassica nigra*
2	Sesame/ Til	*Sesamum indicum*
VEGETABLES		
1	Potato	*Solanum tuberosum*
2	Brinjal	*Solanum melongena*
3	Cucurbits	*Cucurbita maxima*
4	Cucumber	*Cucumis melo*
5	Ladies finger	*Abelmoschus esculentus*
6	Cabbage	*Brassica oleracea var. capitata*
7	Cauliflower	*Brassica oleracea var. botrytis*
8	Tomato	*Solanum lycopersicum*
9	Radish	*Raphanus sativus*
10	Carrot	*Daucus carota sativus*
11	Chilli	*Capsicum frutescens*
12	Onion	*Allium cepa*
13	Spinach	*Spinacia oleracea*
14	Bitter Gourd	*Momordica charantia*
FRUITS		
1	Mango	*Mangifera indica*
2	Jaam	*Syzygium cumini*
3	Date Palm/ Khejur	*Phoenix sylvestris*
4	Banana	*Musa sapientum*
5	Papaya	*Carica papaya*
6	Guava	*Psidium guajava*
7	Jack fruit	*Artocarpus heterophyllus*
OTHER CROPS		
1	White Jute	*Corchorus capsularis*
2	Tossa jute	*Corchorus olitorius*

Terrestrial Fauna

Since there is no eco-sensitive zone like National Park, Wildlife Sanctuary, Reserve Forest etc. in the study area, wild animals in the study area are very rare. Only a few wild animals like Fox, Common Langur etc could be observed in the study area occasionally.

Survey of terrestrial fauna reveals that in general there has been no impact of pollution on fauna. Destructive habits of human population are the only reason for the declining numbers of animals.

During the present investigation, species were examined include mammals, birds, reptiles and amphibians. A total of 13 species of mammals, 21 species of birds, 12 species of reptiles and 4 species of amphibians were observed during the study and have been presented in **Table-3.13.4** according to their schedule number of The Wildlife (Protection) Act, 1972.

TABLE-3.13.4
CHECKLIST OF FAUNAL SPECIES IN THE STUDY AREA

Sl. No.	Common Name	Scientific Name	Family	Schedule of Wildlife (Protection) Act, 1972
a) Mammals				
1	Fox	*Canis aureus*	Canidae	II
2	Common Langur	*Presbytis entellus*	Cercopithecidae	II
3	House rat	*Rattus rattus*	Muridae	V
4	House Mouse	*Mus musculus*	Muridae	V
5	Indian mole rat	*Bandicota bengalensis*	Muridae	V
6	Indian Shrew	*Suncus murinus*	Soricidae	V
7	Domestic Cat	*Felis domesticus*	Felidae	II
8	Fruit bat	*Rousettus Leschenaulti*	Pteropodidae	V
9	Chamchika	*Pipistrellus coromandra*	Vespertilionidae	V
10	Indian Street Dog	*Canis lupus familiaris*	Canidae	II
11	Indian grey Mongoose	*Herpestes edwardsii*	Herpestidae	II
12	Three stripped squirrel	*Funambulus palmarum*	Sciuridae	IV
13	Five-striped palm squirrel	*Funambulus pennantii*	Sciuridae	IV
b) Birds				
1	House Crow	*Corvus splendens*	Corvidae	V
2	Koel	*Eudynamys scolopacea*	Cuculidae	IV
3	Pigeon	*Columba livia*	Columbidae	IV
4	Sparrow	*Passer domesticus indicus*	Passeridae	IV
5	Parrot	*Psittacula krameri*	Psittaculidae	IV
6	Myna	*Acridotheres tristis*	Sturnidae	IV
7	Spotted owl	*Athene brama*	Strigidae	IV
8	Common Kingfisher	*Alcedo atthis*	Alcedinidae	IV
9	Cattle Egret	*Bubulcus ibis*	Ardeidae	IV
10	Pond Heron	*Ardeola grayii*	Ardeidae	IV

11	Oriental turtle dove	*Streptopelia orientalis*	Corvidae	IV
12	Spotted Dove	*Spilopelia chinensis*	Corvidae	IV
13	Little spiderhunter	*Arachnothera longirostra*	Nectariniidae	IV
14	Purple heron	*Ardea purpurea*	Ardeidae	IV
15	Little egret	*Egretta garzetta*	Ardeidae	IV
16	Indian roller	*Coracias benghalensis*	Coraciidae	IV
17	Common tailorbird	*Orthotomus sutorius*	Cisticolidae	IV
18	White-throated kingfisher	*Halcyon smyrnensis*	Halcyonidae	IV
19	Brahminy kite	*Haliastur indus*	Accipitridae	IV
20	Night Heron	*Nycticorax nycticorax*	Ardeidae	IV
21	Brown shrike	*Lanius cristatus*	Laniidae	IV
c) Reptiles				
1	House gecko	*Hemidactylus flaviviridis*	Gekkonidae	II
2	Brook's gecko	*Hemidactylus brookii*	Gekkonidae	II
3	Common Garden lizard	*Calotes versicolor* (Daudin)	Agamidae	II
4	Common or Brahminy skink	*Mabuya carinata*	Scincidae	II
5	Blind Snake	*Typhlops acutus*	Typhlopidae	IV
6	Checkered keelback	*Xenochrophis piscator*	Colubridae	II
7	Rainbow water snake	*Enhydris enhydris*	Colubridae	II
8	Striped Keelback	*Amphiesma stolatum*	Colubridae	II
9	Bronze back tree snake	*Dendrelaphis tristis*	Colubridae	II
10	Indian Krait	*Bungarus caeruleus*	Elapidae	IV
11	Russell's viper	*Vipera russelii*	Viperidae	II
12	Indian Rat Snake	*Ptyas mucosa*	Colubridae	II
d) Amphibians				
1	Indian bull frog	*Rana tigrina*	Dicroglossidae	IV
2	Common Indian toad	*Bufo melanostictus*	Bufonidae	IV
3	Tree Frog	*Hyla sp.*	Hylidae	IV
4	Indian green frog	*Euphlyctis hexadactylus*	Dicroglossidae	IV

3.13.3 AQUATIC ECOLOGY

The study area has a major river, i.e., Hooghly River; several big and small ponds, canals, jheels, beels, tanks, ditches etc which form the ecology of aquatic environment. So, the richness and diversity of aquatic flora and fauna is enough in the study area. The major forms of aquatic biota as recorded during the survey are as follows:

- Macro-phytic flora,
- Planktons, and
- Fishes.

MACRO-PHYTIC FLORA:

There are a number of vegetations found in various water bodies like ponds, canals, beels, Jheels, ditches etc including Hooghly River. All such water bodies are more or less vegetated by different aquatic macrophytic flora and marshy plants in the study area. The details of

aquatic macrophytic flora and marshy plants have been summarized in **Table-3.13.5.**

TABLE-3.13.5
CHECKLIST OF AQUATIC MACROPHYTES & MARSHY PLANTS

Sl. No.	Scientific Name	Common Name	Family
1	*Alternanthera philoxeroides*	Alligatorweed	Amaranthaceae
2	*Azolla pinnata*	Water velvet	Azollaceae
3	*Colocasia esculenta*	Green Taro	Araceae
4	*Eichhornia crassipes*	Common water hyacinth	Pontederiaceae
5	*Enhydra fluctuans Lour*	Helencha/ Hingcha	Asteraceae
6	*Hygrophila spinosa*	Kulekhara	Acanthaceae
7	*Ipomoea aquatica*	Kalmi	Convolvulaceae
8	*Ludwigia adscendens*	Keshardam	Onagraceae
9	*Lemna perpusilla*	Minute Duckweed	Araceae
10	*Marsilea quadrifolia*	Susni	Marsileaceae
11	*Monochoria hastata*	Leaf Pondweed	Pontederiaceae
12	*Nymphaea nouchali*	Blue water lily	Nymphaeaceae
13	*Oxalis corniculata*	Amrulshak	Oxalidaceae
14	*Pistia stratiotes*	Water Cabbage	Araceae
15	*Spirodela polyrhiza*	Common duckweed	Araceae
16	*Salvinia natans*	Floating watermoss	Salviniaceae
17	*Trapa bispinosa*	Water Chestnut	Trapaceae

PLANKTONS

The phytoplanktons are the primary producers and form the base of the food chain. The zooplanktons are the secondary producers and they feed on phytoplanktons. A study of the density, composition, and species diversity of these two organisms gives an idea about the nutrient content, trophic condition of the total aquatic ecosystem and the quality of the water.

Phytoplanktons:

Phytoplankton is the primary producers of an ecosystem and thus helps maintain DO of a water body. Any reduction in number of phytoplankton would ultimately affect the whole ecosystem. Some major phytoplanktons which are found in aquatic ecosystem of the study area are *Euglena sp.*, *Microcystis sp.*, *Diatoma sp.*, *Spirogyra sp.*, *Oedogonium sp.*, *Zygnema sp.*, *Closterium sp.* etc. **(Table-3.13.6)**.

Zooplanktons:

Zooplanktons are animals that occur in the water column of either marine or freshwater ecosystems. Zooplanktons are an important link in the transfer of energy from the algae (the primary producers) to the

ecologically and economically important fish community (the consumers).

In the aquatic ecosystem of the study area most species in the small zooplankton community fall into three major groups - Crustacea, Rotifers, and Protozoans. Crustaceans are generally the most abundant, especially those in the order Cladocera (waterfleas), and the class Copepoda (the copepods), particularly the orders Calanoida and Cyclopoida. Cladocerans are typically most abundant in freshwater, with common genera including *Daphnia* sp. and *Bosmina sp*. The pollution indicator species like *Brachinous calciflores*, *Filinia terminalis* and *Keratella toopica* etc. **(Table-3.13.6)**.

TABLE-3.11.6
CHECKLIST OF PLANKTON SPECIES IN THE STUDY AREA

Sl. No.	PHYTOPLANKTON	ZOOPLANKTON
1	*Microcystis sp.*	*Brachionus sp.*
2	*Euglena sp.*	*Daphnia sp.*
3	*Diatoma sp.*	*Cyclops sp.*
4	*Achnanthes sp.*	*Diaptomus sp.*
5	*Zygnema sp.*	*Moina sp.*
6	*Spirogyra sp.*	*Cypris sp.*
7	*Oscillatoria sp.*	*Keratella sp.*
8	*Scenedesmus sp.*	*Mysis sp.*
9	*Cymbella sp.*	*Diaptomus sp.*
10	*Closterium sp.*	*Filinia terminalis*
11	*Oedogonium sp.*	-

FISHES:

Fishes are at the tertiary level of the food chain of aquatic ecology. As the study area having many inland water bodies like several ponds, canals, jheels, beels, ditches and the most important river Hooghly, so the biodiversity of fishes is rich. Types of freshwater fishes of both confined and unconfined (flowing) surface water bodies in the study area were known by talking with local fishermen and local people and have been summarized in **Table-3.13.7**.

TABLE-3.13.7
CHECKLIST OF FISH SPECIES IN THE STUDY AREA

CHECKLIST OF FISHES IN THE STUDY AREA			
Sl. No.	**Scientific Name**	**Common Name**	**Family**
1	*Amblypharyngodon mola*	Morala	Cyprinidae
2	*Catla catla*	Catla	Cyprinidae
3	*Cirrhina mrigala*	Mrigal	Cyprinidae
4	*Ctenopharyngodon idella*	Grass carp	Cyprinidae
5	*Cyprinus carpio*	Common carp	Cyprinidae
6	*Esomus danricus*	Dadhikha	Cyprinidae
7	*Hypopthalmicthys molitrix*	Silver carp	Cyprinidae
8	*Hypopthalmicthys nobilis*	Bighead carp	Cyprinidae
9	*Labeo bata*	Bata	Cyprinidae
10	*Labeo Calbasu*	Calbasu	Cyprinidae
11	*Labeo rohita*	Rohu	Cyprinidae
12	*Puntius chola*	Punti	Cyprinidae
13	*Puntius sarana*	Swarna punti	Cyprinidae
14	*Puntius ticto*	Teto Punti	Cyprinidae
15	*Rasbora daniconius*	Dankuni	Cyprinidae
16	*Salmostoma sardinella*	Chela	Cyprinidae
17	*Channam arulius*	Shal	Channidae
18	*Channa orientalis*	Chang	Channidae
19	*Channa punctatus*	Leta	Channidae
20	*Channa striatus*	Shol	Channidae
21	*Chanda nama*	Chanda	Chandidae
22	*Chanda ranga*	Chanda	Chandidae
23	*Clarius batrachus*	Magur	Clariidae
24	*Clarias gariepinus*	Thai magur	Clariidae
25	*Pangasius sutchi*	Pangus	Clariidae
26	*Mystus menoda*	Aarr	Bagridae
27	*Mystus tengara*	Tengra	Bagridae
28	*Mystus vittatus*	Bitengra	Bagridae
29	*Notopterus chitala*	Chital	Notopteridae
30	*Notopterus notopterus*	Falui	Notopteridae
31	*Heteropneustes fossilis*	Singi	Heteropneustidae
32	*Wallago attu*	Boal	Siliridae
33	*Monopterus cuchia*	Ban	Symbranchidae
34	*Anabas testudineus*	Koi	Anabantidae
35	*Colisa fasciata*	Khalsha	Belontidae
36	*Glossogobius giuris*	Beley	Gobiidae
37	*Nandus nandus*	Bheda	Nandidae
38	*Oreochromis sp.*	Tilapia	Cichlidae
39	*Rhinomugil corsula*	Kharsula	Mugilidae
40	*Mastacembelus aculeatus*	Pakal	Mastacembelidae

Overall Conclusion:

The observations reflected good vegetation within 10 km radius around the project site. The terrestrial and aquatic ecological scenario constitutes various types of trees, bamboos, herbs, climbers, insects, amphibians, reptiles, birds, mammals, fish, etc. Altogether 44 species of trees, 45 species of climbers, herbs and shrubs indicate a diversified vegetation. Similarly, the faunal communities of the area are also fairly rich. The study area has river, canals, beels, ponds and several other categories of water bodies, so the richness and diversity of aquatic flora and fauna is also high. A good number of birds (21 species) were also observed which is due to good vegetation cover and open fields in the area. Thus, the study area is ecologically fairly rich & diverse (Shannon-Weiner index - 3.75).

3.14 DEMOGRAPHY & SOCIO-ECONOMIC STATUS

3.14.1 GENERAL DESCRIPTION

The growth of industrial sectors and infrastructure development in and around the agriculture dominant areas, village and towns is bound to create its impact on the socio-economic aspects of the local population of the area experiencing development. The impacts may be positive or negative depending upon the development activity. To assess the anticipated impacts of the project and industrial growth on the socio-economic aspects of people, it is necessary to study the existing socio-economic status of the local population, which will be helpful for making efforts to further improve the quality of life in the area under study.

The sociological aspects of this study include human settlements, demography, and social strata such as Scheduled Castes and Scheduled Tribes and literacy levels besides infrastructure facilities available in the study area. The economic aspects include occupational structure of workers.

The Baseline Demographic and Socio economic characteristics with regards to demography, literacy and occupational status have been described based on the Primary Census Abstract, 2011. The proposed expansion project site is located at Village: Kalachhara, P.O & PS:.Dankuni District Hooghly in the state of West Bengal. The 10 km radius study area around the proposed project site comprises of 71 villages and (39) Census towns and Dankuni Municipal Corporation. A comparative assessment has been made for the respective demographic aspects, based on the year 2011 Census data, which has been discussed in the following sections.

The study area is rural-urban mixed in nature and highly populated with the total population of 7,65,965 (as per 2011 Census). Scheduled Caste (SC) and Scheduled Tribe (ST) population in the study area is about 16.44% and 0.58% w.r.t. the total population respectively. The sex ratio in the study area is about 964 females per 1000 males. The overall literacy rate is about 77.7% w.r.t. total population. The principal language is Bengali and the principal staple food is rice. The primary sources of drinking water are tube wells, Hand pump water in rural areas and tube wells, Hand pump and Supply water in urban areas.

3.14.2 DEMOGRAPHIC ASPECTS

3.14.2.1 Average Household Size:

The Study area has an average family size of around 4.21 persons per household. This is considered to be the average family size in West Bengal.

3.14.2.2 Overall population density and family size:

As per 2011 census, the total population in the study area is 7,65,965. According to this population in the study area Population Density is approximately 2439 persons per square kilometer. Total population, population density & family size have been shown below in **Table-3.14.1**.

TABLE-3.14.1
OVERALL POPULATION DENSITY AND FAMILY SIZE

Sl. No.	Particulars	Number
1	No. of Household	182117
2	Population Density	2439 Nos./sq.km
3	Family Size	4.21
4	Male Population	389941
5	Female Population	376024
6	**Total Population**	**765965**

Source: Census of India, 2011

3.14.2.3 Sex Ratio:

According to 2011 census, the sex ratio (female per 1000 male) in the rural segment of the study area is 983 and in the urban segment of the study area is 959. As a whole sex ratio of the study area is 964. Segment-wise sex Ratio of the study area is tabulated in **Table-3.14.2**.

TABLE-3.14.2
SEX RATIO OF THE STUDY AREA

Sl. No.	Segment of the area	Females per 1000 males
1	Rural	983
2	Urban	959
3	**Whole**	**964**

Source: Census of India, 2011

3.14.2.4 Population structure:

As per 2011 census total rural population within the study area is 1,60,806 having 50.42% of male and 49.58% of female population. In comparison with rural population, total urban population within the

study area is 6,05,159 with male and female population is 51.04% & 48.96% respectively. As a whole total population within the study area is 7,65,965 with total male and total female population is 50.91% & 49.09% respectively. The above table reveals that only about 21.0% of the total population within the study area belongs to the rural area. Population structure of the study area is tabulated in **Table-3.14.3**.

TABLE-3.14.3
POPULATION STRUCTURE OF THE STUDY AREA

Sl. No.	Segment of the area	Male	Female	Total
1	81073	79733	160806	81073
2	308868	296291	605159	308868
3	**389941**	**376024**	**765965**	**389941**

Source: Census of India, 2011

3.14.2.5 Social Structure:

As per 2011 census, the Scheduled caste (SC) population in the rural sector of the study area is 24.98% of the total rural population, which is quite higher than the urban sector of the study area, which is 14.18% of the total urban population. As a whole, SC population is 16.44% w.r.t. the total population in the study area.

As per 2011 census, Scheduled Tribe (ST) population in the rural sector of the study area is 0.25% of the total rural population which is quite lower than the urban sector of the study area, which is 0.67% of the total urban population. As a whole, ST population is 0.58% w.r.t. the total population in the study area.
Scheduled caste and scheduled tribe population in rural and urban segment of the study area is shown in **Table-3.14.4**.

TABLE-3.14.4
SOCIAL STRUCTURE OF THE STUDY AREA

Segment of the Area	Number of population								
	Total Population			Scheduled Caste			Scheduled Tribe		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Rural	81073	79733	160806	20106	20071	40177	201	195	396
Urban	308868	296291	605159	43564	42218	85782	2036	1990	4026
Total	**389941**	**376024**	**765965**	**63670**	**62289**	**125959**	**2237**	**2185**	**4422**

3.14.2.6 Literacy Level:

Total literacy rate in rural sector of the study area is 73.9% of the total rural population whereas male literacy rate is 77.8% of the total rural male population and female literacy rate is 42.51% of total rural female population while total literacy rate in urban sector of the study area is 76.43% of the total urban population where male literacy rate is 55.19% of the total urban male population and female literacy rate is 44.81% of the total urban female population. The overall literacy rate in the study area is about 72.42% w.r.t. the total population where male literacy rate is 55.82% (w.r.t. the total male population) and female literacy rate is 44.18% (w.r.t. the total female population). Population classification for literates in the study area is presented **Table-3.14.5.**

TABLE-3.14.5
LITERACY LEVEL IN THE STUDY AREA

Area	No. of Literates		
	Male	Female	Total
Rural	62388	46134	108522
Urban	158284	128540	286824
Total	**220672**	**174674**	**395346**

Source: Census of India, 2011

3.14.3 OCCUPATIONAL STRUCTURE

The occupational structure of population in the study area is studied with reference to main workers and marginal workers. As per Census of India, all persons engaged in 'work' defined as participation in any economically productive activity with or without compensation, wages or profit are workers. The Reference period for determining a person as worker and non-worker is one year preceding the date of enumeration The Census classifies Total Workers into two groups namely, (i) Main workers (ii) Marginal workers. Main Workers are those workers who had worked for the major part of the reference period i.e. 6 months or more. Marginal Workers are those workers who had not worked for the major part of the reference period i.e. less than 6 months.

The main workers include 10 categories of workers defined by the Census Department, which consists of cultivators, agricultural laborers, those engaged in live-stock, forestry, fishing, mining and quarrying; manufacturing, processing and repairs in household industry; and other

than household industry, construction, trade and commerce, transport and communication and other services.

3.14.3.1 Workers and Non-workers:

i) Total Workers:

Total Worker in rural areas is 36.9% of the total rural population of and Total Worker in urban areas is 38.4% of the total urban population, while overall total worker is 38.1% of the overall total population in the study area according to 2011 Census. The total workers are divided into main and marginal workers.

ii) Main Workers:

Main Worker in rural areas is 87.3% of the total rural population of and Main worker in urban areas is 88.15% of the total urban population, while overall total Main worker is 87.97% of the overall total population in the study area according to 2011 Census.

iii) Marginal Workers:

Marginal Worker in rural areas is 12.70% of the total rural population and Marginal worker in urban areas is 11.8% of the total urban population, while overall total Marginal worker is 12.0% of the overall total population in the study area according to 2011 Census.

iv) Non-workers:

Non-Worker in rural areas is 63.1% of the total rural population and Non-Worker in urban areas is 61.6% of the total urban population, while overall Non-worker is 61.9% of the overall total population in the study area according to 2011 Census.

The occupational status of workers and non-workers has been shown in **Table – 3.14.6**.

TABLE – 3.14.6

OCCUPATIONAL STATUS OF THE STUDY AREA

Area	No. of workers						No. of non-workers			Total Population (3)+(6)+(9)
	Main Workers			Marginal Workers						
	Male (1)	Female (2)	Total (3)	Male (4)	Female (5)	Total (6)	Male (7)	Female (8)	Total (9)	
Rural	45965	5804	51769	4121	3435	7556	30987	70494	101481	160806
Urban	174699	30000	204699	14169	13336	27505	120000	252955	372955	605159
Total	**220664**	**35804**	**256468**	**18290**	**16771**	**35061**	**150987**	**323449**	**474436**	**765965**

3.14.3.2 Classified Occupational Status:

Cultivators and agricultural workers in rural areas are 2.8% and 3.3% respectively w.r.t. the total rural population and urban areas these are 0.43% and 0.65% respectively w.r.t. the total urban population. Overall

cultivators and agricultural workers are 0.9% and 1.2% respectively w.r.t. the total population in the study area. The classified occupational status in the study area has been tabulated in **Table-3.14.7**.

TABLE-3.14.7
CLASSIFIED OCCUPATIONAL STATUS

Area	Total Workers	Cultivators	Agricultural Workers	Others
Rural	59325	4505	5236	36813
Urban	232204	2590	3910	186588
Total	**291529**	**7095**	**9146**	**223401**

Graphical presentations of demographical and occupational status have been given below in **FIGURE-3.14.1.**

3.14.4 INFRASTRUCTURE FACILITIES:

Medical Facilities
Medical facility in some form or the other is available to the population residing within the rural segment of the study area. However, medical facilities i.e. Hospital with basic facilities only, is available within the urban segment of the study area.

Drinking Water Facilities
Tap water, ground water and surface water is being used in the different village located in the rural sector of concerned C.D Blocks. In the urban area tube well and tap water are the source of drinking water.

Electricity
Most of the villages have electricity in the Concerned C.D Blocks. Available for domestic purposes.

Communication Transport & Access Facilities
Most of the villages in the concerned C.D Block have Post Office available within study area. Almost all the villages have bus connectivity. Approach paved road is available in the all village areas. In the urban area surface rail, buses and rickshaw etc. are available for communication.

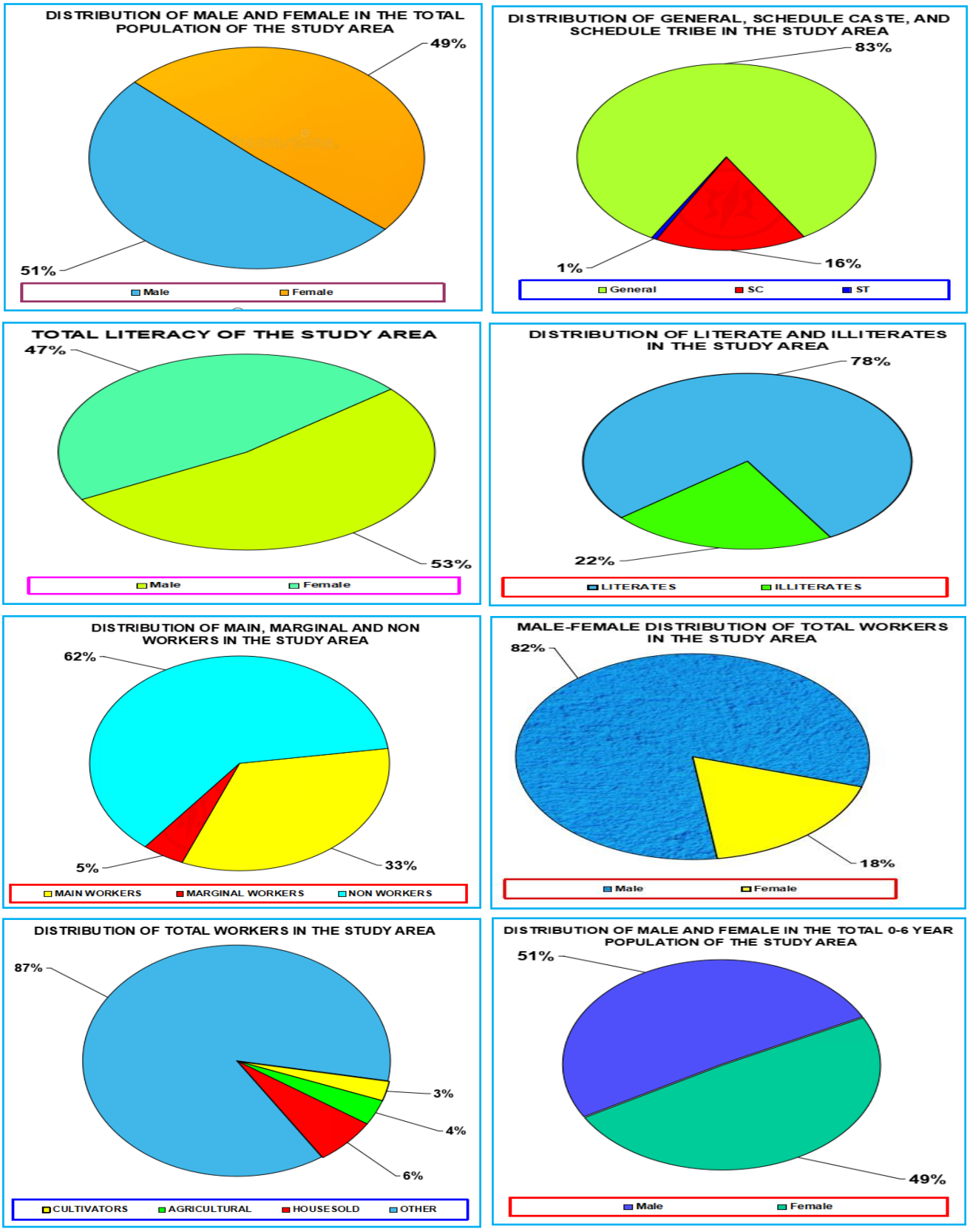


FIGURE-3.14.1
GRAPHICAL PRESENTATION OF DEMOGRAPHIC & SOCIAL STATUS (BASED ON 2011 CENSUS DATA)

3.15 SOCIO-ECONOMIC SURVEY

The 2011 census data have been supplemented and corroborated by a socio-economic sample survey, conducted in January, 2021, covering a sample population size of 5326 numbers covering 1275 number of Households, distributed over 9 villages and 6 Census Towns within the study area through structured questionnaires portraying demographic and socio-economic aspects of the study area population. The names of the villages, considered for the sample survey have been gathered in **Table-3.15.1**. The data of this socio-economic survey including demographic and socio-economic characteristics, income profiles, household amenities, educational status etc. have been presented in **Chapter-7.0**. The salient findings of this sample survey are presented below:

Total Population	5326 (Male: 2681, Female: 2645)
No. of Households	1275
Family Size	4.18
Sex ratio	987 females per 1000 males
Caste	SC & ST (16.90% w.r.t total Sampling population)
Literacy Level in Area	Total Literate 78.76%, Male Literate 82.18%, Female Literate 73.3%
Build of House of sample Households	Brick (72.6%), Multistoried Brick (13.7%), Thatched Roof Brick (10.7%)
Lighting source of sample Households	Electricity (99.7%), Kerosene (0.3%)
Occupational Status of sample population	Workers (35.8%), Non-Workers (66.1%)
Source of Income	Agriculture (5.4%), Business / Trade (28.12%), Service (23.92%), Labour (31.01%), Forestry / Plantation (1.05%), Livestock/ Fishery (2.05%), Others (8.45%)

Comparison of the findings of the socio-economic sample survey with the 2011 census data are presented in **Table-3.15.2**.

Table-3.15.2
Comparison of the Findings of the Socio-Economic Sample Survey

Particulates	2011 Census	2018 Sample Survey
Family Size (persons per household)	4.21	4.18
Literacy Level in Area (% of total population)	77.7	78.76
Sex ratio in rural area	964 females per 1000 males	987 females per 1000 males
Occupational Status in area of the total worker population	Workers (38.1%), Non-Workers (61.9%)	Workers (35.7%), Non-Workers (64.3%)

It is evident from the above comparison that there has been slight increase in the family size, literacy rate has increased, sex ratio has increased and percentage of workers has slightly increased in the villages under sample survey.

Table-3.15.3
List of Villages & Census Towns for Sample Survey

S. N	Name of Village / town	No. of Households	Population		
			T	M	F
1	Pairagachha (CT) WARD NO.-0001	90	369	185	184
2	Barijhati (CT) WARD NO.-0001	150	580	299	281
3	Garalgachha (CT) WARD NO.-0001	95	370	189	181
4	Janai (CT) WARD NO.-0001	180	753	377	376
5	Naiti (CT) WARD NO.-0001	110	464	236	228
6	Ramanathpur (CT) WARD NO.-0001	100	444	220	224
7	Benipur	30	127	64	63
8	Chanditala	85	348	180	168
9	Makhalpara	20	75	42	33
10	Khanpur	80	335	155	180
11	Beledanga	85	360	184	176
12	Gokulpur	35	162	83	79
13	Thero	75	327	169	158
14	Jagannathbati	40	194	87	107
15	Kalachhara	100	418	211	207
TOTAL		**1275**	**5326**	**2681**	**2645**

3.16 OVERALL SUMMARY & CONCLUSION

The field data were generated for soil, meteorology, air quality, water quality, noise & ecology during three months' period **(1st December, 2020 - 28th February, 2021)** of Winter season along with the relevant secondary data, collected from various agencies on the relevant disciplines like Geology and Geo-hydrology, Land Use, Meteorology, Demography & Socio-Economy.

While analyzing the Landuse Pattern of the 10 km radius study area, it is observed that it contains 28.22% Agricultural Land. Open area comes next to it. Land with grasses & scrubs is the next leading category. Forest area comes next in abundance in the 10 km radius of the project site.

The soils are suitable for cultivation of paddy, wheat and seasonal vegetables. As per FAO-UNESCO soil classification, this soil is of Ultisols and is suitable for paddy rice, sesame, ground nut, chillies, mango, rose etc. It is also home for many beneficial biological organisms like bacteria, fungi, lichen, etc. The nutrient status and pH of the soil certainly produces the food and fodder to the end user and retain the sustainability of top soil. No impact of surrounding industry has been found.

The overall mean wind speed during the entire monitoring period was 3.3 Km/hr. The predominant wind direction was North.

The values of all the ambient air parameters i.e., PM_{10}, $PM_{2.5}$, SO_2, NO_2 and CO at the respective 8 monitoring locations are within the stipulated limits on all the occasions as per NAAQ Standard. The maximum value of PM_{10} was observed near project site (at Mollarber) i.e., 88 $\mu g/m^3$, which is considerably on higher side, but is still within the standard. This may be attributed to the wind blown dust due to the unpaved roads and the vehicular emissions in the area. Local industries exerts small effect.

The parameters tested for Ground water sources in the study area complies with the Drinking Water Quality Standards as per IS 10500:2012. The ground water is suitable for drinking purpose as per BIS 10500 with respect to the parameters tested.

The river water quality (SW1 & SW2) parameters are within the standard for Class C i.e., Drinking water source after conventional treatment and after disinfection.

The Equivalent Noise Levels at the Industrial locations are within permissible limits, but they have exceeded the permissible limits at the Commercial, Residential and Sensitive locations in the study area. Such high noise levels may be attributed mainly to the noise, generated due to the vehicular traffic.

The observations reflected good vegetation within 10 km radius around the project site. The terrestrial and aquatic ecological scenario constitutes various types of trees, bamboos, herbs, climbers, insects, amphibians, reptiles, birds, mammals, fish, etc. Altogether 44 species of trees, 45 species of climbers, herbs and shrubs indicate a diversified vegetation. Similarly, the faunal communities of the area are also fairly rich. The study area has river, canals, beels, ponds and several other categories of water bodies, so the richness and diversity of aquatic flora and fauna is also high. A good number of birds (21 species) were also observed which is due to good vegetation cover and open fields in the area. Thus, the study area is ecologically fairly rich & diverse (Shannon-Weiner index - 3.75).

The study area is rural-urban mixed in nature and moderately populated with the population density of approximately 2439 persons per square kilometer. The Study area has an average family size of around 4.21 persons per household which is considered to be a normal family size. As a whole, SC & ST population is 16.44% and 0.58% respectively w.r.t. the total population in the study area. The overall literacy rate in the study area is about 72.42% w.r.t. the total population i.e., the literacy level in the study area is quite satisfactory. Total worker is 38.1% of the total population. Presence of water availability in the region is mainly in the form of tube wells and tap water. As far as sanitary and hygiene is concerned in study area, under Swachh Bharat Mission, toilets have been provided in each household.

CHAPTER-4.0
ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 PROJECT ACTIVITIES

4.1.1 Phases of Impacts

The proposed project will have impacts on the environment in two phases. During the construction phase, which is temporary and short-term, the other during the operation stage, which will have long term effects. The environmental impacts in this study have been discussed during the construction and the operation stage separately.

The impacts have been assessed over the study area of 10 km radius of the project site. Overall impacts in the regional context are negligible.

4.2 IMPACTS DURING CONSTRUCTION PHASE

4.2.1 Activities during Construction Phase

During the construction phase, the following activities are considered to be important towards development of impacts:

a) Site preparation
b) Excavation and backfilling
c) Hauling of earth materials
d) Piling, cutting and drilling
e) Erection of concrete and steel structures
f) Road construction
g) Painting and finishing
h) Clean up operations
i) Landscaping and Afforestation

Construction phase activities will have moderate impacts on land use, demography and socio-economics, on-site soils and on-site noise. It could also develop minor impacts on water use, air and water quality and ecology.

The activities can be divided into two categories, viz. sub-structural and super-structural work. Certain foundation works would require pile driving and the machineries would emit gaseous emission and generate noise pollution.

Moreover, construction work will involve cutting of trenches, excavation, concreting etc. There may be dust, gaseous and noise pollution from these activities.

Mechanical erection work involves use of mechanical equipment for storage, transportation, erection and on-site fabrication work. These activities generally produce some air contaminants and noise pollution which will be contained by using water sprinkling and noise abatement measures.

4.2.2 Impacts on Air Quality

Particulate matter would be the predominant pollutant affecting the air quality during the construction phase. Dust will be generated mainly during excavation works, back filling and hauling operations along with transportation activities during construction phase.

Sprinkling of water from tankers or other suitable means would be undertaken at the construction sites for the suppression of fugitive dust.

Undesirable gaseous pollutants will be generated mostly by the traffic and use of machineries. However, this would not lead to any tangible effect, as the expected emission volume is low.

It would be ensured that all the vehicles plying during construction are properly tuned, maintained and possess PUC certificate to keep various emissions and pollution within acceptable limits for a sustainable environment condition.

4.2.3 Impacts on Hydrology and Water Use

The construction activities will take place inside the existing plant premises. The plant layout has been prepared in such a manner to follow the general ground profile and not to disturb the general drainage pattern of the area. There will be increased storm water run-off due to increase in the paved area, but proper/suitable drainage arrangements will be made to channelize such excess storm water run-off efficiently. No area in the downstream will be affected by such storm water run-off any time.

4.2.4 Impacts on Water Quality

Wastewater from construction activities would mostly contain suspended impurities. Other pollutants which may find their way into it will be in insignificant concentrations and may be safely disregarded. Drains from different locations at construction sites during construction period will be led to sedimentation pits where excess suspended solids will be settled out and relatively clear supernatant will be discharged into the outside surface drains. Domestic waste water from the construction site would be subjected to on-site treatment prior to reuse/ disposal. As such, there will be no adverse impact on the surface water quality of the area.

4.2.5 Impacts on Noise

During the construction phase, noise will be generated due to movement of vehicles and operation of light and heavy construction machineries including pneumatic tools and compressors, which are expected to emit sounds with moderate to high decibel value. Appropriate planning in operation of the machinery already described is required during construction period so that minimum disturbance is caused. Moreover, residential areas not being close to the project site, no significant impact is apprehended.

4.2.6 Impacts on Soil and Land Use

All major construction activities tend to generate some debris, dusts, water mixed sludge etc. along with certain changes in the soils of the area. However, this will take place inside the plant premises. There will be no impact on the soil condition outside the plant boundary with reference to soil fertility is apprehended.

During storms, some of the excavated soil and construction materials such as sand, silt, clay etc. would be blown off and get mixed in the air followed by dispersion and the project site; some dust particulates may even tend to be driven into the soil and make clog inter granular spaces.

However, in order to minimise such impacts, sprinkling of water shall be done.

Preparatory activities like construction of access roads, temporary offices, quarters and godowns, piling, storage of construction materials etc. will be confined within the project area. Such spillage will not have

major pollution problem on the soil inside the plant but the same will change the landuse pattern of the proposed site. Adjoining lands are not in any way affected by this.

As a result, the impact on land use would be very insignificant and any impact due to construction will be confined within the project area and will not hamper the land use aspects outside.

Overall, it could be easily inferred that there will be no adverse impact on soil quality & land use in the study area.

4.2.7 Impacts on Demography & Socio-economics

It is estimated that a large number of workers, comprising of skilled, semi-skilled and unskilled laborers, shall be employed by various contractors at site during the construction phase. Significant number of semiskilled and unskilled laborers would be recruited from the nearby areas. Sequel to this activity some employment generation on a temporary basis will be there which may bring some economic relief for the local labors temporarily. This would create some employment opportunities in the area.

Since most of sizeable labour force will be drawn from neighbourhood, no change in demographic profile is anticipated on a permanent basis. There will be only increased economic opportunities for the local people.

Most of the construction work is labour intensive. As most of the job will be done by the contractors, it will be ensured that the contractor's workers are provided with proper facilities including sanitation and drinking water supply.

4.3 IMPACTS DURING OPERATIONAL PHASE

The process description including quantum of pollution loads from liquid and gaseous effluents considering their proposed environmental control measures has been discussed in **Chapter 2 - Project Profile.**

The operational impacts in this study have accordingly been evaluated for this project.

4.3.1 Impacts on Air Quality

4.3.1.1 Sources of Emissions

The major sources of emission from the proposed project has been presented in **Table 4.1**.

TABLE 4.1
PROPOSED STACKS & EMISSION CHARACTERISTICS

Description	Stack attached with Thermic Fluid Heater
Exit gas Temp. (^{0}C)	110
Exit gas Temp. Temp. in Kelvin	383
Exit velocity of flue gas (m/s)	7
Internal diameter at Stack Top (m)	0.3
Internal radius at Stack Top (m)	0.15
Flue gas flow rate (Nm3/Hr)	1270
PM emission rate (mg/Nm^3)	30
PM emission rate (gm/Sec)	0.01
SO_2 emission rate (mg/Nm^3)	50
SO_2 emission rate (gm/Sec)	0.02
NOx emission rate (mg/Nm^3)	30
NOx emission rate (gm/Sec)	0.01

4.3.1.2 Air Quality Dispersion Modelling

Selection of Model

The plant operation will emit gaseous pollutants through stacks, which have the potential to deteriorate the air quality of the area. In order to evaluate the impact on ambient air quality due to such releases, the ground level concentrations (GLCs) as a result of the plant emissions have been evaluated through mathematical modelling using computer aided techniques.

Upon discharge to atmosphere, the emissions from sources are subjected to transport and diffusion processes which together are termed as dispersion. There are a large number of processes which govern the atmospheric dispersion of pollutants viz plume rise, transport by wind, diffusion by turbulence and a number of other physico-chemical processes such as gravitational settling, deposition, chemical reactions, transformation, decomposition and wash out.

The computation has been made by applying **ISCST3 of USEPA**, which is widely used and also recommended by **CPCB (PROBES/70/1997-98)**. The model is based on some assumption i.e., steady state conditions, continuous homogeneous flow, inert passive pollutants, no ground absorption and a Gaussian distribution of the plume in both horizontal and vertical planes.

4.3.1.3 Data Used for Modelling

Stack emission data as presented in **Tables–4.10** have been used as input to the model. The prediction of **GLCs** and corresponding impact has been made for the emission figures mentioned therein.

The hourly meteorological data like ambient temperature, wind speed and wind direction used for air quality modelling have been taken from such data generated through continuous on-site monitoring during **(1st December, 2020 – 28th February, 2021)** representing the study period.

The hourly occurrence of various atmospheric stability classes has been determined from the on-site hourly wind speed and cloud cover data using the insolation-based stability classification.

The Mixing Height data were taken from one of the published documents i.e., **"Spatial Distribution of Hourly Mixing Depth over Indian Region"** of **R. N. Gupta**, applicable for the region. The mixing heights considered for modelling are given in **Table 4.11**.

TABLE 4.11: MIXING HEIGHT

Hour of the day	Mixing Height (m) (December, January & February)
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	50
9	100
10	200
11	500
12	800
13	1000
14	1000
15	1200
16	1200
17	1000
18	800
19	500
20	200
21	100
22	50
23	0
24	0

4.3.1.4 Modelling Procedure

Modelling exercise has been performed for one (1) new stack attached with Thermo Fluid Heater of the Proposed Unit only.

The actual locations of the emission sources have been defined in a Cartesian co-ordinate (x, y) system, with Absolute Reference Point, being the proposed raw material yard.

As recommended by CPCB, radial pattern of receptor locations has been implemented using the polar (r,θ) co-ordinate system with origin at the ARP of the Cartesian co-ordinate system. The locations of the receptors have then been defined with respect to 16 radial directions (N to NNW angle θ of such directions measured clockwise from North) and radial distance 'r' from the ARP.

The receptors are selected in such a way that more receptors are located close to the maximum concentration point. The maximum distance covered is 10 km., which has been seen adequate to cover the maximum concentrations for this particular situation.

For multiple stacks computation, inter-stack distances have been considered. Since the contributions from different pollution sources are additive, the contributions of all sources at a given receptor have been computed separately and then added to give the total concentration.

In order to compute the 24 hourly concentrations due to the operation of the proposed project, the hourly meteorological data recorded at the site meteorological observatory set up near the project site was used. The model was used to compute the 24-hour concentrations for each day for the study period.

4.3.1.5 Discussion on Modelling Results

The predicted maximum GLC of PM is presented in **Table – 4.2**.

TABLE – 4.2

PREDICTED MAXIMUM GLCS OF VARIOUS POLLUTANTS

Pollutants	Max. GLCs ($\mu g/m^3$)	Direction	Distance (km)
PM	0.00	-	-
SO_2	0.00	-	-
NO_X	0.00	-	-

Thermic Fluid Heater (TFH) will heat the reaction vessels. Limited diesel will be burnt to produce the steam in boiler and to heat the fluid in TFH.

Hence, there will be little emission and so there are no incremental values of PM, SO_2 and NOx w.r.t. the ARP for the proposed project.

It may also be noted that the modelling results depict the worst-case scenario as washout due to rain has not been considered and deposition on other forms of structures as buildings, trees etc. have not been taken into account. Thus, in reality, the pollutant concentrations are zero for the proposed project site.

4.3.1.6 Impacts on Air Quality due to transportation of materials (raw materials, Products and Solid Wastes) and Manpower movement:

The Quantity of raw materials and products, to be transported by different modes is summarized and presented in **Table-4.3**.

TABLE-4.3
MATERIAL TRANSPORTATION DETAILS FOR PROPOSED PROJECT

Mode	Product Quantity	Raw material Quantity	Solid Waste	Total Quantity
Road	24 TPA	167 TPA	0	**191 TPA**

The whole raw materials and products will be transported by wagon through rail and/ truck through road.

All the trucks and wagon for raw materials and finished products and solid wastes transportation shall comply with the applicable environmental norms.

4.3.2 FUTURE TRAFFIC LOAD

The background emissions in the project area are primarily confined to emissions from traffic plying on Champadanga-Dankuni Road and the nearby Delhi-Kolkata connecting National Highway-2 (NH-2) passing within 4 kms distance in E direction w.r.t. the Project site. During the operation phase of the proposed project, movement of goods' vehicles along with loading and unloading operations will contribute to air emission if not handled very carefully. Control measures like Bag Filters and other dust suppression system will be installed to mitigate/suppress such fugitive emissions. With stringent traffic management system within the project site, scope for air pollution due to movement of goods transports will be minimized. The plant layout of

the proposed green field project has earmarked a good amount of area for greenery development.

The vehicular traffic plying in and around the project site will be one of the significant sources of air pollution. If the site is not properly regulated, it can create disruption in free traffic movement leading to air pollution problems. This difficulty can be tackled to a great extent by properly regulating the traffic and by following strict and disciplined vehicular movement and operation at the project site. By imposing vehicular emission standards & permitting only those vehicles with PUC to ply, this problem can be curbed to a large extent. The authority of SSOC will provide adequate free space and planned road network inside the plant for smooth movement of the goods' vehicles and workers.

The Location Map on Google for the Traffic Survey Assessment has been shown in **Figure-4.1A & B**.

Traffic density was monitored under four different vehicle categories i.e., Heavy, Medium, Light and two wheelers. The heavy vehicles included trucks, buses, cranes etc. The medium vehicles included mini buses, matadors etc. while cars, jeeps, auto rickshaws and trekkers were considered under the light vehicles category.

The data were recorded once for a day in the month of February, 2021, for continuous 24 hours in a day. The relevant account has been gathered in **Tables-4.4**.

Comparison of overall Traffic load with IRC: 106 – 1990

The same has been compared with Indian Roads Congress code for Guidelines for Capacity of Roads in Urban Areas (IRC:106 – 1990). Relevant abstract of the same is presented in **Table-4.5.**

Based on the details of the raw materials and products as derived in the above mentioned **Tables-4.3**, total 191 TPA materials will be transported through road for the overall plant after implementation. All the materials will be transported by trucks. Thus, around 13 trucks per year (considering 365 working days in a year, 15 T/Truck) will be required to transport the materials by road.

Moreover, there will be some additional traffic load due to manpower movement during operation for proposed project of **M/s. Saraogi Shellac Overseas Corporation**. There shall be around 12 persons to

operate and maintain the proposed project. Majority of the people will come from the nearby village and as such there will be no transport requirement for them. It is estimated that around all 2 persons will come to the plant by cars & around total 5 persons will come to the plant by two wheelers (Motor Cycle) in 3 shifts. The rest of the persons will come from nearby village and areas in and around the factory location and will come by their own transport i.e., bicycle.

However, their movement will be well spread on the different road stretches in the area, the impact prediction has been done, considering the entire vehicular movement on Champadanga-Dankuni Road for the projection of the worst case scenario.

TABLE-4.4
NAME OF THE LOCATION: Near Dankuni Automart, Champadanga-Dankuni Road
DATE OF SAMPLING: 20.02.2021

HOUR	HEAVY	MEDIUM	LIGHT	TWO WHEELERS	TOTAL
0700 - 0800	58	22	37	50	**167**
0800 - 0900	76	40	64	68	**248**
0900 - 1000	57	21	79	49	**206**
1000 - 1100	65	38	52	70	**225**
1100 - 1200	92	56	63	84	**295**
1200 - 1300	54	18	48	59	**179**
1300 - 1400	67	33	37	65	**202**
1400 - 1500	49	13	19	41	**122**
1500 - 1600	89	53	59	82	**283**
1600 - 1700	47	12	81	94	**234**
1700 - 1800	90	54	60	87	**291**
1800 - 1900	56	20	76	48	**200**
1900 - 2000	93	57	63	76	**289**
2000 - 2100	59	23	29	51	**162**
2100 - 2200	34	20	37	60	**151**
2200 - 2300	9	12	16	27	**64**
2300 - 0000	13	0	3	5	**21**
0000 - 0100	11	2	9	3	**25**
0100 - 0200	16	1	0	2	**19**
0200 - 0300	28	0	2	0	**30**
0300 - 0400	19	7	11	0	**37**
0400 - 0500	23	13	5	17	**58**
0500 - 0600	40	9	35	30	**114**
0600 - 0700	58	22	29	39	**148**
Total	**1203**	**546**	**914**	**1107**	**3770**
Addition for material movement due to Project.	**24**	**-**	**-**	**-**	**24**

Addition for staff movement due to proposed project	**-**	**-**	**4**	**10**	
Grand Total	**1215**	**546**	**918**	**1117**	**3794**
PCU Factor	**3**	**1.5**	**1**	**0.5**	
PCU per day	**3645**	**819**	**918**	**559**	**5941**
As per IRC: 106-1990 code, Table no. 2, a Four Lane (two-way) divided road in Plain terrain can accommodate vehicular traffic load of 86,400 PCU per day.					
Champadanga-Dankuni Road is a Four Lane (two-way) divided road and can well accommodate existing traffic load along with the additional load due to M/s Saraogi Shellac.					
Note : **HEAVY :** Truck, Bus, Cranes **MEDIUM :** Minibus, Matador **LIGHT ;** Car, Jeep, Auto Rickshaw, Trekker					

Table no. - 4.5
Abstract from Indian Roads Congress (IRC:106 – 1990 code)
Guidelines for Capacity of Urban Roads in Plain Areas

TABLE 1. RECOMMENDED PCU FACTORS FOR VARIOUS TYPES OF VEHICLES ON URBAN ROADS

Vehicle Type	Equivalent PCU Factors — Percentage composition of Vehicle type in traffic stream	
	5%	10% and above
Fast Vehicles		
1. Two wheelers Motor cycle or scooter etc.	0.5	0.75
2. Passenger car, pick-up van	1.0	1.0
3. Auto-rickshaw	1.2	2.0
4. Light commercial vehicle	1.4	2.0
5. Truck or Bus	2.2	3.7
6. Agricultural Tractor Trailer	4.0	5.0
Slow Vehicles		
7. Cycle	0.4	0.5
8. Cycle rickshaw	1.5	2.0
9. Tonga (Horse drawn vehicle)	1.5	2.0
10. Hand cart	2.0	3.0

TABLE 2. RECOMMENDED DESIGN SERVICE VOLUMES
(PCUs PER HOUR)

S. No.	Type of carriageway	Total Design Service Volumes for Different Categories of Urban Roads		
		Arterial*	Sub-arterial**	Collector***
1.	2-Lane (One-Way)	2400	1900	1400
2.	2-Lane (Two-Way)	1500	1200	900
3.	3-Lane (One-Way)	3600	2900	2200
4.	4-Lane Undivided (Two-Way)	3000	2400	1800
5.	4-Lane Divided (Two-Way)	3600	2900	—
6.	6-Lane Undivided (Two-Way)	4800	3800	—
7.	6-Lane Divided (Two-Way)	5400	4300	—
8.	8-Lane Divided (Two-Way)	7200	—	—

* : Roads with no frontage access, no standing vehicles, very little cross traffic.

** : Roads with frontage access but no standing vehicles and high capacity intersections.

*** : Roads with free frontage access, parked vehicles and heavy cross traffic.

Mitigation Measures

- It would be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits.
- Speed Limit/ bumper will be imposed to regulate vehicle speed.
- Transportation will be through covered trucks.
- Truck shall be parked in designated parking area only;
- Minimize use of roads at any particular time by planning vehicles movements.
- Road crossings to be used will be well marked.
- With strict traffic management system and various environmental management practices, contribution of pollutants in the ambient air will be kept under control so as to create minimum disturbances in the neighbourhood.
- Adequate and planned road network will be set up in the project for smooth movement of the goods vehicles.
- At loading and unloading points, arrangement for Water sprinkling will be made so that dust generation during transportation of materials will be minimized further.
- All the internal roads within the plant shall be concreted; hence dust arising from the internal roads shall be insignificant. The greenbelt development shall further help in reduction in fugitive emissions.

FIGURE-4.1A
Location of the Traffic Survey

FIGURE-4.1B
Location of the Traffic Survey

Mitigation Measures

All trucks for transporting raw materials shall be fully covered to avoid dust pollution.

With strict traffic management system and various environmental management practices, contribution of pollutants in the ambient air will be kept under control so as to create minimum disturbances in the neighbourhood.

The vehicular traffic plying in and out of the project site will also be one of the significant sources of air pollution. It will be mitigated by properly regulating the traffic and by following strict and disciplined vehicular movement and operation in the project site. Adequate and planned road network will be set up in the proposed project for smooth movement of the goods vehicles.

It would be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits. At loading and unloading points, arrangement for Water sprinkling will be made so that dust generation during transportation of materials will be minimized further. All the internal roads within the plant shall be metalled; hence dust arising from the internal roads shall be insignificant. The greenbelt development shall further help in reduction in fugitive emissions.

With strict traffic management system and various environmental management practices, contribution of pollutants in the ambient air will be kept under control so as to create minimum disturbances in the neighbourhood.

4.3.3 Impacts on Water Quality

The Company will follow “the zero liquid discharge concept” with respect to management of wastewater generated in the process. It will be achieved by proper planning of wastewater re-cycling in the plant for various non critical usages. Thus there is no scope for wastewater getting access outside the plant. In view of this it may be concluded that the plant on full commissioning will not create any environmental disturbance in the area of water pollution and also soil pollution as no wastewater is discharged outside even after treatment. This s also reflected in water balance scenario.

4.3.4 Impacts on Hydrology and Water Use

Water requirement for steam generation in boiler is 1 Kilo litre initially followed by make up of 100 litre per month. The above water will be supplied by nearly Bislery company. Water for domestic purpose (i.e., 200 ltrs/day) will be met from borewell water. An application has been submitted to the local panchayat for sanction of creating one borewell inside the plant premise. Hence, it is expected that it will have no significant impact on the hydrological system.

The Company will follow "the zero wastewater discharge concept" and the entire wastewater will be recycled to the plant for various uses. As no wastewater will be discharged outside the plant premises, there will be no impact on any surface water hydrology of the area.

4.3.5 Impacts on Noise during Operation

Sources of Plant Noise

The operation of the new units is expected to generate relatively high and continuous noise levels. However, all the machineries will be within the permissible noise limit as per Environment Protection Act.

Impacts of Plant Noise

Operational activities are not expected to cause any undue disturbances to the people living in the proximate areas outside the plant boundary. This unit will be a silent unit as all reactions take place under closed vessels and pipelines under high vaccum. All pipelines and vessels will be insulated . The only scope of noise is from running motors , which is very minimal .

Impacts of noise on workers could be further minimized through the adoption of adequate protective measures in the form of (a) use of personal protective equipment (ear plugs, ear muffs etc.), (b) education and public awareness, and (c) exposure control through the rotation of work assignments in the intense noise areas.

As such, due to protection, there will not be any appreciable impact from noise due to the operation of the new project.

4.3.6 Impacts on Soil

The solid wastes that will be generated on full commissioning will be managed appropriately following standard protocol for solid waste management and the same has been discussed in **Chapter-2.0** of the

report. This will ensure that there will not be any impact on soil quality due to the disposal or deposition of solid wastes.

4.3.7 Impacts on Land Use

The proposed project will be installed on the available land within the existing plant premises, comprising of total 0.54 acres (2240.82 sqm). The land has already been earmarked for the industrial purpose. The proposed development will take place inside the already acquired land area, so there will not be any impact on the land use pattern outside the plant area.

4.3.8 Impacts on Ecology

Impacts on Terrestrial Ecology

The baseline status of terrestrial flora and fauna within the study area have been drawn up earlier. The harmful effects of such air pollutants as SO_2 NO_x, & PM in affecting growth and other similar functions of trees, either singularly or synergistically is well known. However, such effects are experienced only at high levels. During the operation of the overall project, no significant pollutant is to be discharged from the new stacks and is not envisaged to cause any stress on the ecological fabric of the study area. Moreover the greenbelt proposed would be useful in controlling fugitive emissions and process noise from disturbing ecological environment in the study area.

Impact on Aquatic Ecology

After the implementation of the proposed project, the effluent will be totally re-used after necessary treatment. As such, no impact on aquatic ecology is envisaged due to operation of this project.

Moreover, there will be adequate greenbelt inside the plant area, which will further ameliorate the ecological condition of the area.

4.3.9 Impacts on Demography and Socio-economics

The employment opportunities, both direct and indirect, that will arise from the proposed project are 10 persons, who will get employment on daily average basis during the operation stage.

The labour force involved during construction phase will discontinue after construction and installation is over. There will be replacement of

this labour force by skilled manpower to operate and maintain the plant.

As the area is close to Dankuni urban area, the skilled people will be available to work in the industrial complex. So, there will be no major change in local occupational scenario, the establishment of the new projects will however increase the direct and indirect jobs and some economic opportunities. Development of some secondary service sector is expected and this may be beneficial to the local economy.

CHAPTER-5.0
ANALYSIS OF ALTERNATIVES

5.1 ANALYSIS OF ALTERNATIVES

M/s. Saraogi Shellac Overseas Corp. will set-up a green field Ambrettolide Manufacturing Plant with a net production of high purity Ambrettolide of 24 TPA synthesized from Aleuritic Acid through sequential chemical reactions. Four types of distillates along with small amount of Gummy mass (1500 Kg), TBR (120 Kg), Bad crude (160 Kg), R3 residue (50 Kg) and processed residuals (100 Kg) will also be generated in course of sequential reactions as by product. The project will be coming up within the industrial area of Dankuni at Chanditala-Serampore Road opposite to MBW & Bhagardhar, Dankuni, Hooghly, West Bengal, Pin Code- 712702.

The geographical co-ordinates of the overall project site are varying between Latitude: 22°41'39.08"N to 22°41'41.06"N and Longitude: 88°15'9.85"E to 88°15'12.45"E with average elevation of 5 m (16.4 ft) above Mean Sea Level (MSL). The proposed project will be located on the available vacant land of 0.54 acres/ 2240.82 Sqm (0.224 hectare) within the industrial area of Dankuni, Hooghly, West Bengal. The said land has already been taken on a long term lease basis. M/s SSOC has conducted a good amount of home work before the said land was acquired. Hence, no additional land will be acquired for the proposed project. The land is generally flat and does not come under flood hazard zone.

The above parcel of land has been selected from three different plots of land including the one already described. The said lands are located at different parts of district Hooghly. While surveying the plots of land for suitability regarding the project activity, several criteria (mostly environmental, technical & commercial) relevant for the project activity have been duly considered.

Based on the findings from review of the plots of land one plot has been selected. The details of the selection procedure is presented below, viz -

Plot no. 01

Star Battery Industrial Complex is located in Mollaber Village, Dankuni Coal Complex Township, Housing Estate Colony, Dankuni, Kolkata, West

Bengal 712310. The following criteria have been considered while reviewing the plot for its fitness to install the Ambrettolide manufacturing plant as proposed:

- The plot is non-gated.
- The plot is located around 1.5 km inside from the main road/ the entrance.
- Not in compliance to vastu.
- There are a host of factories in and around the plot, thus leaving minimum scope for expansion in future. Further this issue will add to the risk in the operation management.
- There is no street light in the complex. The complex appears to be very much inadequately lighted, an issue not complying both to Vastu and environmental setting.
- The approach road to the plot is in a very bad shape (kuchha & uneven). The road itself will pose problem to the movement of transport system to and fro and during rainy season will be difficult to access.

The plot of land has not been selected based on the above mentioned consideration.

Plot no. 02

Sai Shivalik Comples is located in 22/1, SH 13, Bangihati Village, Hooghly, West Bengal 712249 .
The plot of land has been reviewed on following grounds which is relevant to different environmental and commercial settings viz-

- The plot is located around 1 Km mtr inside from the main road.
- Not in compliance to vastu.
- There are a good number of small to medium manufacturing units in and around the plot. Few of the units have been observed to emit odour to outside during its operation. The Ambrettolide manufacturing unit can not be located in this plot as the quality of the product will be in danger.
- The entire complex does not have sufficient lighting arrangement and as such the complex gives look of a dark area during night which is not good on safety and Vastu reason.
- The plot is non-gated.

The plot of land has not been considered with respect to above mentioned reasons. The plot has been rejected for the above very relevant reasons.

Plot no. 03

Chanditalla plot is located in village & p.o. – Chanditala, Saradarpara, Opp of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The plot of land has been taken over on a long term lease basis.

The plot of land has been selected on following grounds which are relevant to different environmental and commercial settings viz-

- The plot is located inside a gated complex with 24-hour security and adequate power and street lights.
- The plot is not far from main road and entrance of the complex.
- The plot is in compliance to the requirement of Vastu.
- Close to the plot, land is available. Thus future expansion of the project will be possible.
- The entire complex is adequately lighted
- The plot is located in Dunkuni Industrial Complex.
- Cost wise the plot is not prohibitive.
- There was no problem to get the plot of required dimension as per felt need of the project
- The proposed plot is located inside an industrial area where several factories are already operating which will not in any way damage the objective of the Company.
- The complex is well connected by NH2 (Delhi-Kolkata Road) and NH6 (Mumbai- Kolkata Road). Besides, Dankuni being on the Howrah – Bardhaman chord line, is well connected with the dedicated freight corridor for the rail base movement of cargo connecting Eastern Railway and Southern Railway.
- There is no designated eco-sensitive places within 10 kms of the proposed site.

CONCLUSION:

M/s SSOC has already procured the plot of land located inside Dankuni Industrial complex, Dankuni - 712702, for installation of the green field Ambrettolide manufacturing plant for the reasons stated above. The land has been sold to us by the land owner .

CHAPTER-6.0
ENVIRONMENTAL MONITORING PROGRAMME

6.1 INTRODUCTION

Environmental monitoring is the repetitive and systematic measurement of the characteristics of environmental components to test specific hypotheses of the effects of human activity on the environment. The post project environmental monitoring program serves as the key tool to keep track on performance of mitigation measures implemented & pollution control technologies installed to prevent impacts associated with various operations of the project.

Thus, environmental monitoring is the effective observation of site conditions and work activities, and identification of potential non-compliance situations and initiation of corrective or remedial actions. Monitoring is as important as that of control of pollution, since the efficiency of control measures can only be determined by monitoring. Environmental monitoring programme is in other words assessment of ground reality of the environment in and around the plant and enabling the proponent to understand the real efficacy of the pollution control measures that are in place to combat the pollution due to the project.

6.2 ENVIRONMENTAL MONITORING PROGRAMME

Monitoring of the following aspects is important to keep a constant check on the environmental performance of the project and also the environmental quality of the area.

- Ambient Air Quality
- Stack Emission
- Work zone Air quality,
- Water Quality
- Wastewater Quality
- Drinking Water Quality
- Noise Level
- Plantation Condition
- Periodic Preventive Maintenance
- Occupational Health & Safety Monitoring
- Fire Safety Monitoring

Ambient Air Quality

Ambient air quality monitoring will be conducted at 1 location with a frequency of once in a month inside the plant. The parameters, to be monitored include all 12 parameters as per NAAQS (**Table 6.1)**.

Fugitive emission will be monitored with a frequency of once in a month at a number of relevant locations inside the project area to ensure that air pollution devices are working properly.

Stack Emissions

The proposed project will have a single stack for dispersing diesel burning PM and gaseous pollutants. All the emissions from this stack will have to be monitored. Periodic monitoring of stack emission by stack monitoring kit will be carried out.

The flue gas from the stack will be monitored twice in a year for PM, SO_2, NOx following CPCB guidelines and BIS methods.

Ground Water Quality

SSOC will receive water supply from borewell constructed inside the project premises for use in domestic and drinking purposes. Bore well water inside the plant will be monitored for different parameters as applicable for drinking purpose ref. BIS 10500-2012 (**Table 6.1)**. The monitoring will be carried out with a frequency of once in a month.

Wastewater Quality

Zero wastewater discharge has been planned for the proposed project. There will be no wastewater treatment plant and the water accumulated due to condensation of steam after treatment with pure Ambrettolide for stabilization will be used for non critical purposes like watering of plant in green belt development. However, the above water will be tested for quality before use once in a month as per parameters presented in **Table 6.1.**

Meteorology

A meteorological station will be set-up at the project site for the record of meteorological parameters such as wind velocity and direction, ambient temperature, atmospheric pressure, relative humidity and rainfall.

Noise

Noise monitoring will be carried out inside the plant premises once in a month.

Plantation

The project proponent will train people to look after and record the conditions of tree plantation and greening of the project area.

Periodic Preventive Maintenance

All instruments/ sensors/ valves/ glands etc. installed or used for monitoring of safety, working environmental parameters & various risk components are to be meticulously monitored for their performance. Working environmental parameters will be regularly recorded and the respective records will be systematically maintained. Any accidents, major/ minor, shall be critically monitored, recorded and periodically reviewed.

Occupational Health & Safety Monitoring

The occupational health and safety monitoring program shall include safety inspection, testing and calibration of associated equipment. Project proponent will consist of inspection and testing of all safety features and hazard control measures for plant operation. This will include regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used. The inspection will verify the effectiveness and issues of personal protective equipment (PPE) to provide adequate protection and regular use of PPE as and when required.

The post project monitoring programme, consisting of various disciplines, no. of locations, parameters, frequency of monitoring for the proposed plant has been presented in **Table-6.1**.

However, the monitoring programme w.r.t. the frequency and the sampling locations will be finally decided in consultation with the State Pollution Control Board.

Table-6.1
Monitoring Programme

Discipline	Locations	Parameters	Frequency
Ambient Air Quality	One	All 12 parameters as per NAAQS	Once in a month
Fugitive Emission	In and around the plant	VOC	Twice in a month
Stack Emission (measurement through stack kits)	One Unit	PM, SO_2 & NO_x	Once in a year
Steam condensate from Ambrettolide stabilization	Water condensate	pH, TDS, TSS, COD, Oil & Grease.	Once in a month
Ground Water Quality	Bore well inside the plant	pH, Temperature, Conductivity, Turbidity, Alkalinity, Chlorine, Total Suspended Solid, Total Dissolved Solids, Total Hardness, Ca-hardness, Mg-hardness, Coliform, Fe, Cu, Cd, Cr^{6+}, Pb, As, Hg, Zn	Once in a month
Noise	Plant Area	Day-and Night-Time Noise Levels	Once in a month

6.3 PERFORMANCE MONITORING OF POLLUTION CONTROL DEVICES:

M/s. SSOC will continuously monitor performance of pollution control devices through its process, & good preventive maintenance system. Performance of pollution control system for particulates is mainly monitored by operator & maintenance staff through pressure drop measurement system. If it crosses its acceptable limit then operator will get alarm of failure. In case of failure, Operator will take immediate action by stopping the particular machine & inform maintenance dept. for necessary corrections.

Maintenance team of the company will continuously work for better performance of PC devices by deploying dedicated manpower & maintaining proper schedule for maintenance to achieve pollution free working environment.

CHAPTER-7.0
ADDITIONAL STUDIES
(HAZARD IDENTIFICATION & RISK ASSESSMENT, DISASTER MANAGEMENT PLAN AND PUBLIC CONSULTATION)

7.1 INTRODUCTION

Accident can occur in every industry in spite of efforts to prevent them. Frequently they give rise to suffering and damage, the extent of which is, in part, determined by the potential of loss due to consequent events. Many parts of industries may have high potential of loss and there may be cases, where the loss, measured in both human and monetary terms, is considered to be severe. It is equally true to say that there have been other cases where, because of effective action taken at right time, the full potential loss has been largely avoided. Effective action, in these cases, has been possible due to the existence of pre-planned and practiced procedures for handling major emergencies utilizing the combined resources of the industries' internal arrangement and outside services.

Section 41-B(4) of the Factories Act, 1948 requires that every occupier of a hazardous factor shall draw up an onsite emergency plan and detailed disaster control measures for the factory and make known to the workers employed therein and to the general public living in the vicinity, the safety measures required to be taken in the event of an emergency taking place. Also the Manufacture, Storage, and Import of Hazardous Chemicals Rules 1989 (amended in 2000), under the Environment (Protection) Act 1986, describes the preparation of both Onsite & Offsite Emergency action plan for better operation of the plant and its surrounding. This document is prepared in compliance of the same. To fulfil the above statutory requirement and the social obligations towards protection of the environment, SSOC has developed the captive use of the ON- SITE and OFF-SITE EMERGENCY ACTION PLAN.

In the ON-SITE and OFF-SITE emergency action plan, an effort is made to cover aspects like risk and environmental impact assessment, role of emergency organizations, communication systems, actions on site in case of an emergency, off-site emergency plan, training, rehearsal, record generation etc., in detail and fill up necessary Annexure to support the plan as per the guidelines received from Office of the Chief Inspector of Factories.

Industrial units which produce, treat, store and handle hazardous substances, have responsibility to take care of safety of manpower, local habitats and environment. Recognizing the need to control and minimize the risks posed by such activities, the Ministry of Environment & Forests have also notified the "Management, Handling & Trans-boundary Movement Rules" in the year 2008 in super session of the Hazardous Wastes (Management and Handling) Rules, 1989. Finally for effective implementation of the rule, Ministry of Environment, Forest & Climate Change has provided a set of guidelines in Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016. The guidelines, in addition to other aspects, set out the duties required to be performed by the occupier along with the procedure. The rule also lists out the industrial activities and chemicals, which are required to be considered as hazardous.

During the process of synthesis of Ambrettolide in the proposed unit of M/s SSOC hazardous chemicals like TMOF & Acetic Anhydride will be refluxed in reactor which will be stored appropriately for correct handling and management. The major chemicals handled / stored by the plant includes Aleuritic Acid, TMOF, Acetic Anhydride, Potassium Hydroxide, MEG, Sodium Methoxide, Glycerin & IPA among which TMOF & Acetic Anhydride are literally hazardous for human health. In view of this, proposed activities have been scrutinized in line with the risk and hazard involved vis-a-vis guidelines for "Manufacture, Storage and Import of Hazardous Chemicals Rules" (MSIHC 1989, MoEF) and observations/findings are presented in this chapter. The assessment has been made in a systematic manner covering the requirements of the above-mentioned rules. Accordingly subsequent sections have been described as follows:

- Process description
- Applicability of the rule
- Description of hazardous chemicals
- Hazard Identification
- Hazard Assessment (& hazard scenarios)
- Disaster Management plan

7.1.1 Process description

M/s Saraogi Shellac Overseas Corp. is proposing a green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product from starting material Aleuritic acid. All reactions to synthesize Ambrettolide will take place under high vacuum and completely sealed channels and thus no gaseous emission during the manufacturing process is expected to occur. The proposed project will be installed on the available 0.54 acres/ 2240.82 Sqm of vacant land within the industrial complex of Dankuni, Hooghly, West Bengal.

The production will follow a sequence of 5 stages of distillation process. Ambrettolide will be manufactured through treatment of Aleuritic acid (1800Kg) with TMOF (1600 Kg) followed by acetylation with Acetic Anhydride (1130 Kg). Then the product is treated with Potassium Hydroxide (41.1 Kg) & Mono Ethylene Glycol (162 Kg) and then in the 4th stage refluxed with Sodium Methoxide (35.8 Kg) & IPA (155.8 Kg). Finally mixing the product with Glycerin (2240 Kg) followed by co-distillation and then fractional distillation to separate the glycerin produces 1150Kg of pure Ambrettolide. Four types of distillate generated in intermediate steps, reaction recovered glycerine (1200Kg) and gummy mass (1500 kg), TBR (120 Kg), bad crude (160 Kg), R3 residue (50 Kg) & processed residuals (100 Kg) will be collected in drums in course of reactions and sold in the local market. The production configuration of finished product and handling of raw material have been demonstrated in **Table - 7.1**.

Subsequently steam generated from diesel fired boiler is passed through pure Ambrettolide to stabilize the final product.The final Ambrettolide is drained in new food grade aluminum drums which is packed for export.

Table-7.1
Different Units & its Target Production Capacity

Reaction Vessel	Substrate (TPA)	Product	Quantity of product (TPA)	Sale outlet
Reactor A	Aleuritic Acid (43.2 TPA) + Tri Methyl Orthoformate (38.4 TPA)	Distillate - A	33.6	Sold in the local market
		Mixture - I	-	-
	Mixture-I + Acetic Anhydride (27.12 TPA)	Distillate - B	26.4	Sold in the local market
		Mixture - II	-	-
	Mixture-II + Catalyst-I (KOH 0.98 TPA + MEG 3.89 TPA)	Distillate - C	3.96	Sold in the local market
		Mixture - III	-	-
	Mixture-III + Catalyst-II (Sodium Methoxide 0.86 TPA + IPA 3.74 TPA)	Distillate - D	5.28	Sold in the local market
		Final Mixture	-	-
Reactor B (R_1A) & then transferred to Reactor C (R_2) in portions	Final Mixture + Glycerine (53.76 TPA)	Glycerine recovered	28.8	Sold in the market
		Gummy mass, TBR, Bad crude, R3 residue & processed residuals	Gummy mass (36 TPA), TBR (2.88 TPA), Bad crude (3.84 TPA), R3 residue (1.2 TPA), processed residuals (2.4 TPA)	Sold in the local market
		Crude Ambrettolite	-	-
Reactor D (R_3)	Crude Ambrettolide subjected to fractional distillation	Pure Ambrettolide	24	-
Reactor E (R_4) *	Pure Ambrettolide treated with steam	Water	-	Used for non-critical purposes
		Stabilized Ambrettolide	24	Exported Globally

*Complete reaction cycle will take a span of 15 days time.

7.1.2 Applicability of the rule

As per Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 with subsequent amendments, the Ambrettolide manufacturing process has been classified as an "industrial activity" not associated with storing/ handling hazardous chemicals except the use of TMOF & Acetic Anhydride.

To decide whether the above mentioned industrial activities/chemicals are likely to come within the scope of the above mentioned "Manufacture Storage and Import of Hazardous Chemicals Rules, 1989", the threshold quantities mentioned in the rules are used for comparison, as given in **Table 7.2.**

Table: 7.2
Threshold Quantity & the Chemicals to be handled at SSOC

Sn	Chemical Stored / Handled	*Quantity Stored (In Tonne)	Whether Included in The List of Hazardous & Toxic Chemicals (MSIHC)	Upper Threshold Qty. (In Tonne)	Remarks
1	Aleuritic Acid	*3.6 T (produced from natural product shellac)	Not included	-	Does not come under purview of MSIHC Rules
2	Tri Methyl Orthoformate	*3.2 T	Not included	-	Does not come under purview of MSIHC Rules
3	Acetic Anhydride	*2.26 T	Included	One time storage amount is not very high	Corrosive to skin & eye irritant and come under the purview of MSIHC Rules
4	Potassium Hydroxide	*0.082 T	Included	Small storage	Corrosive and come under the purview of MSIHC Rules
5	Mono Ethylene Glycol	*0.324 T	Included	Small storage	Come under purview of MSIHC Rules
6	Sodium Methoxide	*0.072 T	Not included	Small storage	Not described in MSIHC Rules
7	Isopropyl Alcohol	*0.312 T	Included	1500 T (Very highly flammable Liquid, Part II, Schedule 1)	Very highly flammable liquid, coming under the purview of MSIHC Rules
8	Glycerine	*4.48 T	Not included	-	Not cited in MSIHC Rules and used in medicine & cosmetics
9	Ambrettolide	*2 T	Not included	-	Ambrettolide is used for skin contact in perfumery & cosmetics and food processing
10	Diesel	600 L	Included	5000 T (Flammable Liquid, Part II, Schedule 1)	Come under purview of MSIHC Rules

* 1 month storage

Having done the comparison between stored/handled and threshold quantities for the raw materials and distillate recoveries along with disposable solid wastes, it is observed that none of the materials/ chemicals/residues of reactor/distillate recovered/final product are covered under the purview of MSIHC rules. The only rule no. 17 i.e., preparation and maintenance of material safety data sheets are required to be in place while the plant operates commercially. Also notification of site requires submission of a written report containing among other information the followings:

- Identification of major accident hazards

- The conditions or events which could be significant in causing the hazard
- Brief descriptions of the measures taken
- Area likely to be affected by the major accident etc.

7.1.3. Description of hazardous chemicals

Hazardous substances may be classified into four categories viz., Corrosive, reactive/oxidisable, ignitable/flammable & toxic (CRIT concept). The chemicals, fuels etc., their storage capacities along with associated hazards are all presented in the **Table-7.3.** All these chemicals and fuels will be used for different purposes in the green field project of **M/s BSTPL** i.e., Coal Tar Distillation Plant at Durgapur, EPIP.

Table-7.3
Hazardous Chemicals to be handled by SSOC

Sl. No	Material/other chemicals/solid wastes Stored	Purpose of use	Quantity handled annually (TPA)	Handling Mode	Storage Capacity (1 month storage)	Hazard characteristics
1	Tri Methyl Orthoformate	Used in the synthesis of Ambrettolide.	38.4	Adopt closed mechanical conveyance system (pipe network & pumping) to transfer to the reactor; store in cool place; keep container tightly closed in a dry and well-ventilated place during storage.	3.2 T	Flammable liquid and vapour; keep away from sources of ignition & smoking; causes serious eye irritation on exposure; avoid breathing vapours.
2	Acetic Anhydride	Used in the synthesis of Ambrettolide.	27.12	Directly conveyed from storage area to the reactor through a closed pipe line system; stored in fire protected area with adequate ventilation.	2.26 T	Extremely hazardous in case of skin contact (irritant), eye contact (irritant), & inhalation; flammable in presence of heat.
3	Potassium Hydroxide	Used in the synthesis of Ambrettolide.	0.98	Closed mechanical conveyance system and use of protective gloves & safety goggles during handling is essential.	0.082 T	Corrosive and contact with skin / eye causes severe skin burns and eye damage; do not breathe dust; wash exposed skin thoroughly after handling.
4	Mono Ethylene Glycol	Used in the synthesis of Ambrettolide.	3.89	Directly conveyed from storage area to the reactor through a closed pipe line system.	0.324 T	Irritant in contact with eyes & due to inhalation; mutagenic for mammalian somatic cells; may be toxic to kidneys, liver & Central Nervous System.

	Isopropyl Alcohol	Used in the synthesis of Ambrettolide.	3.74	Closed mechanical conveyance system (pipe network & pumping) and will be stored in poly barrel away from main plant operations.	0.312 T	Highly flammable liquid and vapour; keep away from heat, hot surfaces, open flames, sparks etc.; no smoking; keep container tightly closed; causes serious eye irritation; may cause respiratory irritation; avoid breathing mist, vapors, spray; use only non-sparking tools, electrical equipment, lighting etc.; ventilate the storage area.
	Diesel	Used in diesel fired boiler for generation of steam & heating the fluid used in Thermic Fluid Heater (TFH)	36000 litre per annum (considering 100 litre average consumption per day)	Handle as a flammable liquid; stored in metal drum/poly barrel in specified protected area complying Fire Prevention & Safety requirements; transferred through closed pipe line conveyance system without any leakage.	Capacity for 600L storage	Extremely flammable liquid; easily ignited when exposed to heat, spark, open flame or other source of ignition; being heavier than air, vapors may travel long distances to an ignition source and flash back; no smoking; electrical equipment should be approved for classified area.

Note: The storage capacity of the plant has been stated to be the one month inventory though the actual storage will be the half of the stated quantity as 50% of the above quantity will be utilized in the on-going process and hence the probability of hazard will be further reduced.

7.1.4. Hazard Identification

Hazard is a source or situation that has the potential for harm in terms of human injury, ill health, damage to property or the environment, or a combination of these factors. It has got a short or a long term effect on the work environment with considerable human and economic costs. A hazard can have a potential to create an emergency like situation at the work place. Hazard is a potential cause to generate a disaster.

Hazards exist in every workplace in different forms and required to be identified, assessed and controlled regarding the work processes, plant or substances. They arise from (i) workplace environment, (ii) use of plant and equipment (iii) use of substances and materials, (iv) poor work and/or plant design, (v) inappropriate management systems and work procedures, and (vi) human behaviour.

Chemical synthesis of Ambrettolide is by and large a less hazardous activity and operations in the process don't impose much environmental, health and safety risk to the workforce and environment network as well. If there is any potential for hazard, they may create

potential risk to the work environment which include work force and work place and hence need proper assessment.

M/s. Saraogi Shellac Overseas Corp. is proposing an Ambrettolide manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed plant is expected to have lower risk potential than those industries dealing with large quantities of toxic and flammable chemicals. The total materials under hazardous category handled as raw material and materials recovered in the chemical synthesis of Ambrettolide process are very low in quantity to cause any potential impact. **Table-7.3** above presents the hazards associated with all chemicals and materials to be handled/stored/used. Also the distillates and other remaining materials of reactor are collected in drums and sold in the local market. In these unit there is no scope for generation of sludge/ hazardous waste from the reactors or, the refluxing vessels. All residues in reaction vessel are collected in drums and sold in the mark.

7.1.5. Hazard Assessment

An assessment of the conceptual design is conducted for the purpose of identifying and examining hazards related to feed stock materials, major process components, utility and support systems, environmental factors, proposed operations, facilities, and safeguards.

In the proposed Ambrettolide manufacturing plant, small quantities of hazardous material will be processed, transferred to the reactors and conveyed through closed pipe line systems. The major hazardous chemicals handled/stored by the plant includes TMOF, acetic anhydride, potassium hydroxide, MEG, isopropyl alcohol, diesel etc. Due to movement of various equipment and large masses of materials, workers are exposed to the heat at high temperatures, toxic or corrosive substances, respirable air-borne contaminants and noise.

In any plant hazardous situation arises due to:

- Failure in the monitoring of crucial process parameters e.g. pressure, temperature, malfunctioning of valve, flow quantity etc.
- Failure in the utilities e.g. cooling water.
- Failure control elements e.g. pressure, temperature level, flow controllers etc./valves.
- Failure of components such as pumps, compressor etc.

- Failure of safety systems, safety valves/relief valves, sprinkler systems, alarm, smoke detectors, fume extractors etc.,
- Mechanical failure of vessels or pipe work due to excessive stress, over pressure, corrosion etc.
- Wrong operation, failing to adhere to the safety norms etc.

The situation mentioned above is possible during the storage in bulk quantities of TMOF, acetic anhydride, MEG, IPA, diesel etc. in storage drums/containers. In this plant the material handling amount for both hazardous and non-hazardous material are low and as such do not pose any problem as the proponent is keen to install all safety measures and providing adequate training to the human resources. The system will operate almost as a zero defect system. It is unlikely that small leakage through pipes, gaskets, glands or any other means (user points) will create a hazardous situation unless allowed to be released for a long time. It is expected that during such small leakage preventive steps will be taken within short span of time. Therefore a Preliminary Hazard Analysis (PHA) is carried out first and then a hazard and operability study will be carried out for assessment of hazard. Proper ventilation process will be established in the chemical storage are to drive out the accumulated vapour to minimize the risk of worker exposure as well as fire hazard.

Consequence analysis for the identified hazards :

The effect of accidents is prone to observe in the facilities & utilities of the unit and can be controlled within the areas by the operating personnel themselves. At the extreme it may require the resources of the whole facility to control the effects but these are not at all expected to spill over to the community. **Table 7.4** compartmentalizes several project components along with the incident type, occurrence & preventive Measures.

Table-7.4
Hazard Analysis

Sl. No.	Project component	Incident type	Occurrence	Proposed preventive measures
1.	Storage yard for chemicals (TMOF, acetic anhydride, MEG, IPA, glycerin etc.)	Leak / spill	Leakage from faulty barrel/ drum or associated fittings; Malfunctioning of pump or faulty pipeline or operator error leading to spreading of liquid on ground, soil and air i.e., soil pollution and fugitive emission; fire hazard due to accumulation of vapour can't be ruled out.	➢ Design of storage yard to maintain well separated racks to store individual chemicals as per relevant standards and Legislation. ➢ Emergency Collection tanks provided to minimize potential impacts of leaks/spills. ➢ Regular inspections and maintenance. ➢ Spill management equipment (i.e. spill kits) to be located on-site. ➢ Spill management procedures and training will be carried out. ➢ Operator induction and ongoing training will be carried out. ➢ Operational procedures will be set up to the date. ➢ Opening of drums will be closed immediately after transferring the chemicals through pipe lines. ➢ Material safety data sheet (MSDS) will be kept on-site and signage will be demonstrated at relevant locations. ➢ Hazard Signage will be installed at appropriate place.
		Fire or Explosion	Poor maintenance, poor design, collision or human error leading to fire/short circuit from electrical lines/sparking from electrical equipment/splinter from external sources.	➢ Appropriate storage of all chemicals and dangerous substances will be ensured in accordance with relevant Hazardous Chemical Rules, as per MoEF guidelines 2016. ➢ Appropriate ventilation will be established in warehouse to avoid any impending fire hazard. ➢ Housekeeping activities – site will be kept clean and tidy. ➢ Appropriate Firefighting arrangements and empty container to collect leaked materials will be kept ready and checked at a regular interval. ➢ Operator induction & training and mock trial of fire drill will be conducted at specified interval. ➢ Storage locations will be in isolated place with minimum interaction of

Sl. No.	Project component	Incident type	Occurrence	Proposed preventive measures
				people and property.
		Sabotage	Malicious act/sabotage resulting in accidental impacts.	➢ Restriction of access to storage areas, including secured storage facilities. ➢ Provision of adequate lighting around storage facilities. ➢ Signage (i.e. unauthorized entry warning and information signs). ➢ Police would be notified as soon as possible in case of a suspected breach.
2.	Storage yard for Diesel	Leak / spill	Leakage from faulty barrel/ drum or associated fittings; malfunctioning of pump or faulty pipeline or operator error leading to impacts of fuel contamination.	➢ Organized & well designed storage racks to preserve diesel as per relevant standards and Legislation. ➢ Emergency Collection tanks provided to minimize potential impacts of leaks/spills. ➢ Regular inspections and maintenance. ➢ Spill management equipment (i.e. spill kits) to be located on-site. ➢ Spill management procedures and training will be carried out. ➢ Operator induction and hazard training will be carried out. ➢ Operational procedures will be updated as per requirement. ➢ Material safety data sheet (MSDS) will be preserved and accessible to the employee. ➢ Hazard Signage will be installed at appropriate place.
		Fire or Explosion	Poor maintenance, poor design, collision or human error leading to fire / short circuit from electrical lines/ sparking from electrical equipment/splinter from external sources.	➢ Design of storage yard as per relevant standards and legislation. ➢ Appropriate storage of fuel in accordance with relevant Hazardous Chemical Rules, as per MoEF guidelines 2016 ➢ Appropriate ventilation will be established in the warehouse to avoid accumulation of vapour. ➢ Housekeeping activities – site will be kept clean and tidy ➢ Appropriate firefighting arrangements and provision of empty container for collection of leaked materials from the area of incidence and vigilance for process check at regular interval. ➢ Operator induction and ongoing training and mock trial at a certain interval.

Sl. No.	Project component	Incident type	Occurrence	Proposed preventive measures
		Sabotage	Malicious act/sabotage resulting in accidental impacts.	➢ Restriction of access to storage areas, including secure storage facilities. ➢ Provision of adequate lighting around storage facilities. ➢ Signage (i.e. unauthorized entry warning and information signs). ➢ Police would be notified as soon as possible in case of a suspected breach.
3.	Storage yard for solid chemicals (KOH etc.)	Spreading of flakes/ pellets/ power	Escape of chemicals from small holes or opening in the packaging; spreading of chemicals during transfer of material to the reactor.	➢ Designing of storage racks/ container as per relevant standards and Legislation. ➢ Emergency collection container to be provided to minimize potential impacts of chemical spread. ➢ Regular inspections and maintenance. ➢ Spill management equipment (i.e. spill kits) to be located on-site. ➢ Spill management procedures and training will be imparted. ➢ Operator induction and relevant training will be provided. ➢ Operational procedures/ instruction will be updated time to time. ➢ Material safety data sheet (MSDS) will be available at operation site. ➢ Hazard Signage will be installed at appropriate place. ➢ Showers and eyewash stations (in case of splashing) will be provided. ➢ Appropriate personal protective equipment (PPE) will be provided to the working personnel
		Sabotage	Malicious act/sabotage resulting in environment & health impacts.	➢ Restriction of access to storage areas, including secure storage facilities. ➢ Provision of adequate lighting around storage facilities. ➢ Signage (i.e. unauthorized entry warning and information signs). ➢ Police would be notified as soon as possible in case of a suspected breach.
4.	Pipe line connectivity for transfer of chemicals from storage vessel to reactors	Leak / spill	Leakage in transfer line or associated fittings; malfunctioning of pump or operator error leading	➢ Emergency Collection vessels provided to minimize potential impacts of spills. ➢ Regular inspections and maintenance. ➢ Spill management equipment (i.e. spill kits) to be located on-site. ➢ Spill management procedures and training will be provided.

Sl. No.	Project component	Incident type	Occurrence	Proposed preventive measures
			to impacts including chemical or fuel contamination.	➢ Operational procedures will be updated through training. ➢ Awareness signage will be installed at appropriate place.
5.	Other infrastructure and supporting systems viz. storage of distillates, by-products & remaining.	Leak/Spill	Spillage of distillates and other products/ by-products.	➢ The storage structures / drums will be designed to relevant standards and legislation. ➢ Storage containers will be located to minimize potential impacts of leaks/spills. ➢ Showers and eyewash stations (in case of splashing) will be provided. ➢ Appropriate ventilation and firefighting arrangements will be established in the warehouse. ➢ Appropriate personal protective equipment (PPE) will be provided to the working personnel and be maintained as well. ➢ Use PPE such as impervious clothing by the workers will be ensured

7.2. Disaster Management Plan

Need & Scope

A major emergency in an activity/project is one which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the activity/project. It would normally require the assistance of emergency services to handle it effectively.

An important element for mitigation is emergency planning, i.e. identifying accident possibility, assessing the consequences of such accidents and deciding on the emergency procedures, both on site and off site that would need to be implemented in the event of an emergency.

Emergency planning is just one aspect of safety and cannot be considered in isolation. Works management will ensure that the necessary standards, appropriate to safety legislation, are in place.

The overall objectives of the emergency plan will be:

- To localize the emergency and, eliminate it; and
- To minimize the effects of the accident on people and property.

Elimination will require prompt action by operations and works emergency staff using, for example, fire–fighting equipment, water sprays etc. In the proposed Ambrettolide manufacturing plant fire occurrence may be moderate to violent if proper safety measures are not in place.

Minimization of effects may include plant shutdown, safety of the warehouse, security rescue, first aid, evacuation, rehabilitation and giving information promptly to people living nearby and different administrative wing needed to combat during such occurrence.

On Site Emergency Plan

The on-site emergency plan relates to the laid-down and well-practiced procedure after taking care of all design based precautionary measures for risk control. The emergency plan of SSOC is detailed herein viz.

M/s SSOC is committed to operate at highest standard to protect health and safety of their employees, and all those who work on behalf of the organization, public at large and environment. Therefore as a part of emergency preparedness, the employees of M/s SSOC, have developed and will maintain this emergency plan in compliance with applicable laws and industry standards to ensure a timely & appropriate response to emergency situations. The objective of this manual is to establish and maintain plans and procedures to identify the potential hazard and responses, incidents and emergency situations. This plan gives guidelines for four basic activities such as Mitigation, Preparedness, Response and Recovery.

This plan is prepared for location specific premises. It is prepared to:

- Minimize the loss of life during emergencies.
- Minimize the injuries during emergencies.
- Minimize the loss of property.

And to make the staff, contractors, sub-contractors and other people involved in business activities familiar with:

- Emergency Management Procedures, Safe Work Procedures, Emergency Escape Routes, Emergency Exits and where to report during evacuation of the site i.e., the emergency assembly point located near security gate.

- When and how to handle work place emergencies and evacuate the people in the site.
- Location of Fire Extinguishers, First Aid Kits and other emergency management equipment.
- Proper procedures for notifying emergencies to Emergency Control Team members.

Activities under this plan

Mitigation

Getting ready to handle a disaster to reduce the intensity when it strikes.

Response

All activities undertaken at the time of an emergency are addressed to save lives, property and to reduce injuries.

Preparedness

Any activity that is undertaken, before a disaster strikes, to eliminate or reduce the possibility of an emergency or the impact a disaster may have on a community or site.

Recovery

Activities undertaken to return things back to normal, or to better condition, after the initial shock and emergency response activities have subsided.

Emergency

An emergency is a situation, which may lead to or cause a large-scale damage or destruction to life or property or environment within or outside the factory. Sometimes, Emergency results into uncontrollable situations and leads towards disaster. Such an unexpected severe situation may be too great for the normal workforce in the area within the plant. In any industry, emergency can arise at any moment and this depends on the type of

- ✓ Structure
- ✓ Raw Materials
- ✓ Machines / Plant
- ✓ Nearby Industries etc.

Critical Elements of this plan

- Reliable and early detection of an emergency and careful planning.
- The command, coordination and organization structure along with efficient trained personnel.
- Resources for handling emergencies.
- Appropriate emergency response actions.
- Effective notification and communication facilities.
- Identification of emergency isolation valves.
- Proper training of concerned personnel.
- Regular mock drill / rehearsal.
- Regular review and updating of plan.

Each workplace at SSOC and the factory is required to have a fully implemented Onsite Emergency Plan. The procedures to be followed are designed to assist in the organization and implementation of Onsite Emergency Plan for the workplaces at **SSOC**. **Table-7.5** presents the potential risk areas inside the factory.

Table-7.5
Important Potential Risk areas inside the factory

Sr. No.	Chemical	Location				Hazard			
		Plant	Storage	Loading	Unloading	Spillage	Toxic gas release	Fire	Explosion
1	Tri Methyl Orthoformate	✓	✓	x	✓	✓	✓	✓	x
2	Acetic Anhydride	✓	✓	x	✓	✓	✓	✓	x
3	KOH	✓	✓	x	✓	✓	x	x	x
4	Mono Ethylene Glycol	✓	✓	x	✓	✓	✓	✓	x
5	Iso Propyl Alcohol	✓	✓	x	✓	✓	✓	✓	✓
6	Diesel	✓	✓	x	✓	✓	x	✓	✓
7	Distillates	✓	—	✓	x	✓	x	✓	x
8	Gummy Mass etc.	✓	—	✓	x	✓	x	✓	x

On Site Emergencies:

On site emergencies are classified into –

1. Level – 1 Type
2. Level – 2 Type

Emergencies of Level – 1 Type :

Level – 1 Emergency is defined as an emergency which will require the resources from other Departments, may be from outside AVH also, and it may require dynamic assessment of progression of risk, it may require other plant/personnel to be kept on alert for evacuation and safe shut downs.

Emergency situation may get created due to fires, explosion or combination of those, from the following places / areas which may be either because of natural calamities or man made mistakes or sabotage.

- Diesel storage drums & associated piping
- TMOF/ Acetic Anhydride/MEG/ IPA storage drums & associated piping to transfer to the reactor
- Distillates/ Gummy Mass etc.storage drums & associated pipelines to drain the materials from reactors
- Explosion in Boiler & associated equipment's.
- Bursting of any other high pressure lines or explosions in reactors or pipe lines.
- Collapse of structure.

Emergencies of Level – 2 Type :

Level – 2 Emergency is defined as emergency in which only the concerned Plant/Department and fire department can combat without disturbing working of other Plants/Departments, it will not require evacuation from that Plant/department or from any other Plant/Department.

- Food poisoning due to canteen food.
- Fire due to leakage of flammable liquid from flanges, pumps, seals, valves, glands.
- Vessel overflow
- Chemical Leakage from flanges, pumps, seals, valves, glands.
- Fall from height
- Burn injuries / first aid injuries
- Electric Shock (Electrocution)
- Personal Confinement

Emergency Control Room/Escape Routes/Assembly Points/Sirens/ Wind Sock locations:

Emergency Control Room:

In the event of a major accident the Security Office at the Main gate will function as control room of Chief Emergency Controller. This control room will maintain an up to date list of telephone numbers of all key personnel and outside agencies. This control room will be manned round the clock.

Incident Site Control Room:

The control room of the affected plant will function as Incident Site Control Room.

Escape Route:

In the event of an emergency requiring evacuation of people from affected plant, it would be required to direct the evacuees to proceed towards Assembly Point depending upon the wind direction. Accordingly the escape route will be marked through signage.

Wind Socks:

Several Wind Socks installed in plant areas will guide the evacuees to move towards safe assembly point.

Assembly Point:

Considering area of the plant, Assembly points are designed to be used as per the nature of emergency and wind direction.

Siren:

There is an emergency siren fixed in the complex. The sound of the siren can be heard up to 5 KM.

Roles & responsibilities of various personnel:

In an emergency during day time and silent hours i.e. from 6:30 p.m. to 9:30 a.m. on working days, full day on weekly off and holidays, actions are required to be taken by Shift-in-Charges/Shift Engineers, Operators & Technicians till the senior persons come to the site. During general shift hours also first few minutes, the same persons will be available immediately. In an emergency it is important that at incident site one person takes the command of the situation and leads the team to combat the emergency. Under his guidance all other key persons will carry out their duties and he will ensure that all related actions are

taken simultaneously. In an emergency, Incident Controller will concentrate at incident site. At times, he may require the additional resources in terms of equipment, additional manpower, etc. At the same time, there may be a need to interact with outside agencies for getting resources, complying with statutory provisions and interacting with Police, neighboring industries, etc. In emergency plan this role is allotted to Chief Emergency Controller and he will be the overall controller of emergency.

Primary Observer :

The person who first notices the incidence will inform to concerned Control Room and report as follows:

-Identify himself
-Location and type of incidence
-Severity of incidence
-Wind direction - safe route of approach

If possible, fights the emergency e.g. fight the fire with extinguisher; isolate the system, etc. by keeping himself safe.

Wait at site if atmosphere is conducive for arrival of Incident Controller or rush to relevant Control Room to inform.

Chief Emergency Controller:

Factory Manager in his absence Head – Engg. & Utility will be the Chief Emergency Controller.

Beyond General Shift hours and on Holidays Site Shift Manager will act as Chief Emergency Controller until Plant Head or Head – Engg. & Utility arrives.

Chief Emergency Controller will be over all controller of the emergency. On receipt of information, he will proceed to Emergency Control Room. He will take ultimate decision on the following aspects and execute the same with the assistance of Head HR & Administration who will also rush to Emergency Control room:

- Essential communication
- Fire fighting and Rescue work
- Emergency Plant shut-down
- Evacuation actions, if required and Head Count
- Demolition and Repairs

- Transportation
- Investigation
- Public Relation
- Urgent medical attention and actions
- Assess whether off-site emergency needs to be declared. In case 'yes',
- inform District Authorities, Police and Mutual Aid Response Group members.
- Evacuation and directive to vicinity community through state Govt. agencies

The Shift-in-charge of the Plant will function as an Incident Controller until concerned HOD arrives at the Site:

Go to the Site and;

- Assess the emergency
- Instruct Security to sound appropriate Siren
- Direct the fire fighting and rescue operation
- Direct the plant operations / shut-down to control the emergency
- Direct the Mechanical / Electrical / Instrument / Civil Managers / Officers for support services.
- Ensure constant feedback to C.E.C.
- Deploy officers and staff for control room and field for coordinating and directing the work of the fire fighting and rescue operation.

Head (Safety & EHS):

In absence of Head – EHS & Safety, Safety officer will take over this role. Rush to the site of emergency and;

- Review the action taken and advise Security / Fire Executive and Incident controller in the area of fire fighting and rescue operations and further steps required for reducing the spread of risk.
- Arrange for additional safety equipment.
- Provide help to C.E.C. to get help from outside agencies like local Fire Brigade etc.
- Decide the method of disposal of hazardous spillage. Collect information on weather condition, ambient air quality and drain discharge during emergency.
- Collect plant data relevant to the incident and maintain a log book which will be properly documented, signed and shall be kept at a convenient place. This log book shall be accessible to the major important officers / staffs who are directly involved with the mitigation measures.

Head – Engineering & Utility:

In absence of Head – Engg. & Utility, Manager -Mechanical will take the role of Head

– Engg. & Utility.

Rush to the Emergency Control Room and maintain consultation with Chief Emergency Controller.

- Arrange and provide necessary equipment like cranes, dozers, pay loaders, forklifts, trucks, welding / cutting sets, jacks, chain pulley blocks, water pumps, etc. and power to operate these equipment.
- Ensure continuous operation of fire water pumps.
- Arrange and provide required number of personnel to do civil, mechanical and
- electrical jobs like sand bags, bundling, excavation, repairs, structure and debris removal, lighting, etc.
- Make arrangement for permanent / temporary lighting / flood lights /emergency lights to the affected area, shelters and other places
- Direct the operation of above equipment and services
- Keep constant touch with Chief Emergency Controller.

Shift Maintenance :

Shift Maintenance Engineer will carry out following function until Manager (Mechanical)takes over;

- Necessary equipment like cranes, dozers, pay loaders, forklifts, welding /cutting sets, jacks, chain pulley blocks, tools and tackles, etc. to the site of emergency.
- Arrange and depute operators, riggers, welders and technician, etc. to operate the above equipment.

Shift Electrical:

Shift Electrical Engineer will carry out following function until Manager – Electrical takes over;

- Arrange to cut off / restore power supply as needed in emergency situations.
- Provide temporary connection for flood lights, street lights and electrical tools.
- Provide power connection for pumps and other equipment
- Keep liaison with MSEB / MIDC.
- Remain in constant touch with Incident Controller.

Shift Instrumentation:

Shift Instrumentation Engineer will carry out following function until Manager –Instrumentation takes over;

- Organize instrumentation jobs such as repairs, adjustment of settings,
- bypassing, switching over to the mode of control, repairs, calibration and the like, which are needed for effective process control during emergency.
- Restore the functioning of controls, alarms and recorders, indicators, etc. for stabilizing the operations.
- Remain in constant touch with Incident Controller.
- Ensure availability of information and data, pre- disaster time and at the time of disaster and store it in proper fashion so that as and when required is available.

Head Commercial & Marketing

Head Commercial & Marketing will take over this role in absence of Manager–Purchase & Stores.

- Immediately contact Chief Emergency Controller and ascertain the material requirements to control emergency.
- Arrange adequate supply of required material and transport for material.
- Procure or hire material, labor and transport to meet urgent requirement from outside parties / industries.

Head - HR& Admin. (Communication Controller)

Manager –HR & Administration will take over this role in absence of Head – HR & Admin.

Go to Emergency Control Room and

- Organize hospitalization, evacuation, head count and relief camps.
- Maintain law and order in factory premises (with the help of security)
- Control entry and exit of personnel & vehicles with the help of security
- Seek assistance from outside agencies such as police, civil defense, fire brigade and mutual aid scheme.
- Ensure dissemination of authentic information to public and press
- Keep relatives/ family members of involved employees informed from time to time
- Inform to statutory authorities in consultation with C.E.C.
- Give constant feedback to C.E.C.

Security in Charge (Emergency Centre Controller)

Security In charge will carry out following function until Chief Security Officer take over.

- Reinforce security at gates and vital installations
- Depute security personnel to help firefighting, rescue and stretcher service
- After instruction of Incident Controller blow of appropriate siren.
- Restrict entries of unauthorized persons
- Regulate entry and exit of personnel to ensure smooth function of emergency services
- Ensure smooth entry and exist of fire brigades, ambulances and service vehicles
- Organize transportation for affected/evacuated employees, their families and public.
- Keep liaison with police, home guards for additional help to control law and order, traffic and evacuation.

Male Nurse:

Factory Medical Officer will take over this function after reaching the O.H.C.

- Organize ambulance services, treatment and hospitalization of affected persons
- If necessary, get help of outside hospitals and medical professionals
- Pass on information regarding condition and treatment of patients to Head HR & Admin. from time to time
- Contact Blood Bank and organize blood supply
- Get blood donors. Get the help of social service organizations for this purpose
- Contact Head HR & Admin. for welfare arrangements of treated and discharged persons
- Give feedback to Head HR & Admin.

Operators / Technicians:

- Perform duties as assigned by incident controller & shift engineer.
- Take action to stop supply of fuel to the point of fire / leakage keeping yourself safe as directed by Shift-in-charge / Engineer.
- Standby for instructions from Shift Engineer. Keep ready for evacuation, if needed.

Other Control Room Persons:

If Control room is not conclusive, bring the plant to safe condition with minimum crew by using Breathing Apparatus and evacuate.

Communication Controller

- Notifying the appropriate emergency service as per instruction by the Incident Controller/Site Controller.
- Notifying the members of the Critical Incident Management Team as directed by the site Controller.
- Relaying information.
- Maintaining a chronological record of organizational response and key events during the emergency.
- Maintaining liaison with Press, Government agencies and neighborhood regarding the emergency under instructions from the Site Controller.
- Disclosing all the necessary information in the site so as to avoid rumors and confusion.

Fire, Rescue & Evacuation Team:

- This team directly handles the emergency under the instruction from Site controller / Incident Controller.
- Upon hearing the emergency siren, the group leader should establish communication with the Incident Controller and start handling the emergency directly.
- Direct the rescue operations in co-ordination with Incident Controller and Head – Safety & EHS.
- He should take the help of Security to cordon off the area.
- He should ensure that the emergency does not escalate, but is contained within the spot of occurrence.
- The leader should mobilize his team and establish contact with the Incident Controller regarding Head Count and start the search operations, if required.
- The leader should ensure that he and his team members wear the necessary Personal Protective Equipment while searching for missing personnel.

First Aid Team:

If notice any medical emergency, inform Incident Controller immediately.

- If you hear emergency siren, get the details from the Incident Controller.

- Use First Aid equipment available in the premises.
- Provide First Aid to the injured.
- Arrange for medical help/ambulance/doctor and transport the injured to the hospital as required in case of major injury.

Engineering Team:

The team should ensure that remaining part of the site is safe.

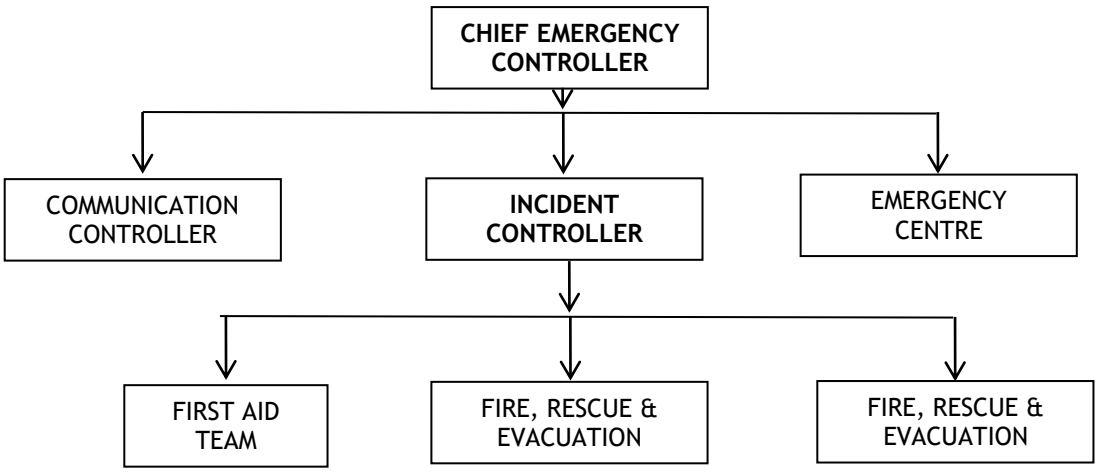
- Carry out civil work that may become necessary during the emergency.
- Carry out electrical / electronic shut down procedures.
- Mobilize necessary tools and tackles to handle any repair work on emergency basis.

All Others:

In case Evacuation siren is sounded, rush to Assembly Point after seeing the wind direction.

- Direct and lead Drivers / Contractors / Visitors to Assembly Point.
- Do not phone unless it is necessary.
- Do not spread any rumors.
- Proceed to head count at Assembly Point in orderly manner.
- Obey the instruction of Security at Assembly Point

Emergency Management Team



Emergency Procedures in case of Incidents

Response Requirement for Incidents

- The person first noticing the accident should inform the Incident Controller / Security to send Ambulance to the spot of accident.

- The trained First Aid Team Member available at accident spot will give the preliminary First Aid.
- If the accident is of serious nature Factory Medical officer will arrange victim to send to the nearest hospital.

Victim of Burns

- Pour cold water on the burn area till the burning sensation is reduced.
- Cover it lightly with a clean cotton cloth.
- Do not apply butter, oil, ointments or any home remedies
- Immediately rush to Occupational Health Centre to get medical help.

First aid for scalds

- Pour cold water.
- Do not rupture the blisters
- Cover them with clean cloth.
- Do not apply any ointment
- Immediately rush to Occupational Health Centre to get medical help.

First aid for injury (Fracture)

- Keep the patient in a comfortable position
- Apply splint if required
- Do not forcibly move the affected part
- Immediately rush to Occupational Health Centre to get medical help.

First aid for cut injury

- Control the bleeding by: Elevation of the affected part, local pressure.
- Apply tight clean bandage.
- Shift to the hospital.

Electric shock

- Do not touch the person directly, cut off the supply.
- If it is not possible to isolate from electrical supply, remove the victim with the help of insulating material e.g. dry wooden stick by ensuring personal safety.
- Administer the First Aid on the spot by the First Aid Team Member
- Shift the affected person to a comfortable position.
- Give artificial respiration if needed.
- Keep victim lying down.
- Do not move victim if you suspect neck or spine injury, unless absolutely necessary.

- Immediately rush to Occupational Health Centre to get medical help.

Alkali/Chemicals/Hot Reagents/Hot Solvents splash or contact and resulting burns on body

- Clean the area with plenty of water for at least 20 minutes.
- Do not apply any cotton tape or home remedies (medicines)
- Administer first aid on the spot by the qualified first aider.
- Immediately rush to Occupational Health Centre to get medical help.

Food Poisoning

- Call the ambulance, provide first aid.
- Immediately rush to Occupational Health Centre to get medical help.
- Stop supply /consumption of food.

Leakage & spillage of Alkali/Chemical/Reagents/Organic Solvents

- Stop the work
- Barricade the area immediately and do not allow any movement
- Contain and absorb the leak or spillage by suitable method / spill kit.
- Store absorbed chemicals in a container.
- Dispose the material properly.
- Removal of hot products must be done only after the temperature cools to ambient levels.

Emergency Communication System in the plant:

Walkie talkies

- Walkie talkies are always available with following persons:
- Shift In charge – Electrical
- Shift In charge – Mechanical
- Shift In charge – Instrumentation
- Shift In charge – Production
- Control room – In charge
- Security - Main Gate
- Security – Material Gate
- Fire Pump House
- Safety Department

Public Address System (PA System)

- PA system is distributed in the entire plant; emergency announcements can be done through this system from control room.

- Battery operated Public address system is also available in fire tender which can be used at emergency situation/site.

Fire Detection System:

Smoke detectors: 10
Heat Detectors: 20
Manual Call Points: 6
Hooters: 2
Fire Panel: 2

Fire Extinguishing Systems:

Portable Fire Extinguishers in the plant

Portable fire extinguishers are placed in the entire plant at different locations according to the class of fire. Following type of fire extinguishers are available in the plant:

Type	Capacity	Total Quantity
ABC	5 Kg	7
ABC	10 Kg	5
DCP	10 Kg	4
DCP	25 Kg	2
CO2	4.5 Kg	10
CO2	22.5 Kg	2
CO2	9 Kg	5
M. Foam	9 Lit.	5
M. Foam	10 Lit.	5
M. Foam	50 Lit.	5
Water Gun	-	2
Total		**52**

Fire water Pond:

Capacity: 100 KL.

Fire water pump house:

Fire Hydrant and Sprinkler systems

Jockey pump – 1 No. – 6 meter cube per hour, Head – 75 Meter.
Main pump – 1 No. - 273 meter cube per hour,Head - 80 Meter.
Diesel pump – 1 No. 440 meter cube per hour, Head - 80 Meter.

Safety shower with Eye wash:

Safety showers are placed in the entire plant at different locations, total 3 No

Self-Containing Breathing Apparatus (SCBA)

In Plant: 3 No's.

In Fire Tender: 02 No's

Off-Site Emergency Preparedness Plan

The task of preparing the Off-Site Emergency Plan lies with the district collector; however the off-site plan will be prepared with the help of the local district authorities. The proposed plan will be based on the following guidelines.

Introduction

Off-site emergency plan follows the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off- site emergency is essentially the responsibility of the public administration. However, the factory management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighboring population.

The off-site plan in detail will be based on those events which are most likely to occur, but other less likely events which have severe consequence will also be considered. Incidents which have very severe consequences (yet have a small probability of occurrence) will also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

The roles of the various parties who will be involved in the implementation of an off-site plan are described below. Depending on local arrangements, the responsibility for the off-site plan will be either rest with the works management or, with the local authority. Either way, the plan will identify an emergency co-coordinating officer, who would take the overall command of the off-site activities. As with the on-site plan, an emergency control center will be setup within which the emergency co-coordinating office can operate.

An early decision will be required in many cases on the advice to be given to people living "within range" of the accident - in particular whether they should be evacuated or told to go indoors. In the latter

case, the decision can regularly be reviewed in the event of an escalation of the incident. Consideration of evacuation may include the following factors.

In the case of a major fire but without explosion risk (e.g an oil storage tank), only houses close to the fire are likely to need evacuation, although a severe smoke hazard may require this to be reviewed periodically.

If a fire is escalating and in turn threatening a store of hazardous material, it might be necessary to evacuate people nearby, but only if there is time; if insufficient time exists, people should be advised to stay indoors and shield themselves from the fire.

Aspects to be considered in the Off-Site Emergency Plan

The main aspects, which will be included in the emergency plan, are:

- Details of command structure, warning systems, implementation procedures, emergency control centers.
- Names and appointments of incident controller, site main controller, their deputies and other key personnel.
- Identification of personnel involved, communication center, call signs, network, lists of telephone numbers.

Specialized Knowledge

- Details of specialist bodies, firms and people upon whom it may be necessary to call i.e. those with specialized chemical knowledge, laboratories.
- Voluntary Organizations
- Details of organizers, telephone numbers, resources etc

Chemical Information

- Details of the hazardous substances stored or procedure on each site and a summary of the risk associated with them.

Meteorological Information

- Arrangements for obtaining details of weather conditions prevailing at the time and weather forecasts.

Humanitarian Arrangements

- Transport, evacuation centers, emergency feeding, treatment of injured, first aid, ambulances, temporary mortuaries.

Public Information

- Arrangements for dealing with the media press office; informing relatives, etc.

Assessment

- Arrangements for: (a) collecting information on the causes of the emergency; (b) reviewing the efficiency and effectiveness of all aspects of the emergency plan.
- Role of the Emergency Co-coordinating Officer

The various emergency services will be coordinated by an emergency coordinating officer (ECO), who will be designated by the District Collector. The ECO will liaise closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control will be passed to a senior local authority administrator or even an administrator appointed by the central or state government.

Role of the Local Authority

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed will carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO will liaise with the works, to obtain the information to provide the basis for the plan. This liaison will ensure that the plan is continually kept up-to-date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans will be organized by the EPO.

Role of Police

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements. Their functions will include controlling bystanders, evacuating the public, identifying the

dead and dealing with casualties, and informing relatives of death or injury.

Role of Fire Authorities

The control of a fire will be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer will also have a similar responsibility for other events, such as explosions. Fire authorities in the region will be apprised about the location of all stores of flammable materials, water and foam supply points, and fire-fighting equipment. They will be involved in on-site emergency rehearsals both as participants and on occasions, as observes of exercises involving only site personnel.

Role of Health Authorities

Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, will have a vital part to play following a major accident, and they will form an integral part of the emergency plan.

For major fires, injuries will be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally available in most of the hospitals.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical “mutual aid” scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

Role of Government Safety Authority

Factory Inspectors of the region may like to satisfy themselves that the organization responsible for producing the off-site plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well documented procedure and evidence of exercise undertaken to test the plan.

In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations.

7.3 Occupational Health & Safety Facilities and Logistics:

A) Occupational Health Center (OHC):

- The plant will install one OHC located at any convenient place inside the plant premises. There will be one qualified Doctor who will visit the centre at some frequency regularly and would be available on call if there is any incidence of emergency. In addition to that there shall be qualified and trained dresser and pharmacists who will also visit at same interval with the Doctor.
- There will be a well-equipped ambulance to carry the patient to the nearby hospital/health centre whenever there is emergency for any patient.
- All necessary medicine stock and medical equipment will be available for management of emergency treatment.
- The management of M/s SSOC shall take the initiative to build up a tie up relation with the local hospital/nursing home/healthcare centre so that the patients at time of danger and emergency can be admitted.

B) Fire Fighting Equipments / Facilities:

The plant will maintain well equipped fire fighting facilities which includes different types of portable fire extinguishers and arrangement of water for the fighting at required places as per identified locations through HIRA. The Security Guards will be trained in operation of fire fighting equipment. In addition to that the management will maintain liaison with the fire Brigade service under West Bengal Fire and Emergency Services situated at a distance of 05 Km from the plant for obtaining fire fighting assistance / services for further management of the fire incident in case of any emergency. The plant will have permit / Fire License from competent statutory authorities.

Fire water will be installed with required fire hose at specified location inside the plant not very far either from the plant or warehouse. The water for fire fighting has been kept under provision. Further there will be a rain water harvesting reservoir which also can supply water at some part of the year in case of emergency.

C) Emergency Assembly Point:

Spots/locations will be declared as per convenience for assembly purposes at the time of emergency and will be marked as emergency assembly point

inside the plant. In the event of emergency people will evacuate from the work place and be assembled at those points till further instruction.

D) Emergency Control Room:

There will be be one emergency control room which will be provided with CCTV and PA facility and telephone connectivity. In case of emergency condition the planned mitigation activity as per proposal will be communicated and monitored from this control room till the time the emergency situation disappears. This control room may have emergency siren/hooter.

Conclusions:

The green field Ambrettolide manufacturing plant of M/s Saraogi Shellac in Dunkuni Industrial Complex is really a small manufacturing unit as the unit will handle only 24 TPA of Ambrettolide production along with other by-products like distillates & reactor remaining. M/s Saraogi Shellac Overseas Corp. will have to develop an absolutely need based compatible SOP for combating risk, hazards and various disasters which are expected to happen during commercial operation of the project. The plant under discussion has elaborately explain the risks, hazards, disasters etc. which are associated with such type of projects.

Both risk and hazard issue vis-a-vis occurrence of disaster have been described for the green field project of M/s SSOC Ambrettolide manufacturing plant in Dunkuni Industrial Complex at Chanditala-Serampore Road, Dankuni - 712702, West Bengal. Considering the configuration of target production and raw material handling to achieve the production it may be concluded that risk and hazard potential associated with the plant is not a matter of severe concern. Whatever risk, hazard and disaster have been identified can all be mitigated through a planned strategy and its implementation.

CHAPTER-8.0
PROJECT BENEFITS

M/s. Saraogi Shellac Overseas Corp. proposes to install a green field Ambrettolide manufacturing plant in Dankuni Industrial Complex at a total project cost of Rs. 4.45 crores at Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed project will have certain benefits which will include both social and commercial. The project would bring a series of benefits both direct and indirect right from the day one i.e., start of construction till the commercial take off of the plant and its subsequent sustainability with time. The production profile of the Ambrettolide manufacturing plant will help to enhance the infrastructure developmental activities in the locality. Worthy to mention here that the project would help both Union Govt and State Government to earn taxes so that the exchequer is strengthen. The benefits of the project are identified, analyzed for merits and presented below in this chapter.

8.1 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

- M/s SSOC shall initiate activities for public convenience in the areas of road development and maintenance in and around the plant for assuring better movement of transport system and work force.
- The green belt development activity of M/s SSOC, although will take place along the boundary of the plant, will act as a sink for green house gases and fugitive dusts. Further this greenbelt will also help to remove discomfort partly causing from noise and vibration in the area.

8.2 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

- Proposed project will not disturb the existing pattern of demographic structure in the locality. Influx of population due to project will not be significant.
- No R & R Plan is required as M/s SSOC has purchased the land from private owner of the land. The land has been sold to M/s SSOC by the land owner.
- By the presence of this industry, local transporters will get business to some extent.

- The villagers will have very limited employment opportunity but livelihood and basic amenity support in the locality will be increased in future.
- Fire fighting facilities may now be available on request by the nearby habitation.
- There may be some improvement in the primary education centers due to the flow of fund from the proposed greenfield Ambrettolide manufacturing plant as a part of corporate responsibility.
- There will be some improvement in primary health centers (PHC) due to financial assistance from the proponent i.e., M/s SSOC, as a part of corporate social responsibility and policy.
- Unit will actively support the efforts to spread the primary education down to the children of economically backward community and unemployed women folk will get temporary construction job initiated to the project site.
- M/s SSOC will encourage all initiatives towards plantation programme across villages attached to the project site so that in near future a large sink for environmental pollution is available at the factory's doorstep.

8.3 EMPLOYMENT POTENTIAL

- The Proposed green field Ambrettolide manufacturing plant of M/s SSOC will require staff members/officers/workers for various activities pertaining to administration, plant & its operation management, security and safety, environmental aspect management, health care, risk & hazard management & other commercial activities. The total manpower for managing all these activities that will be required for the plant is approximately 10 persons. Majority of the human resource will be absorbed from the locally available human resource. As such this particular unit will not be able to generate a good employment potential directly but over the years of operation the unit will generate scope for down stream industries and some other indirect employment.
- It can be envisaged that employment potential in tertiary sector will be significant as the unit will starts production used in perfumery, cosmetic and food processing industries across pan India level.
- It is expected that some infrastructural improvement will take place in and around the project site.

- It may be recorded that improvement in transport sector will increase day by day and will continue as long as the project sails smoothly with profit.
- The project will provide benefit to the local people by boosting opportunities for starting small/medium scale business in trade and commerce.
- There will be an overall improvement of the peripheral human habitat in the project area.

8.4 OTHER TANGIBLE BENEFITS

- Flood control by rain water arresting and harvesting. Erosion control by nalla training, terracing and bonding.
- Under corporate social responsibility programme M/s SSOC will perform certain activities in the area of improvement in primary education and primary health care. This is of course a direct benefit to the local people and will continue till the time the units operates satisfactorily.
- **M/s SSOC** will not discharge anything either from the process site or from the raw material warehouse to the outside environment. Thus land character/status will not change due to contamination. This is a direct benefit to the land owners in and around the plant.
- **M/s SSOC** through rainwater harvesting technique will minimize the chances of water logging/flooding of the land or public sewer in and around the plant.

CHAPTER-9.0
COST BENEFIT ANALYSIS

M/s SSOC has proposed to install a green field Ambrettolide manufacturing plant to produce pure Ambrettolide along with 4 types of process distillates, gummy mass, bad crude, R3 residue, processed residuals etc. as by products. The product is manufactured from Aleuritic Acid which is generated from the plant product i.e., lac. Since the starting material is generated from a natural product, the synthesis of Ambrettolide is performed in an environmental friendly manner. This project contrary to any other project doesn't effect the environment much for its inherent process quality. But as a preventive measure the proponent has proposed adoption of different pollution mitigation measures and tried to arrest any plausible damage to the environment due to the establishment of the project.

M/s SSOC has made an attempt to study in a humble way the cost and benefit analysis to the environment due to the project.

Cost-benefit analysis of environment for a project is widely regarded as an essential step for sustainability of the project policy. It helps decision makers to visualize the picture of how society would be affected under the influence of the project activity associated with the production.

Synthesis of Ambrettolide involves reaction with few hazardous materials like TMOF, Acetic Anhydride, IPA etc. The chemicals are transferred to the reactor through closed pipelines. Fugitive emission of toxic vapors is thus eliminated to the maximum extent. Pure Ambrettolide is extensively used in food processing units and hence may be considered as safe. The product being used in perfumery & cosmetics is also dermatologically safe.

The detail cost benefit analysis is an exhaustive activity and beyond the scope of the current EIA-EMP report for the project vide ToR issued by SEIAA ref. File No.238/EN/T-II-1/061/2021 dated 16-02-2022 (Refer **Annexure-I)**. As per S.O. 1533 dated 14th September 2006, this chapter is to be prepared if prescribed at scoping stage.

It may be concluded that the synthesis of Ambrettolide along with various by products have important commercial uses and production sequence does not

pose any problem to the environment if different protective measures which already exists for pollution mitigation is installed appropriately. Further the product of Ambrettolide will directly help to the development of food processing, perfumery industry and cosmetics and there by facilitate employment generation in both direct and indirect way. This is the benefit of the project.

The prescribed scope does not require environmental cost benefit analysis.

CHAPTER-10.0 ENVIRONMENTAL MANAGEMENT PLAN

10.1 BASIC CONTENTS

Environmental Management Plan is the key to ensure a safe and clean environment. A plant may have taken proper pollution control measures but without a management plan to assure its proper function, the desired results may not be obtained.

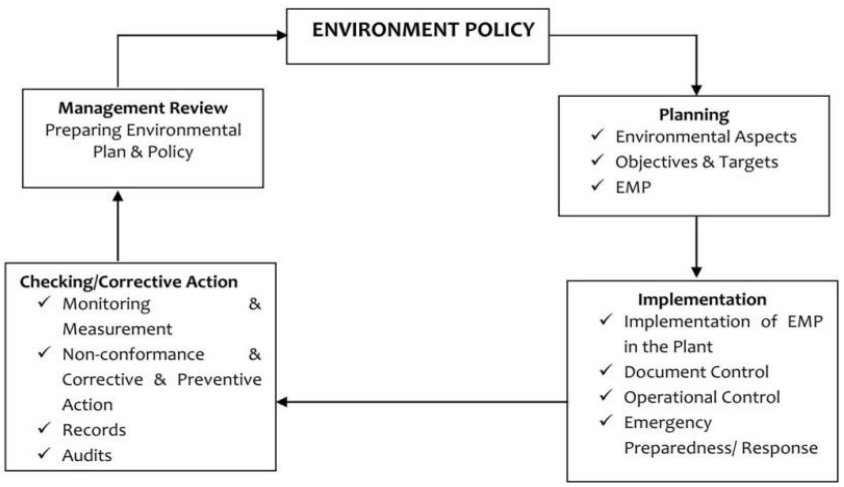
Various pollutants' generation, their control & disposal for the proposed project has been discussed in **Chapter-2**. In this chapter, various mitigatory measures, to be taken by the proponent to ensure the good and healthy overall Environmental Management System for the plant have been discussed.

10.2 ADMINISTRATIVE MANAGEMENT AND POLICIES

Environmental management plan can be implemented effectively if the company has certain employees dedicated towards management of environment and certain policies depicting various goals towards sustainable environment. **M/s. SSOC** has the same objective towards environment management. The company has defined its objective and policies towards sustainable environment. Accordingly some personnel have been earmarked to implement certain defined aspect of environmental policies for achieving sustainability.

The working of environment management is given below: -

Working of Environment Management Plan



10.2.1 ENVIRONMENTAL MANAGEMENT CELL

Establishment of an environmental management cell will be a positive step towards protection of environment. **Figure 10.1** presents the Hierarchical Structure of Environment Management Cell. For effective pollution control and environmental protection measures, following functions of environmental management cell are recommended:

Functions of Environmental Management Cell

Ensuring :

I. correct data collection, proper management of treatment and disposal facilities for air emissions and waste water.
II. Routine monitoring of relevant parameters to determine pollution levels.
III. Ecological monitoring and green belt maintenance.
IV. Implementation of environmental management plan.
V. Data handling, reporting, liaison with statutory bodies and future planning regarding environment management.

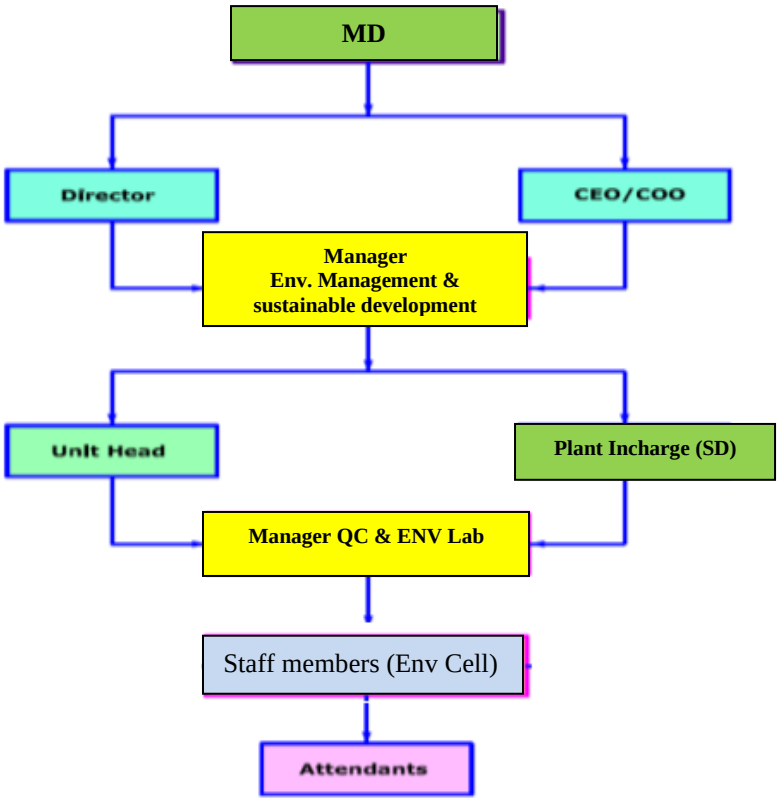


Figure 10.1
Hierarchical Structure of Environment Management Cell

10.3 CORPORATE ENVIRONMENT HEALTH & SAFETY POLICY

The Company has set goals and objectives/policies laid by its board of Directors **(Annexure-VII)**. Corporate Environment Policy prescribes standard operating process/ procedures to bring into focus any infringement/ deviation/ violation of the environmental or forest norms/ conditions. It also constitutes the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions. The company has system of reporting of non-compliances/ violations of environmental norms for the Board of Directors of the company and/ or shareholders or stakeholders at large. All the above statements are mentioned in Corporate Environment Policy (CEP) and company has its working based on it concerned towards Environment.

For point wise Compliance to ToR (File No.238/EN/T-II-1/061/2021 dated 16-02-2022 issued by SEIAA, West Bengal) please refer **Chapter 1 (Table 1.3).**

10.4 GREEN BELT DEVELOPMENT PLAN

The potential value of vegetation in controlling air pollution has been well recognized. Trees can filter particulates and are effective sink for pollutants, toxic odours, fumes & gaseous pollutants. Vegetation also reduces noise level and regulates the oxygen balance in the area by consuming carbon dioxide. In order to improve the aesthetic look of the area, plan for better land use and to compensate the loss in ecology if any during construction, adequate plantation programme around the project site have been planned and will be implemented. Development of green belt will include plantation of trees along boundary of the factory, roads, raw material yard and other available spaces. The plant species will be selected on the basis of their growth and morphological characteristics (i.e., height, crown and ornamental values). The green belt development plan has envisaged also the plantation of local species, plants that can absorb the toxic emission and noise from the project site. The entire plantation programme will be based on plant layout, meteorological conditions, soil structure and quality and last but not the least water availability.

As the proposed project site has few industries in and around the project site, a well planned Green Belt will be developed in the proposed project site, which will cover 33.0% area of the project site i.e., 0.183 acres (0.074 hectare) out of the total project site area (0.54 acres). Around 185

numbers of trees (2500 trees/ha) will be planted to develop the proposed green belt for the project. The tree species thus selected for green belt include the native species like Butea Monosperma, Dalbergia Sissoo, Cassea Fistula, Azadirachta Indica etc.

The existing trees are a mix of different varieties. In the **Table-10.1** below have been presented different trees and plants which will be planted inside the premises in the scope of green belt development.

Table-10.1
List of Selected Trees for Plantation

Sl. No.	TREE SPECIES	COMMON NAME
1	*Pongamia Pinnate*	Karanj
2	*Mimusops Elengi*	Bakul
3	*Butea Monosperma*	Palash
4	*Cassea Fistula*	Amaltas
5	*Dalbergia Sissoo*	Sissoo
6	*Neolamarckia Cadamba*	Kadam
7	*Ficus Bengalensis*	Banyan
8	*Ficus Religiosa*	Peepal
9	*Madhuca Latifolia*	Mahua
10	*Purging Cassia*	Sonajhuri
11	*Moringa Oleifera*	Drumstick
12	*Terminalia Arjuna*	Arjun
13	*Azadirachta Indica*	Neem
14	*Tectona Grandis*	Teak
15	*Mangifera Indica*	Mango
16	*Albizzia Lebbeck*	Siris
17	*Artocarpus Heterophyllium*	Jackfruit
18	*Cocos Nucifera*	Coconut
19	*Polyalthia Longifolia*	Ashoka
20	*Dendrocalamus Strictus*	Bamboo

Choice of Species and Quality planting materials:

Quality Planting Materials of Indigenous and naturalized origin as mentioned above will be planted in 2-3 rows in the greenbelt. Planting materials will have following quality parameters:

- Seedlings will be raised from very good quality seeds with proven provenance. Properly certified Seeds will be used only.

- Multiple seed germination in the poly pot will be undertaken to select the best germinant to grow as a seedling. The fittest and ablest germinant is retained to grow as a seedling in the poly pot.
- No root coiling will be allowed for the seedlings by adopting continuous shifting and grading procedures in the nursery.
- Only the seedlings having height 900-1000 mm. or more shall be used. (Height is measured from collar to tip)
- Only the seedlings having collar diameter more than 20-25 mm shall be used.
- Age of the seedlings shall be 12 month or more.
- Non-succulent, Hardened, vigorous, healthy and morbidity free seedlings shall be used.
- Seedlings which must not have grown under the influence of Nitrogenous fertilizers shall be used.
- Average height of the seedlings of a given species shall be 90% of the Maximum height of that species.
- Native Species/seeds will be considered for plantation in consultation with local Horticulturists and Forest department.

Planting techniques and methods (Technical standards):

- Dimension of the pits shall be 1000mm x 1000mm x 1000mm to promote immediate and appropriate roots establishment. This dimension of the pits is chosen to avoid heat shocks to the roots due to refractory nature of the soil and extreme climatic condition. Better pit dimension makes aeration better and it improve edaphic factors.
- Pit should be filled with dug out soil mixed with sand and manure with a ratio of soil: sand: manure = 2:1:1.This mixture is to be treated with appropriate fungicides and
- Insecticides as per the site condition to enhance the conducive edaphic factors in order to promote faster growth and better survival of the plants.
- Staggered trenched are to be provided within the rows for better moisture conservation.
- Major plantation will be done in the Monsoon season.

Post Planting Maintenance Operations:

- Regular watering as and when required. In summer season, watering twice daily (morning and evening) will be mandatory.
- Without prejudice to any other definition of summer; for the present work, summer is defined as the climatic condition in which maximum temperature exceeds 35 degree Celsius.

- Regular watch & ward throughout the year.
- In a year, minimum 3 times of weeding, soil working backed by nutrient, fertilizer and pesticides application is to be carried out without fail.
- Every year there should be 100% casualty replacement as per field requirements.
- Plant hygiene will be maintained round the year without fail
- Morbid plants will be treated as casualty and will be replaced every year along with casualty replacement.
- Officer in charge of environmental management cell will evaluate every month all Planting and other Afforestation work.
- Appropriate textual and visual documentation will be maintained. Chronological log of the afforestation work is to be thoroughly maintained and preserved.
- Quarterly progress and status report is to be transmitted to Pollution Control board and F & E Department regularly.
- Planting density is 2500 Plants per Hectare.

Strategies for Annual Maintenance of Greenery:

- Regular watering as and when required. In Summer season, watering twice daily (morning and evening) will be mandatory. Trees are watered from the fresh water.
- The kitchen waste from the plant canteen can be used as manure either after composting or by directly putting the manure at the base of the plants.
- A plan for post plantation care will be reviewed in the monthly meetings. Any abnormal death rate of planted trees shall be investigated.
- In a year, minimum 3-nos. of weeding, soil working backed by nutrient, fertilizer and pesticides application is to be carried out without fail.
- Plant hygiene will be maintained round the year without fail
- After installation of the proposed project total number of tress will be 168.

10.5 HAZARDOUS WASTE MANAGEMENT

Domestic waste would be received and disposed of by septic tank attached with soak pit systems as per municipal guidelines. There will be no solid waste (hazardous) generation during plant operation which will be discharged to the authorized agent. Kitchen waste from the plant canteen will be used as manure for the development of green belt.

10.6 MITIGATORY MEASURES DURING CONSTRUCTION

The site is a vacant plot of land. There will be no long-term dismantling or decommissioning or restoration works involved in the project.The impacts during the construction phase of the proposed project on the environment would be temporary and will disappear within a short period after completion of construction. During construction , there will be no debris or scrap generated particularly during shed construction and fabrication. All steel items will be carefully ordered in required quantities and there will be minimal scrap generated at site. Everything will be attempted to be utilized. During civil work, there will be minimal amount of debris and all that will be used in the land filling. Nothing will be thrown/ disposed off as waste during construction nor during operation. The impacts in different aspects of environment due to the construction programmes have been elucidated in **Chapter-4**. To maintain the different environmental attributes as per prevailing standards some mitigation measures have been proposed.The measures have been elaborated below:

Traffic deployment and Safety

- Vehicle shall not exceed the speed limit of 25 km/hr inside the plant premises.
- All vehicles shall be maintained properly as per norms of Indian Road Congress.
- Traffic congestion shall be kept minimum as much as possible through instruction and demonstration. The contractor shall abide by all the instructions related to guidelines for traffic movement inside and outside the premises in close proximity. Default traffic contractor will be penalized. All vehicles shall have valid PUC certificate.

Fuel and Sanitation

- The project management shall take adequate steps to ensure suitable sanitary facilities for the workers. These facilities include water supply, sanitary toilets, washing facilities etc.
- All the labours engaged during construction will be of temporary in nature and will come from nearby places. Such labours will not stay in the construction site after their daily work.

Handling & Storage of Hazardous Chemicals

- Hazardous chemicals/materials like raw material inputs, diesel, other chemicals etc., will be stored as per guidelines for Storage, Handling and Management of Hazardous Chemicals act, 2008 amended in 2016.

Emission & Noise Control

- During construction, **M/s. SSOC** shall take adequate measures (e.g. water sprinkling) to avoid dust emissions.
- **M/s. SSOC** shall ensure proper maintenance of the construction equipment.
- Construction work will follow cut and fill technique and debris will be used inside the premises as much as possible and material which can not be used will be transported in covered condition to avoid fugitive emission.
- The equipment used as aid for construction work shall comply with the Statutory limit of 85 dB(A) (at 1 meter away from the source) for noise. Such equipment will also comply with the norms for emission to air due to fuel burning and shall poses PUC certificate as may be applicable.

Waste Collection & Disposal

- The impact of waste shall be reduced through adoption of segregation followed by collection methodology.
- The construction work shall target generation of less waste/debris for outside disposal and should adopt using technologies which uses optimum quantity of various material inputs both solid and liquid. This is how the temporary pollution due to construction can be reduced to a minimum level.
- M/s. SSOC shall provide sufficient number of bags/ storage bins to store trash and debris temporarily onsite for ultimate disposal offsite. Care shall be taken for generation of minimum trash and debris.
- No waste, regardless of composition, shall be drained to sewers, trenches, ditches or channels.
- There will be no hazardous waste generation during plant operation which will be discharged to the authorized agent/ recyclers of WBWML.
- Waste handling shall be in compliance with applicable Legislation.

Personal Safety

- **M/s. SSOC** shall provide the workers with Personal Protective Equipment (PPE) (e.g. Helmet, Goggles, Dust Mask, Ear Plug/ Muff, Hand Gloves etc.).

- The company shall maintain First-aid Facility at the site and the contractor deployed shall be responsible for all sorts of medical assistance in case of accidents which may require offsite facility.

HSE

- M/s SSOC shall engage one or two staff members at the site during construction work to monitor the progress of work, capacity of the contractor to manage the labours and commitment of the contractor to the labours.

10.7 FIRE AND SAFETY MANAGEMENT

Intensive firefighting facilities shall be provided in the plant to tackle any fire accidents. Regular safety audits will be carried out for improving safety performance. On-site and Off-site Disaster Management Plans shall be developed and mock drills will be conducted at regular intervals to keep the disaster management team in a state of full preparedness. The company shall posses Fire and Explosive Licence as applicable under the West Bengal fire services Act-1950

10.8 ENVIRONMENTAL AWARENESS CAMPAIGN

In addition to imparting frequent training to employees in various aspects of pollution control and measures applicable for the plant, programmes like celebration of World Environment Day, World Safety Day, screening of films on environment, tree plantation etc. will be regularly observed in order to create greater awareness towards environment protection amongst employees and the people in the neighbouring areas.

10.9 CONSERVATION MEASURES FOR WASTE MINIMIZATION, ENERGY AND NATURAL RESOURCE

M/s. SSOC has always considered environment as important element which might be impacted by the plant activities. The proponent believes in prevention than curing. The company believe in concept of conservation & waste minimization.

10.9.1 Waste Minimization – 3R's

(A) Reuse:

- Waste generated from construction activity will be utilized in leveling of land.

(B) Recover:

- The sludge from septic tank will be disposed through local municipality

(C) Recycle:

- M/s Saraogi Shellac Overseas Corp. will adopt water re-circulation technology in their plant operation to optimize the process water requirement.
-

10.9.2 Energy Conservation

The following measures will be adopted for reduction in specific energy consumption:

- Use of energy efficient electric motors complying IEE3 Standards.
- Optimizing loads through periodic preventive maintenance & lubrication
- Periodic energy audits.
- Bringing awareness through training and motivational programmes.
- Installation of energy efficient lightings and use of energy saving light fittings.

10.9.3 Natural resource Conservation

Water will be conserved by practicing rainwater harvesting inside the plant premises. Water will be recycled in the plant for cooling purpose to optimize the process water requirement. The plant will be designed as zero liquid discharge unit.

10.10 LEGAL AND STATUTORY COMPLIANCE

All the environmental standards/guidelines/norms as applicable shall be rigidly followed and adhere to.

The plant will abide by all the T&C as mentioned in the NOC issued by the SPCB including CTO renewal. The unit shall obtain the certificate from SPCB (WBWML) for storage and handling of hazardous chemicals. The staff member in charge of the environmental cell of the company will be fully responsible for initiating actions to comply with the requirements as mentioned.

10.11 DOCUMENTATION

All the monitoring data, environmental and health related data should be stored in systematic manner so that these could be retrieved efficiently as and when required.

10.12 INFORMATION DISSEMINATION AND PUBLIC RELATIONS

Everybody now a day is concerned about environmental pollution. It is, therefore, needed that people should be provided with environmental data related to the plant so that wrong apprehensions can be removed. This requires a well-planned public relation and information dissemination process so that unnecessary public intervention is avoided. In this connection, **M/s. SSOC** will organize different programmes with participation from local bodies, encouraging local

community to take part in environmental projects (like tree plantation) etc.

The company proposes to invest some funds towards cost of compliance to CER activities for the project as per guidelines of MoEF&CC. However, since 30th September 2020, the guidelines for such activities has changed and the necessary office order has been issued from MoEF&CC ref. MoEF &CC OM vide F.No. 22-65/2017-IA.III dated 30th Sep, 2020. Such CER activities will be decided after the completion of the public consultation process. However, the company is proposing certain such activities which will be taken up subject to public consultation meeting approval as described in **Table 10.2**.

Table-10.2
Some activities under CER programme

Sl. No.	ACTIVITIES	EXPENDITURE (IN LAKHS) to be finalized after public consultation
1	Financial Support to the Local School for development of library facilities	2
2	Development of parks, plantation of trees in the nearby areas.	4
3	Healthcare facilities	3

10.13 OCCUPATIONAL HEALTH ACTIVITIES

10.13.1 Introduction

The Occupational Health and Safety Management System is a vital part in Industrial Sectors. In this section, management of Health and Safety are taken into consideration. The purpose of the Occupational Health and Safety Management System is as follows:

- Minimize the risk to employees and others from chemical & physical exposure in production shop floor
- Improve business performance
- Assist the organization to establish a responsible image for health and safety.

10.13.2 Approach

The basic approach for the establishment and implementation of the occupational health and safety management system will involve the following steps:

- Identify the hazards involvement in the activities of the organization.
- Evaluate the risks which are involved in the performance of these activities.
- Control these risks to an acceptable level.

All the plant employees will be forced to use needed safety gears. All contractor personnel and temporary staff will also be advised to use safety equipment. Even the visitors will be advised to use helmet and nose mask during plant visit.

10.13.3 Standards for the Occupational Health and Safety Management System

The organization will follow the following specifications:

- The establishment of an Occupational Health and Safety Management System to eliminate risk to employees and other interested parties.
- Implement, Maintain and continually improve the occupational health and safety management system.
- Assign itself of its conformance with its stated occupational health and safety policy.

10.13.4 Core Elements of the Occupational Health and Safety Management

The basic core elements are:

- ❖ Occupational Health and Safety Policy
- ❖ Planning (Anticipation, Recognition, Evaluation & Control)
- ❖ Implementation and operation
- ❖ Checking and corrective action
- ❖ Management review

10.13.5 Occupational Health and Safety Policy

It sets an overall direction of the system. It lays down the principles involved as responsibilities, performance requirement, commitments, framework for setting objective and targets.

- In **M/s. SSOC**, the hazards' places shall be identified and signage will be placed for the safety precaution to the relevant equipment.
- All the operational components of the various departments will be identified and assessed.

- In the operational area, the broad categories of hazards could be mechanical, electrical, substance fire and explosions, which will be carefully monitored.

10.13.6 Structure and Responsibilities

In M/s. SSOC, the following structure and responsibilities will form occupational health and safety management system:

- All HODs of the respective departments will lay down as applicable the safety rules and safety status of their work places and they will have the authority to place the manpower accordingly.
- The communication between the worker and management will be clear about the position of hazards situation.
- The top management of the company will be provided resources such as human resources, technological resources and financial resources for the implementation and control of the situation.
- There will be a quarterly evaluation of the improvement of the safety and occupational health of the employees.
- Safety officer will monitor the compliance of safety rules.

10.13.7 Training Awareness

Departmental heads will select personnel from their respective Departments who will be given training on the following issues:

- The occupational health and safety consequences of their activities.
- The emergency preparedness and response
- Importance of the occupational health and safety management system.
- Training to be taken into account the responsibility, ability and literacy of the person concerned and the nature and the extent of risk involved.

In **M/s. SSOC**, there will be a periodic internal audit.

10.13.8 Management Review

In M/s. SSOC, there will be continuous efforts to improve the suitability, adequacy and effectiveness of the established Occupational Health and Safety Management System. The necessary information about the system will be collected and reviewed.

During First-Aid training programme, classes on occupational health & hygiene will be held for the officers & staffs. All employees will be exposed to this training.

10.13.9 PROPOSED HEALTH CHECK-UP PLAN & COST

For the proposed Project pre-employment health check-up will be followed by periodical health check-up with special attention to occupational health. The periodicity of occupational health check-up will be followed as per the following schedule **(Table-10.3):**

Table-10.3
Health check-up programme

Sl. No.	Age Limit (years)	Frequency of Health Check-up
1.	Below 31	Once in 5 years
2.	31 – 40	Once in 4 years
3.	41 – 50	Once in 2 years
4.	Above 50	Once a year

The health check-up will be conducted as per the pre-designed format which will include Chest X-rays, Audiometry, Spirometry, Vision Testing, ECG, Blood and Urine test etc.

Under Pre-employment check-up the following test will be conducted:

- Chest x-rays
- Audiometry
- Spirometry
- Vision testing (Far & Near vision, color vision and any other ocular defect)
- ECG
- Haemogram (examination of the blood)
- Urine (Routine and Microscopic)

Medical records of each employee will be maintained separately and will be updated as per finding during monitoring. Medical records of the employee at the end of his / her term will be updated.

10.13.10 USE OF PERSONNEL PROTECTIVE EQUIPMENT (PPE)

The practice of using the Personnel Protective Equipment (PPE) as enlisted in **Table-10.2** shall be strictly followed.

10.14 ENERGY CONSERVATION MEASURES

Energy efficient lamps and LED lighting system which will give more light output by consuming less energy will be used. High energy efficient pumps, Motors, Compressor etc. will be adopted. Solar lights shall be installed in the relevant areas within the plant premises.

10.15 ENVIRONMENTAL COST

The total project cost for the proposed project has been estimated to be Rs. 4.45 Crores. The capital cost of environmental mitigation measures is estimated to be Rs. 0.46 Crores and the estimated annual cost of environmental mitigation measures for the proposed installation project has been estimated to be Rs. 5 Lakhs. The Breakup of the Capital Cost and recurring cost for environmental mitigation measures is tabulated and furnished below.

Sl. No.	Particulars	Capital Investment (INR in lacs)	Recurring Investment per annum (INR in lacs)
1	Air Pollution Control, online emission monitoring system & dust suppression measures	20	2.0
2	Environment Monitoring and Management	12	1.2
3	Occupational Health	2	0.6
4	Green Belt	7	0.7
5	Water conservation and management, like Rain water harvest	5	0.5
Total		**46**	**5**

10.16 CONCLUSION

Environmental Management Plan as has been presented herein illustrate by and large the general management policy and implementation procedure. The installation of green field Ambrettolide manufacturing plant by M/s Saraogi Shellac Overseas Corp. is a very small project and as such the proponent will develop SOP for environmental management plan as per convenience. The policy is just a guideline to develop the SOP.

As discussed, it is safe to say that the proposed project is not likely to cause any significant impact on the surrounding area, as most efficient preventive measures as per the latest and proven technology will be adopted to contain various reactants/products within the permissible limits besides conserving various resources, energy etc. Greenbelt development around the area will also be taken up as an effective pollution mitigation measure, as well as to control the fugitive dust released from the premises of M/s. SSOC.

CHAPTER-11.0
SUMMARY & CONCLUSION

11.1 INTRODUCTION

Considering the progressive demand of Ambrettolide, **M/s Saraogi Shellac Overseas Corp.** (SSOC) is proposing a green field manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product. The unit will come up at Chanditala-Serampore Road, opposite to MBW & Bhagardhar, Dankuni - 712702, West Bengal. M/s SSOC has already acquired a vacant land of 0.54 acres/ 2240.82 Sqm (0.224 hectare) on a long term lease basis within the industrial area of Dankuni, Hooghly, West Bengal, to setup the plant.

In view of the above, SSOC has made an online application which was submitted to the State Environment Impact Assessment Authority (SEIAA), West Bengal, vide **online proposal no. SIA/WB/IND2/61329/2021 dated 27-02-2021** along with the application in prescribed format (Form-I), copy of pre-feasibility report, proposed ToRs and authenticated land documents for undertaking detailed EIA study as per deemed requirement of the EIA Notification, 2006 vide date 14th September and Gazette notification S.O. 1533 (E)..

Upon reviewing the application along with the associated documents the State Expert Appraisal Committee (SEAC) vide **File no. 238/EN/T-II-1/061/2021 dated 16-02-2022** has granted ToR for the proposed project dated 16.02.2022 to conduct the EIA study **(Annexure-I).**

The proposed project activity is listed in Sl. No. 5(f) of Synthetic Organic Chemical Industries under Category "B" in the EIA Notification, 2006.

The Environmental Impact Assessment (EIA) report preparation and the corresponding work have been entrusted to the Environmental Consultant **M/s. Envirotech East Pvt. Ltd, Kolkata (copy of the NABET monthly circular in the QCI website enclosed).**

The EIA was prepared by using the baseline data collected during Winter season i.e. from December 2020 to February 2021.
As per EIA notification 2006 and its amendment dated 25th June 2014, the proposed project of M/s SSOC is classified under schedule 5(f), Category 'B'.

11.2 PROJECT DESCRIPTION

M/s. Saraogi Shellac Overseas Corp. is proposing an Ambrettolide manufacturing unit for the production of 24 TPA of high quality Ambrettolide as the main product at Chanditala-Serampore Road. Opp. of MBW & Bhagardhar, Dankuni - 712702, West Bengal. The proposed project is an independent project in nature. Ambrettolide will be manufactured through 6 distinct steps of treatment of Aleuritic acid (1800Kg) with TMOF followed by acetylation with Acetic Anhydride and finally fractional distillation of crude Ambrettolide to separate from remaining glycerin to generate 1150Kg of pure product. Four types of distillate generated in intermediate steps, reaction recovered glycerine (1200Kg) and gummy mass (1500 kg), TBR (120 Kg), bad crude (160 Kg), R3 residue (50 Kg) & processed residuals (100 Kg) will be duly collected in drums in course of reactions and sold in the local market. Pure Ambrettolide after stabilization with steam is stored in new food grade aluminum drums and is packed for export. **Table 11.1 & 11.2** present the overall project configuration and the salient features of the proposed project.

Table-11.1
Proposed Project Configuration

Reaction Vessel	Substrate	Product	Quantity of product (TPA)	Utility	Sale outlet
Reactor A	Aleuritic Acid (1800Kg) + Tri Methyl Orthoformate (1600Kg)	Distillate - A	33.6	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - I	-	Used in the next stage of reaction	-
	Mixture-I + Acetic Anhydride (1130Kg)	Distillate - B	26.4	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - II	-	Used in the next stage of reaction	-
	Mixture-II + Catalyst-I (KOH 41.1Kg + MEG 162.0Kg)	Distillate - C	3.96	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Mixture - III	-	Used in the next stage of reaction	-
	Mixture-III + Catalyst-II (Sodium Methoxide 35.8Kg + IPA 155.8Kg)	Distillate - D	5.28	Used by fragrance and flavor manufacturing companies	Sold in the local market
		Final Mixture	-	Used in the next stage of treatment	-
Reactor B (R_1A) & then transferred to	Final Mixture + Glycerine (2240Kg)	Glycerine recovered	28.8	-	Sold in the market
		Gummy mass,	Gummy mass (36	Used by fragrance	Sold in the local market

Reactor C (R_2) in portions		TBR, Bad crude, R3 residue & processed residuals	TPA), TBR (2.88 TPA), Bad crude (3.84 TPA), R3 residue (1.2 TPA), processed residuals (2.4 TPA)	and flavor manufacturing companies	
		Crude Ambrettolite	-	Used in the next stage of fractional distillation	-
Reactor D (R_3)	Crude Ambrettolide subjected to fractional distillation	Pure Ambrettolite	24	Used for the subsequent treatment with steam	-
Reactor E (R_4) *	Pure Ambrettolide treated with steam	Water	-	-	Used for non-critical purposes
		Stabilized Ambrettolide	24	Used in consumer products like perfumery, food items & cosmetics and pharmaceutical product industries	Exported Globally

*Complete reaction cycle will take a span of 15 days time.

Table-11.2
Salient features of the proposed project

S. NO.	PARTICULARS	DETAILS
1.	*Nature of the Project*	Proposal for establishment
2.	*Size of the Project*	24 TPA Ambrettolide Synthesis Plant for production of pure Ambrettolide
3.	*Category of the Project*	This project falls under S. No. 5(f) under Category 'B'
4.	*Location Details*	
	Village	Chanditala (on Chanditala-Serampore Road. Opp. to MBW & Bhagardhar)
	District	Hooghly (Dankuni - 712702)
	State	West Bengal
	Latitude	Vide Google Map and site location 22°41'39.08"N to 22°41'41.06"N
	Longitude	Vide Google Map and site location 88°15'9.85"E to 88°15'12.45"E
	Toposheet No.	79 B/6, 79 B/1, 79 B/2 & 79 B/5
	Location Map has been shown in Figure – 1	
5.	*Area Details*	
	Total Plant Area	0.54 acres/0.224 hectare/2240.82 sqm

S. NO.	PARTICULARS	DETAILS	
6.	*Environmental Setting Details (with approximate aerial distance & direction from the nearest plant boundary)*		
1.	Nearest Town	Dankuni is located aerially approximately at 4.6 KMs. SE from the project site.	
2.	Nearest City	Kolkata is located aerially approximately at 17 KMs. SE from the project site.	
3.	Nearest National / State Highway	National Highway - 2 (NH-2) is passing within 4 Kms distance in E direction w.r.t. the Project site.	
4.	Nearest Railway station	Dankuni Junction Railway Station – 4.2 Kms in SE direction from the project site.	
5.	Nearest Airport	Netaji Subhash Chandra Bose International Airport, Dum Dum, Kolkata – 20.0 Kms in SE direction from the project site.	
6.	National Parks, Wildlife Sanctuaries, Biosphere Reserves, within 10 km radius	N.A.	
7.	Reserved Forests (RF) / Protected Forests (PF) within 10 km radius	N.A.	
8.	Water Bodies (within 10 km radius)	Hoogly River - 11 Kms in East direction w.r.t. the Project site.	
9.	Seismic Zone	Seismic Zone - III	
10.	*Cost Details*		
	Total Cost of the Project	Approx. Rs. 4,45,00,000/- (including Contingencies @ 5%)	
	Cost for Environment Management Plan		
	Capital Cost	Rs.46 lac	
	Recurring Cost / annum	Rs. 5 lac	
11.	*Basic Requirements for the project*		
	Water Requirement	Water requirement for steam generation in boiler is 1 Kilo litre initially followed by make up of 100 litre per month. The above water will be supplied by nearly Bislery company. Water for domestic purpose (i.e., 200 ltrs/day) will be met from borewell water.	
	Power Requirement (KVA)	**Quantity**	**Source**
		125 KVA	*WBSEDCL*

S. NO.	PARTICULARS	DETAILS	
		160KVA+160KVA	D.G. Set Stand by (02 no.)
	Manpower Requirement	Permanent: 10 Persons; During construction temporarily requirement: 12 persons	Local

11.3 BASELINE ENVIRONMENTAL SCENARIO

11.3.1 Air Environment

Arithmetic Mean of the 24-hourly average values of PM10 varied station-wise between 63.6 μg/m3 (at krishnarampur primary school) to 75.2 μg/m3 (at Mollarber) with overall mean of all 8 stations being 69.3 μg/m3. The same for PM2.5 was observed to vary in the range of 25.6 μg/m3 (at krishnarampur primary school) to 32.7 μg/m3 (at Mollarber) with overall mean of all 8 stations being 29.4 μg/m3. Concentration of SO2 was varying between 6.6 μg/m3 (at krishnarampur primary school) to 10.1 μg/m3 (Near Kharial High school, Kharial) with overall mean of all 8 stations being 8.0 μg/m3 and the concentration of NO2 over the entire study area was 23.6 μg/m3 while individual arithmetic mean levels computed at 8 stations ranged between 19.8μg/m3 (Mahadev Bidya mandir, Nonakundu) to 28.5 μg/m3 (Kharial High school, Kharial).

On the contrary, 8-hourly average values of CO over the entire study area was 0.362 mg/m3 while individual arithmetic mean levels computed at 8 stations ranged between 0.317 mg/m3 (Mahadev Bidya mandir, Nonakundu) to 0.394 mg/m3 (at Mollarber).

The above data reveal that the ambient air quality monitoring stations like (AQ1), (AQ2), (AQ3), (AQ4) and (AQ5) are affected by pollution arising due to brick field, industries and transportation of materials along the nearby roads.

The values of all the ambient air parameters i.e., PM10, PM2.5, SO2, NO2 and CO at the respective 8 monitoring locations are within the stipulated limits on all the occasions as per NAAQ Standard. The maximum value of PM10 was observed at Mollarber i.e., 75.2 μg/m3, which is considerably

on higher side, but is still within the standard. This may be attributed to the wind blown dust due to the unpaved roads and the vehicular emissions in the area. The values of Ni, As, Pb and BaP were also observed to exist well within the stipulated limit.

11.3.2 Water Environment

Surface Water:

Surface water samples were collected and analyzed from total ten (10) locations, including one (1) from a canal, one (1) from a lake and eight (8) from ponds of different locations.

As per CPCB norms for classification of surface water, the Pond water quality (SW1, SW8 & SW10) parameters were observed to fall within the range of Class C category. But the values of BOD in case of SW2, SW4, SW5, SW7 and SW9 were reported to be 4 mg/l, 5 mg/l, 6 mg/l, 7 mg/l and 4 mg/l respectively, which is more than the standard, 3 mg/l. Hence, these water sources are suitable for "Propagation of Wildlife & Fisheries" (i.e., Class D) and "Irrigation, Industrial Cooling, and Controlled Waste Disposal" (i.e., Class E). On the other hand, though the water collected from lake (SW3) was suitable for drinking purpose after treatment, the water sampled from canal was unsuitable for drinking purpose.

Ground Water:

Ground Water samples (from bore-well and Tube well) were collected from 9 locations (GW1 to GW9). The pH values of collected ground water samples were found in the range of (6.87 – 7.54) with an average of 7.21. Total Dissolved Solids (TDS) was found in the range of (312 – 654) mg/lit with an average of 479.33 mg/l, while Total Hardness (as CaCO3) was found in the ranges of (155 – 269) mg/lit with an average of 205.56 mg/l. Alkalinity (as CaCO3) was found in the ranges of (166 – 294) mg/lit with an average of 216.22 mg/l. Calcium (as Ca) and Magnesium (as Mg) were found varying in the ranges of (41 – 70) mg/lit and (9 – 27) mg/lit respectively. Heavy metals like Copper (as Cu), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Manganese (as Mn), Arsenic (as As) and Mercury (as Hg) were below their respective detection limits.

Ground water physico-chemical properties in the study area showed that the water strata mainly form Bicarbonate buffer system with appreciable amount of alkalinity & Hardness. Calcium & Magnesium which are beneficial for human health are found at appreciable level. The other parameters (i.e. Sulphate, Chloride etc.) also fall within satisfactory level.

While comparing with IS 10500:2012, it can be concluded that all ground water samples are within permissible limit & can be used as drinking water source.

The plant will be based on Zero Liquid Discharge (ZLD) Concept. Therefore, there will be no impact on any surface or ground water quality of the area.

11.3.3 Noise Environment

The noise levels were monitored at ten (10) locations. The study area is of both industrial & residential in nature.Monitoring was done, covering both day and night time. The sampling location in the study area was identified considering location of industry, commercial shopping complex, residential areas with various traffic activity and sensitive areas like hospital, court, temple, schools etc.Noise levels in LAeq at the respective locations separately for Day and Night times were measured. During the day time, the equivalent noise levels were found to vary in the range of (56.1 - 68.3) dB (A) while in the night time, the equivalent noise levels were observed to be varying in the range of (43.9 - 53.3) dB (A). As usual, the day time noise levels were found to be higher than those, observed at night level.

So far as Industrial locations are concerned, the measured values of Equivalent Noise Levels were observed to lie within permissible limits. But, the noise level was observed to exceed the permissible limits for Residential, Commercial and Sensitive locations in the study area. Such high noise levels may be attributed mainly to the noise generated due to the vehicular traffic movement. Trees and shrubs can make a contribution to noise reduction. Since the study area is rich in floral composition with much concentration of large and medium size trees, their presence can effectively reduce noise level in the study area.

11.3.4 Soil Environment

Texture of the soil was found to be clayey loam with good water holding capacity. The pH was found to be slightly acidic, which has favoured the growth of biota. Plant nutrient like phosphorus, nitrogen, potassium and organic matter were found to be moderate. Concentration of trace metals and non metals were observed to be sufficient for usual growth of plant.

The collected soil samples were observed to lie in neutral pH range (6.5 - 6.9). Electrical conductivity (EC) was found varying between (251 - 336)

µmhos/cm. In soil samples, calcium content of the soils varied between (316 - 401) mg/kg. Ranges of sodium in the soils varied between (166 - 234) mg/kg. In comparison to sodium, potassium levels were slightly low. Range of potassium varied between (115 - 137) mg/kg. In the study area, Nitrogen level varied between (66 - 91) mg/kg. Most of the nitrogen is available in form of nitrates, nitrites, NH_4^+ and organic nitrogen. The Phosphorous content ranged between (24.8 - 27.9) mg/kg. Cation Exchange Capacity (CEC) varied between (20.2 – 22.9) meq/100 gm. Ranges of Magnesium and Sulphur were varied between (171 - 212) mg/kg and (24.2 - 30.5) mg/kg. Organic Matter in the soils was observed to be ranging between (1.3 – 1.9)%. Literature survey points out that soil quality under study is suitable for cultivation of paddy rice, sesame, ground nut, chillies, mango, rose etc.It is also home for many beneficial biological organisms like bacteria, fungi, lichen, etc. No impact of surrounding industry has been observed on soil.

11.3.5 Ecology

- The present observation revealed that the terrestrial aquatic vegetation of 10 km radius study area is moderately rich and diverse.The terrestrial and aquatic ecological scenario constitutes various types of trees, bamboos, herbs, climbers, insects, amphibians, reptiles, birds, mammals, fish, etc.
- Altogether 44 species of trees, 45 species of climbers, herbs and shrubs indicate a diversified vegetation.Among terrestrial flora qualitatively altogether 44 species of trees, 37 species of shrubs & herbs and 8 species of climbers were observed along with 33 species of prominent cash crops like cereals, pulses, oil seeds, vegetables, fruits, other crops. The biodiversity value of the studied ecosystem obtained was 3.75. This signifies positive ecological health of the site.
- Terrestrial fauna was also rich. Altogether 13 species of mammals, 21 species of birds, 12 species of reptiles and 4 species of amphibians were recorded. Since there is no eco-sensitive zone like National Park, Wildlife Sanctuary, Reserve Forest etc. in the study area, wild animals in the study area are very rare. Only a few wild animals like Fox, Common Langur etc could be observed in the study area occasionally.
- The study area has a major river, i.e., Hooghly River; several big and small ponds, canals, jheels, beels, tanks, ditches etc which form the ecology of aquatic environment. Altogether 17 species of macrophytes & marshy plants, 11 species of phytoplankton and 10 species of zooplanktons each are observed. So, moderate richness has been observed in aquatic flora and fauna. Thus, it may be concluded that the water reservoirs of the study area are moderately rich in primary

producers (i.e phytoplanktons) and any reduction in their numbers may affect the level of dissolved oxygen in water.

- By contrast the zooplanktons constitute a link between primary producers and ecologically important consumers i.e., fish community (40 species). Hence, any destruction of zooplanktons may lead to break in transfer of energy from producers to consumers. It causes imbalance in aquatic ecosystems.
- A good number of birds (21 species) were observed in the study area which is due to good vegetation cover and open fields in the area.
- No species were found to be endangered. There were no migratory routes of fauna, presence of breeding grounds and sensitive habitats and absence of protected areas.

11.4 ANTICIPATED ENVIRONMENTAL IMPACTS

The proposed project will have impacts on the environment in two phases, first during the construction phase (which is temporary and short-term) and the other during the operation stage (which will have long term effects).

11.4.1 Impacts During Construction Phase

11.4.1.1 Impacts on Air Quality

- Particulate matter would be the predominant pollutant affecting the air quality during the construction phase. Dust will be generated mainly during excavation, back filling and hauling operations along with transportation activities.
- Undesirable gaseous pollutants will be generated mostly by the traffic and use of machineries. However, this would not lead to any tangible effect, as the expected emission volume is low.

11.4.1.2 Impacts on Hydrology and Water Use

- All construction activities will take place within the project site. The plant layout has been prepared in such a manner so as to follow the general ground profile and not to disturb the drainage pattern of the area.
- Best practices will be followed to ensure least disturbance to the natural drainage pattern of the site and the neighbourhood and thus there will be negligible impact on the local hydrology.

11.4.1.3 Impacts on Water Quality

- Waste water from construction activities would mostly contain suspended impurities. Other pollutants which may find their way into it will be in insignificant concentrations and may be safely disregarded. Drains from different construction sites will be led to sedimentation pits where excess suspended solids will be settled out and relatively clear supernatant will be discharged into the outside surface drains.
- Domestic waste water from the construction site would be subjected to on-site treatment prior to absorption in soak pit. As such, there will be no adverse impact on the surface water quality of the area.

11.4.1.4 Impacts on Noise

- During the construction phase, noise will be generated due to movement of vehicles and operation of light and heavy construction machineries including pneumatic tools and compressors. Careful planning of their operation and maintenance is required during this period so that minimum disturbances are caused. Moreover, residential areas not being close to the project site, no significant impact is apprehended.

11.4.1.5 Impacts on Soil and Land Use

- All major construction activities tend to create certain changes in the soils of the area. However, this will take place inside the plant premises and as such there will be no impact on the soil condition outside the plant boundary in terms of fertility.
- During storms, some of the excavated soil and construction materials such as sand etc. would be blown up in the air and dispersed around the project site.

11.4.1.6 Impacts on Demography & Socio-economics

- It is estimated that around 12 workers, comprising of skilled, semi-skilled and unskilled labour, shall be employed by various contractors at site during the construction phase. Most of the semiskilled and unskilled labour would be recruited from the nearby areas. This would create some employment opportunities in the area.
- Since most of the labour force will be drawn from neighbourhood, no change in demographic profile is anticipated.This activity will generate some employment opportunity on a temporary basis which may bring some economic relief for the local people temporarily.

11.4.2 Impacts During Operational Phase

11.4.2.1 Impacts on Air Due to Plant Operation

- In the proposed project, there will be only one stack which will be attached with a common duct connected to the steam boiler and heater of Thermic Fluid. Limited diesel will be burnt to produce the steam in boiler and to heat the fluid in TFH. Hence, there will be little emission and as a result there will be no incremental values of PM, SO_2 and NOx for the proposed project.
- In order to evaluate the impact on ambient air quality due to such releases, the ground level concentrations (GLCs) as a result of the plant emissions have been evaluated through mathematical modelling which was evaluated to be insignificant.

11.4.2.2 Impact on air due to transportation of raw materials and finished products and plant workers' movement

- The entire raw materials and products estimated approximately to be 191 TPA, will be mostly transported by truck through road. Considering the worst case scenario, around 13 trucks per year (considering 15 T/Truck) will be required to transport the materials by road.
- It is estimated that around 2 persons will come to the plant by cars & around 5 persons will arrive to the plant by two wheeler (Motor Cycle) in 3 shifts.
- Since their movement will be well spread on the different stretches of road in the area, the predicted impact will be not much pronounced.

11.4.2.3 Impacts on Water Quality

- The company will follow "zero waste water discharge concept" and the entire waste water will be recycled to the plant for various uses.
- During steam stabilization of finished Ambrettolide, water will be accumulated from condensation of steam and the same will be reused for various non critical purposes.
- As no waste water will be discharged outside the plant premises, there will be no impact on the water quality of any surface water body of the area.

11.4.2.4 Impacts on Hydrology and Water Use

Water requirement for steam generation in boiler is 1 Kilo litre initially followed by make up of 100 litre per month. The above water will be supplied from nearby Bislery company. Water for domestic purpose (i.e., 200 ltrs/day) will be met from borewell water and the same will be used occasionally to fill in the tanks of cooling tower and fire fighting equipment. Hence, it is expected that it will have no significant impact on the hydrological system.

11.4.2.5 Impacts of Noise in environment

- Operational activities are not expected to cause any undue disturbances to the people living in the proximate areas outside the plant boundary.
- Impacts of noise on workers will be minimised through the adoption of adequate protective measures in the form of (a) use of personal protective equipment (ear plugs, ear muffs etc.), (b) education and public awareness, and (c) exposure control through the rotation of work assignments in the intense noise areas.
- Due to implementation of appropriate precautionary measures, there will be no appreciable impact from noise due to the operation of the new project.

11.4.2.6 Impacts of Solid Waste in environment

- There will be no solid waste that needs to be treated for disposal. No chances of generation of solid waste (from processing units) is expected as the recovered gummy sludge will be collected in closed containers which will be sold to the market.
- Kitchen waste from the plant canteen will be used as manure for the development of green belt.

11.4.2.7 Impacts on Land Use

- The proposed development will take place inside the acquired land area, so there will be no impact on the land use pattern outside the plant area.

- The surrounding area has substantial vegetation in the form of village orchards, roadside trees and agriculture. If the gaseous emission is controlled properly, there will be no significant impact. There will be sufficient plantation of trees at the plant site. All these measures, if implemented properly will ensure insignificant impact on the local vegetation from the proposed project.

11.4.2.8 Impacts on Demography and Socio-economics

- The labour force involved during construction phase will be replaced by more skilled manpower to operate and maintain the plant.
- As the area is close to Kolkata, skilled people from the city will be available to work here. So, there will be no major change of local occupational scenario, though the establishment of the new project will increase the direct and indirect jobs and other economic opportunities. There will be some development of secondary service market, which will be beneficial to the local economy.

11.5 MITIGATION MEASURES

11.5.1 AIR Pollution Control Measures

Following measures will be taken to control air/fugitive pollution:

- Stack height would be approx 30 m for gaseous emission confirming to the CPCB norms. D. G. Sets, stack height of 3.0 m above the roof level will be maintained.
- It would be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits.
- Speed Limit/ breaker will be imposed to regulate vehicle speed.
- Transportation will be executed through covered trucks.
- In order to avoid fugitive emissions from different sources, water will be sprayed. Also the roads within the premises will be concreted to prevent dust emission.
- The ambient air monitoring will be carried out regularly in the work zone and surrounding areas to check the contaminant levels well below the stipulated norms.
- Green belt (33%) around the periphery within the proposed plant premises will be developed to attenuate the pollutants emitted by the plant.

11.5.2 Water Quality Management

- The proposed project would be based on “Zero Liquid Discharge” (ZLD) concept. Water generated from condensation of steam in course of steam stabilization of pure Ambrettolide is reused in different non critical purposes.

11.5.3 Noise Pollution Control

- Various components of industrial operations will cause some amount of noise, which will be controlled by proper maintenance and compact technology.
- Time to time oiling and servicing of machinery will be done.
- Acoustic enclosure for D.G. sets will be provided.
- Green belt development (plantation of dense trees across the boundary) will help in reducing the noise levels in the plant premises.

11.6 CONCLUSION

As discussed, it can be stated that the project is not likely to cause any significant impact on the different attributes on the environment. Adequate preventive measures will be adopted to contain the various pollutants within permissible limits. Green belt development around the area will also be extensively done as an effective pollution mitigation technique, as well as to control the pollutants released from the premises of the project.

CHAPTER-12.0 DISCLOSURE OF CONSULTANT ENGAGED

Brief Profile of M/s. Envirotech East Pvt. Ltd.

M/s. Envirotech East Pvt. Ltd., Kolkata has acquired the status of one of the Prime organizations of the country in undertaking various assignments in the areas like Environmental Impact Assessment, Environment Management Plan, Risk Analysis, Detailed Project Report, Environmental Audit / Statement, Geo-Technical Statement etc., since it was formed in 1988 by Prof. G. D. Agrawal, former Dean, IIT Kanpur and Member Secretary, Central Pollution Control Board.

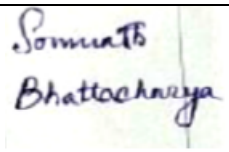
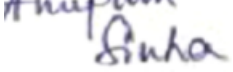
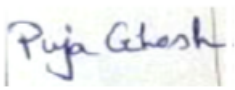
M/s Shree Ambey Ispat Pvt Ltd, commenced its commercial production in year 2014 by installing one 9 MVA submerged electric arc furnace for producing Manganese alloys or Ferro silicon. The company proposes to expand the existing ferro-alloy plant by installation of 2x9 MVA Submerged Arc Furnaces along with Briquetting Plant (10 TPH) at Mouza: Basudevpur (North), PO: Hat Asuria, PS: Barjora, District: Bankura, West Bengal.

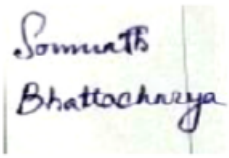
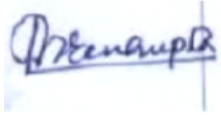
The company now has decided to expand its existing 1x9 MVA SAF, Ferro-Alloy plant having installed capacity of 17,400 TPA Silico Manganese (Si-Mn) or 22,600 TPA Ferro Manganese (Fe-Mn) or 7,600 TPA Ferro Silicon (Fe-Si) by installation of 2x9 MVA SAFs for production of 32,800 TPA Silico Manganese (Si-Mn) or 44,400 TPA Ferro Manganese (Fe-Mn) or 15,200 TPA Ferro Silicon (Fe-Si) or 33,600 TPA Ferro Chrome (Fe-Cr) along with 10 TPH Briquetting Plant at Mouza: Basudevpur (North), PO: Hat Asuria, PS: Barjora, District: Bankura, West Bengal.

The company has a well-equipped laboratory, which is recognized by Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India and West Bengal Pollution Control Board (WBPCB).

TABLE-12.1
MANPOWER ENGAGED FOR EIA STUDY FOR PROPOSED FERRO ALLOY PLANT AT MOUZA: BASUDEVPUR (NORTH), PO: HAT ASURIA, PS: BARJORA, DISTRICT BANKURA, WEST BENGAL

Discipline	Name of Expert	Key Qualifications indicating area of specialization relevant to the respective discipline	Involvement (Period & Task)	Signature
EIA Coordinator : Mr. Asoke Kumar Banerjee		M.Sc. (Chem.)	November, 2021 to till date Assessment & identification of the overall project, co-ordination with respective functional area experts, finalisation of action plans for the overall preparation of EIA report	
Functional Area Experts involved:				
Air Pollution	Mr. A K. Sinha	P.G. Diploma in Environmental Science and Technology	November, 2021 to till date Finalization of monitoring locations for Ambient Air Quality Monitoring, evaluation of Ambient Air Quality results, suggestions & finalization of air pollution control measures, with client and contribution to overall EIA report preparation.	
Meteorology	Mr. T. Kundu	Bachelor of Technology (Chemical Engineering)	November, 2021 to till date Identification of air emission sources and their inventorisation, prediction of cumulative impacts on ambient air quality due to all identified point & mobile sources, suggestions & finalization of mitigation measures with project proponent and contribution to overall EIA report preparation.	

Water Pollution Control	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Finalization of sampling locations for surface water and ground water quality monitoring, evaluation of water quality results, analysis of water balance, identification of sources for wastewater generation and give suggestions on suitable water pollution control, exploring the ways for conservation of water, identification & assessment of impacts, finalization of mitigation measures with project proponent and contribution to overall EIA report preparation.	
Geology Hydrology	Dr. Somenath Bhattacharyya	Ph.D in Geology	November, 2021 to till date Assessment of existing Geology and hydrology of the area, Understanding and representing groundwater conditions, finalization of groundwater sampling locations, finalization of survey findings, identification of probable impact due to proposed industrial activity, suggestion of mitigation measures and contribution to overall EIA report preparation.	
Ecology & Bio-diversity	Dr. (Mrs.) Anupam Sinha	Ph.D in Botany	November, 2021 to till date Assessment of the existing Ecology & Bio-diversity with proper emphasis on eco-sensitive locations, assessment of possible impacts to the biological and ecological environment of the area due to the proposed industrial activity and EIA report preparation.	
	Ms. Puja Ghosh (TM)	M.Sc in Environmental Science		
Noise & Vibration	Mr. R.K. Dasgupta	Bachelor of Engineering (Mechanical)	November, 2021 to till date Finalization of noise sampling location and analysis of data, identification of impacts, suggestions & finalization of suitable mitigation measures with client and contribution to overall EIA report preparation.	

Land Use	Dr. Somenath Bhattacharyya	Ph.D in Geology	November, 2021 to till date Site visit, supervising development of land use maps of study area using GIS tools, finalization of landuse maps, based on ground truth verification, identification of any probable changes due to the proposed industrial activity and contribution to EIA report preparation.	
Solid & Hazardous Waste	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Identification of potential solid & hazardous waste generating sources and their inventorisation, finalization of waste management strategies, identification of impacts, finalization of mitigation measures with project proponent and contribution to overall EIA report preparation.	
Soil Conservation	Mr. Asoke Kumar Banerjee	M.Sc. (Chem.)	November, 2021 to till date Finalization of soil sampling locations, identification of potential sources of impacts due to project, finalization of suitable mitigation measures with project proponent and contribution to overall EIA report preparation.	
Risk & Hazard	Mr. T. Kundu	Bachelor of Technology (Chemical Engineering)	November, 2021 to till date Identification of major hazards, assessment of risks associated with the proposed project, quantification of the identified risks with the help of the standard software. preparation of on-site and off-site emergency plan and contribution to overall EIA report preparation.	
Socio-economics	Prof. Pabitra Sengupta	M.Sc. (Economics)	November, 2021 to till date Field survey, assessment of the existing socio-economic scenario of the area, assessment of possible changes to socio-economics of the area due to the	

			proposed project and contribution to overall EIA report preparation.	

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National Accreditation Board for Education and Training

Certificate of Accreditation

Envirotech East Private Limited
UN F13, 1050/1 Survey Park, Kolkata - 700 075

*The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Thermal power plants	4	1 (d)	A
2	Metallurgical industries (ferrous & nonferrous) - both primary & secondary	8	3(a)	A
3	Cement plants	9	3 (b)	A
4	Petroleum refining industry	10	4 (a)	A
5	Coke oven plants	11	4 (b)	A
6	Petrochemical based processing	20	5 (e)	A
7	Synthetic organic chemicals industry	21	5 (f)	A
8	Distilleries	22	5 (g)	A
9	Pulp & paper industry excluding manufacturing of paper from waste paper and manufacture of paper from ready pulp without bleaching	24	5 (i)	A
10	Ports, harbours, break waters and dredging	33	7 (e)	A
11	Building and construction projects	38	8 (a)	B
12	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Feb. 16, 2021 and supplementary minutes dated Aug. 13 and Oct.19, 2021 posted on QCI-NABET website

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/2192 dated Dec. 29, 2021. The accreditation needs to be renewed before the expiry date by Envirotech East Private Limited, Kolkata following due process of assessment.

Sr. Director, NABET
Dated: Dec. 29, 2021

Certificate No.
NABET/EIA/2124/SA 0145

Valid up to
Sep. 12, 2022

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

WEST BENGAL POLLUTION CONTROL BOARD

(Department of Environment, Government of West Bengal)
Paribesh Bhawan
Bldg. No. 10A, Block – LA, Sector – III, Bidhannagar, Kolkata – 700 106
Tel: 2335-9088 / 5076 / 5079 / 8861 / 7428 / 8211
Fax: (0091) (033) 2335-2813 / 8073 / 5272
Website: www.wbpcb.gov.in

Memo No: 0920 -5/WPB-S/99 (Part-VI) Date: 29 .03.2022
[E-File: WBPCB-15012(14)/1/2021-SEC(WBPCB)-WBPCB]

ORDER

In exercise of the power conferred under section 17(2) of the Water (Prevention and Control of Pollution) Act 1974 and under section 17(2) of the Air (Prevention and Control of Pollution) Act 1981, the West Bengal Pollution Control Board (hereinafter referred as the "State Board") recognizes Private/Government Laboratories for the purposes of environmental monitoring within the State of West Bengal.

The validity of recognition of the Private/Government Laboratories would expire on 31.03.2022. The State Board has decided to **extend the validity of recognition up to 30.06.2022** i.e. for another three (3) months.

Sl. No.	Name & address of the Laboratory	Reference order(s) of WBPCB	Processing fees payable
1.	M/s. Asansol Mines Board of Health, Court Compound, Katchari Road, P.O.- Asansol Court, Dist- Paschim Bardhaman	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 2000/-
2.	M/s. Bharat Foundation 25/11A, K. P. Roy Lane, Kolkata- 700031	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
3.	CSIR- Central Mechanical Engineering Research Institute Mahatma Gandhi Avenue, Durapur-713209, Paschim Bardhaman	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 2000/-
4.	M/s. Eco Care Manoj Talkies Basement, Asansol, Burdwan	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
5.	M/s. Edward Food Research and Analysis Centre Limited Subhash Nagar, PO-Nilgunj Bazar, Barasat, Kolkata -700121	147-5/WPB-S/99 (Part-V) dated 31.12.2019 0989-5/WPB-S/99 (Part-V) dated 27.05.2020 2342-5/WPB-S/99 (Part-V) dated 28.12.2020 0922-5/WPB-S/99 (Part-VI) dated 13.04.2021 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
6.	M/s. Envirocheck 189 & 190, 192 &63B, Rastraguru Avenue, Kolkata- 700028	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
7.	M/s. Envirotech East (P) Ltd. 100, Kalikapur, Madurdaha, Kolkata- 700107	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
8.	M/s. Fresh Environment Consultancy 123, R. N. Tagore Road, Berhampore, Murshidabad Pin-742101	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 2000/-
9.	M/s. Good Earth Enviro Care S. D. Park, Kusumba, P.O.- Narendrapur, Kolkata-700103	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
10.	M/s. Green Vision Urvashi Malhar, Phase II, MEAV-25, Bengal Ambuja Housing Complex, City Centre, Durgapur-713216	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
11.	M/s. Indicative Consultant India HPL Link Road, Basudevpur, Khanjanchak, Haldia, Dist- Purba Medinipur, Pin-721602	147-5/WPB-S/99 (Part-V) dated 31.12.2019 0868-5/WPB-S/99 (Part-V) dated 13.03.2020 1220-5/WPB-S/99 (Part-V) dated 21.09.2020 0697-5/WPB-S/99 (Part-VI) dated 08.03.2021 1680-5/WPB-S/99 (Part-VI) dated 01.09.2021 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-

Sl. No.	Name & address of the Laboratory	Reference order(s) of WBPCB	Processing fees payable
12.	M/s. J. M. Biotech (Pvt) Ltd. Sipta, P.O.- Amila, PS. Raina, Purba Bardhaman-713423	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
13.	M/s. Mitra S. K. Pvt. Ltd. Udyan Industrial Estate, P-48, 3- Pagla Danga Road, Kolkata- 700015	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
14.	M/s. N. D. International 107B, Block-F, New Alipore Kolkata- 700053	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
15.	M/s. Pollution Analizer Consultant 10, Sourin Roy Road, (2nd & 3rd Floor) Behala Kolkata-700034	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
16.	M/s. Pollution and Project Consultants P- 145, Bangur Avenue Block A, Kolkata-700055	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
17.	M/s. Qualissure Laboratory Services 361, Prantik Pally, 45/361, Bose Pukur Road, Kolkata- 700107	147-5/WPB-S/99 (Part-V) dated 31.12.2019 0623-5/WPB-S/99 (Part-VI) dated 26.02.2021 1021-5/WPB-S/99 (Part-VI) dated 04.05.2021 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
18.	M/s. Quality Control Laboratory, PO: Haldia Oil Refinery, Dist: Purba Medinipur, Pin-721606	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 2000/-
19.	M/s. R.V. Briggs & Co. Pvt Ltd. 9, Bentinck Street, 1st Floor, Taher Mansion, Kolkata- 700001	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
20.	M/s. S. M. Scientific Service 486, Dumdum Park, Kolkata-700055	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
21.	M/s. Scientific Research Laboratory 90, Lake East (4th Road), Santoshpur, Jadavpur, Kolkata - 700075	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
22.	M/s. SGS India Pvt. Ltd. CS Plot No.- 512(P), Mauza - Hanspukuria, Diamond Harbour Road, P.O. - Joka, Dist.- South 24 Paraganas, Kolkata- 700104	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
23.	M/s. Superintendence Co. of India Pvt Ltd Plot- y-23, Block-EP, Sector-V, Salt Lake City, Kolkata- 700091	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-
24.	M/s. Unitech Environmental Services Pvt. Ltd. 52D/12/1A, Babu Bagan Lane, Kolkata-700031	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 2000/-
25.	M/s West Bengal Waste Management Limited (A division of Ramky Enviro Engineers Ltd) J. L. No. -103, Mouza - Purba Srikrishnapur, P.S.- Sutahata, Haldia, Dist. -Purba Midnapur, Pin- 721635	147-5/WPB-S/99 (Part-V) dated 31.12.2019 2600-5/WPB-S/99 (Part-VI) dated 15.12.2021	Rs. 3000/-

The terms and conditions and the recommended parameters as mentioned in the above referred respective order(s) of the State Board will remain same and unaltered.

The Laboratories are requested to deposit the requisite processing fees mentioned against respective laboratory, to the State Board, within 30.04.2022.

Roshni Sen
Member Secretary, WBPCB

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

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पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 15 नवम्बर, 2018

का.आ. 5768(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) नियम, 1986 के नियम 10 के साथ पठित, पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 12 की उपधारा (1) के खंड (ख) और धारा 13 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए भारत सरकार के तत्कालीन पर्यावरण और वन मंत्रालय की अधिसूचना सं. का.आ. 1174 (अ), तारीख 18 जुलाई, 2007 में निम्नलिखित और संशोधन करती है, अर्थात् :-

2. उक्त अधिसूचना से संलग्न सारणी में,

(i) क्रम संख्यांक 29, 31, 38, 54 और 73 तथा उससे संबंधित प्रविष्टयों के स्थान पर, निम्नलिखित क्रम संख्यांक और प्रविष्टियां रखी जाएंगी, अर्थात् :-

(1)	(2)	(3)	(4)
"29	मैसर्स महाबल ईनवायरो इंजीनीयरस प्राइवेट लिमिटेड, प्लाट नं. 13,17, 18, ग्रामपंचायत बोखारा, नागपुर शहर से 8 कि.मी. की दूरी पर, पटेल पैट्रोल पंप के सामने छिंदवाड़ा रोड, पोस्ट कोराडी, जिला नागपुर-441111, महाराष्ट्र	(i) श्री हरीश प्रभाकर मेंधी (ii) श्री किशोर चंद्रभान जी येओल (iii) श्री सचिन सुभाष गोरे	15 नवंबर, 2018 से 14 नवंबर, 2023
31	मैसर्स ईनवायरो ईस्ट प्राइवेट लिमिटेड, बंगाल अंबूजा कमर्शल कम्पलेक्स, यू एन-एफ-13, 1050/1, सर्वे पार्क, कोलकाता-700075	(i) श्री असोक कुमार बंदोपाध्याय (ii) श्री तापस कुंडु (iii) डा.शिबम मित्रा	15 नवंबर, 2018 से 14 नवंबर, 2023
38	मैसर्स ईनवायरोकेयर लैबस प्राइवेट लिमिटेड, ईनवायरो हाउस, ए-7, एम आई डी सी, वागले	(i) डा.प्रीती एन अमृतकर (ii) कुमारी स्नेहा औंकार मेथर	15 नवंबर, 2018 से 14 नवंबर, 2023

	इडस्ट्रीयल ईस्टेट, मेन रोड, थाने -400604, महाराष्ट्र	(iii) कुमारी मनीषा खराडे	
54	मैसर्स इको प्रो ईंजीनीयर्स प्राइवेट लिमिटेड, 32/41, जी टी रोड से पश्चिम की ओर, यू पीएस आई डी सी इंडस्ट्रीयल एरिया, गाजियाबाद-201009, उत्तर प्रदेश	(i) श्री अमित सक्सेना (ii) सुश्री दिव्या सक्सेना (iii) सुश्री पूर्णिमा चौहान	15 नवंबर, 2018 से 14 नवंबर, 2023
73	मैसर्स के के बी माइक्रो टेस्टींग लैबस प्राइवेट लिमिटेड, तरूण प्लाजा, 3-5-244, दूसरा तल, एन एफ सी मेन रोड, कृष्णा नगर कालोनी, मौला अली, हैदराबाद-500040	(i) श्री चौ रामाकृष्णा (ii) श्रीमती पी. राजेश्वरी (iii) श्रीमती अमृता नलिनी	15 नवंबर, 2018 से 14 नवंबर, 2023"

(ii) क्रम सं. 168 उससे संबंधित प्रविष्टयों के पश्चात्, निम्नलिखित क्रम सं. और प्रविष्टियां रखी जाएंगी, अर्थात् :-

"169	मैसर्स ईकोसिस्टम रिसोर्स मैनेजमैंट प्राइवेट लिमिटेड, ए-अशोका पैविलियन, कपाड़िया हैल्थ क्लब के सामने न्यू सिविल रोड, सूरत-295001, गुजरात	(i) श्री सुनील कुमार पांडे (ii) श्री पटेल नीरव कुमार भागवत प्रसाद (iii) श्री पटेल शिरीश धीरुभाई	15 नवंबर, 2018 से 14 नवंबर, 2023
170	मैसर्स एस सी एसईनवायरो सविर्स प्राइवेट लिमिटेड. 7 केसरविहार, खाटू श्यामजी मंदिर के सामने रामन्नागरिया रोड, जगतपुरा, जयपुर-302017, राजस्थान	(i) डा. डी एस परीहार (ii) श्री जितेन्द्र दीक्षित (iii) श्री अभिषेक गौतम	15 नवंबर, 2018 से 14 नवंबर, 2023
171	मैसर्स एपेक्स इनवायरो लेबोरटरी, 3-डेबर कालोनी, आई टी आई के पास, प्रताप नगर, उदयपुर, राजस्थान	(i) डा. वाई एल मेहता (ii) श्री अमित सक्सेना (iii) श्री किशनलाल अग्रवाल	15 नवंबर, 2018 से 14 नवंबर, 2023
172	मैसर्स पोलीटेस्ट लेबोरटरीज, 22 सोनी इंडस्ट्रीयल ईस्टेट, पीरांनगुट, पुणे-412115, महाराष्ट्र	(i) श्रीमती स्मिता अजय कपाडने (ii) श्री सचिन हरि कापडे (iii) श्रीमती स्वाती महेन्द्र उमारानी	15 नवंबर, 2018 से 14 नवंबर, 2023
173	मैसर्स इंडस्ट्रीयल रिसर्च एंड डवेलपमैंट हाउस प्राइवेट लिमिटेड, सी-10,सेक्टर-6, नौएडा-201306, उत्तर प्रदेश	(i) डा. एस एन ए रिजवी (ii) सुश्री वंदना गुप्ता (iii) सुश्री कविता शर्मा	15 नवंबर, 2018 से 14 नवंबर, 2023
174	मैसर्स विनमैट टैकनोलोजीस प्राइवेट लिमिटेड, प्लाट नं. आ-65, साईट- यूपी एस आई डी सी, ग्रेटर नौएडा-201306, उत्तर प्रदेश	(i) श्री कुलदीप सिंह तेवतिया (ii) श्रीमती उपासना (iii) श्री सुनील कुमार बंसल	15 नवंबर, 2018 से 14 नवंबर, 2023
175	मैसर्स नेक्सस टेस्ट लैबस प्राइवेट लिमिटेड 29, दूसरा तल, तीसरा मेन सींगेहनापलाया, महादेवपुरा, बैंगलोर-560048	(i) श्रीविजया सिंहा रेड्डी पीआर (ii) श्रीमती के कृष्णावेनी (iii) श्रीमती एस मल्लेस्वरी	15 नवंबर, 2018 से 14 नवंबर, 2023
176	मैसर्स इको टैक लैबस प्राइवेट लिमिटेड, 48 ए, दूसरी मेन रोड, रामनगर, साउथ एक्सटेंशन, पालीकरनई, चेन्नई-600100	(i) श्री ए. दामोधरन (ii) सुश्री एस कोकिला (iii) डा. आर रेणुका	15 नवंबर, 2018 से 14 नवंबर, 2023
177	मैसर्स एलकेटी रिसर्च लेबोट्रीज इंडिया प्राइवेट लिमिटेड, प्लाट नं. 1652, एम आई ई, पार्ट-बी, बहादुरगढ़-124507, हरियाणा	(i) डा. राजेश कुमार शर्मा (ii) श्री संजय कुमार पांडे	15 नवंबर, 2018 से 14 नवंबर, 2023

178	मैसर्स रोबस्ट मैटीरियल टेकनोलोजी प्राइवेट लिमिटेड, सं. 94, दूसरा तल, थिरूमाला कमपलेक्स, एन जी ई एफ लेआउट, नागराभावी, बैंगलौर-560072	(i) डा. के. आर रवीकुमार (ii) डा. ममता एस एन (iii) श्री संदेशा के एस	15 नवंबर, 2018 से 14 नवंबर, 2023"

[फा. सं. क्यू 15018/21/2017-सीपीडब्ल्यू]

बृजेश सिक्का, सलाहकार

टिप्पण : मूल अधिसूचना भारत के राजपत्र, असाधारण, में अधिसूचना संख्यांक का. आ. 1174(अ), तारीख 18 जुलाई, 2007 द्वारा प्रकाशित की गई थी और अधिसूचना संख्यांक का.आ.1539(अ), तारीख 13 सितम्बर, 2007, का.आ. 1811(अ), तारीख 24 अक्तूबर, 2007, का.आ. 55(अ), तारीख 9 जनवरी, 2008, का.आ. 428(अ) तारीख 4 मार्च, 2008, का.आ. 865(अ), तारीख 11 अप्रैल, 2008. का.आ. 1894 (अ) तारीख 31 जुलाई, 2008, का.आ. 2728(अ) 25 नवम्बर, 2008, का.आ. 1356 (अ) तारीख 27 मई, 2009, का.आ.1802(अ) तारीख 22 जुलाई, 2009, का.आ.2399 (अ) तारीख 18 सितम्बर, 2009, का.आ.3122(अ) तारीख 7 दिसम्बर, 2009, का.आ. 3123(अ), 7 दिसम्बर, 2009, का.आ. 142(अ) तारीख 21 जनवरी, 2010, का.आ.619(अ) तारीख 19 मार्च, 2010, का.आ. 1662(अ) तारीख 13 जुलाई, 2010, का.आ. 2390(अ) तारीख 30 सितम्बर, 2010, का.आ. 2904(अ) तारीख 8 दिसम्बर, 2010, का.आ.181(अ) तारीख 28 जनवरी, 2011, का.आ. 692(अ) तारीख 5 अप्रैल, 2011, का.आ. 1537(अ) तारीख 6 जुलाई, 2011, का.आ.1754(अ) तारीख 28 जुलाई, 2011, का.आ. 2609(अ) तारीख 22 नवम्बर, 2011, का.आ. 264(अ) तारीख 13 फरवरी, 2012, का.आ. 1150(अ) तारीख 22 मई, 2012, का.आ. 1295(अ), 6 जून, 2012 का.आ.2039(अ) तारीख 5 सितम्बर, 2012, का.आ. 2850(अ) तारीख 7 दिसम्बर, 2012, का.आ.592(अ) तारीख 8 मार्च, 2013, का.आ. 945(अ) तारीख 8 अप्रैल, 2013, का.आ. 2287(अ) तारीख 27 जुलाई, 2013, का.आ. 3489(अ) तारीख 26 नवम्बर, 2013, का.आ.21(अ) तारीख 3 जनवरी, 2014, का.आ. 561(अ) तारीख 26 फरवरी, 2014, का.आ. 1190(अ) तारीख 2 जून, 2014, का.आ. 2003(अ) तारीख 9 अगस्त, 2014, का.आ.137 (अ) तारीख 12 जनवरी, 2015, का.आ. 1783(अ) तारीख 30 जून, 2015, का.आ. 2453(अ) तारीख 7 सितम्बर, 2015 का.आ. 1953(अ), तारीख 2 जून, 2016 और का.आ.388(अ) तारीख 10 फरवरी, 2017 और का.आ.सं. 857(अ) तारीख 26 फरवरी, 2018 द्वारा उनका अन्तिम संशोधन किया गया।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, 15th November, 2018

S.O. 5768 (E).— In exercise of the powers conferred by clause (b) of sub-section (1) of section 12 and section 13 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 10 of the Environment (Protection) Rules, 1986, the Central Government hereby makes the following further amendments in the notification of the Government of India in the erstwhile Ministry of Environment and Forests, vide number S.O. 1174(E), dated the 18th July, 2007, namely: -

in the said notification, in the table, -

(i) for serial numbers 29, 31, 38, 54 and 73 the entries relating thereto, the following serial numbers and entries shall be substituted, namely: -

(1)	(2)	(3)	(4)
"29	M/s. Mahabal Enviro Engineers Pvt. Ltd. Plot No. 13,17,18, Grampanchayat Bokhara, 8 KM from Nagpur City, Opp. Patel Petrol Pump, Chhindwara Road, Post Koradi, Distt. Nagpur-441111, Maharashtra	(i) Mr. Harish Prabhakar Mendhi (ii) Mr. Kishor Chandrabhanji Yeole (iii) Mr. Sachin Subhash Gore	15th November, 2018 to 14th November, 2023
31	M/s. Envirotech East Pvt. Ltd. Bengal Ambuja Commercial Complex, UN-F-13, 1050/1, Survey Park, Kolkata-700075	(i) Mr. Asoke Kumar Bandyopadhyay (ii) Mr. Tapas Kundu (iii) Dr. Shibam Mitra	15th November, 2018 to 14th November, 2023
38	M/s. Envirocare Labs Pvt. Ltd. Enviro House, A-7, MIDC, Wagle Industrial Estate, Main Road, Thane-400604, Maharashtra	(i) Dr. Priti N. Amritkar (ii) Ms. Sneha Omkar Methar (iii) Ms. Manisha Kharade	15th November, 2018 to 14th November, 2023
54	M/s. Eko Pro Engineers Pvt. Ltd., 32/41, South Side of G.T. Road, UPSIDC Industrial Area, Ghaziabad-201009, Uttar Pradesh	(i) Mr. Amit Saxena (ii) Ms. Divya Saxena (iii) Ms. Purnima Chauhan	15th November, 2018 to 14th November, 2023
73	M/s. KKB Micro Testing Labs Pvt. Ltd. Tarun plaza, #3-5-244, 2nd Floor, NFC Main Road, Krishna Nagar Colony, Moula Ali, Hyderabad-500040	(i) Mr. Ch. Ramakrishna (ii) Mrs. P. Rajeswari (iii) Mrs. Amrutha Nalini	15th November, 2018 to 14th November, 2023

(ii) after serial number 168 and the entries relating thereto, the following serial numbers and entries shall be inserted, namely: -

(1)	(2)	(3)	(4)
"169	M/s. Ecosystem Resource Management Pvt. Ltd. A`-Ashoka Pavillion, Opp. Kapadia Health Club, New-Civil Road, Surat-395001, Gujarat	(i) Mr. Sunil Kumar Pandey (ii) Mr. Patel Niravkumar BhagvatPrasad (iii) Mr. Patel Shirish Dhirubhai	15th November, 2018 to 14th November, 2023
170	M/s. SCS Enviro Services Pvt. Ltd. 7 Kesar Vihar, Opposite Khatu Shyamji Temple, Ramnagariya Road, Jagatpura, Jaipur-302017, Rajasthan	(i) Dr. D.S Parihar (ii) Mr. Jitendra Dixit (iii) Mr. Abhishek Gautam	15th November, 2018 to 14th November, 2023
171	M/s. Apex Enviro Laboratory 3-Dhebar Colony, Near I.T.I Pratapnagar, Udaipur, Rajasthan	(i) Dr. Y.L. Mehta (ii) Mr. Amit Saxena (iii) Mr. Kishan Lal Agrawal	15th November, 2018 to 14th November, 2023
172	M/s. Polytest Laboratories 22 Sonaee Industrial Estates, Pirangut, Pune-412115, Maharashtra	(i) Mrs. Smita Ajay Kapadne (ii) Mr. Sachin Hari Kapade (iii) Mrs. Swati Mahendra Umarani	15th November, 2018 to 14th November, 2023
173	M/s. Ind Research & Development House Pvt. Ltd. C-10, Sector-6, Noida-201301, Uttar Pradesh	(i) Dr. SNA Rizvi (ii) Ms. Vandana Gupta (iii) Ms. Kavita Sharma	15th November, 2018 to 14th November, 2023
174	M/s. Winmet Technologies Private Ltd. Plot No. E-65, Site-IV, UPSIDC, Greater Noida-201306, Uttar Pradesh	(i) Mr. Kuldeep Singh Teotia (ii) Mrs. Upasna (iii) Mr. Sunil Kumar Bansal	15th November, 2018 to 14th November, 2023
175	M/s. Nexus Test Labs Pvt. Ltd. #29, Second Floor, 3rd Main,	(i) Mr. Vijaya Simha Reddy P.R (ii) Mrs. K. Krishnaveni	15th November, 2018 to

	Singaiahnaplaya, Mahadevapura, Bangalore-560048	(iii) Mrs. S. Malleswari	14th November, 2023
176	M/s. Eco Tech Labs Pvt. Ltd. 48A, 2nd Main Road, Ram Nagar , South Extension, Pallikaranai, Chennai-600100	(i) Mr. A. Dhamodharan (ii) Ms. S. Kokila (iii) Dr. R. Renuka	15th November, 2018 to 14th November, 2023
177	M/s. Alcatec Research Laboratories India Pvt. Ltd. Plot No. 1652, M.I.E , Part-B, Bahadurgarh-124507, Haryana	(i) Dr. Rajesh Kumar Sharma (ii) Sh. Sanjay Kumar Pandey	15th November, 2018 to 14th November, 2023
178	M/s. Robust Materials Technology Pvt. Ltd. No. 94, 2nd Floor, Thirumala Complex, NGEF Layout, Nagarabhavi, Bangalore-560072	(i) Dr. K.R. Ravikumar (ii) Dr. Mamatha S.N. (iii) Mr. Sandesha K.S	15th November, 2018 to 14th November, 2023"

[F. No. Q. 15018/21/2017-CPW]

BRIJESH SIKKA, Advisor

Note.- The principal notification was published in the Gazette of India, Extraordinary vide number S.O. 1174 (E), dated the 18th July, 2007 and subsequently amended vide notification numbers S.O. 1539 (E), dated the 13th September, 2007, S.O.1811(E), dated the 24th October, 2007, S.O.55(E), dated the 9th January, 2008, S.O. 428(E), dated the 4th March, 2008, S.O. No. 865(E), dated the 11th April, 2008, S.O.No.1894(E), dated the 31st July,2008, S.O. No. 2728(E), dated the 25th November, 2008, S.O.1356(E), dated the 27th May, 2009, S.O.No.1802(E), dated the 22nd July, 2009, S.O.No. 2399(E), dated the 18th September, 2009, S.O.No. 3122(E), dated the 7th December, 2009, S.O.No. 3123(E), dated the 7th December, 2009, S.O.No. 142(E), dated the 21st January, 2010, S.O. 619 (E), dated the 19th March, 2010, S.O.No. 1662(E), dated the 13th July, 2010, S.O.No. 2390(E), dated the 30th September, 2010, S.O.No. 2904 (E), dated the 8th December, 2010 , S.O.No. 181(E), dated the 28th January, 2011, S.O.No. 692(E) dated the 5th April, 2011, S.O No. 1754 (E), dated the 28th July, 2011, S.O. No. 2609, dated the 22nd November, 2011, S.O No. 264(E) , dated the 13th February, 2012, S.O No. 1150 (E) dated the 22nd May, 2012, S.O No. 1295(E), dated the 6th June, 2012, S.O. No. 2039 (E), dated the 5th September, 2012, S.O No. 2850 (E), dated the 7th December, 2012, S.O. No. 592 (E), dated the 8th March, 2013, S.O. No. 945(E), dated the 8th April, 2013, S.O. No. 2287 (E), dated the 26th July, 2013, S.O No. 3489(E) dated the 26th November, 2013, S.O No. 21(E), dated the 3rd January, 2014, S.O No. 561 (E), dated the 26th February, 2014, S.O. No. 1190(E), dated the 1st June, 2014, S.O. No. 2003(E), dated the 9th August, 2014, S.O. No. 137 (E), dated the 12th January, 2015, S.O. No. 1783(E), dated the 30th June, 2015, S.O. No. 2453(E), dated the 7th September, 2015 , S.O. No. 1953(E), dated the 2nd June, 2016, S.O. No. 388(E), dated the 10th February, 2017, S.O No. 2836 (E), dated the 30th August, 2017 and S.O. 857(E) dated the 26th February, 2018

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