DRAFT EIA/EMP REPORT
OF
Common Biomedical Waste Treatment Facility (CBWTF)

Location at Khasra No. 724
Village Kunja (Bahadarpur), Tehsil – Bhagwanpur,
District – Haridwar, Uttarakhand

Project Proponent

M/s ECON Waste Solution

Village Kunja (Bahadarpur), Tehsil – Bhagwanpur,
District – Haridwar, Uttarakhand

TOR Details SEIAA Uttarakhand
TOR Ref No -Letter No. 278/SEIAA, Dated 30 May, 2023
Baseline data – 1st March 2023 to 31st May, 2023

Prepared by

Environment Management Division

of

M/s India Glycols Limited, Kashipur, Udham Singh Nagar

(NABET, QCI Approved Accredited Consultant)

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1 INTRODUCTION

1.1 Purpose of the Project

Improper management of waste generated in health care facilities causes a direct health impact on the community, the health care workers and on the environment. Every day, a significant amount of potentially infectious bio-medical waste is generated around the world. Indiscriminate disposal of bio-medical waste and exposure to such waste poses a serious threat to environment and to human health bio-medical waste requires specific treatment and management prior to its final disposal

Ministry of Environment, Forest & Climate Change (MoEFCC), Govt. of India has introduced the new notification as Biomedical Waste Management Rules, 2016 based on draft Biomedical Waste (Management & handling) 2011, under the Environment (Protection) act 1986 which replaced the earlier Biomedical waste (management & handling) rules, 1998. In accordance with the rules, every occupier of a healthcare establishment (HCE) shall either set up requisite biomedical waste treatment facilities on site or ensure requisite treatment of the biomedical waste at an approved common treatment facility. It is to ensure that no untreated biomedical waste shall be kept stored beyond a period of 48 hours.

According to Bio-Medical Waste Management Rules 2016, Bio-Medical Waste (BMW) means "any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps".

The treated waste may finally be sent for disposal after incineration or for recycling purposes.

Installation of individual treatment facilities by small healthcare units requires comparatively high capital investment. In addition, it requires separate manpower and infrastructure development for proper operation and maintenance of treatment systems. The concept of CBWTF not only addresses such problems but also prevents proliferation of treatment equipment in a city. In turn it reduces the monitoring pressure on regulatory agencies. By running the treatment equipment at CBWTF to its full capacity, the cost of treatment per kilogram gets significantly reduced especially with the introduction of new Biomedical Waste

Management Rules in 2016 which prescribes the standards for dioxin & furans from incinerator. Its considerable advantages have made CBWTF popular and proven concept in many developed countries. CBWTF as an option has been legally introduced in India. The Bio-medical Waste Management Rules makes it mandatory for the bio-medical waste generator within 75 km radius to treat the biomedical waste at the CBWTF.

The Government of India has made it mandatory for all developmental projects to prepare a detailed EIA study so that the impacts of the proposed developmental activity can be predicted and a suitable management plan can be implemented before commissioning the project.

Environmental Impact Assessment (EIA) serves as a useful tool in prediction of potential impacts on the surrounding environment due to developmental project. The purpose of this EIA report is to reduce the burden of environmental impacts for sustainable development. It helps the project proponent, impact assessment authorities, regulatory agencies and other stakeholders in understanding the project, environmental impacts and mitigation measures, and establishing emission requirements and other measures early in the project cycle. This report describes the project location, baseline environmental scenario, potential impacts of the project on the environment and proposed measures for effective environment management during the project cycle (Environmental Management Plan during construction and operation stage of the project).

M/s ECON Waste Solution is a private company proposes to setup a Common Bio-medical Treatment Facility (CBWTF) at Khasra No. 724, Village- Kunja (Bahadarpur), Tehsil Bhagwanpur, District Haridwar. The proposed project of setting up the Common Bio-medical Waste Treatment Facility (CBWTF) includes Incinerator with Air Pollution Control Device (APCD), Autoclave, Shredder and Effluent Treatment Plant. It is proposed to utilize 0.8320 Ha. of land for the proposed project.

As per EIA Notification 2006, the project was earlier considered by MoEF &CC under Category “B1” Projects of activity 7d (a), namely Common hazardous waste Treatment and Disposal Facility. Subsequently in the amendment vide Gazette Notification dated 17 thApril 2015, separate entry has been made therein for Bio-medical Waste Treatment Facilities. Thus, all Projects of Bio-medical Waste Treatment Facilities now fall under “Category B” activity

7(da). As a part of above process, the application (Form-1 along with Pre-Feasibility Report) was submitted for setting up of Biomedical Waste Treatment Facility.

Environment Management Division of India Glycols Ltd., Kashipur, a NABET approved consultant with Certificate No. NABET/EIA/2124/IA0078 dated 19/07/2024, has been assigned for the Environmental Impact Assessment (EIA) studies. The study is done based on Terms of Reference (TOR) issued by State Level Environment Impact Assessment Authority, Uttarakhand for assessing the impact of the proposed of Common Biomedical Waste Treatment Facility on various environmental parameters in the study area.

1.2 Identification of the Project

The present proposal is for setting up of Common Biomedical Waste Treatment Facility (CBWTF), which includes Incinerator with APCD, Autoclave, Shredder and Effluent Treatment Plant which will be built at project site located at Khasra No. 724, Village- Kunja (Bahadarpur), Tehsil Bhagwanpur, District Haridwar. It is proposed to utilize 0.8320 Ha. of land for setting up of Common Biomedical Waste Treatment Facility.

Common Bio-Medical Waste Treatment Facility (CBWTF) is providing services to Health Care Units for collection of bio-medical wastes for its final disposal to their site. Bio-Medical Waste Management Rules 2016, stipulates that occupier of every organization generating bio-medical waste (as defined in the rules) must manage bio-medical waste as prescribed in the rules such that it does not cause any harm to the environment.

1.3 Objective of the Project

- Establish a Common Bio-medical Waste Treatment facility including the Incinerator, autoclave, shredder and effluent treatment unit.
- Collection of Segregated Biomedical waste and its transportation, storage, treatment and disposal in accordance to the Biomedical Waste Management Rules 2016.
- Compliances with statutory and environmental norms.
- Develop concise waste management principles.
- Introduce a continuing waste management education program for all staff to increase awareness of Occupational Health & Safety issues and waste minimization principles.

- ❖ Adopt policies and procedures to minimize the environmental impacts of waste treatment and Disposal.

1.4 Reporting to regulatory authorities as needed.

- ❖ Establish a Common Bio-medical Waste Treatment facility including the Incinerator, autoclave, shredder and effluent treatment unit.
- ❖ Collection of Segregated Biomedical waste and its transportation, storage, treatment and disposal in accordance to the Biomedical Waste Management Rules 2016.
- ❖ Compliances with statutory and environmental norms.
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- ❖ Adopt policies and procedures to minimize the environmental impacts of waste treatment and Disposal.
- ❖ Reporting to regulatory authorities as needed

1.5 Relevant Provisions of Biomedical Waste Management Rules 2016

"Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps.

"Handling" in relation to bio-medical waste includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment, destruction, conversion, or offering for sale, transfer, disposal of such waste.

"Health Care Facility" means a place where diagnosis, treatment or immunization of human beings or animals is provided irrespective of type and size of health treatment system, and research activity pertaining thereto;

"Major accident" means accident occurring while handling of bio-medical waste having potential to affect largemasses of public and includes toppling of the truck carrying bio-medicalwaste, accidental release of bio-medical waste in any water body but exclude accidents like needle prick injuries, mercury spills.

"Management" includes all steps required to ensure that bio- medical waste is managed in such a manner as to protect health and environment against any adverse effects due to handling of such waste;

"Occupier" means a person having administrative control over the institution and the premises generating biomedical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, health care facility and clinical establishment, irrespective of their system of Medicine and by whatever name they are called;

"Operator of a common bio-medical waste treatment facility" means a person who owns or controls a Common Bio-medical Waste Treatment Facility (CBMWTF) for the collection, reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste;

Duties of the Occupier- It shall be the duty of every occupier to-

a. Take all necessary steps to ensure that bio-medical waste is handled without any adverse effect to human health and the environment;
b. Make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in colored bags or containers in the manner, to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises shall be directly transported in the manner as prescribed Biomedical Waste Management Rules 2016 to the common bio-medical waste treatment facility or for the appropriate treatment and disposal.
c. Pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on-site in the manner as prescribed by the World Health Organization (WHO) or National AIDs Control Organization (NACO) guidelines and then sent to the common bio-medical waste treatment facility for final disposal;
d. Phase out use of chlorinated plastic bags, gloves and blood bags

e. Dispose off solid waste other than bio-medical waste in accordance with the provisions of respective waste management rules made under the relevant laws and amended from time to time;
f. Not to give treated bio-medical waste with municipal solid waste;
g. Provide training to all its health care workers and others, involved in handling of bio medical waste at the time of induction;
h. Ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralization prior to mixing with other effluent generated from health care facilities;
i. Ensure treatment and disposal of liquid waste in accordance with the Water (Prevention and Control of Pollution) Act, 1974;
j. Ensure occupational safety of all its health care workers and others involved in handling of bio-medical waste by providing appropriate and adequate personal protective equipment;
k. Maintain and update on day-to-day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and color coding.
l. Report major accidents including accidents caused by fire hazards, blasts during handling of bio-medical waste and the remedial action taken
m. Establish a system to review and monitor the activities related to bio-medical waste management, either through an existing committee or by forming a new committee and the Committee shall meet once in every six months.

1.8.3 Duties of the operator of a common bio-medical waste treatment and disposal facility:

It shall be the duty of every operator to-

a. Take all necessary steps to ensure that the bio-medical waste collected from the occupier is transported, handled, stored, treated and disposed of, without any adverse effect to the human health and the environment, in accordance with Biomedical Waste Management Rules, 2016 and guidelines issued by the Central Government or the central pollution control board from time to time;
b. Ensure timely collection of bio-medical waste from the occupier;

c. Establish bar coding and global positioning system for handling of bio-medical waste within one year;
d. Inform the prescribed authority immediately regarding the occupiers which are not handing over the segregated bio-medical waste in accordance with these rules;
e. Provide training for all its workers involved in handling of bio-medical waste at the time of induction and at least once a year thereafter;
f. Assist the occupier in training conducted by them for bio-medical waste management;
g. Report major accidents including accidents caused by fire hazards, blasts during handling of bio-medical waste and the remedial action taken and the records relevant thereto;
h. Maintain a log book for each of its treatment equipment according to weight of batch; categories of waste treated; time, date and duration of treatment cycle and total hours of operation;
i. Allow occupier, who are giving waste for treatment to the operator, to see whether the treatment is carried out;
j. Shall display details of authorization, treatment, annual report etc.
k. After ensuring treatment by autoclaving or microwaving followed by mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass, shall be given to recyclers having valid consent or authorization or registration from the respective State Pollution Control Board or Pollution Control Committee;
l. Supply non-chlorinated plastic-coloured bags to the occupier on chargeable basis, if required;
m. Common bio-medical waste treatment facility shall ensure collection of biomedical waste on holidays also;

1.8.4 Duties of Common Biomedical Waste Treatment Facility (CBWTF):

- Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients:
- Report to SPCBs/PCCs about receiving of waste from COVID-19 isolation wards / Quarantine
- Camps / Quarantined homes / COVID-19 Testing Centers;

- Operator of CBWTF shall ensure regular sanitization of workers involved in handling and collection of biomedical waste;
- Workers shall be provided with adequate PPEs including three layer masks, splash proof aprons/gowns, nitrile gloves, gum boots and safety goggles;
- Use dedicated vehicle to collect COVID-19 ward waste. It is not necessary to place separate label on such vehicles;
- Vehicle should be sanitized with sodium hypochlorite or any appropriate chemical disinfectant after every trip.
- COVID-19 waste should be disposed-off immediately upon receipt at facility.
- In case it is required to treat and dispose more quantity of biomedical waste generated from
- COVID-19 treatment, CBWTF may operate their facilities for extra hours, by giving information to SPCBs/PCCs.
- Operator of CBWTF shall maintain separate record for collection, treatment and disposal of COVID-19 waste.
- Do not allow any worker showing symptoms of illness to work at the facility. May provide adequate leave to such workers and by protecting their salary.
- CBWTF operator shall register on 'COVID19BWM' Tracking App developed by CPCB and also ensure registration of Waste Handler (with vehicle) for entering the data of COVID-19 biomedical waste received and disposed.

1.6 Salient features

The salient feature of the project is summarized in **Table 1.**

Table 1-1: Salient Features of the Project

S.No.	Parameters	Description
1.	Identification of Project	The Proposed project of CBWTF falls under Category B-1, schedule (da) as per the EIA Notification 14th Sep, 2006 and subsequent amendments dated 1st December, 2009 & 17th April, 2015.
2.	Project Proponent	**M/s ECON Waste Solution**
3.	Brief description of nature of the project	Biomedical waste is generated from all health care institutions; nursing homes, clinics, dispensaries,

<table>
<tr><td></td><td></td><td>veterinary institutions, animal houses, pathological laboratories, blood banks etc. The responsibility of collection, treatment and safe disposal of all types of solid wastes rests with the generator.
A Common Bio-medical Waste Treatment Facility (CBWTF) is proposed to be set up where bio-medical waste, generated from a number of healthcare units, will be suitably treated as per the prescribed procedure & norms laid down in the regulation.
Proposed project of setting up of the Common Bio-medical Waste Treatment Facility includes Incinerator, Autoclave, Shredder and Effluent Treatment Plant. The present proposal is to utilize 0.4050 ha land for setting up of Biomedical Waste Treatment Facility.</td></tr>
<tr><td>4.</td><td colspan="2">Salient Features of the Project</td></tr>
<tr><td>5.</td><td>Proposed plant capacity</td><td>Proposed Capacity of CBWTF:
<table><tr><th>Equipment</th><th>Capacity</th><th>Number</th></tr><tr><td>Double Chambered Incinerator</td><td>200 kg/hr</td><td>1</td></tr><tr><td>Autoclave</td><td>1000 liters/Batch</td><td>1</td></tr><tr><td>Shredder</td><td>200 kg/hr</td><td>1</td></tr><tr><td>Chemical Disinfection Tank</td><td>1500 Ltr</td><td>1</td></tr><tr><td>Effluent Treatment Plant</td><td>10.0 KLD</td><td>1</td></tr></table></td></tr>
<tr><td>6.</td><td>Category of Projects</td><td>Category “B1” and Schedule- 7(da)</td></tr>
<tr><td>7.</td><td>Number of working days</td><td>365</td></tr>
<tr><td>8.</td><td>Total Plot Area</td><td>0.8320 Hactare</td></tr>
<tr><td>9.</td><td>Plot Number</td><td>Khasra No. 724</td></tr>
<tr><td>10.</td><td>Location</td><td>Village- Kunja (Bahadarpur), Tehsil Bhagwanpur, District Haridwar</td></tr>
<tr><td>11.</td><td>Latitude & Longitude</td><td>Latitude: 29°52'31.49"N
Longitude: 77°47'6.12"E</td></tr>
<tr><td>12.</td><td>Nearest habituated area</td><td>Iqbalpur - 1.0 Km SE</td></tr>
<tr><td>13.</td><td>Nearest Main Public Road</td><td>Puhana Jhabrera Road: 0.95 Km</td></tr>
<tr><td>14.</td><td>Nearest Railway station/Airport</td><td>Iqbalpur Railway Station – 1.74 Km E
Jolly Grant Airport – 52.0 Km NW</td></tr>
<tr><td>15.</td><td>Nearest water body</td><td>Ganga Canal – 9.62 Km E</td></tr>
<tr><td>16.</td><td>Water requirement</td><td>Water requirement for the proposed CBWTF project is 11.0 KLD.</td></tr>
<tr><td>17.</td><td>Source of water</td><td>Water requirement will be met through ground water.</td></tr>
<tr><td>18.</td><td>Wastewater Generation</td><td>Waste water generated from the treatment of Biomedical waste during autoclaving, washing of</td></tr>
</table>

		floors, etc. is 4.75 KLD and it shall be treated in effluent treatment plant and reuse in process
19.	Man Power	During Construction phase, the labors and workers will be hired from nearby villages. Total 20 persons are proposed to hire for plant operation including officers, skilled and unskilled workers.
20.	Air Pollution Control Device	Venturi Scrubber & Stack
21.	Nos. of Stack	2
22.	Power requirement	Total power requirement of will be around 65 KVA. DG Set of 65.0 KVA is proposed for the project and lines will be taken from the authorized electricity board. ~ 1% of the total power load will meet through solar energy.
23.	Alternative site	No Alternative site is examined
24.	Land form, Land use and land ownership	The land for project is located in Khasra No. 724, Village- Kunja (Bahadarpur) Tehsil Bhagwanpur, District Haridwar

1.8.5 Project Proponent

Dr. Mahadev Semwal (Partner)

Dr. Pawan Tyagi (Partner)

M/s ECON Waste Solution

Village Khabarwala, P.O Jaintanwala, Garhicantt, Dehradun-248003

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Email: econwastesolution@yahoo.com

1.8.6 Brief Description of the Project

Nature of the project

A Common Bio-medical Waste Treatment Facility (CBWTF) is a set up where bio-medical waste, generated from a number of healthcare units, is suitably treated to reduce adverse effects that this waste may pose. The treated waste may finally be sent for disposal in a secured landfill or for recycling purposes.

Proposed project of setting up of the Common Bio-medical Waste Treatment Facility includes Incinerator, Autoclave, Shredder, Storage, Recycling Unit and Effluent Treatment Facility.

Size of the Project

The proposed project of setting up of the Common Bio-medical Waste Treatment Facility (CBWTF) includes Incinerator, Autoclave, Shredder and Effluent Treatment Plant. It is proposed to utilize 0.8320 Hectare land for setting up of Biomedical Waste Treatment Facility.

Cost of the Project

Total Cost of the Proposed Project is estimated approximately **Rs.2. 0 Cr.**

Location of the Project

The study area of proposed project of setting up of the Common Bio-medical Waste Treatment Facility (CBWTF) is situated at Khasra No. 724, Village- Kunja (Bahadarpur), Tehsil-Bhagwanpur, District-Haridwar, Uttrakhand. The Survey of India Toposheet 53K/2 covers it.

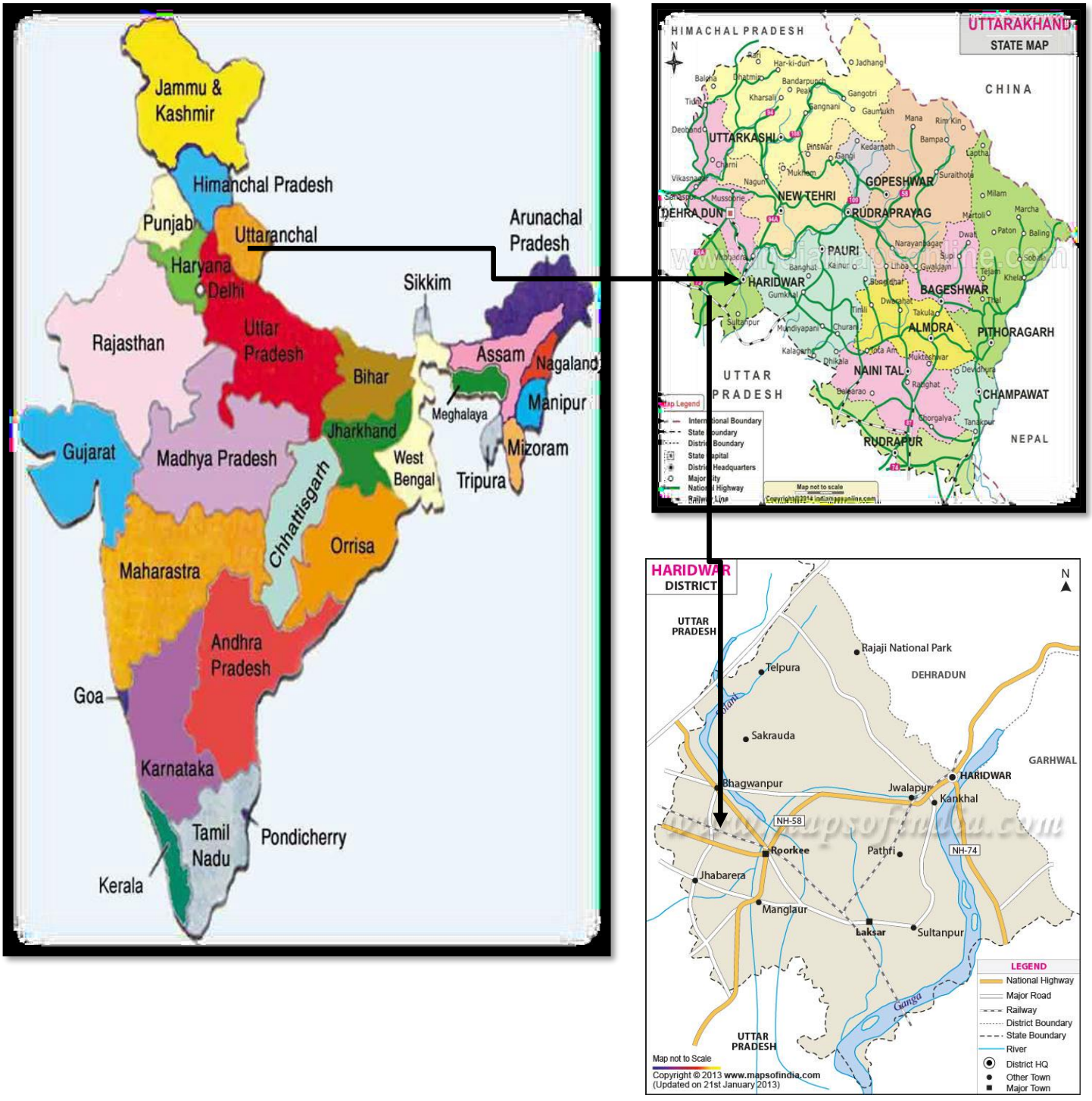


Figure 1-1: Location of the project

1.7 Importance of Project to Country & Region

In 1983, the World Health Organization Regional office for Europe convened a meeting of concerned personal at Bergen, Norway, which was the first time when this issue was discussed. The seriousness of improper Bio-Medical Waste management was brought to the limelight during the "beach wash-ups" during summer 1998; which was investigated by the Environment Protection Agency (EPA) of USA; and it culminated in the passing of Medical Waste Tracking Act (MWTA).

The issue of indiscriminate Bio-Medical Waste management in India has attracted the attention of the highest judicial body at the level of Hon'ble Supreme Court of India and Apex Court has, from time to time issued instructions regarding management of Bio-Medical Waste. In this background in persuasion to the directive of the Court, the Ministry of Environment and Forests, Government of India notified the Bio-Medical Waste (Management and Handling) Rules on 20thJuly 1998; futher amended in Biomedical Waste Management Ltd, 2016, under the provision of Environment Protection Act 1986. These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle bio-medical waste in any form. The 'prescribed authority' for enforcement of the provisions of these rules in respect of all the health care facilities located in any State/Union Territory is the respective State Pollution Control Board (SPCB)/ Pollution Control Committee (PCC) and in case of health care establishments of the Armed Forces under the Ministry of Defense shall be the Director General, Armed Forces Medical Services (DGAFMS).

'Bio-medical waste' means any waste generated during diagnosis, treatment or immunization of human beings or animals. Management of waste generated from health care facilities is an integral part of infection control and hygiene programs in healthcare settings. These settings are a major contributor to community-acquired infection, as they produce large amounts of biomedical waste.

A Common Bio-medical Waste Treatment Facility (CBWTF) is a set up where bio-medical waste, generated from a number of healthcare units, is imparted necessary treatment to reduce adverse effects that this waste may pose. The treated waste may finally be sent for disposal in a landfill or for recycling purposes. Installation of individual treatment facilities by small healthcare units requires comparatively high capital investment. In addition, it requires separate

manpower and infrastructure development for proper operation and maintenance of treatment systems. The concept of CBWTF not only addresses such problems but also prevents proliferation of treatment equipment in a city. In turn it reduces the monitoring pressure on regulatory agencies. By running the treatment equipment at CBWTF to its full capacity, the cost of treatment of per kilogram gets significantly reduced. Its considerable advantages have made CBWTF popular and proven concept in many developed countries.

CBWTF as an option has also been legally introduced in India. The Biomedical Waste Management Ltd, 2016, gives an option to the bio-medical waste generator that such waste can also be treated at the common bio-medical waste treatment facility. The Second Amendment of the Rules in June, 2000, further eased the bottleneck in upbringing the CBWTF by making Local Authority responsible for providing suitable site within its jurisdiction. The concept of CBWTF is also being widely accepted in India among the healthcare units, medical associations and entrepreneurs. Recently, a gazette notification dated 28thMarch 2016 has come into effect posing the rules and regulations of handling, storage and treatment of biomedical waste generated under Biomedical Waste Management Rules, 2016.

In order to set up a CBWTF to its maximum perfection, care shall be taken in choosing the right technology, development of CBWTF area, proper designing of transportation system to achieve optimum results.

1.8 Demand- Supply Gap

The Biomedical Waste Management Rules, 2016 stipulates that no occupier shall establish an on-site treatment and disposal facility, if a service of Common Bio-medical Waste Treatment Facility (CBWTF) is available within seventy-five kilometers. There has been a gradual increase in the bio-medical waste generation from the past consecutive years. Present proposal is to utilize 0.8320 Hectare land for setting up of Biomedical Waste Treatment Facility.

1.9 Scope of the study

To conduct EIA Study and prepare report for setting up of Common Biomedical Waste Treatment Facility, which is situated at Khasra No. 724, Village- Kunja (Bahadarpur), Tehsil-Bhagwanpur, District-Haridwar, Uttrakhand which will be operated accordance to Terms of

Reference prescribed by the SEIAA, Uttarakhand vide letter No. **278/SEIAA dated 30/05/2023.** Copy of TOR is attached as **Annexure-I.**

1.8.7 Methodology

The Environment Impact Assessment report has been prepared with the following steps:

Establishment of Baseline Environmental Status

A comprehensive database on the baseline environmental status/conditions of the study area has been established through review, compilation & analysis of:

- Existing published secondary data/literature/information, and
- Primary data generated/collected through initial site surveys and field study. The field monitoring has been carried out as per the guidelines of CPCB and requirement of the MoE for one complete season. Field study/monitoring has been conducted on:

(I) Soil Quality
(II) Water Quality (ground and surface waters)
(III) Ambient Air Quality
(IV) Noise
(V) Ecological Aspects
(VI) Socio- Economic Aspects

1.8.8 Environmental Impact Assessment

The project data/activities has been analyzed & linked with the baseline environmental condition in order to list out the affected environmental parameters and assess the likely impacts on such parameters. Compliance of the project with national standards has been duly checked.

1.8.9 Preparation of Environment Management Plan

Environmental Management Plan (EMP) is the key to ensure a safe and clean environment. The desired results from the environmental mitigation measures proposed in the project may not be obtained without a management plan in order to assure its proper implementation & function. The EMP envisages the plans for the proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities. EMP has been prepared addressing issues such as:

- Details of management plans
- Pollution control/mitigation measures for abatement of the undesirable impacts caused during construction and operational activities
- Maintenance of water resources and water quality
- Post project environmental monitoring programme
- Institutional set up identified/recommended for implementation of the EMP

The study area covers an area of 10 km radius around the proposed project site. Baseline environmental quality of the study area has been assessed based on primary and secondary data collected from various sources supplemented by data generated at site during the period Pre Monsoon season from 1st March 2023 to 31st May, 2023. Environmental attributes and frequency of monitoring are outlined in Chapter -3.

1.10 Status of Litigation

There are no litigation/ court cases pending against the project as on date.

1.11 Structure of EIA Report

The entire EIA report has been prepared in line with generic structure of EIA document as annexed in EIA Notification, 2006:

Chapter 1: Introduction: This chapter describes the Purpose of the project, Identification of project & project proponent, Brief description of nature, size, location of the project and its importance to the country, region, Scope of the study – details of regulatory scoping carried out (As per Terms of Reference).

Chapter 2: Project Description (Based on pre-feasibility Report): This chapter includes Type of project, Need for the project, Location (maps showing general location, specific location, project boundary & project site layout), Size or magnitude of operation (including associated activities required by or for the project, Proposed schedule for approval and implementation, Technology and process description, Project description (Including drawings showing project layout, components of project etc. Schematic representations of the feasibility drawings which give information important for EIA purpose), Description of mitigation measures incorporated into the project to meet environmental standards, environmental operating conditions, or other

EIA requirements (as required by the scope), Assessment of New & untested technology for the risk of technological failure.

Chapter 3: Description of the Environment: It covers Study area, period, components & methodology, Establishment of baseline for valued environmental components, as identified in the scope, Base maps of all environmental components.

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures: It includes Details of Investigated Environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project, Measures for minimizing and / or offsetting adverse impacts identified, Irreversible and Irretrievable commitments of environmental components, Assessment of significance of impacts (Criteria for determining significance, Assigning significance) and Mitigation measures.

Chapter 5: Analysis of Alternatives (Technology & Site): In case if scoping includes any alternative then it includes description of each alternative, Summary of adverse impacts of each alternative, Mitigation measures proposed for each alternative and Selection of alternative.

Chapter 6: Environmental Monitoring Program: This chapter covers technical aspects of monitoring the effectiveness of mitigation measures (including Measurement methodologies, frequency, location, and data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules).

Chapter 7: Risk Assessment and additional Studies: This chapter includes Public Consultation, Risk assessment, Social Impact Assessment and Rehabilitation & Resettlement Action Plans.

Chapter 8: Project Benefits: This chapter describes the benefits coming from the project in terms of improvements in the physical and social infrastructure, employment potential –skilled, semi- skilled and unskilled and other tangible benefits.

Chapter 9: Environmental Cost & Benefit Analysis: This chapter describes if recommended at the Scoping stage.

Chapter 10: Environmental Management Plan: This chapter describes the administrative aspects of ensuring that mitigation measures are implemented and their effectiveness monitored after approval of the EIA.

Chapter 11: Summary and Conclusion: It includes overall justification for implementation of the project and Explanation of how, adverse effects have been mitigated

Chapter 12: Disclosure of consultants Engaged: The names of the Consultants engaged with their brief resume and nature of Consultancy rendered.

1.12 Compliance of TOR

TOR Details SEIAA Uttarakhand TOR Ref No -278/SEIAA, Dated- 30 May, 2023**.** Copy of TOR is attached as **Annexure – I.**

Table 1-2: TOR Compliance

S.NO	TOR	Compliance
1	Reasons for selecting the site with details of alternate sites examined/rejected/ selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damages, resources sustainablity associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.	The proposed location at Khasra No. 724, Village- Kunja (Bahadarpur), Tehsil- Bhagwanpur, District- Haridwar, Uttrakhand meets the criteria for selection of site.
2	Subject the details of the road/rail connectivity along with the likely impacts and mitigative measures	Details of road and rail connectivity are given in Chapter 1, in Table 1-1. And the impacts and mitigation measure are given in Chapter 4
3	Submit the present land use and permission required for any conversion such as forest, agriculture etc.	Land details are given in Chapter 2, Land Document is attached as **Annexure-II**
4	Examine the details of Transportation of Hazardous wastes and its safety in Handling	Details are given in Chapter 4 and 7.

5	Examine and Submit the details of line pollutant monitoring.	As per CPCB guidelines, online monitoring system shall be installed for the measurement of Temperature, CO & CO_2.
6	Examine the details of monitoring of Dioxin and Furon.	Quencher followed by Venturi Scrubber with droplet separator and then Packed bed scrubber followed by mist eliminator shall be provided as APCS for the control of the emissions generated from the Incineration & shall comply with standards for Dioxins & Furans.
7	MoU for disposal of ash through TSDF.	MoU will be done after obtaining EC.
8	MoU for disposal of scrubbing waste water through CETP.	All the waste water generated shall be treated in proposed ETP within the unit. Hence, MoU for disposal of scrubbing waste water through CETP is not applicable.
9	Examine and submit details of monitoring of water quality around the landfill site.	Our proposed project is Bio-medical waste treatment facilities. Details of monitoring of water quality at onsite and buffer zone is given at **Chapter 3 in** EIA report.
10	Examine and submit details of the odour control measures	Details of the odour control measures are given in **Chapter 7**of EIA report.
11	Examine and submit details of impact on water body and mitigative measures during rainy season	As it will be a Zero liquid discharge unit there will be no impact on nearby water body. The mitigation measures area given at **Chapter 4**of EIA report.
12	Environmental Management plan should be accompanied wih Environmental monitoring plan and environmental cost and benefit assessment. Regular monitoring shall be carried our for odour control.	Environmental Management Plan is given at **chapter 9** of EIA report. Environmental Monitoring Plan is given at **chapter 6** of EIA report. Regular monitoring shall be carried out for odour control. Detail is given in **chapter 6** of EIA report.
13	Water quality around the landfill site shall be monitored requlary to examine the impact on the ground water	It will be a Zero liquid discharge unit. The impact & mitigation on the ground water is given at **Chapter 4** of EIA report.

14	The storage and handling of hazardous wastes shall be as per the hazardous waste management rules.	Details of waste management is given in **Chapter 2.**
15	Submit details of a comprehenive disaster management plan including emergency evacuationduring natural and mam made disaster. Examine and submit a brief description of the project, project name, nature, size its importance to the region/state and the country.	Comprehensive Disaster Management Plan including details of fire safety measure, emergency evacuation during natural and man-made disaster is discussed in **Chapter 7** of EIA Report.
16	Public hearing to be conducted for the project in accordance with provisions of Environmental Impact assessment notification, 2006 and the issues raised by te public should be addressed in the environmental management plan. The public hearing should be conducted based on the ToR letter issued by the ministry and not on the basis of Minutes of the Meeting available on the Website.	Draft EIA report is being submitted for public hearing.
17	A detailed draft EIA/EMP report should be prepared in accordance with the above additional ToR and should be submitted to the Ministry in accordance with the notification	Draft EIA report is prepared based on the ToR given by Uttarakhand SEIAA.
18	Details of litigations pending against the project, if any with direction/ order passed by any court of Law against the project should be given	Not applicable.
19	The cost of the project (Capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spell out.	The estimated cost of the project is **Rs. 2.0 Crores.** The Environmental cost (EMP) of the proposed project is 38.0 Lacs and recurring cost is 18.0 Lacs
21.	The project proponent shall obtain clerance under the Wildlife (Protection) Act, 1972 from the competent Authority as may be applicable to this project.	Not Applicable

22.	The Project Proponent Shall follow all relevant directions/Orders issued by Hon'ble High Court/NGT/Supreme Court.	We will follow all relevant directions/Orders issued by Hon'ble High Court/NGT/Supreme Court time to time.
23	EC will be consideres after sitting regarding Consent to Establish from CPCB/UKPCB.	Noted and Agreed
24	Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measures, project proponent can refer to the model avilable on Ministry website "http://moef.nic.in/Manual/incinerator"	The present report is draft EIA. Which is only prepared for Public hearing purpose as per given Terms of Reference.

2 PROJECT DESCRIPTION

Proposed Common Bio Medical Waste Treatment Facility (CBWTF) by M/s ECON Waste Solution is located at Village Kunja (Bahadarpur), Tehsil- Bhagwanpur, District-Haridwar, where bio-medical waste, generated from various healthcare units, are suitably treated to reduce adverse effects that these wastes may pose. The Bio-medical Waste Management Rules, 2016 makes it mandatory for the biomedical waste generators within 75 km distance to get the biomedical waste treated and disposed of through CBMWTF. The Central Pollution Control Board has published "Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities" in December 2016 for effective implementation of the new Rules and it prescribes location criteria and specification for development of a new Common Bio-medical Waste Treatment and Disposal Facility.

2.1 Need for the Project

In need of professional attention for effective management to contain costs on the one hand and enhance efficiencies on the other, M/s ECON Waste Solution has proposed for development of Common biomedical waste treatment facility (CBWTF) for biomedical waste generation in the District of Haridwar of Uttarakhand. The project aims to cater the biomedical waste generated from nearby health care facilities and medical institutions from the proposed site.

2.2 Site selection criteria

Site is suitable as per the Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities. Following criteria are compliance as per the guideline

Table 2-1: Compliance of Condition as per guideline

S.no	Condition as per guideline	Compliance
1.	A CBWTF can be located at a place reasonably far away from notified residential and sensitive areas and should have a buffer distance of preferably 500 m so that it shall have minimal impact on these areas.	No notified residential and sensitive areas in 500 m from the project site.
2.	Sufficient land shall be allocated to the CBWTF to provide all requisite systems which include dedicated space for storage of waste (both treated and untreated), waste treatment equipment, vehicle washing bay, vehicle parking space, ETP, incineration ash storage provision, administrative room, space for DG Set etc.	0.8320 hectares of land was already taken on lease and land conversion is in process for the industrial use. Land document and conversion document are attached **Annexure -II.**

	Coverage area of CBWTF **Suggested coverage area for development of a CBWTF is as follows:**	
3.	In case, number of beds is exceeding >10,000 beds in a locality (i.e. coverage area of the CBWTF under reference) and the existing treatment capacity is not adequate, in such a case, a new CBWTF may be allowed in such a locality in compliance to various provisions notified under the Environment (Protection) Act, 1986, to cater services only to such additional bed strength of the HCFs located.	As it is evident from UKPCB report, it is estimated waste generation is 19 MTD (Metric ton per day). However as per annual report 2020 waste generation is 7.38 MTD. This shows a clear gap in generation & disposal of BMW in Uttarakhand. Further, there is a strong requirement of additional CBWTFs, not only in the hilly areas but even in the Plain areas as well. As per the data, there are a total of 12,317 beds in District Haridwar and Dehradun alone. However CBWTF working in this area is catering 7640 Beds. Therefore, a CBWTF may be allowed in this region as no. of Beds are more than 10,0001. In rest of Garhwal region, there are 3,365 Beds as reported in the annual report of UKPCB. Therefore, a CBWTF may be allowed for the hilly areas of the Garhwal region to fully cover the hill districts.

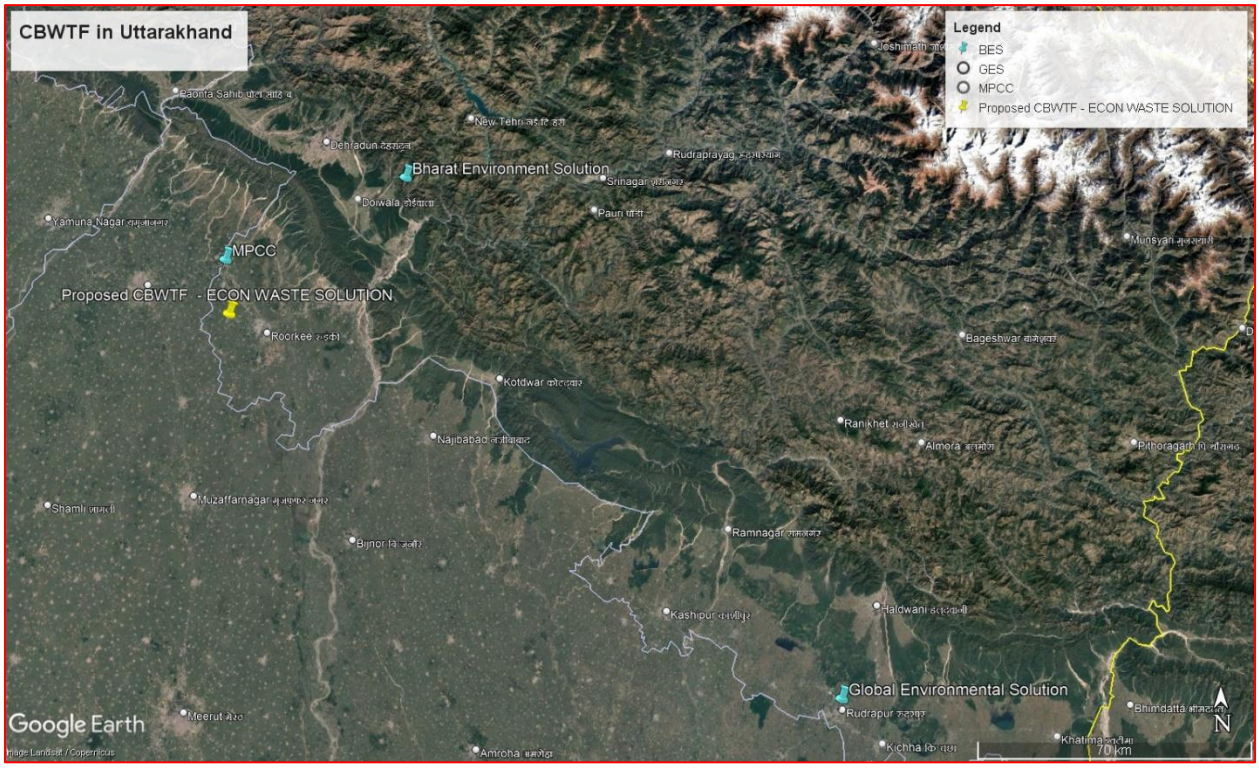


Figure 2-1: Location of other CBWTF in Uttarakhand State

2.3 Environmental Setting of the Project

The details of the Environment setting project are shown in below Table 2.2.

Table 2-2: Environment setting project

S. No.	Particulars	Details
1.	Topo-sheet no.	53K/2
2.	Elevation	70 m
3.	Nearest settlement	Iqbalpur – 1.0 km in SE direction
4.	Nearest major town	Bhagwanpur is located at 7.71 Km in NE direction.
5.	Nearest highway	NH – 58: 0.67 Km NE
6.	Nearest railway Station	Iqbalpur Railway Station – 1.74 Km E
7.	Nearest major Airport	Jolly Grant Airport – 52.0 Km NW
8.	Nearest tourist Places	Nil (Within 15 kms of study area)
9.	Defense Installations	Roorkee – 10.20 Km SE
10.	Archaeologically Listed important Place	Nil (Within 15 kms of study area)
11.	Ecological sensitive Zones	Nil (Within 15 kms of study area)
12.	Reserved/Protected Forest	Nil (Within 15 kms of study area)
13.	Nearest Streams/Rivers	Ganga Canal – 9.51
14.	Seismic zone	Seismic zone- IV

2.4 Size and magnitude of Operation

The proposed facility is extended up to 0.8320 ha land. The total cost of the project is estimated to be Rs. 2.00 Cr. The following are the proposed equipment's to be installed in the plant:

Table 2-3: Size and magnitude of Operation

S.No.	Equipment	Installed Capacity	Number
1	Incinerator	200 kg/Hr	1
2	Autoclave	1000 ltr/beach	1
3	Shredder	200 kg/hr	1
4	Chemical Disinfection Tank	1500 Ltr	1
5	Effluent Treatment Plant	10 KLD	1

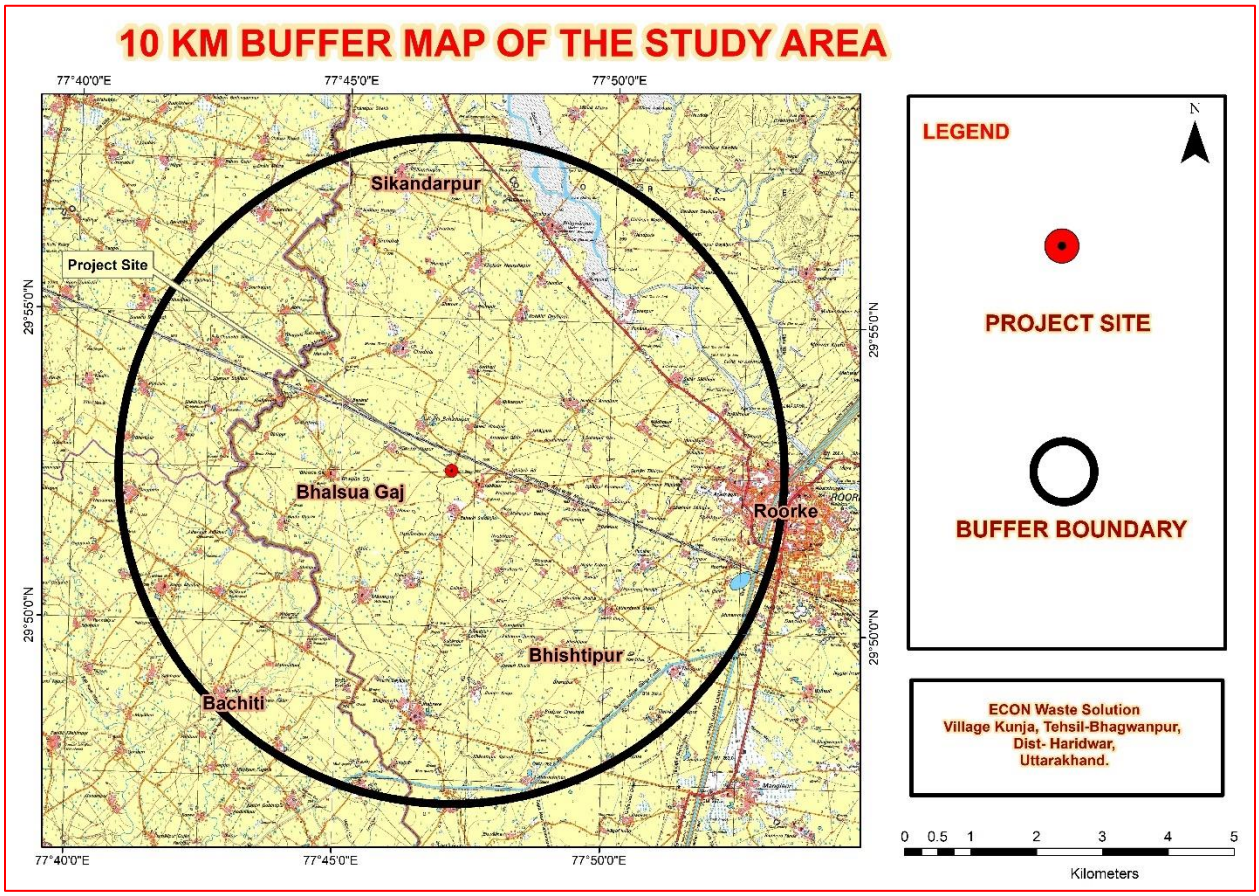


Figure 2-2: Buffer map of the study area

2.5 Land requirement and availability

M/s ECON Waste Solution has proposed to setup the Common Biomedical Waste Treatment Facility at is located at Village Kunja (Bahadarpur), Tehsil- Bhagwanpur, District-Haridwar,

Uttarakhand. The present proposal is to utilize 0.8320 Hectares land for setting up of Biomedical Waste Treatment Facility.

2.5.1 Land Ownership Details

Land Documents Such as Jamabandi, Registration documents are attached as **Annexure II.**

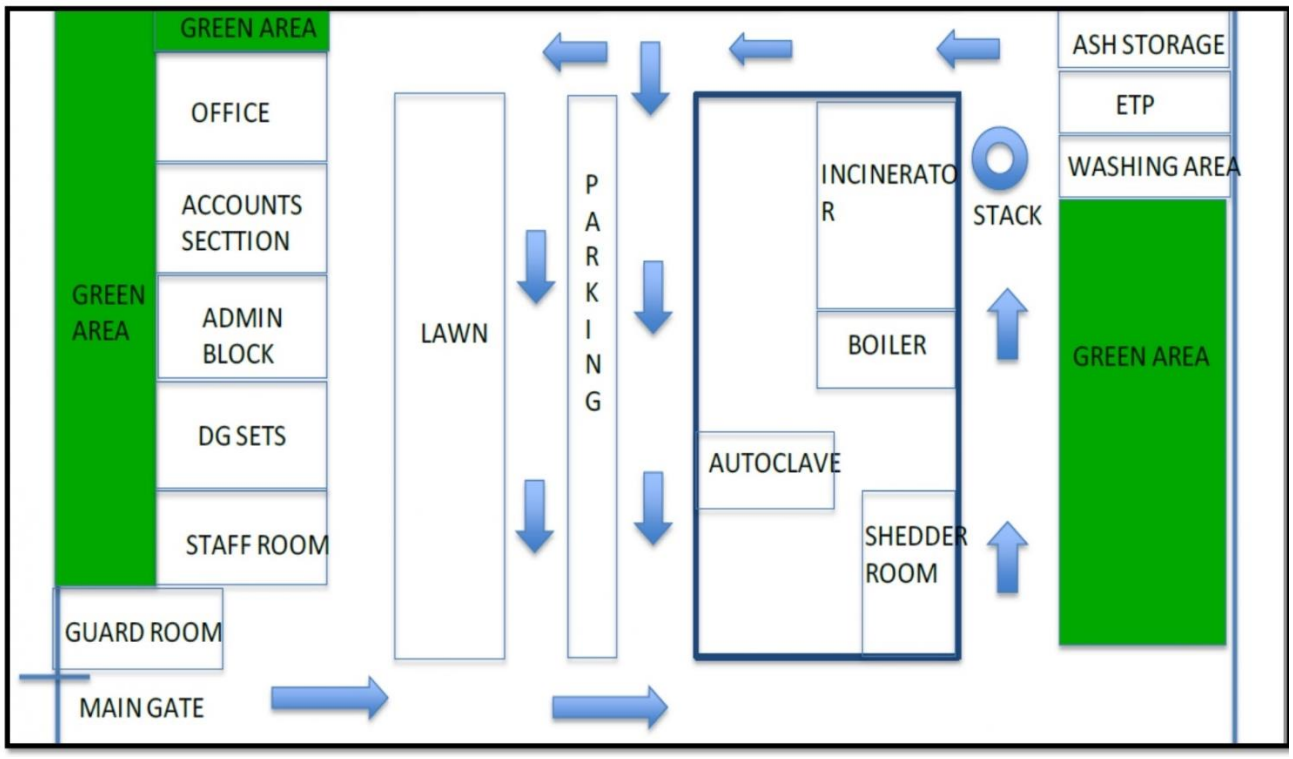


Figure 2-3: Layout plan of the site

Figure 2-4: Site Photograph

2.5.2 Alternate Sites

The proposed projects have no alternative site

Process of Biomedical Waste collection, storage, treatment and disposal

The flow chart of process of collection, transportation, storage, treatment and disposal of biomedical waste is shown in figure-2.5 below.

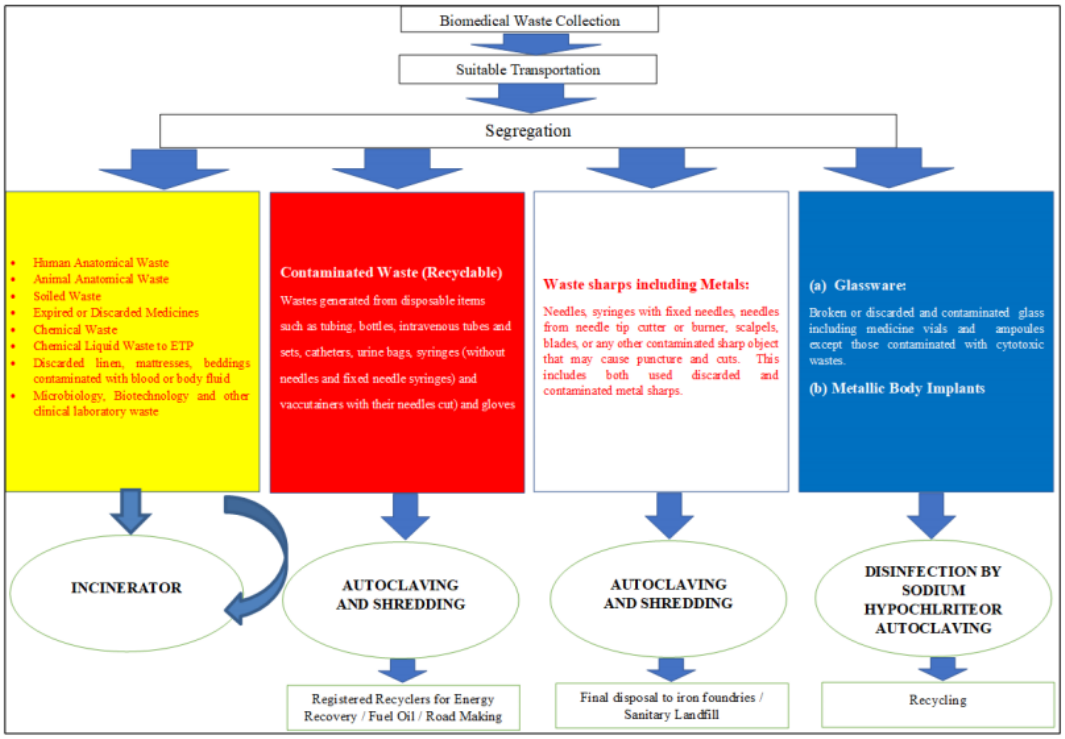


Figure 2-5: Process Flow Diagram

2.5.3 Collection of Biomedical Waste from Hospitals

The health care facility shall be advised to segregate the waste and enable trained personnel to carefully pack the waste as it contains sharps, solid waste etc. The waste collected shall be endorsed by issuing a small manifest. It is also realized that the Bio-medical Waste shall be collected every day and not be delayed more than 48 hours as it has tendency to give out odour & deteriorate with long standing storage. The collection of the waste from hospital and its movement to the carrying vehicle shall be properly managed by avoiding any spillage in the path. It is intended to have 5 closed vehicles (E.g. dimension size of 14ft x 6ft x 5.5ft with carrying capacity 3000 kg) for collection and transportation of biomedical waste to CBWTF covering all the 5 districts proposed to cater within 100 km radius.

2.5.4 Transportation of the Waste to CBWTF

Proper fully covered dedicated vehicles shall be used for transportation of biomedical waste from healthcare facility to the treatment facility. The personnel hired for the transportation will be licensed driver and shall be trained for specific requirements of collection of infectious biomedical waste the bins containing the waste shall be stacked in a manner to avoid overturning in case of jerks. The Waste bins shall be unloaded from the trucks manually by trained staff at the facility wearing a persona viz. Overalls, Gloves, Gum Boots etc. ensuring there are no health impacts during the process. The dedicated vehicle for transportation of waste shall have following features;

(I) Separate cabins shall be provided for driver/staff and the bio-medical waste containers.

(II) The base of the waste cabin shall be leak proof to avoid pilferage of liquid during transportation.

(III) The waste cabin may be designed for storing waste containers in tiers.

(IV) The waste cabin shall be so designed that it is easy to wash and disinfect.

(V) The inner surface of the waste cabin shall be made of smooth surface to minimize water retention.

(VI) The waste cabin shall have provisions for sufficient openings in the rear and/or sides so that waste containers can be easily loaded and unloaded.

(VII) The vehicle shall be labeled with the bio-medical waste symbol (as per the schedule iii of the rules) and display the name, address and telephone number of the CBWTF.

(VIII) The vehicle will be fitted with GPS system for tracking.

Depending upon the area to be covered under the CBWTF, the route of transportation shall be worked out. The transportation routes of the vehicle shall be designed for optimum travel distance and to cover maximum number of healthcare units. As far as possible, the transportation shall be carried out during non-peak traffic hours. It shall be ensured that the total time taken from generation of bio-medical waste to its treatment, which also include collection and transportation and treatment time, shall not exceed 48 hours.

2.5.5 Storage

The proposed CBWTF will have storage area. The storage shed consists of different cells for storing different kinds of bio-medical waste. The storage building is an enclosed structure with sufficient ventilations. The bio medical waste can be directly stored in dumper containers with lids of suitable size. The storage area will be at the entry point of the CBWTF to unload and store all biomedical wastes that have been transported to the facility by vehicle. The front portion of the room shall be utilized for unloading the wastes from the vehicle and back or side portion shall be utilised for shifting the wastes to the respective treatment equipment. The room where waste is unloaded the floor shall be made impermeable so that any liquid spilled during unloading does not percolate into the ground. The liquid generated during handling of wastes and washing, shall be diverted to the inlet of ETP.

In the main storage room, wastes shall be stacked with clear distinction as per the color coding of the containers. From here, the coloured containers will be sent to the respective treatment equipment.

2.5.6 Treated Waste Storage

After autoclaving the wastes will be segregated and stored in the treated waste storage area. Plastic waste will be stored after shredding. Plastics, metals, glass will be stored separately. Waste having recycle value will be sold to registered or authorized recyclers. Disinfection & destruction.

Upon receipt at the facility, wastes containers shall be unloaded. Wastes based on their colour codes shall be separated and properly treated and disposed off as per MoEF&CC rules the incinerable waste shall be loaded into the incinerator while autoclavable shall be loaded into the autoclave for dis-infection. Residue from incinerator units shall be disposed into a landfill and waste from autoclave shall send to authorized recyclers.

2.5.7 Treatment of Waste

The segregated waste shall be subjected to treatment in accordance to procedure prescribed in Biomedical Rules and CPCB guidelines.

2.5.7.1 Incineration

Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials. As being high temperature thermal process employing combustion of the waste under controlled condition for converting it into inert material and gases.

A process combination of pyrolysis and controlled air combustion, where heat and air for combustion is regulated in such a way as to first volatalise/gasify the waste in conditions of inadequate air, i.e., below stochiometric air conditions and heat and then totally destroy it in adequate heat and excess air, thereby making the end products environmentally safe.

The primary purpose of incineration is to burn the waste to ashes through a combustion process. Proposed project intends to setup a 200 Kg/ hr incinerator. The unit shall be a dual chambered incinerator. The primary chambers primary purpose would be combustion of the waste materials into safe end products (ash). The temperature of the primary chamber would be850°C and above wherein, wastes shall be completely destroyed. The primary chamber would have an attached burner with auxiliary fuel supply to augment the fuel requirements and ensure maintenance of temperatures. The purpose of the secondary chamber would be to burn the off gases and ensure safe end products (gaseous). The secondary chamber would operate at a temperature of 1050°C and above. The gases would be completely burnt and safe gases then shall be let out of the incinerator unit. The incinerator shall be completely automated with control panel and continuous recording of temperatures. The entire system is very simple and is easy to operate. The system is environmentally safe without any hazard.

The size of the opening through which the waste is charged shall be larger than the size of the waste bag to be fed. Volume of the primary chamber shall be five times the volume of one batch. Pressure gauges shall be provided on the primary and secondary air ducting. Combustion air measurement through flow transmitter should be provided and the display shall be in PLC. "Controlled air" incineration principle shall be followed, as particulate matter emission will be low. The combustion air shall be supplied through a separate fan after accounting for the air supplied through the burners. Air supply in the primary and secondary chamber may be regulated between 30%-80% and 170%-120% of stoichiometric requirement respectively. Primary air shall be admitted near / at the hearth for better contact.

Flow meter/suitable flow measurement device shall be provided on the primary & secondary air ducting. The combustion air shall be supplied through a separate forced draft fan after accounting for the air supplied through burners. The pressure in the incineration chambers under all circumstances should be lower than the ambient pressure in the room where the incinerator is installed A minimum negative draft of 1.27 to 2.54 mm of Water Column (WC) shall be maintained in the primary chamber to avoid leakage of gaseous emissions from the chamber and fitted with WC measurement mechanism (eg. U-tube manometer etc.) or digital display provision and connected with PLC.

The waste shall be fed into the incinerator in small batches (about 15-20% of total capacity of the incinerator) after the fixed interval of time in case of fixed hearth incinerator and continuous charging using appropriate feeding mechanism in case of rotary kiln incinerator or as recommended by the manufacturer, depending on the capacity of the incinerator. The size of the hearth i.e. primary chamber shall be designed properly. The sides and top of the primary and secondary chamber shall have rounded corners from inside to avoid possibility of formation of black or cold pockets/dead zones. The size of the secondary chamber shall be properly designed so as to facilitate a minimum of two seconds residence time to ensure combustion of the gas flow, unburnt material such as volatiles, smoke and soot. For the estimation of residence time in the secondary chamber its volume shall be calculated starting from the secondary burner tip to the thermocouple.

Incinerator walls shall be protected with insulated fire bricks/refractory system. The refractory lining of the chamber shall be strong enough to sustain thermal shocks i.e., minimum

temperature of 1000° C in the primary chamber and 1050 +/- 50 ° C in the secondary chamber. The refractory & insulation bricks shall have suitable thickness each & shall conform to IS: 8-1994 & IS: 2042-2006 respectively. However, in case the bio-medical waste incinerator operator wishes to treat outdated medicines or cytotoxic waste, the refractory lining of the chamber shall be designed suitably in conform to IS Specifications for bricks or refractory to with stand minimum temperature of 1200° C in secondary chamber. The incinerator combustion chamber(s) should be designed for easy maintenance of all internal parts including the refractory and insulation.

The materials used in the individual parts of the incinerator shall be heat resistance and shall with stand against the mechanical properties, oxidation, corrosion, etc. The Incinerator shell shall be made of mild steel plate of adequate thickness (minimum 5 mm thick) & painted externally with heat resistant aluminum paint suitable to withstand temperature of 250°C with proper surface preparation and also the outside surface temperature of the incinerator casing being touched during normal operations should not exceed 45 to 50 °C above ambient temperature and should be provided with a safety measure in the form of a spikes or mesh around hot surface which will prevent direct touch.

Refractory lining of all the hot ducts shall be done with refractory castable & insulating castable. Good quality Ceramic wool shall be used at all hot duct flanges & expansion joints.

The thermocouple sensor location shall be after tip of the burner and before exit of the incinerator chambers as follows:

There shall be separate burners for both Primary and Secondary Chamber. One ormore separate burners each for primary and secondary chambers may be required depending on diameters of the incinerator chambers to maintain desired temperatures in the incinerator chambers. The temperature of Primary and Secondary chambers shall be maintained 800°C and 1050±50°C respectively. The burners shall have automatic switches. However, considering the life of refractory and also to avoid cracks in the refractory, pre-heating and cooling should be done gradually before and after incineration process. Also, the Incinerators (combustion chambers) shall be able to incinerate the waste so as to achieve the Total Organic Carbon (TOC) content in

the slag and bottom ashes less than 3%or their Loss on Ignition (LoI) shall be less than 5%of the dry weight.

The burners shall have automatic switching "off/on" control to avoid the fluctuations of temperatures beyond the required temperature range. Each burner shall have spark igniters and main burner. Proper flame safeguard provision of the burner shall be installed. View port shall be provided to both the chambers. Burner retracting mechanism in both the chambers to safeguard the burners. (d) Provide projected type of observation or view ports (high-temperature glass with a metal closure provision) to observe visual condition of the burning process and waste/ash accumulation in the combustion chamber. Neither heat, flame, nor particles should be able to pass through the observation or viewport. The flame of the Primary chamber shall be pointing towards the centre of the hearth. shall be having a length such that it touches the waste but does not impinge directly on the refractory floor or wall. The Secondary burner shall be positioned in such a way that the flue gas passes through the flame. The automatic feeding mechanism shall be provided with the Incinerator.

There shall not be any manual handling during charging of waste in to the primary chamber of the incinerator. The waste shall be charged in bags through automatic feeding device at the manufacturer's recommended intervals ensuring no direct exposure of furnace atmosphere to the incinerator operator. The device shall prevent leakage of the hot flue gas & any backfire. The waste shall be introduced on the hearth in such a way so as to prevent the heap formation. Suitable raking arrangement shall be provided for uniform spreading of waste on the hearth.

A tamper-proof PLC (Programmable Logic Control) based control system or SCADA in case of all the upcoming new incinerator with higher capacity (i.e., more than 200 Kg/hour) shall be installed to prevent: (a) Opening of waste charging door while the incinerator is in operation with burning of waste or while the incinerator chamber is having temperature is less than 750°C and if the temperature in primary chamber is higher than 850°C. Waste charging in case of any unsafe conditions such as very high temperature in the primary & secondary chambers. (b) failure of the combustion air fan, ID fan, recirculation pumps; (c) low water pressure & high temperature of the flue gas at the outlet of air pollution control device.

The incineration system must have an automatic emergency vent designed with a provision of valves and a compressor. The emergency vent shall remain closed and such provision it shall not emit flue gases or leakages during normal operation of the incinerator. Each incineration system shall have graphic or computer recording devices which shall automatically and continuously monitor and record dates, time of day, batch sequential number and operating parameters such as temperatures in both the chambers as well as stack exit gas. Flue gas parameters such as CO, CO2, and O2 as well as other relevant parameters in gaseous emission as set by the prescribed authority shall also be measured during the operation of the incineration using continuous emission monitoring system (CEMS).

Provision of heat recovery system/heat exchanger with the incinerator shall also be considered wherever possible or feasible. Pre-heating of combustion air shall be practiced wherever possible. Structural design of the chimney / stack shall be as per IS: 6533-1989. The chimney/stack shall be lined from inside with natural hard rubber suitable for the duty conditions and shall also conform to IS:4682 Part I-1994 or suitable thickness of Fibre Reinforced Plastic (FRP) lining also be used to avoid corrosion due to oxygen and acids in the flue gas.

The incinerator should have alarm system to alert the incinerator in the event of power failure, non-operation of the APCD, not maintaining adequate temperatures in primary and secondary chambers or in case of any emergency including the following:

- Deviation from permitted range of pH of the scrubbed liquid;
- Deviation from permitted range of ID Fan Temperature;
- Low level of diesel;
- Low temperature of primary chamber at the time of waste feeding;
- Exceeding of outlet water temperature
- Fault in chimney lighting arrestor;
- Failure of water and electricity supply; and
- Failure of solenoid valve of any of the burners.

Relevant operating parameters as per technology provider/design requirement. The incinerator should have instruction plate(s) attached in a prominent location on the unit that clearly addresses:

- Cleaning ashes and slag from the combustion chamber(s) and cleaning of combustion air openings before starting the incinerator and
- Operating procedures and instructions. These should include proper start-up procedures, normal shut-down procedures, emergency shut-down procedures, and procedures for loading waste.

All the measuring devices attached with the incinerator shall have digital display and have provision of connecting to the recording system, which includes fuel meter and separate energy meter.

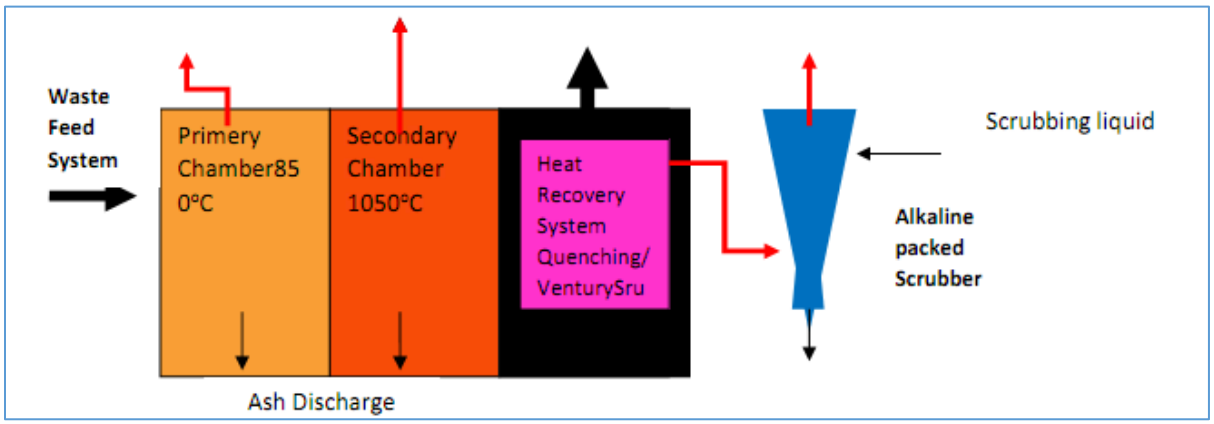


Figure 2-6: Diagrammatic view of Incinerator

2.5.8 Air Pollution Control Device (APCD)

The gases after being burnt at 1050°C shall be run into a ventury scrubber followed by a flooded scrubber with water quenching arrangement. The scrubber shall be an alkaline scrubber to neutralise the gases and ensure trapping of any pollutants escaping into the environment. The purpose of water quenching is to reduce the temperature of the gases which are at high temperature. The clean gases are let out into the environment. The scrubbed water shall be collected into a sump, where the water is neutralised, and then sent into a cooling tower from where the water is recirculated into the scrubber after cleaning them of their particulates by way of pressure sand filter and activated carbon filter. The system is thus a zero discharge system in terms of water discharges and is pollution free.

Autoclave

An autoclave is a specialized piece of equipment designed to deliver 1210 C temperature under 15 psi pressures to a chamber, with the goal of decontaminating or sterilizing the contents of the chamber. Decontamination is the reduction of contamination to a level where it is no longer a hazard to people or the environment. Intends to establish an autoclave with above principle. To ensure safety and quality control, all bio-hazardous materials and items contaminated with potentially infectious agents should be decontaminated before use or disposal. Such items include, but are not limited to: culture media, surgical instruments, laboratory equipment, glassware, and biomedical waste including sharps.

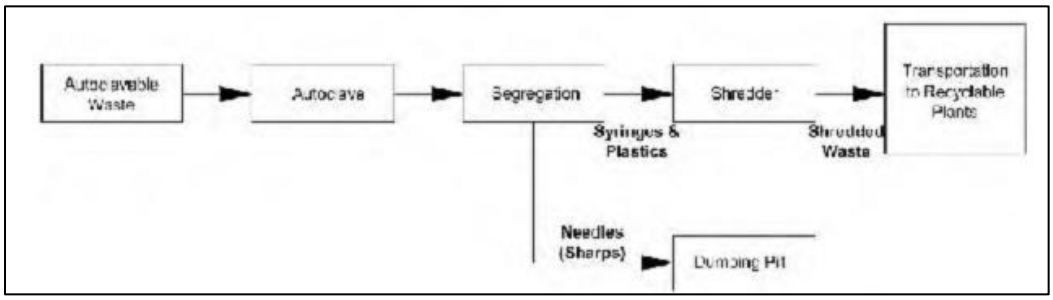


Figure 2-7: Process Flow Diagram of Autoclave

Shredder

Shredding is a process by which waste are de-shaped or cut into smaller pieces so as to make the waste Shredding is a process by which waste are de-shaped or cut into smaller pieces so as to make the waste unrecognizable. Shredder has non- corrosive sharp blades capable for shredding of plastic waste, sharps, bottles, needles, tubing's, and other general waste. The low speed two shaft systems is effective for bottles, needles, tubing's, and other general waste. The low speed two shaft systems is effective for shredding hard and solid waste. Environment intends to establish a Shredder, thus rendering the waste free from infection. The dis-infected waste shall then be segregated into HDPE, PP, rubber, latex, glass and metal. The segregated materials shall then be shredded completing the process of dis-infection sent to recycler approved by UKPCB.

Waste Treatment and Disposal Scheme

Depending on the category/nature of the waste the following treatment and disposal method are employed according to Bio-medical Waste Treatment Rules 2016.

Table 2-3: Treatment and disposal method are employed according to Bio-medical Waste Treatment Rules 2016

Category	Type of Waste	Type of Bag or Container to be used	Treatment and Disposal options
(1)	(2)	(3)	(4)
Yellow	(a) Human Anatomical Waste: Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination)	Yellow coloured non-chlorinated plastic bags	Incineration
	(b) Animal Anatomical Waste: Experimental animal carcasses, body parts, organs tissues, including the waste generated from animals used in		
	(c) Solid Waste: Items contaminated with blood, body fluids like dressings, plaster caste, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration deep burial* or Plasma Pyrolysis or In absence of above Facilities, Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	(d) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along	Yellow coloured non chlorinated plastic bags or containers	Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature>1200 0C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200 0C or Encapsulation or Plasma Pyrolysis at 12000C. All other discarded medicines shall be either

			sent back to manufacturer or disposed by Incineration.
	(e) Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or encapsulation hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste: Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, Discarded Formalin, Infected Secretions, Aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule III.
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-Chlorinated yellow plastic bags or suitable packing material	Non- chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Waste to be sent for energy recovery or incineration or Plasma Pyrolysis.
	(h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers	Pre- treat to sterilize with nonchlorinated chemicals on-site as per National AIDS Control Organization or World Health Organization guidelines thereafter for Incineration.
RED	Contaminated Waste	Red coloured	Autoclaving or micro-

	(Recyclable) (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and vaccutainers with their needles cut) and gloves.	Non chlorinated plastic bags or containers	waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent landfill sites.
WHITE (Translucent)	**Wastesharps including Metals:** Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other Contaminated sharp object that may cause puncture and cuts. This includes used, discarded and contaminated metal sharps.	Puncture proof, Leak proof, tampe	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
BLUE	**(a) Glassware:** Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
	(b) Mettalic Body Implants	Cardboard boxes with blue colored marking	

STANDARDS FOR INCINERATION:

All incinerators shall meet the following operating and emission standards-

A. Operating Standards

Combustion efficiency (CE) shall be at least 99.00%.

The Combustion efficiency is computed as follows:

$$C.E. = \frac{\%C02}{\%C02 + \%CO} \times 100$$

The temperature of the primary chamber shall be a minimum of 800 °C and the secondary chamber shall be minimum of 1050°C + or - 50°C.

The secondary chamber gas residence time shall be at least two seconds

B. Emission Standards

Table 0-1: Emission Standards

S.No.	Parameter	Standards	
1.	**2.**	**3.**	**4**
		Limiting concentration in mg/Nm3 unless stated	**Sampling Duration in minutes, unless stated**
1.	Particulate matter	50	30 or 1NM3 of sample volume, whichever is more.
2.	Nitrogen Oxides NO and NO2 expressed asNO2	400	30 for online sampling or grab sample.
3.	HCl	50	30 or 1NM3 of sample volume, whichever is more.
4.	Total Dioxins and Furans	0.1ngTEQ/Nm3 (at 11% O2)	8 hours or 5NM3 of sample volume whichever is more.
5.	Hg and its compounds.	0.05	2 hours or 1NM3 of sample volume, whichever is more.

C. Stack Height: Minimum stack height shall be 30 meters above the ground and shall be attached with the necessary monitoring facilities as per requirement of monitoring of 'general parameters' as notified under the Environment (Protection) Act, 1986 and in accordance with the CPCB Guidelines of Emission Regulation Part- III.

Note:

a) Common Bio-medical Waste Treatment and Disposal Facilities having incineration facility or captive incinerator shall comply with standards for Dioxins and Furans.
b) Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants.
c) Ash from incineration of biomedical waste shall be disposed of at Common Hazardous Waste Treatment and Disposal Facility. However, it may be disposed of in municipal landfill, if the toxic metals in incineration ash are within the regulatory quantities as defined under the Hazardous Waste (Management and Handling and Transboundary Movement) Rules, 2008 or as revised from time to time.
d) Only low Sulphur fuel like Light Diesel Oil or Low Sulphur Heavy Stock or Diesel, CNG, PNG or LPG shall be used as fuel in the incinerator.
e) The occupier or operator of a common bio-medical waste treatment facility shall monitor the stack gaseous emissions (under optimum capacity of the incinerator) once in three months through a laboratory approved under the Environment (Protection) Act, 1986 and record of such analysis results shall be maintained and submitted to the prescribed authority. In case of dioxins and furans, monitoring should be done once in a year.
f) The occupier or operator of the common bio-medical waste treatment facility shall install continuous emission monitoring system for the parameters as stipulated by SPCBs or PCCs in authorization and transmit the data real time to the servers at SPCBs or PCCs and CPCB.
g) All monitored values shall be corrected to 11% Oxygen on dry basis.
h) Incinerators (combustion chambers) shall be operated with such temperature, retention time and turbulence, as to achieve Total Organic Carbon (TOC) content in the slag and bottom ashes less than 3% or their loss on ignition shall be less than 5% of the dry weight.
i) The occupier or operator of a common bio-medical waste incinerator shall use combustion gas analyzer to measure CO_2, CO and O_2.

2.5.8.1 Chemical Disinfection

This treatment shall be to microbiology & biotechnology waste, waste sharps, infectious solid waste and chemical wastes. Chemical treatment involves use of at least 1%hypochlorite solution with a minimum contact period of 30 minutes or other equivalent chemical reagents such as

phenolic compounds, iodine, hexachlorophene, iodine-alcohol or formaldehyde-alcohol combination etc. No chlorinated compound shall be used for disinfection of waste to be treated in incinerator. Waste after disinfection will be shredded and will be disposed in secured landfill or recycled through registered recyclers. Chemical waste after chemical treatment is discharged into drains and solids are disposed in secured in landfill.

2.5.8.2 Sharp pits

Sharp pits shall be provided for the disposal of treated sharps. Needles are cut into pieces to avoid reuse. For disposal of sharps, pits of about 3m diameter and 3m depth will be constructed of concrete/concrete hollow bricks with suitable plastering.

2.5.8.3 Effluent Treatment Plant

The proposed CBWTF will have an ETP of 10 m3 per day (KLD) capacity. Chemical wastes after chemical treatments are discharged into ETP. The waste water generated from the scrubber, vehicle sterilization area and floor washing will also be treated in an effluent treatment plant. Sealed drainage will be provided to collect the all liquid effluents. Effluent will be collected in equalization tanks after passing through the grit chamber. Grit chamber removes large solid particles. From the equalization tank, raw effluent is pumped to the flash mixers where flocculants and coagulants are added. Effluent is taken to primary clarifier where settling of solids takes place. The thickened sludge is collected, dewatered and disposed in the landfill. The wet sludge is dewatered in sludge drying bed and temporarily stored in sludge storage area. Sludge after drying will be disposed in landfill. Clarified effluent is biologically treated by activated sludge process in an aeration tank. The biologically treated effluent will be taken to the secondary clarifier and the overflow from the secondary clarifier will be allowed to pass through pressurized sand filters (PSF) and activated carbon filters (ACF).

Finally, the treated effluent will be recycled for floor washing and gardening. The treated effluent recycled for the use in scrubber will not be treated with hypochlorite solution.

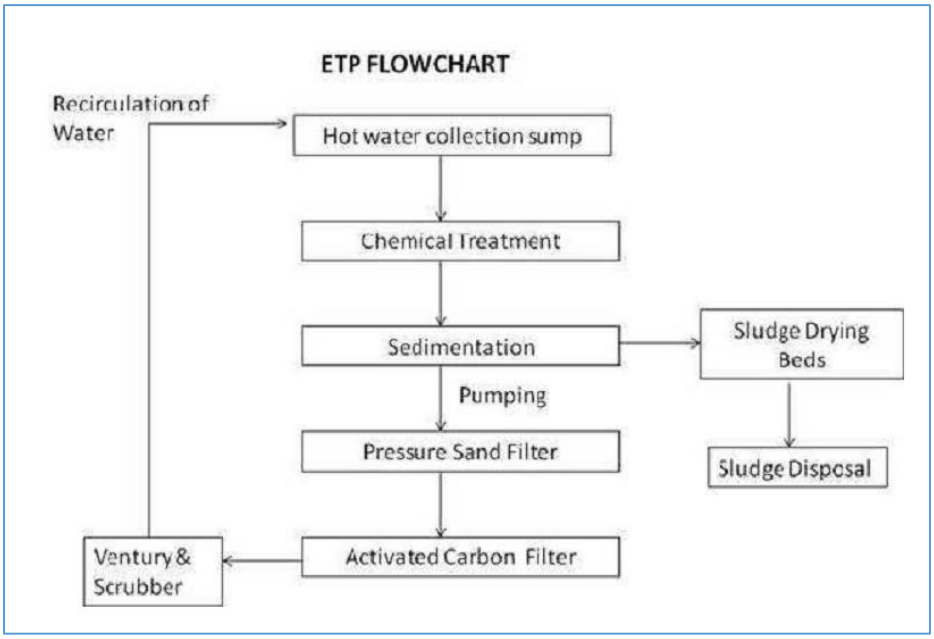


Figure 0-1: Effluent Treatment Plant Flow Diagram

2.5.9 Disposal

Ash, residue from high temperature incineration and other material residues from the process shall be collected into containers and shall be disposed into a secure landfill.

Recycle of Treated Waste

The treated waste will be segregated and option for sale of recyclable waste will be worked out. Recovery of metal scraps from sharps will also be worked out.

Health and Safety

The operators, who are in contact with the infectious waste generated, are continuously at risk during their working hours. Therefore, it is essential that adequate protection measures are provided against occupational health hazards.

Occupational Hazards

The following types of occupational hazards can occur with cleaning/collection or transportation of waste etc. Accidental cut or punctures from infected sharps such as, hypodermic needles, scalpels, knives etc. Contact with infected material like pathological waste, used gloves, tubing etc.

Safety Measures

- Display of illustrated notices with clear instructions for do's and don'ts in English and the local language.
- Issuance of all protective gears such as, gloves, aprons, masks, gum boot etc. without fail.
- Provision of disinfectant, soap etc. of the right quality and clean towels.
- Provision of a wash area.
- Washing and disinfecting facility for the cleaning equipment and tools.
- Regular medical checkup for the employees

Documents and Records

Daily records shall be maintained for the waste accepted and treated waste removed from the site. This record shall include the following minimum details:

Waste Accepted: Waste collection date, Name of the healthcare unit, Waste category as per the Rules, Quantity of waste, Vehicle number & receiving date (at site).

Treated Waste Removed: Date, treated waste type, quantity, vehicle number and location of disposal.

- Label for transport of bio-medical waste containers / bags.
- Logbook for Treatment Equipments
- Logbook for Treatment Equipments
- The weight of each batch.
- The categories of waste as per the Rules.
- The time, date and duration of each treatment cycle and total hours of operations.
- The complete details of all operational parameters during each cycle
- Lab analysis
- Accident reporting

Site Records

- Site records shall include the following:
- Maintenance schedule, breakdowns/trouble shootings and remedial actions
- Emergencies
- Incidents of unacceptable waste received and the action taken
- Details of site inspections by the officials of the regulatory Agency and necessary action on the observations.

3 DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 Introduction

This chapter describes the existing environmental status of the study area with reference to the prominent environmental attributes. The study covers the core zone and buffer zone of 10 km radius around the project site.

3.2 Present Environmental Scenario

Baseline study is conducted in order to identify the changes to the natural and socioeconomic environments, or any potential impact and to have a thorough understanding of the nature of those existing environments prior to utilize 0.832 ha of land for setting up of biomedical waste treatment facility. The present environmental scenario has been described in this chapter in respect of ambient air quality, water and effluent quality, noise level measurement, land use/cover pattern, socio- economic scenario, biodiversity, and hydrogeology.

3.3 Sources of Environmental Data

The baseline information on micro-meteorological data was generated by M/s Econ Laboratory & Consultancy.

3.4 Study Area

For the description of baseline environmental scenario, the CBWTF project area has been considered as the core zone. The area falling within a distance of 2 km from the boundary of the core zone has been considered as the buffer zone. The core zone and the buffer zone, combined together, form the study area. The study area is considered 10 km around the proposed project located in Khasra No. 724, Village Kunja (Bahadarpur), Tehsil Bhagwanpur, District Haridwar, Uttarakhand.

Study Period: The baseline data were collected during post monsoon season ***1st March 2023 to 31st May, 2023.***

Approach and Transportation

The study area is at distance of approx. 1.74 km (Aerial) to Iqbalpur Railway Station in NE direction. The airport (Jolly grant Airport) is at a distance of 52.0 km (Aerial) from the project site in NW direction.

3.5 Topography

Hardwar district is located in south – western part of Uttarakhand State. The topography is undulating in the northern part and more or less plain towards south. The altitude ranges from 869 to 232 m. In the vicinity of Siwalik Hills, the gradient is steep. Geomorphologically Hardwar district can be divided into four geomorphic units. These are flood plain, lower piedmont plain, upper piedmont plain and structural hills.

3.6 Climatology

The average normal annual rainfall in Hardwar district is 1174.3 mm, out of which 84% is received during monsoon season and only 16% occurs during non-monsoon period. The district receives heaviest rainfall in northern part. The rainfall gradually decreases towards south. The monthly distribution of rainfall during the monsoon season over the district shows that July and August are the wettest month in the district having a rainfall 329.3 and 393.8 mm, respectively. The rainfall during the month of July and August is more or less the same. The monsoons retreat in the first fortnight of October giving a meager rainfall of about 31 to 34 mm. Maximum rainfall occurs in the foothills of Himalayas and gradually decreases towards south.

3.6.1 Meteorology

The meteorological data recorded continuously during season of Post-Monsoon Season (March-May, 2023) on hourly basis for wind speed, wind direction, relative humidity, precipitation and temperature and the same is processed to extract the 24-hour mean meteorological data as per the guidelines of IMD and MoEF for application of AERMOD Version 10.0.1 model.

Primary Data

Table 3-1: Weather Monitoring Data of the Site

Months	Relative Humidity, %	Rainfall, mm	Mean Wind Speed, m/sec	Wind Directions (blowing from)	Avrg Temperature (degree Celsius)
March	56%	35	3.56	East	31
April	45%	5	3.42	East	28
May	34%	6	2.96	South East	22

Source: Indian Meteorological Data, GoI

3.6.1.1 Secondary Data

The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Haridwar. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.

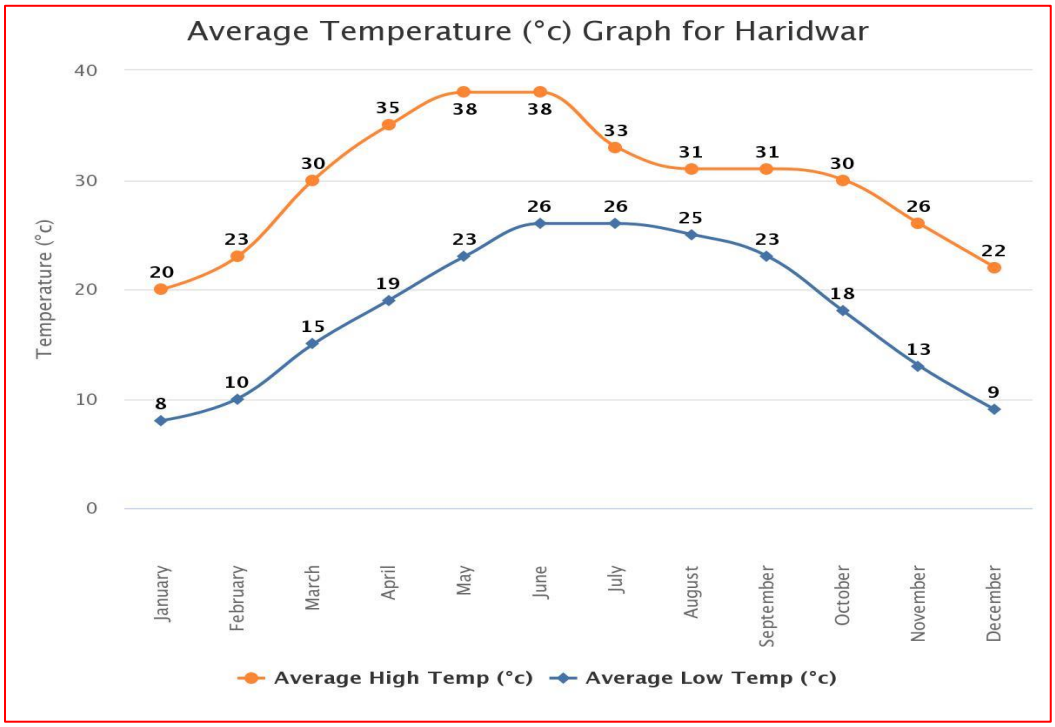


Figure 3-1: Average Temperature Graph for Haridwar

The average normal annual rainfall in Hardwar district is 1174.3 mm, out of which 84% is received during monsoon season and only 16% occurs during non-monsoon period. The district receives heaviest rainfall in northern part. The rainfall gradually decreases towards south. To study the recent trend of rainfall distribution over the district, monthly rainfall during monsoon has been given in Table 2. The monthly distribution of rainfall during the monsoon season over the district shows that July and August are the wettest month in the district having a rainfall 329.3 and 393.8 mm, respectively. The rainfall during the month of July and August is more or less the same. The monsoons retreat in the first fortnight of October giving a meager rainfall of about 31 to 34 mm. Maximum rainfall occurs in the foothills of Himalayas and gradually decreases towards south.

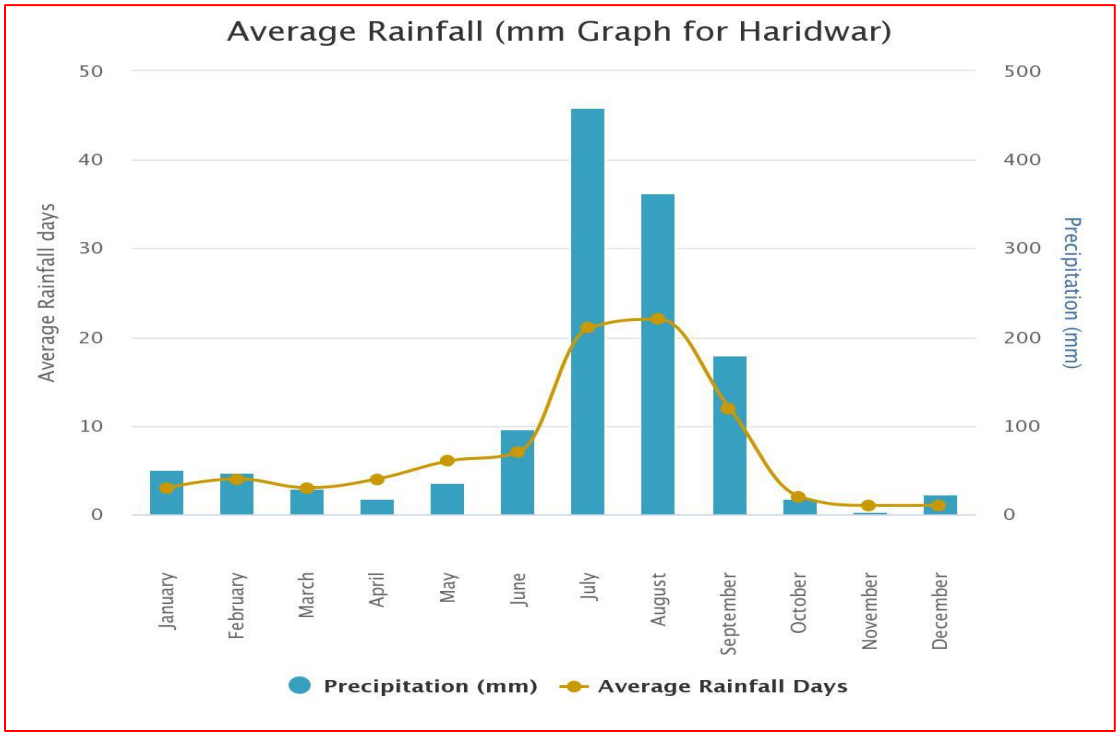


Figure 3-2: Average Rainfall (mm Graph for Haridwar)

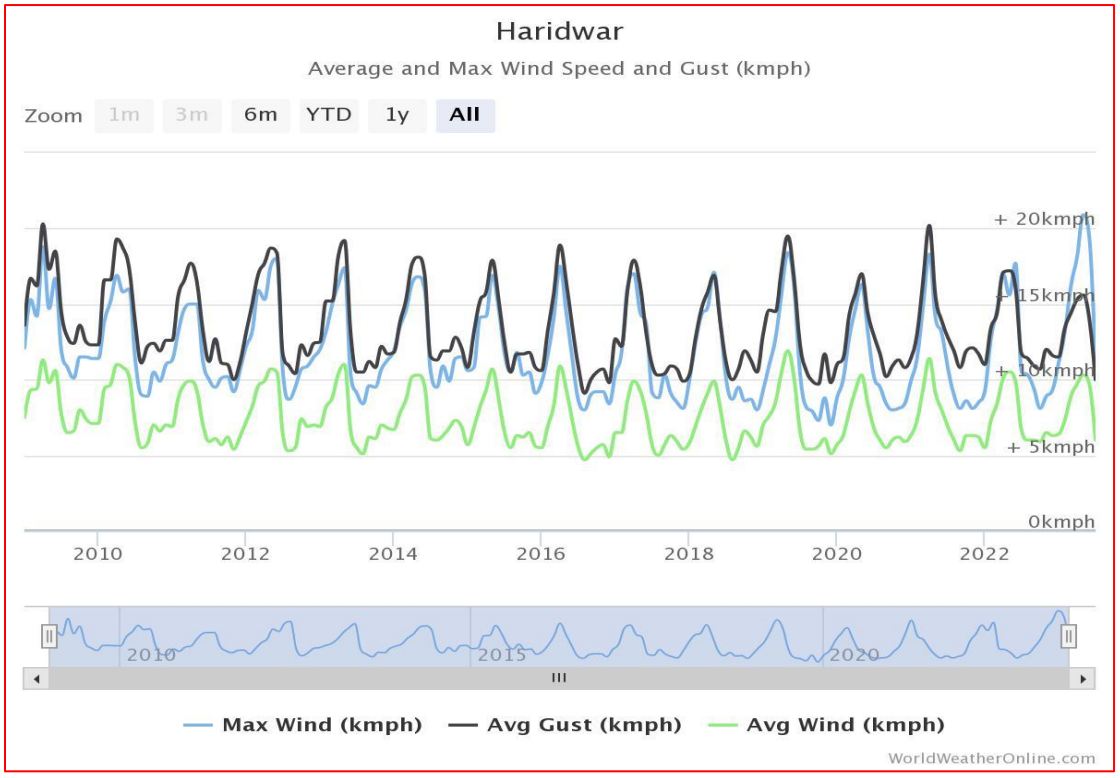


Figure 3-3: Monthly Wind Speed variation of Haridwar District

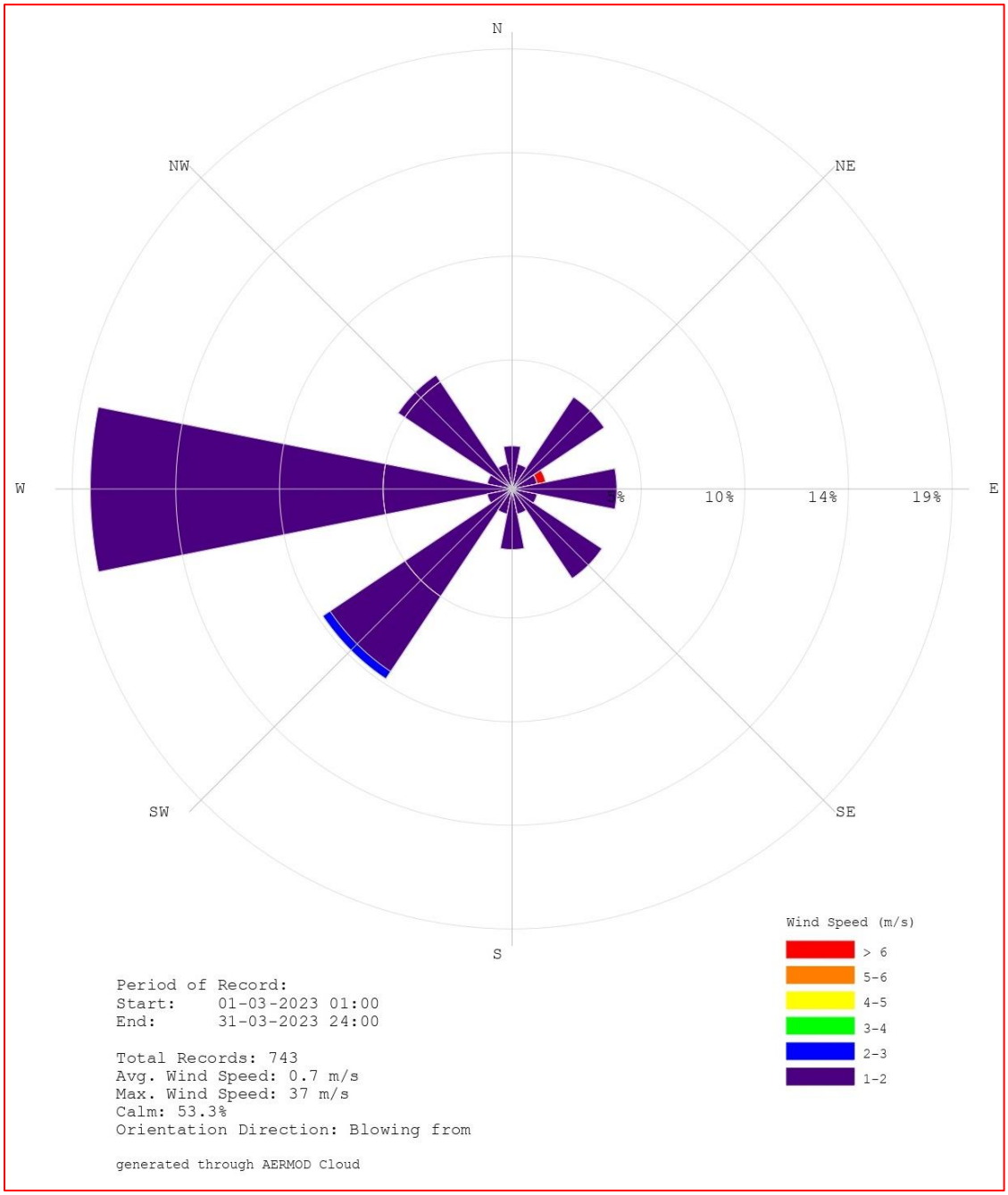


Figure 3-4: Wind Rose Diagram at project site

The wind direction is predominantly from West to East during study period. The wind rose diagram prepared from data collected at site is shown in Figure 3-5: Wind Rose Diagram.

3.7 Ambient Air Quality

The prime objective of the baseline ambient air quality monitoring is to evaluate the existing air quality of the area and to confirm whether the ambient air quality during the operation of the proposed project meets the air quality standards. This section describes the selection of sampling locations, methodology adopted for sampling, analytical techniques and frequency of sampling.

3.7.1 Location and selection of ambient air sampling stations

The ambient air quality monitoring locations were established in the study area. For selection of ambient air quality monitoring locations, the following factors were considered:

- Meteorological conditions in the area;
- Topography of the study area;
- Representativeness of the habitation for establishing baseline status;
- Likely impact areas.

Table 3-2: Details of Ambient Air Quality Monitoring stations

Station Code	Name of the Station (AAQ)	Distance from the Project Boundary (km)	Direction w.r.t Boundary	Justification for selection of station
AAQ-0	Project Site	-	-	-
AAQ-1	Village Bhalsuagaj	3.59	W	Core station
AAQ-2	Village Kunja	1.5	NW	Core station
AAQ-3	Village Puhana	6.64	NE	Buffer Station
AAQ-4	Near Iqbalpur Kamelpur	4.32	SE	Core Station
AAQ-5	Near Makanpur	2.08	SE	Core station
AAQ-6	Village Molna	2.33	SW	Core station
AAQ-7	Village Salempur	7.24	ESE	Buffer Station

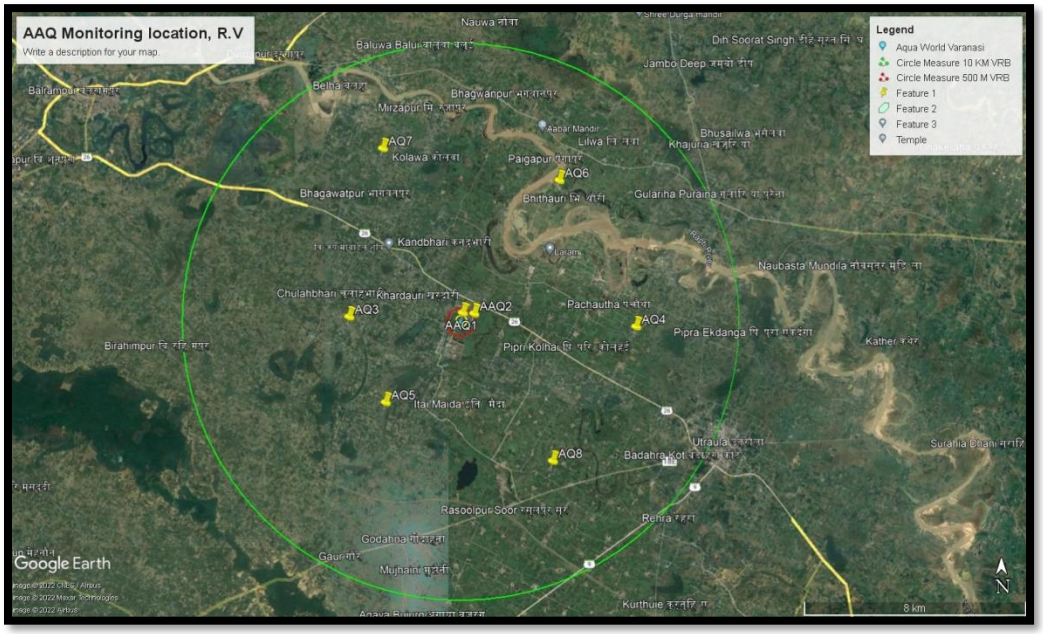


Figure 3-5: Air monitoring Locations

Figure 3-6: Air Monitoring photographs

3.7.2 Frequency and parameters of sampling

Ambient air quality monitoring has been carried simultaneously at 8 locations (One in the Core Zone and seven in the Buffer Zone) with a frequency of two consecutive days per week for 12 weeks. The samples were analyzed in laboratory by adopting the methods specified in National Ambient Air Quality Standards.

The following air pollution parameters were monitored during the sampling periods, for each sample:

- Respirable Particulate Matter (PM10)
- Fine particulate Matter (PM2.5)
- Sulphur dioxide (SO2)
- Oxides of nitrogen (NOx)
- Carbon Monoxide {CO)

Table 3-3: Report of collected ambient air monitoring samples

Parameter		AAQ – 0 (Project Site)	AAQ - 1	AAQ - 2	AAQ - 3	AAQ - 4	AAQ - 5	AAQ - 6	AAQ - 7	NAAQS
PM_{10} ($\mu g/m^3$)	**Min.**	60.20	60.10	64.50	67.20	63.2	61.30	69.30	61.20	**100**
	Max.	78.46	75.40	76.50	81.0	84.6	80.40	78.20	73.30	
	Mean	69.33	65.94	70.50	73.74	73.10	70.65	69.57	67.32	
	98 %	79.58	75.18	75.58	80.63	84.6	78.46	76.12	72.88	
$PM_{2.5}$ ($\mu g/m^3$)	**Min.**	33.54	37.20	33.70	38.10	31.4	33.20	30.20	30.30	**60**
	Max.	43.70	46.20	43.20	46.35	50.2	42.70	43.10	40.70	
	Mean	39.68	42.21	39.54	40.61	42.91	38.52	38.0	36.05	
	98 %	43.24	45.78	42.78	40.61	49.97	42.47	42.87	40.65	
SO_2 ($\mu g/m^3$)	**Min.**	8.2	9.0	8.20	8.10	9.20	8.20	8.20	8.20	**80**
	Max.	13.2	14.0	12.50	12.80	12.90	13.20	12.50	12.50	
	Mean	11.54	11.62	10.35	10.29	11.41	10.86	10.52	12.32	
	98 %*	13.15	14.0	12.36	12.75	7.4	12.82	12.40	12.32	
NO_X ($\mu g/m^3$)	**Min.**	16.8	17.20	16.8	16.30	18.60	18.4	18.4	19.20	**80**
	Max.	25.9	25.30	25.9	24.90	25.50	24.70	26.30	24.50	
	Mean	19.67	21.29	19.67	19.25	20.83	20.37	21.05	21.15	
	98 %*	25.85	24.84	25.85	24.9	25.30	24.65	25.24	24.40	
(CO) (mg/m^3)	**Min.**	0.0	0.0	0.00	0.22	0.86	0.18	0.12	0.12	1 Hrs.=04
	Max.	0.24	0.26	0.24	0.42	1.28	0.37	0.28	0.26	
	Mean	0.143	0.202	0.143	0.287	1.065	0.248	0.207	0.196	
	98 %*	0.24	0.25	0.24	0.40	1.301	0.36	0.275	0.26	

The summary of results of ambient air quality monitoring of $PM_{2.5}$, PM_{10}, SO_2, NO_2, CO are presented in Table 3-6. On the basis of tabulated data in Table 3-6, the following observations can be made:

Particulate Matter (PM_{10})

The maximum and minimum concentrations for PM_{10} were recorded as 84.6 µg/m^3 and 60.10 µg/m^3, respectively. The maximum concentration of PM_{10} was recorded at the (AAQ - 4) Iqbalpur Kalempur and minimum concentration was observed at (AAQ - 0) Project Site. The mean concentration ranges between 65.94 µg/m^3 to 73.74 µg/m^3. 98th percentile values for PM_{10} during study period range between 72.88 µg/m3 to 80.63 µg/m^3.

Fine Particulate Matter ($PM_{2.5}$)

The maximum and minimum concentrations for $PM_{2.5}$ were recorded as 46.35 µg/m^3 and 30.20 µg/m3 respectively. The maximum concentration was recorded at (AQ3) Puhana and the minimum concentration was recorded at (AAQ - 6) Molna. The mean concentration ranges between 36.05 µg/m^3 to 50.2 µg/m^3. 98th percentile values for $PM_{2.5}$ during study period range between 40.61 µg/m^3 to 49.97 µg/m^3.

Sulphur Dioxide (SO_2)

The maximum and minimum SO_2 concentrations were recorded as 25.50 µg/m^3 and 8.10 µg/m^3. The maximum concentration was recorded at (AAQ - 4) Iqbalpur Kamelpur and the minimum concentration was recorded at (AAQ -3) Puhana. The mean values were observed from 10.29 µg/m^3 to 20.83 µg/m^3. 98th percentile values for SO_2 during study period range between 13.15 µg/m^3 to 25.30 µg/m^3.

Nitrogen Oxide (NO_2)

The maximum and minimum NO_2 concentrations were recorded as 26.30 µg/m^3 and 16.30 µg/m^3. The maximum concentration was recorded at (AAQ-6) Molna and the minimum concentration was recorded at (AAQ-3) Puhana. The mean values for NO_2 were observed in the range between 11.41 µg/m^3 to 21.29 µg/m^3. 98th percentile values for NO_2 during study period range between 24.40 µg/m^3 to 25.85 µg/m^3.

Carbon Monoxide (CO)

The maximum and minimum CO concentrations were recorded as 1.28 mg/m^3 and 0.12 mg/m^3. The maximum concentration was recorded at (AAQ-6) Makanpur and the minimum concentration was recorded at (AAQ-6) Molna. The mean values for CO were observed in the range between 0.143 mg/m^3 to 1.068 mg/m^3. 98th percentile values for CO during study period range between 0.24 mg/m^3 to 1.301 mg/m^3.

3.8 Water Environment

3.8.1 Drainage Pattern of the Study area

River Ganga is the major drainage system of the area. It enters in the district at the boundary of Haridwar and flows southwardly draining the eastern part of the district. One stream emerges from river Ganga at near Shahpur Sheetlakhera and passes through Bhogpur, Sultanpur Patti and Raisi called Ban Ganga River. River KotwaliRoa, Rasawan Nadi and Pili Nadi emerging from Siwalik Hills in the eastern part of the district are the tributary of River Ganga River Ganges and Solani are the perennial rivers.

The other prominent river in the area is Solani, which drains the central part of the district. The Solani River originates from Saharanpur. SiplaNadi joins Solani river between Bhagwanpur and Roorkee. MohandRoa, ChillawalRoa, the seasonal tributaries meets Solani River at the northern part of the district. These rivers originate from Siwaliks at the northern end and passes through the Bhabar belt lying below the foothills of Siwaliks. The other major tributaries of Solani River are Ratmau Rao and GholnaRao, Apart from these rivers other seasonal river/nalas also contributes the river Solani. The drainage pattern in the district is sub dendetric to dendetric and trills. The drainage courses of most of the nalas out falling in the various tributaries are broad, flat and occupied with cobbles, boulders and gravels. Most of these nalas are torrential, carried surface run off which fluctuate gently and are losing springs.

Substantial seepage is expected to be taking place from such streams during the monsoon period. Beyond the monsoon season most of these nalas as well as tributaries go dry. However, in Tarai belt, the drainage is more or less perennial as it receives effluent seepage through the ground water body-giving rise to number of springs on depressions along the nalas. A drainage map of

study are showing all the major and minor river system is attached herewith geomorphology at Figur 3.7.

The project is not located within 1.0 km radius of any major river.

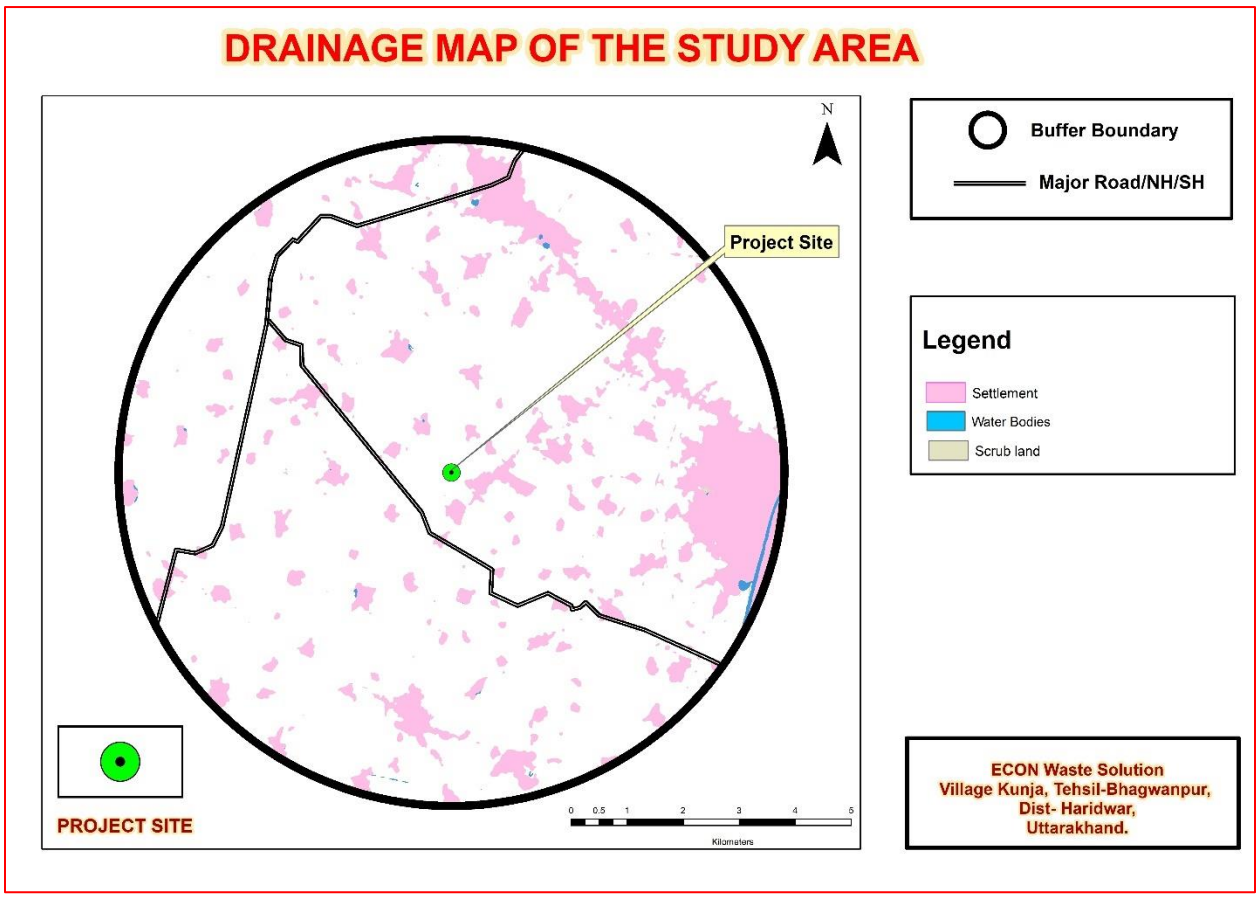


Figure 3-7: Drainage map of the study area

3.8.2 Water Quality report

Baseline Information on Water Quality: Water quality monitoring were carried out at 8 (eight) locations for ground water and 2 (Two) locations for surface water.

Frequency of sampling was once for one season (March, April and May) during Pre - Monsoon season 2023 for Two surface water sampling locations and eight ground water sampling locations. The locations of water quality monitoring stations are mentioned in the Table for surface water and ground water respectively and locations are shown in maps in figure.

Methodology: Water samples were collected manually from selected 8 (eight) sampling points as mentioned in previous paragraphs. Polytetrafluoroethylene (PTFE) sample bottles were used for sample collection. These bottles were washed and sterilized properly in an autoclave before being used for water sample collection.

The analysis of water samples carried out at NABL Accredited Chemical Testing Laboratory of ECON.

Analysis procedures adopted as per the Standard Operating Procedure (SOP) for WATER prepared based on BIS specification confirming to Central Pollution Control Board Guidelines.

Table 3-4: Surface Water Sampling Locations

S.No	Location	Distance from Project Site	Direction from the Project Area	Environmental Setting	Justifications
SW1	Ganga Canal upstream	9.93 km	E	River in buffer zone	Ganga Canal is the major river draining Hardiwar district and there are One other tributaries (Solani) which run almost central part of the district. Four surface water sampling locations are chosen from this area to study over all surface water quality within the total study area comprising 10 km radius from the boundary of the project site.
SW2	Ganga Canal downstream	9.61 km	E/SE	River in buffer zone	
SW3	Solani River upstream	7.10 km	NE	River in buffer zone	
SW4	Solani River Downstream	8.52 km	NE	River in buffer zone	

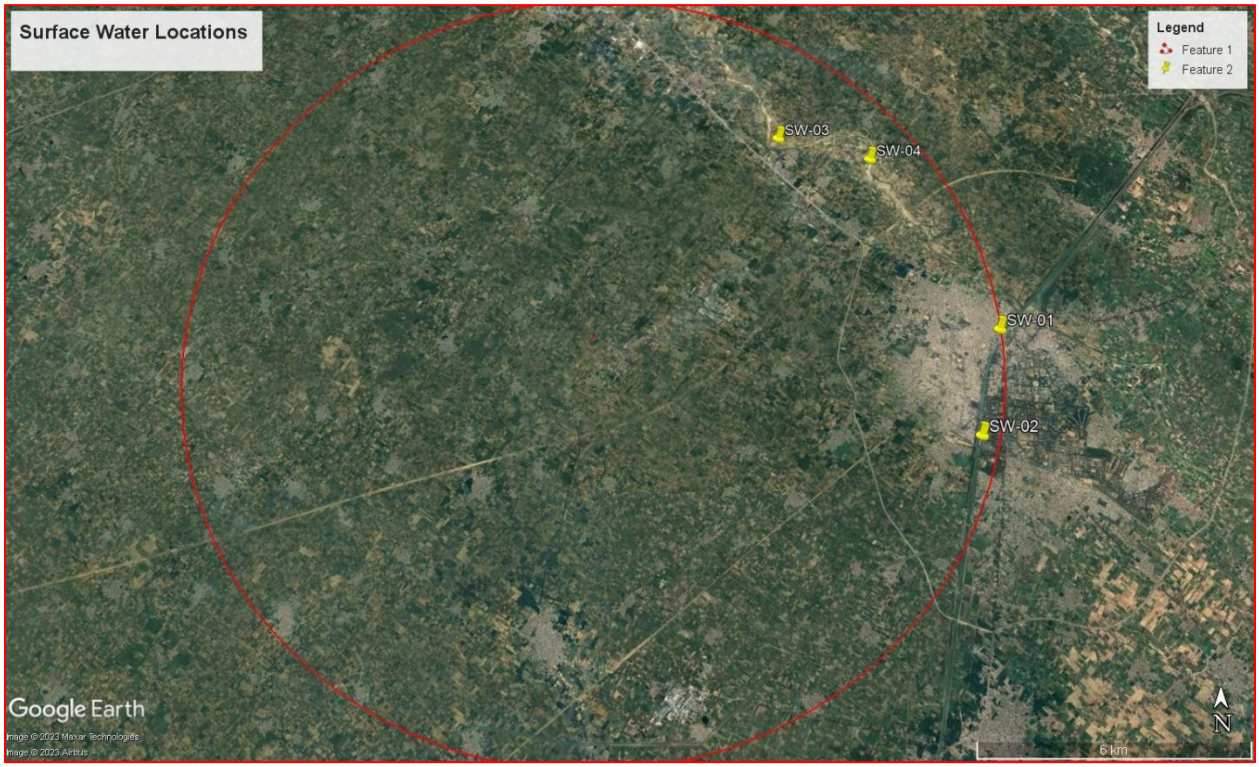


Figure 3-8: Surface water location

Table 3-5: Analysis Report of Surface Water

S.No.	Parameter	Unit	SW-01 Ganga Canal – Upstream	SW-02 Ganga Canal – downstream	SW-03 Solani River – upstream	SW-04 Solani River – downstream
1	pH	-	8.76	8.42	7.70	7.56
2	Dissolved Oxygen	mg/l	10.03	9.82	8.0	7.6
3	BOD (3 Days at 27 °C)	mg/l	5.67	4.72	5.60	6.2
4	Free Ammonia (as N)	mg/l	<0.1	<1.0	<0.1	<0.1
5	Sodium Adsorption Ratio	-	0.54	0.42	0.50	0.40
6	Boron	mg/l	Not Detected	Not Detected	Not Detected	Not Detected
7	Conductivity	µmhos/cm	175.4	180.2	185.2	179.2
8	Turbidity	NTU	12.0	14.2	10.0	11.4
9	Magnesium hardness (as CaCO3)	mg/l	16.4	17.6	17.4	16.2
10	Total Alkalinity (as CaCO3)	mg/l	134.3	128.5	138.2	140.6
	Chloride (as Cl)	mg/l	9.7	10.2	9.0	8.6
12	Sulphate (as SO4)	mg/l	13.6	14.2	11.2	12.4
13	Nitrate (as NO3)	mg/l	Not Detected	Not Detected	Not Detected	Not Detected
14	Fluoride (as F)	mg/l	0.12	0.14	0.10	0.14
15	Sodium (as Na)	mg/l	66.2	68.0	62.2	64.6
16	Potassium (as K)	mg/l	2.9	2.2	2.3	2.7
18	Total Phosphorous (as P)	mg/l	0.04	0.08	0.04	0.06
19	COD	mg/l	8.9	7.6	8.3	7.6

20	Phenolic compounds (as C6H5OH)	mg/l	Not Detected	Not Detected	Not Detected	Not Detected
21	Iron (as Fe)	mg/l	1.2	0.8	1.30	1.25
22	Zinc (as Zn)	mg/l	0.76	0.72	0.70	0.82
23	Arsenic (as As)	mg/l	Not Detected	Not Detected	Not Detected	Not Detected
24	Mercury (as Hg)	mg/l	Not Detected	Not Detected	Not Detected	Not Detected
25	TDS	mg/l	154	152	150	148
Microbiological Parameters						
1	Total Coliform	MPN/100ml	208	210	202	198
2	Faecal Coliform	MPN/100ml	116	120	110	108

Table 3-6: Standards of Surface Water Quality Criteria

Class of Water	Designated best use	Criteria
A	Drinking Water Source without conventional treatment but after disinfection	• 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 20°C 2mg/l or less
B	Outdoor bathing (Organized)	• 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 20°C 3mg/l or less
C	Drinking water source after conventional treatment and disinfection	• 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 20°C 3mg/l or less

Class of Water	Designated best use	Criteria
D	Propagation of Wild life and Fisheries	• pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
E	Irrigation, Industrial Cooling, Controlled Waste disposal	• pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2 mg/L

As per ISI-IS: 2296-1982	
Classification	**Type of use**
Class A	Drinking water source without conventional treatment but after disinfection
Class B	Outdoor bathing
Class C	Drinking water source with conventional treatment followed by disinfection
Class D	Fish culture and wild life propagation
Class E	Irrigation, industrial cooling or controlled waste disposal

Observations:

The baseline quality of water based on the results of the surface water quality monitoring within the study area, it is observed that,

- pH was observed in the range of 7.70 – 8.76 with minimum at Solani River Upstream (SW-03) and maximum at Ganga Canal upstream (SW - 01).
- TDS was observed in the range of 148.0 – 154.0 mg/L with minimum at Solani River downstream (SW-04) and maximum at Ganga Canal Upstraem (SW-01).
- COD was in the range of 7.6 – 8.9 mg/L with minimum at Solani Downstream (SW-4) and maximum at Ganga Canal Ustream (SW -01).
- BOD was in the range of 4.72 – 6.2 mg/L with minimum at Ganga Canal downstream (SW – 02) and maximum at Solani downstream (SW-04).

It is observed from the analysis of the surface water at 4 locations within the study area, which are compared with classes for designated use of River are suitable for "E class" i.e. irrigation, industrial cooling and controlled waste disposal.

3.8.3 Ground Water

Ground water samples were collected from **08** locations during the study period of 1st March 2023 to 31st May 2023 and analyzed for a number of physico-chemical parameters.

Table 3-7: Ground Water sampling locations in the study area

Station Code	Name of the Station (AAQ)	Distance from the Plant Boundary (km)	Direction w.r.t Boundary	Justification for selection of station
GW-01	Project Site	-	-	-
GW-02	Village Bhalsuagaj	3.59	W	Core station
GW-03	Village Kunja	1.5	NW	Core station
GW-04	Village Puhana	6.64	NE	Buffer Station
GW-05	Near Iqbalpur Kamelpur	4.32	SE	Core Station
GW-06	Near Makanpur	2.08	SE	Core station
GW-07	Village Molna	2.33	SW	Core station
GW-07	Village Salempur	7.24	ESE	Buffer Station

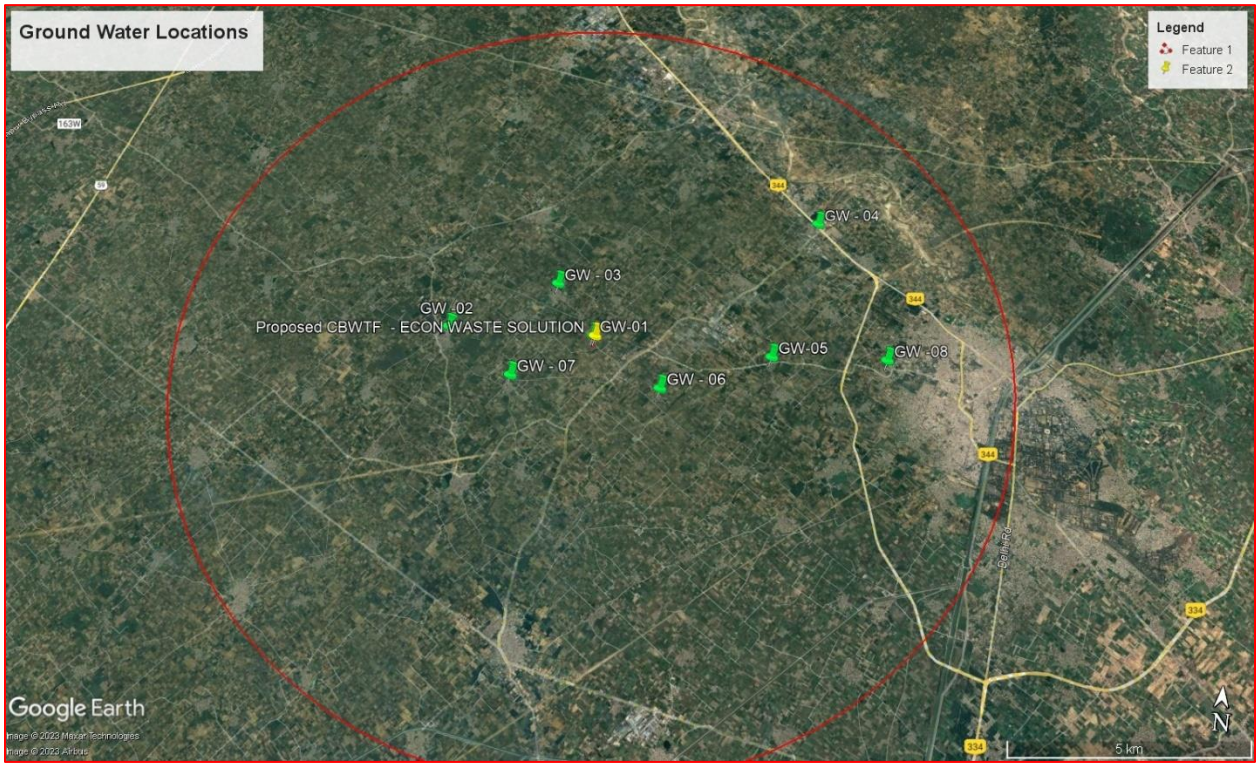


Figure 3-9: Ground water location

Table 3-8: Analysis Report of Ground Water

S. No.	Parameter	Limit (as per IS: 10500:2012)		Unit	GW1	GW2	GW3	GW4	GW5	GW6	GW 7	GW 8
		Desirable	Permissible									
1	Colour	5	15	Hazen	<5	<5	<5	<5	<5	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<5	<5	<5	<5	<5	<5	<5	<5
5	pH	6.5-8.5	No Relaxation	-	7.28	6.78	7.71	6.76	7.34	7.18	7.40	7.31
6	Total Hardness (as $CaCO_3$)	200	600	mg/l	156	122.4	124.1	123.4	134.4	198	167	184
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.14	Not Detected	0.12	N.D.	0.24	0.12	0.18	0.16
8	Chlorides (as Cl)	250	1000	mg/l	12.5	15.4	16.3	12.5	14.5	18.4	14.8	17.3
9	Fluoride (as F)	1	1.5	mg/l	0.17	0.11	0.21	N.D.	0.04	0.11	0.16	0.15
10	TDS	500	2000	mg/l	276	262	265	252.0	245	289	296	274
11	Calcium(as Ca2+)	75	200	mg/l	62.4	58.2	47.3	10.5	48.4	34.2	28.4	27.3
12	Magnesium	30	100	mg/l	21.0	18.4	20.7	3.6	17.3	16.2	15.3	18.4
13	Copper (as Cu)	0.05	1.5	mg/l	Not Detected	0.005	0.02	N.D.	N.D.	N.D.	N.D.	N.D.
14	Manganese (as Mn)	0.1	0.3	mg/l	Not Detected	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
15	Sulphate (as SO4)	200	400	mg/l	11.5	18.3	22.6	2.2	8.4	12.5	13.7	14.5
16	Nitrate (as NO3)	45	No Relaxation	mg/l	1.22	1.4	3.5	N.D.	4.2	2.0	5.0	4.5
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
19	Cadmium (as Cd)	0.003	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
20	Selenium (as Se)	0.01	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
21	Arsenic (as As)	0.01	0.05	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
22	Cyanide (as CN)	0.05	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
23	Lead (as Pb)	0.01	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
24	Zinc (as Zn)	5	15	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

25	Anionic Detergent (as MBAS)	0.2	1	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
26	Total Chromium	0.05	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
27	Mineral oil	0.5	No Relaxation	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
28	Alkalinity (as CaCO3)	200	600	mg/l	143.6	129.7	187.5	124.8	181.06	187.6	176.3	185.7
29	Aluminum (as Al)	0.03	0.2	mg/l	0.14	0.01	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
30	Boron (as B)	0.5	1	mg/l	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Microbiological Parameter												
1	Total Coliform	Absent	-	MPN/100 ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
2	E.coli	Absent	-	MPN /100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

3.8.3 Interpretation of Ground Water Quality

- All the samples were colourless meeting desirable norms (<5 Hazen).
- All the samples meet the desirable standards (pH ranges from 6.76 to 7.40).
- TDS in samples ranges from 245 mg/L to 296 mg/L. All the samples meet the permissible limit of 2000 mg/L.
- Total Hardness in the water ranges from 122.4 mg/L to 198 mg/L. All the samples meet the permissible limit of 600 mg/L.
- Calcium content in the water ranges from 10.5 mg/L to 62.4 mg/L all the samples meet the permissible limit of 200 mg/L.
- Magnesium content in the water ranges from 3.6 mg/L to 21.0 mg/L. All the samples meet the permissible limit of 100 mg/L.
- Sulphate content in the water ranges from 2.2 mg/L to 18.3 mg/L. The permissible limit of Sulphate is 400 mg/L for drinking water.
- Total alkalinity in the water samples ranges from 124.8 mg/L to 187.6 mg/L. All the samples are within the permissible limit of drinking water (600 mg/L).
- Chloride ranges from 12.5 mg/L to 18.4 mg/L. Which are below permissible limits (1000 mg/l)

3.9 Noise Environment

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

Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness.

The time of day at which noise occurs, for example high noise levels at night in residential area are not acceptable because of sleep disturbance. The location of the noise source w.r.t. noise sensitive area, which determines the loudness and period of exposure.

3.9.1 Monitoring Locations

Eight monitoring locations were selected so as to represent the entire study area. A map of the study area showing the monitoring locations as mentioned in Table 3-11 is presented in Figure 3-13.

Table 3-9: Noise monitoring Locations

Station Code	Name of the Station (AAQ)	Distance from the Plant Boundary (km)	Direction w.r.t Boundary	Justification for selection of station
NQ-0	Project Site	-	-	-
NQ-01	Village Bhalsuagaj	3.59	W	Core station
NQ-02	Village Kunja	1.5	NW	Core station
NQ-03	Village Puhana	6.64	NE	Buffer Station
NQ-04	Near Iqbalpur Kamelpur	4.32	SE	Core Station
NQ-05	Near Makanpur	2.08	SE	Core station
NQ-06	Village Molna	2.33	SW	Core station

NQ-07	Village Salempur	7.24	ESE	Buffer Station

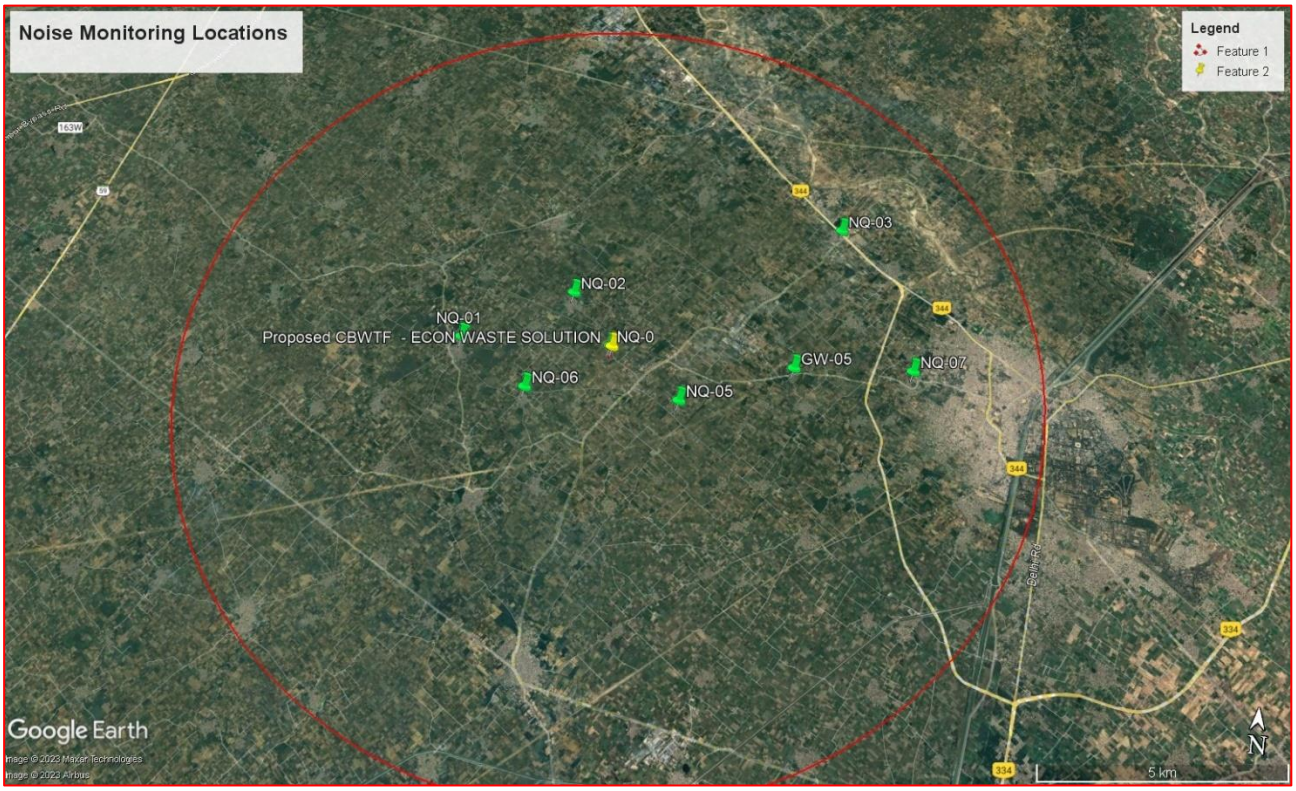


Figure 3-10: Noise monitoring location map

Figure 3-11: Noise monitoring photos

3.9.2 Methodology of data generation

3.9.3 Method of Monitoring

The noise monitoring was carried out at eight locations in day time during and at night time in the study area covering all the areas i.e. industrial, commercial, and residential and silence zones as mentioned in Noise (Pollution and Control) Rules, 2000.

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

Sound Pressure Level (SPL) measurements were measured at all locations. The readings were taken for every hour for 24 hours. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the locations covered in 10-km radius of the study area. The noise levels were measured once during the study period.

These readings were later tabulated and the frequency distribution table was prepared.

Finally, hourly and 24-hourly values for various noise parameters viz. L Day and L night were calculated.

For noise levels measured over a given period of time, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time certain noise levels exceed the time interval. The notations for the statistical quantities of noise levels are described below:

- L10 is the noise level exceeded 10 per cent of the time
- L50 is the noise level exceeded 50 per cent of the time and
- L90 is the noise level exceeded 90 per cent of the time

Equivalent Sound Pressure Level (Leq)

The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the actual fluctuating sound measured in the same period. This is necessary because sound from noise source often fluctuates widely during a given period of time.

This is calculated from the following equation:

Leq= L50 + (L10 - L90)2/60

Noise level was recorded at every hour for 10 minutes continuously for 24 hours at 'A' response. Then the data was tabulated to get frequency table with different intervals. The ambient noise levels measure for the study is given in Table 3-10.

Table 3-10: Noise monitoring data

S. No.	Test Parameters	Unit	Result	Ambient Noise Standards/Specification (CPCB)
NQ 0 - PROJECT SITE				
1	Noise Level Day Time	Leq :dB (A)	49.4	75
2	Noise Level Night Time	Leq :dB (A)	42.6	70
NQ - 1 VILLAGE BHALSUAGAJ				
1	Noise Level Day Time	Leq :dB (A)	52.0	55
2	Noise Level Night Time	Leq :dB (A)	42.2	45
NQ – 02 VILLAGE KUNJA				
1	Noise Level Day Time	Leq :dB (A)	50.0	55
2	Noise Level Night Time	Leq :dB (A)	41.0	45
NQ - 03 VILLAGE PUHANA				
1	Noise Level Day Time	Leq :dB (A)	51.0	55
2	Noise Level Night Time	Leq :dB (A)	43.2	45
NQ – 04 NEAR IQBALPUR KAMELPUR				
1	Noise Level Day Time	Leq :dB (A)	63.0	65
2	Noise Level Night Time	Leq :dB (A)	50.0	55
NQ – 05 NEAR MAKANPUR				
1	Noise Level Day Time	Leq :dB (A)	47.0	55
2	Noise Level Night Time	Leq :dB (A)	42.0	45
NQ – 06 VILLAGE MOLNA				
1	Noise Level Day Time	Leq :dB (A)	51.0	55
2	Noise Level Night Time	Leq :dB (A)	43.0	45
NQ – 07 VILLAGE SALEMPUR				
1	Noise Level Day Time	Leq :dB (A)	52.0	55
2	Noise Level Night Time	Leq :dB (A)	49.3	45

Observations

- The maximum and minimum concentrations for Noise were recorded as 63.0 dB (A) and 47.0 dB (A) respectively in day. The maximum concentration was recorded at NQ-04 (Iqbalpur Kamelpur) and the minimum concentration was recorded at NQ5 (Makanpur).
- The maximum and minimum concentrations for Noise were recorded as 50.0 dB (A) and 42.0 dB (A) respectively in Night. The maximum concentration was recorded at NQ-4 (Iqbalpur Kamelpur) and the minimum concentration was recorded at NQ-5 (Makanpur).

3.10 Soil Environment

The land of Haridwar district is highly fertile. The important soils of the district are Ultisols, which are the brown hill soil, occurring all through the northern part of the district in Siwaliks. These are the soils with a horizon of clay accumulation and low base supply. The Entisols are the soils also called the Bhabar soil occurs all along the foothills of Siwaliks and extends up to Tarai. These are soils without pedogenic horizons. Though these soils consist of boulders, pebbles, sand, silt and clay but are also highly fertile. Molisols soil occurs in the southern part of the district also called the Tarai soil, which consist mainly of the fine-gained sand, silt and clay. These are soils with a nearly black; organic-rich surface horizon and high base supply. These three types of soils are mineral soils with organic matter less than 25%. This is the most fertile soils of the district.

Soil Quality

To understand the soil characteristics, 08 locations in the study area were selected for soil sampling.

For selection of soil sampling locations, the following criterion was considered:

- Soil from agricultural land, park open land, and
- Soil from industrial area, where there is possibility of contamination

Table 3-11: Soil Monitoring Location

Station Code	Name of the Station (AAQ)	Distance from the Plant Boundary (km)	Direction w.r.t Boundary	Justification for selection of station
SQ-01	Project Site	-	-	-
SQ-02	Village Bhalsuagaj	3.59	W	Core station
SQ-03	Village Kunja	1.5	NW	Core station
SQ-04	Village Puhana	6.64	NE	Buffer Station
SQ-05	Near Iqbalpur Kamelpur	4.32	SE	Core Station
SQ-06	Near Makanpur	2.08	SE	Core station
SQ-07	Village Molna	2.33	SW	Core station
SQ-08	Village Salempur	7.24	ESE	Buffer Station

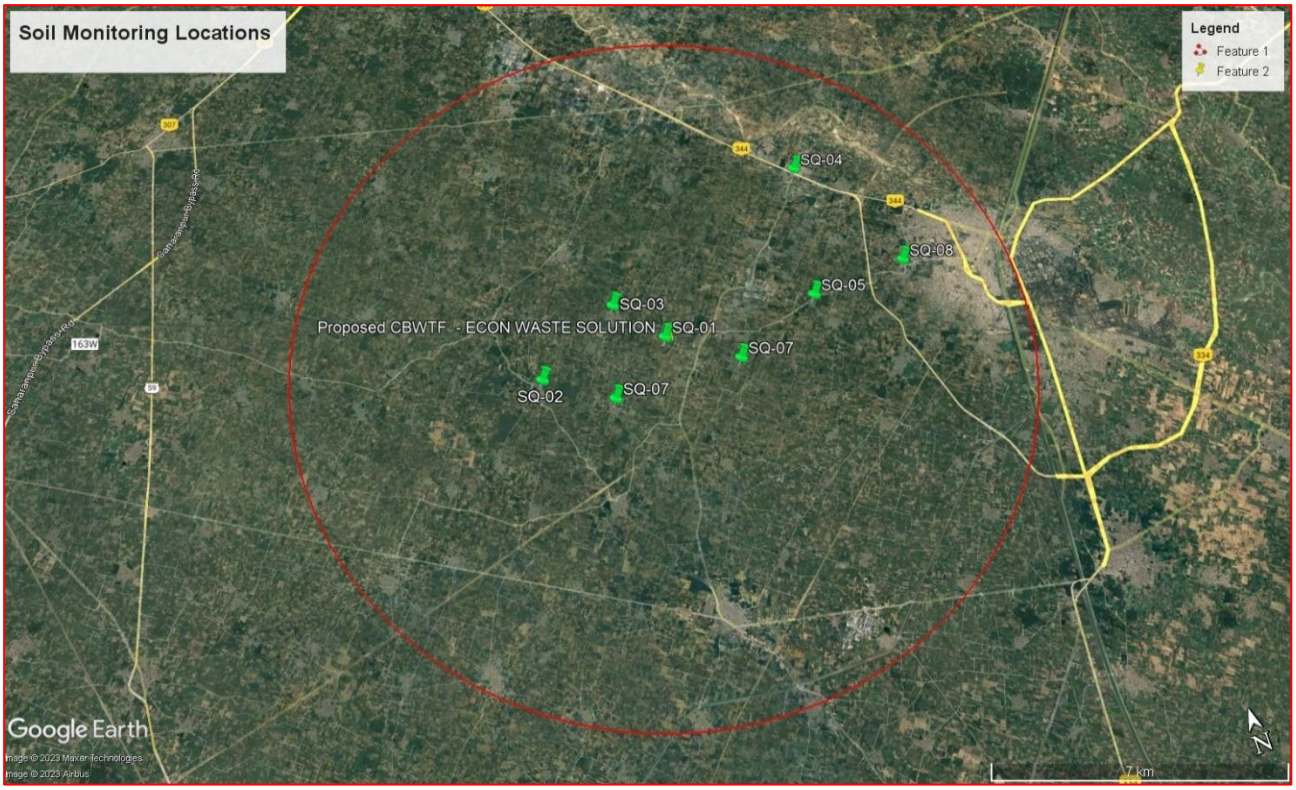


Figure 3-12: Soil Monitoring Location Map

Analysis results of physical and chemical parameters of soil samples are given in Table 3-19 Chemical classification of soil quality as per Indian Council Agriculture Research (ICAR) is given in Table 3-18.

The details of soil sampling locations are given in Table 3-13. The soil sampling locations are shown in Figure 3-15. Composite sampling of soil up to root depth (10 - 15 cm) was carried out at each location.

Table 3-12: Chemical Classification of Soil Quality

Sr. No.	Soil Analysis Parameters	Classification
1	pH	4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1ppm = 640 mmho/cm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (Sensitive to salts)

3	Organic Carbon (%)	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potash (Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Table 3-13: Results of soil sample analyses report

S.No	Parameter	Unit	SQ-1	SQ-2	SQ-3	SQ-4	SQ-5	SQ-6	SQ-7	SQ-8
1	Silt	%	28.1	20.7	21.2	14.6	23.1	22.6	15.2	18.5
	Clay	%	17.4	17.8	18.1	12.9	16.5	17.2	19.4	17.2
	Sand	%	45.5	46.8	54.4	64.3	52.2	52.4	41.9	43.4
	Gravel	%	9.0	8.3	7.2	8.2	8.2	7.8	7.3	7.7
2	pH	-	7.04	7.22	7.87	7.34	7.21	7.08	7.45	7.12
3	Electrical Conductivity	ds/m	1.09	0.98	0.94	1.04	1.0	0.89	0.91	1.10
4	Cation exchange capacity	meq/100 gm	14.8	13.7	15.1	14.7	14.8	15.5	16.3	17.5
5	Potassium	mg/kg	108.2	111.8	114.4	117.2	122.5	123	138	117
6	Sodium	mg/kg	398	406	412	354	388	786	673	683
7	Calcium	mg/kg	3398	3435	3876	3765	3709	3365	2987	3054
8	Magnesium	mg/kg	576	514	526	576	509	389	489	455
9	Sodium Absorption Ratio	-	.38.6	.41.9	47.3	46.4	47.4	1.09	1.07	0.91
10	Water Holding Capacity	%	24.5	23.3	27.2	29.4	30.5	37.5	38.4	38.2
11	Porosity	%	48.7	52.4	50.4	49.5	51.4	54.7	52.6	48.7

Observations of Results:

Soil texture is sandy loam in most of the sites selected for monitoring. The pH is found in the range of 7.04 to 7.87. Potassium is 111.8 mg/kg found lowest at project site and maximum 138.0 mg/kg at Village Molna. Sodium 354 mg/kg found lowest at Village Puhana and highest 683 mg/kg at Village Salempur. SAR is 0.91 found lowest at Salempur Village and highest 47.4 mg/kg at Iqbalpur Kamelpur village.

3.11 Landuse/Landcover

For the study of land use, literature review of various secondary sources such as District Census Handbooks, regional maps regarding topography, zoning settlement, industry, forest etc., were taken. The data was collected from various sources like District Census Handbook, Revenue records, state and central government offices and Survey of India (SOI) Topo-sheets and also through primary field observations.

Land use Study

Based on the census report, 10 km radius distance around this plant boundary has been considered in the study. The land use map of 10 Km Radius of the study area is presented in Figure – 3.4. These areas were studied in detail to get the idea of land use pattern in the study area. The land use data of the study area is presented in Table –3.14 below.

Table – 3.14: Land Use Pattern in the Study Area

S. No.	Land-use Type	% of the area	Area (Ha.)
1.	Scrub land	0.013	4.15
2.	Forest land	1.284	403.92
3.	River /Water Bodies	0.243	76.44
4.	Settlement	14.635	4603.03
5.	Vegetation	0.028	8.98
6.	Agriculture	83.795	26355.17
Total Land		**100**	**31451.69**

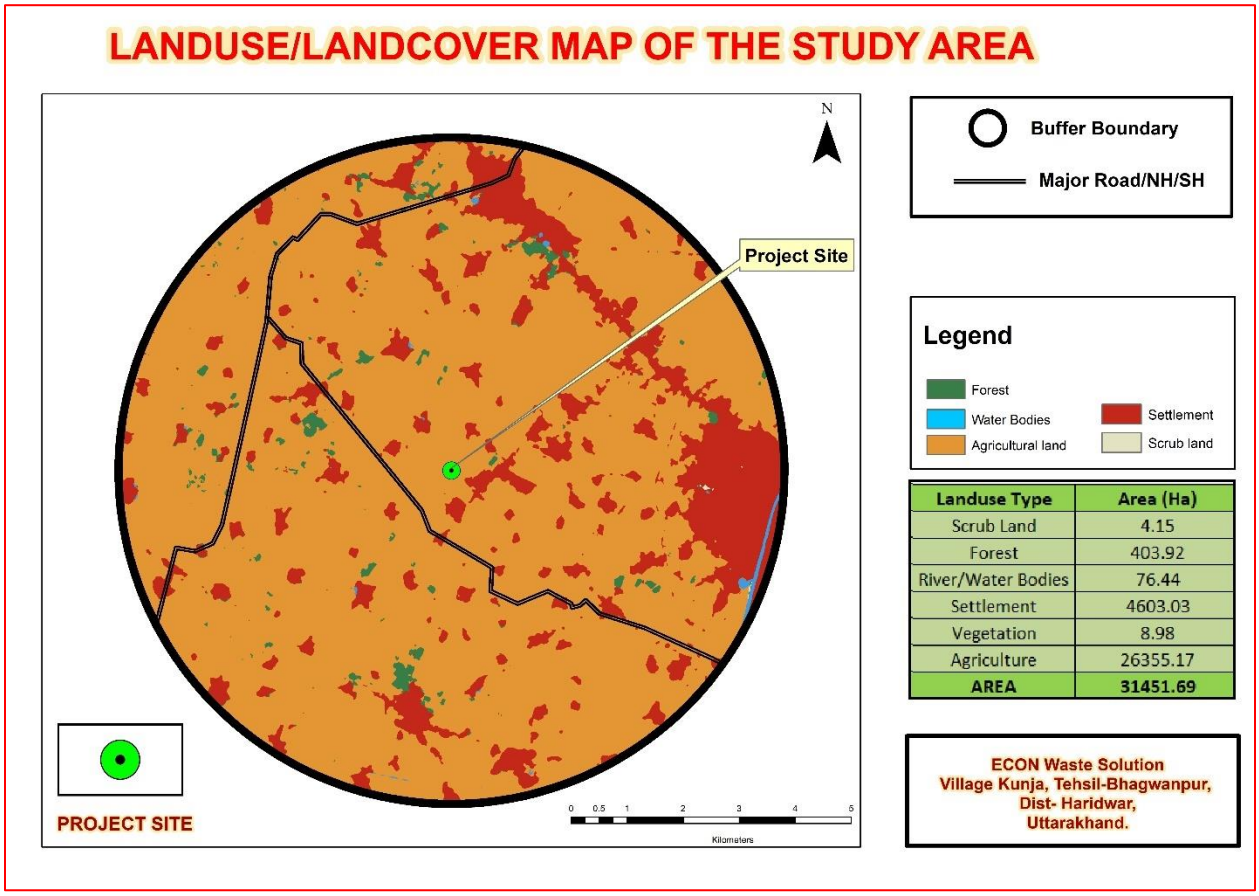
Forest: 1.284 percent land present within 10 km radius of the study area.

Land under Cultivation of Agriculture and other productive land: This includes all land which was taken up for cultivation for agriculture and other productive land for irrigated, un-irrigated and land under miscellaneous tree crops etc. was observed in the study area. The total land is 83.795 % the total geographical area (i.e., 31415.69 Ha) of total study area.

Scrub Land: The Scrub land is 0.013% of the total study area (i.e., 31415.69 Ha), which includes area of land with scrub, land without scrub, permanent pastures, quarry, mining area, rocky/ stony and barren area.

Area under rural settlement: The rural area under the study area consists 4603.03 (14.635 %) of the total geographic area.

River area: The study area comprises about 0.243% river area/water bodies.



Landuse Type	Area (Ha)
Scrub Land	4.15
Forest	403.92
River/Water Bodies	76.44
Settlement	4603.03
Vegetation	8.98
Agriculture	26355.17
AREA	**31451.69**

Figure 3-13: Shows Landuse landcover classification

3.12 Biological Environment

3.12.1 Introduction

Biological study is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if required.

The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measure for maintaining its health.

A baseline survey was conducted to study floral and faunal diversity of the terrestrial and aquatic environment of the study area within in 10 Km radius of the plant site.

Some of the information was collected from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. Survey of the wild plants as well as agriculture crop plants was done and all the available information was recorded. Night survey was also conducted with the help of spotlight to record nocturnal animals, birds and reptiles.

Interpretation of Flora and Fauna:

No Schedule I species was found in the core as well as buffer zone. No endangered or endemic species (as notified in IUCN Red Data Book) are located within the study area. No migratory birds breed in the study area. No Tiger Reserve/ Elephant Corridor/ Turtle breeding place is located within 10 Km radius of the study area. The present baseline floristic study has been carried out to inventories floral composition in the study area. Sampling stations were selected from project site and buffer zone of 10 km radial area around the core zone for carrying out vegetation surveys and an inventory of various floral species. In order to understand the composition of the vegetation, most of the plant species were identified in the field itself whereas the species that could not be identified a specimen was collected along with their photographs for identification later with the help of available published literature and floras of the region. The

inventory of flora and fauna is attached as Annexure. The study area has no protected forest or national park or sanctuaries. Therefore, the biodiversity is medium in the study area due to dominance of anthropogenic activity in the study area. No schedule I wild life species or rare and endangered species have been recorded from the study area.

Flora

A floral survey was carried out in the core as well as buffer zone of the proposed project site. The plant Species found in the area are given in table below: -

Table 3-14: List of Flora in the Study Area by Site Visit, Inputs from the Locals and Pursued from Secondary Data

S. No.	Botanical Name	Family	Common Name
Trees			
1.	*Alnus nepalensis*	Betulaceae	Nepal Alder
2.	*Aegle marmelos*	Myrtaceae	Bel
3.	*Albizzia procera*	Mimosaceae	Kala Siris
4.	*Albizzia lebbeck*	Mimosaceae	Siris
5.	*Acacia nilotica*	Mimosaceae	Desi Babul
6.	*Acacia auriculiformis*	Mimosaceae	Babul
7.	*Azadirachta indica*	Meliaceae	Neem
8.	*Ailanthus excelsa*	Simaroubaceae	Adusa
9.	*Anogeissus latifolia*	Combretaceae	Dhaura
10.	*Annona squamosa*	Annonaceae	Sitafal
11.	*Bauhinia verigata*	Caesalpiniaceae	Kachnar
12.	*Bauhinia racemosa*	Caesalpiniaceae	Apta
13.	*Bischofia javanica*	Phyllanthaceae	Bishopwood
14.	*Butea monosperma*	Fabaceae	Palash
15.	*Bombax ceiba*	Malvaceae	Semal
16.	*Cassia fistula*	Caesalpiniaceae	Amaltas
17.	*Castanopsis indica*	Fagaceae	Indian Chest Nut

18.	*Dendrocalamus strictus*	Poaceae	Lathi Baans
19.	*Delonix regia*	Fabaceae	Gulmohar
20.	*Dalbergia paniculata*	Fabaceae	Dhoban
21.	*Dalbergia sissoo*	Fabaceae	Shisham
22.	*Eucalyptus camaldulensis*	Myrtaceae	Safeda
23.	*Ficus racemose*	Moraceae	Gular
24.	*Ficus religiosa*	Moraceae	Peepal
25.	*Ficus benghalensis*	Moraceae	Bargad
26.	*Mangifera indica*	Anacardiaceae	Aam/Mango
27.	*Morus alba*	Moraceae	Mulberry
28.	*Melia azedarach*	Meliaceae	Bakain
29.	*Macaranga denticulate*	Euphorbiaceae	Blistery Macaranga
30.	*Populous deltoids*	Salicaceae	Popular
31.	*Pongamia pinnata*	Fabaceae	Karanj
32.	*Phoenix sylvestris*	Aeracaceae	Khajur
33.	*Syzygium cumini*	Myrtaceae	Jamun
34.	*Saraca asoca*	Fabaceae	Ashok
35.	*Schefflera venulosa*	Araliaceae	Dain
36.	*Terminalia tomentosa*	Combretaceae	Asan
37.	*Terminalia arjuna*	Combretaceae	Arjun
SHRUB & HERBS			
1.	*Argemmone maxicana*	Papaveraceae	Satyanashi
2.	*Acacia pennata*	Leguminoceae	Agla
3.	*Amaranthus spinosa*	Amaranthaceae	Kate Chawli
4.	*Achyranthes aspera*	Amaranthaceae	Chirehitta
5.	*Adhatoda vasica*	Acanthaceae	Bansa
6.	*Ageratum conyzoide*	Asteraceae	Goat weed
7.	*Bauhinia vahlii*	Leguminoceae	Maljhan
8.	*Boerhavia diffusa*	Nyctaginaceae	Punarnawa

9.	*Bidens wallichii*	Actinidiaceae	Gogan
10.	*Colocasia sp.*	Araceae	Taro
11.	*Calotropis procera*	Verbenaceae	Aak
12.	*Cannabis sativa*	Verbenaceae	Bhag
13.	*Caesalpinia sepiaria*	Sapindaceae	Kainju Bel
14.	*Clematis gouriana*	Ranuculaceae	Balkangu
15.	*Cyperus rotundus*	Cyperaceae	Nut grass
16.	*Cassia tora*	Caesalpiniaceae	Panwar
17.	*Cryptolepis buchanani*	Apocynaceae	Dudi
18.	*Carrissa occidentalis*	Apocynaceae	Karaunda
19.	*Chinopodium album*	Amaranthaceae	Bathuwa
20.	*Denderocalamus strictus*	Poaceae	Lathi Baans
21.	*Evolvulus alsinoides*	Convonvulaceae	Morning glory
22.	*Eriophorum Comosum*	Cyperaceae	Nakli Bhabbar
23.	*Euphobia hirta*	Euphorbiaceae	Dudi
24.	*Ipomoea carnea*	Convonvulaceae	Besharam
25.	*Lantana camara*	Verbenaceae	Raimuniya
26.	*Murraya koenigii*	Rutaceae	Gandhela
27.	*Nerium indicum*	Apocynaceae	Kanr
28.	*Ocimum sanctum*	Lamiaceae	Tulsi
29.	*Parthenium hysterophorus*	Asteraceae	Gajar Ghas
30.	*Pueraria truberosa*	Leguminoceae	Sural
31.	*Solonum erianthum*	Solanceae	Aradu, Ban
32.	*Syzygium cumini*	Myrtaceae	Jamn
33.	*Scindapsus officianlis*	Araceae	Gajpipper
34.	*Tridax procumbens*	Asteraceae	Kamarmodi
35.	*Terminalia chebula*	Combretaceae	Bahera
36.	*Tephrosia purpurea*	Fabaceae	Nili
37.	*Typha angustifolia*	Typhaceae	Patea

38.	*Vallaris solancea*	Apocynaceae	Buddhi Bel
39.	*Xanthium stumarium*	Asteraceae	Chota Gokhru
Weeds			
1.	*Abelmoschus esculentus*	Malvaceae	Bhindi
2.	*Allium sativum*	Amaryllidaceae	garlic
3.	*Cucurbita pepo*	Cucurbitaceae	Kaddu
4.	*Capsicum annuum*	Solanaceae	Mirchi
5.	*Carica papaya*	Caricaceae	Papaya
6.	*Lycopersicon lycopersicum*	Solanaceae	Tomato
7.	*Momordica charantia*	Cucurbitaceae	Karela
8.	*Musa paradisiacal*	Musaceae	Banana
9.	*Mangifera indica*	Anacardiaceae	Mango
10.	*Oryza sativa*	Poaceae	Rice
11.	*Psidium gujava*	Myrtaceae	Guava
12.	*Solanum melongena*	Solanaceae	Brinjal
13.	*Solanum tuberosum*	Solanaceae	Potato
14.	*Triticum aestivum*	Poaceae	Wheat
15.	*Zea mays*	Poaceae	Maize
16.	*Zingiber officinale*	Zingiberaceae	Ginger

Fauna

Faunal survey was carried out in the core as well as buffer zone of the proposed project site. No Schedule- I fauna as per (IWPA) Indian Wildlife Protection Act, 1972 was recorded in the study area during field survey.

Details of faunal species found in the study area are given in the table below: -

Table 3-15: List of Flora in the Study Area by Site Visit, Inputs from the Locals and Pursued from Secondary Data

S. No.	Scientific Name	Common Name	Schedule/Status
Mammals			

1.	*Boselaphus tragocamelus*	Nilgai	III
2.	*Canis aureus*	Jackal	II
3.	*Felis catus*	Jungle Cat	II
4.	*Funambulus pennanii*	Five Striped Palm Squirrel	IV
5.	*Herpestes edwerdsii*	Common Mangoose	II
6.	*Mus booduga*	Little Indian field mouse	V
7.	*Maccaca mulata*	Monkey	II
8.	*Rattus rattus*	Black Rat	V
9.	*Rousettus leschenaultia*	Bat	V
10.	*Semnopithecus entellus*	Common Langur	II
Amphibians			
1.	*Bufo stomaticus*	Marble Toad	IV
2.	*Duttaphrynus melanostictus*	Common Indian Toad	IV
3.	*Euphlyctis cyanophlyctis*	Indian Skipper Frog	IV
4.	*Hoplobatrachus tigerinus*	Indian Bull Frog	IV
5.	*Rana hexadactyla*	Indian pond frog	IV
Reptiles			
1.	*Calotes versicolor*	Common garden lizard	IV
2.	*Hemidactylus flavivridis*	House gecko	IV
3.	*Mabuya carinata*	Brahminy skink	IV
4.	*Naja naja*	Indian Cobra	II
5.	*Ptyas mucosa*	Rat Snake	IV
6.	*Sitana ponticeriana*	Famn Throated Lizard	--
Aves			
1.	*Acridotheres tristis*	Common Myna	IV
2.	*Apus apus*	Common swift	IV
3.	*Apus affinis*	House swift	IV
4.	*Accipiter badius*	Shikra	IV
5.	*Ardeola grayii*	Pond heron	IV

6.	*Amaurornis phoenicurus*	White breasted water hen	IV
7.	*Acridotheres ginginianus*	Bank Myna	IV
8.	*Bubulcus ibis*	Cattle Egret	IV
9.	*Bubo bubo*	Owl	IV
10.	*Corvus splendens*	House Crow	V
11.	*Columba livia*	Rock Pigeon	IV
12.	*Coracias benshalensis*	Indian roller	IV
13.	*Corvus corax*	Raven	IV
14.	*Dicrirus macrocercus*	Black Drongo	IV
15.	*Dendrocitta vagabunda*	Tree Pie	IV
16.	*Egretta garzetta*	Little Egret	IV
17.	*Eudynamys scolopacea*	Asian Koel	IV
18.	*Francolinus pondicerianus*	Gery francolin	IV
19.	*Gallus sallus*	Red Jungle Fowl	IV
20.	*Gallinule chloropus*	Common Moorhen	IV
21.	*Halcyon smyrnensis*	White Breasted Kingfisher	IV
22.	*Merops orientalis*	Green bee-eater	IV
23.	*Microcarbo niger*	Little cormorant	IV
24.	*Merops persicus*	Blue Cheeked Bee Eater	IV
25.	*Nectarinia asiatica*	Purple Sun Bird	IV
26.	*Nectarinia minima*	Small Sun Bird	IV
27.	*Orthotomus sutorius*	Tailor Bird	IV
28.	*Pseudibis papillosa*	Black Ibis	IV
29.	*Pavo cristatus*	Indian peafowl	I
30.	*Passer domesticus*	House Sparrow	IV
31.	*Parus major*	Grey Tit	IV
32.	*Pycnonotus cafer*	Red Vented Bulbul	IV
33.	*Psittacula krameri*	Rose Ringed Parakeet	IV
34.	*Ploceus philippinus*	Baya	IV

35.	*Streptopelia decaocto*	Ring dove	IV
36.	*Streptopelia chinensis*	Spotted Dove	IV
37.	*Srniculus lugubris*	Drongo Cuckoo	IV
38.	*Saxicoloides fulicata*	Indian Robin	IV
39.	*Saxicola caprata*	Pied Bush Chat	IV
40.	*Turoides striatus*	Jungle babbler	IV
41.	*Turdoides caudatus*	Common Babbler	IV
42.	*Vanellus indicus*	Red wattled lapwing	IV
Butterflies			
1.	*Cyrestis thyodamas*	Common map	--
2.	*Danaus genutia*	Stripped Tiger	--
3.	*Eurema hecabe*	Common Grass Yellow	--
4.	*Hypolimanas misippus*	Danaid Egg Fly	--
5.	*Ixias marianne*	White orange tip	--
6.	*Mycalesis perseus*	Common Bush Brown	--
7.	*Papilio polytes*	Common mormon	--
8.	*Papilio demoleus*	Lime butterfly	--
Pisces			
1.	*Labeo rohita*	Rohu	Least Concern
2.	*Tor khudree*	Mahseer	Endangered
3.	*Catla catla*	Katla	Least Concern
4.	*Labeo calbasu*	Calbasu	Least Concern
5.	*Mystus cavasius*	Cat fish	Least Concern
6.	*Gambusia affinis*	Mosquito fish	Least Concern
7.	*Barbus chilinadea*	Black Fish	Least Concern
8.	*Clarias batrachus*	Singi	Least Concern
9.	*Notopterus notopterus*	Bronze Feather Back	Least Concern
10.	*Gonialosa manmina*	Ganges River Gizzard Shad	Least Concern
11.	*Tenualosa ilisha*	hilsa	Not Listed

12.	*Barilius barna*	Barna Baril	Least Concern
13.	*Chagunius chagunio*	Chaguni	Least Concern
14.	*Cyprinus carpio*	Common Carp	Least Concern
15.	*Cirrhinus reba*	Reba Carp	Least Concern
16.	*Danio devario*	Sind Danio	Least Concern
17.	*Labeo angra*	Kharsa, Butter	Least Concern
18.	*Labeo bata*	Bata	Least Concern
19.	*Labeo boga*	Boga Bata	Least Concern
20.	*Labeo dyocheilus*	Kali, Boalla	Least Concern
21.	*Labeo gonius*	Kuri, Khursa	Least Concern
22.	*Puntius chola*	Swamp Barb	Least Concern
23.	*Puntius sarana*	Olive Barb	Least Concern
24.	*Puntius ticto*	Ticto Barb	Least Concern
25.	*Wallago attu*	Wallago	Near Threatened
26.	*Chanda nama*	Elongated Grass Perchlet	Least Concern
27.	*Channa maruliuss*	Great Snakehead	Least Concern

3.13 Socio- Economic Environment

Socio-economic survey tools provide a means of improving understanding of local resource management systems, resource use and the relative importance of resources for households and villages.

Data Collection: Following steps were considered for the collection of primary data:

1. Identifying of Study Area
2. Site Visit
3. Analysis of Data Collected

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

3.13.1 Methodology

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

- Evaluation of the parameters defining the socio-economic conditions of the population.
- Analysis of the identification of social attributes like population distribution, sex ratio, occupational structure, available public utilities, etc., through literatures like district census hand book.
- Public opinion for the future development in the study area.

Sociological aspects include human settlements, demographic and socio-economic aspects and infrastructural facilities available in the study area. The economic aspects include agriculture, industry and occupational structure of workers.

The studies carried out are descriptive and exploratory in nature and are done by FAE, Socio-Economic.

Table 3-16: Methodologies of social data collection

S. No.	Collection of data	With Effect From
Secondary Sources		
I	Census of India, 2011	Latest Update available from 2012
Primary Sources		Method / Technique
Field observations		Market area survey
Extensive site-specific survey Survey period Type		Non-Probability Random Sampling Target sample of people interviewed of NH-135A, MDR 97E through Open interview Manner and the order of Sub-round/ per monitoring season Residence Shopkeeper etc.

3.13.2 Demographic structure of the study area

The Socio - economic and demographic details conditions prevailing in the 10 km radius was studied. Study area falls in Roorkee Tehsil of Haridwar district in Uttarakhand. Haridwar is a district of Uttarakhand with its administrative headquarters located at Roshnabad, at a distance of about 12 km from Haridwar railway station. According to 2011 census, the district encompasses a geographical area of 53483 sq. km and has a population of 10,086,292 (persons) including 5,137,773 (males) and 4,948,519 (females). The district has a sex ratio of 963 (females for every 1000 males. The major religions in the district are

Hindu (64.27%) and Muslim (34.28%) of the total population respectively. The literacy rate in the district is 73.43%. Main source of income in the district is from the agriculture sector and per capita income is Rs. 1,87,313. Total cropped area is 2,58,328 in hectares and the forest area is 431.79 in sq km (2019).

Population growth

At the present territorial jurisdiction, the population of the district was 1,447,187 at 2001 Census and growing by 30.62 per cent during the decade 2001-2011 it is 1,890,422 at 2011 Census. The decadal growth at 30.62 per cent in the district has been at higher level than in the state at 18.81 per cents.

Sex - Ratio

The sex-ratio of the district is 880 which is above to the state level (963). Indeed the sex-ratio at the district has all along been lower in the district as against the state since 1901. As against urban areas of the district the sex-ratio is higher in rural areas. Among tahsils, highest sex-ratio is in Laksar and lowest in Roorkee. Among CD Block the sexratio is highest in Khanpur at 897 and lowest in Bhagwanpur at 880. Out of 518 inhabited villages in the district there are 36.29 per cent villages (with 42.13 per cent of rural population) which are having a sex-ratio in the range of 850- 899. In the urban parts of the district the sex-ratio is 866 and highest of 949 in Dhandera C.T. and lowest of 355 in Roorkee (CB). The sex-ratio of population on the age-group 0-6 is 877 in the district which is lower than the state being only at 963. As against a sex-ratio of 877 in the age-group 0-6 of rural population of the district, it is highest at 802 in Bahadurpur CD Block and lowest at 855 in Narsan CD Block. It may be noted that out of 568 inhabited villages in the district in over 85 villages with about 25.03 per cent of rural population the sex-ratio in the age-group 0-6 is ins the range of 850-899. As against the 0-6 age group sex-ratio of 883 in the rural area of the district it is only 882 in urban areas. Among towns this sex-ratio is highest at 949 in Dhandera (CT) and lowest at 851 in Rawali Mohdura (CT).

Table – 3.17: Sex ratio of the state and district, 1901-2011

Census Year	State			District		
	Total	Rural	Urban	Total	Rural	Urban
1901	918	943	668	864	880	794

1911	907	944	585	823	855	701
1921	916	963	547	818	881	621
1931	913	948	604	820	849	708
1941	907	953	579	802	863	612
1951	940	998	647	806	830	738
1961	947	995	695	796	829	700
1971	940	990	721	803	832	726
1981	936	984	764	817	836	775
1991	937	978	810	846	849	841
2001	962	1007	845	865	874	844
2011	963	1000	884	880	889	866

Note: Sex ratio has been defined here as the number of females per 1000 males

(Source: As per Census Data 2011)

Work Participation Rate

In the total population of the district of 1,890,422 as much as 30.6 per cent are workers and rest of 69.4 per cent are non-worker. Among workers 85.6 per cent are main workers and rest of 14.4 per cent are marginal workers. In absolute terms females outnumber males as main worker and marginal workers as well. The extent of main workers is highest at 256318 in Roorkee tehsil and lowest at 59895 in Laksar. In case of marginal workers the proportion is highest in Roorkee tahsil as 41345 in comparison to only 32862 in Hardwar tehsil and 10753 in Laksar. The extent of non-workers in urban parts is higher than rural areas. In the district among workers about 16.2 per cent are cultivators and 62.6 per cent other workers. Over 62.51 per cent of female workers are engaged as other workers.

Literacy

In the district 73.43 per cent population is literate. The literacy is 77.4 per cent in urban areas and 57.2 per cent in rural areas. The male's literacy is as high as 73.8 per cent against 52.1 per cent female's literacy, and, therefore, the gap in male/female literacy rate is 21.7 per cents. In rural areas among 6 CD Blocks, the highest literacy is 59.1 per cent in

Bahadrabad and lowest at 53.1 per cent in Khanpur. The literacy among males in rural areas is 69.0 per cent in comparison to 43.6 per cent among females. Also the gap in male/female literacy rate is highest in this CD Block which is 30.6 per cent. In 30.0 per cent of villages covering also 29.6 per cent of rural population the literacy range is 61 to 70.0. Among urbanites in the district, as much as 83.6 per cent males are literates as against 70.0 per cent females. The highest urban literacy is in Roorkee (CB) at 96.4 per cent and lowest in Landhaura (NP) 43.3 per cent. The maximum male's literacy is also found in Roorkee (CB) at 98.9 per cent and lowest at 50.7 per cent in Landhaura, Bahadrabad (NP). However, the highest female's literacy is in Bahadrabad C.D. Block at 46.0 per cent and lowest 36.6 per cent in Khanpur C.D. Block. Still, the maximum gap in male-female literacy rate at 30.6 per cent is found in Khanpur. The literacy among scheduled castes in urban areas is 69.8 per cent and 54.5 per cent in rural areas. The literacy rate for scheduled tribes is 44.2 per cent in rural and 80.8 per cent in urban areas of the district.

Education

In graduate and above level education the highest percentage is found 19.0 percent in total population, 19.4 percent in male population and 18.7 percent in female population in the age group of 25-29. In post graduate degree other than technical degree the highest percentage is found 6.9 percent in total population in the age group of 25-29, 5.9 percent in male population in the age group of 25-29 and 30-34 and 7.9 percent in female population in the age group of 25-29. In technical degree or diploma equal to degree or post graduate degree Engineering and technology the highest percentage is found 1.6 percent in total population in the age group of 20-24, 2.0 percent in male population in the age group of 25-29 and 1.0 percent in female population in the age group of 20-24. Similarly lowest percentage of education in this level education is seen in the age group of 60+. In other educational level education percentage is observed very negligible in both state and district level.

Amenities

According to the availability of different amenities like education, medical, improved drinking water, post office, telephone, transport, communications, agricultural credit

societies, approach by pucca road and power supply within the village. Out of 518 inhabited villages in the district, 459 villages or 88.61per cent have been provided with the education facilities of one type or the other. Similarly 488 villages in the district constituting 94.21 per cent have medical facilities of one type or the other. Improved drinking water facility is available in 517 or 99.81 per cent villages. As regards, post office facility which includes facilities like telegraph office and post & telegraph, 106 villages constituting 20.46 per cent of villages have been provided with post office facility within the village. 469 or 90.54 per cent villages have been provided with the telephone facility, 248 or 47.88 per cent with transport facility, 56 or 10.81 per cent villages with bank facility and 49 or 9.46 per cent with agricultural credit societies. Similarly there are 445 or 85.91 per cent villages which have been linked with the pucca road and 505 or 97.49 per cent of villages have been provided with the electricity supply. Almost similar pattern of distribution of villages by availability of amenities in the villages at C.D. block has been found with slight variation. Laksar C.D. block has the highest 96.47 per cent villages where educational facility is available and lowest 79.59 per cent is found in Khanpur C.B. Block. Medical facility is highest in Laksar(97.65per cent) and lowest (90.35 per cent) in Bahadarabad C.D. block. Improved drinking water facility is available in most of the villages in all CD blocks. In fact it is above 98.96 per cent. Telephone facility is highest in Narsan (97.92 per cent). Transport and communications is less developed in Khanpur where only 20.41 per cent villages are covered by this facility whereas 79.17 per cent villages of Narsane C.D. block are availing this facility.

3.13.3 Impact Assessment & Conclusion:

The project activity together with inflow of capital, in-migration and employment of local inhabitants has shown positive impact on the overall social and economic condition of the people of the area. The project has provided a direct job opportunity to the local persons as both technical and non-technical workers. Literacy has further increased because of better income and awareness amongst the people. The project has provided direct employment opportunity to local people. Indirect employment is being generated in trade and other ancillary services. Employment in these sectors is both permanent and temporary or contractual and involvement of unskilled labour. A major part of this labour force is mainly from local villagers who are

expected to engage themselves both in agriculture and project activities. This enhances their income and lead to overall economic growth of the area. The following socio-economic changes have taken place due to project activities:

- The project is having a positive employment and income effect, both direct as well as indirect.
- Expected Improvement of infrastructure& transportation.
- The project is having positive impact on consumption behavior by way of raising average consumption and income through multiplier effect.
- The project has brought about changes in the pattern of demand from food to non-food items as sufficient income is being generated.
- People located in the project area and in close vicinity, enjoying positive changes in life style and better quality of life.

3.13.4 Rehabilitation &Resettlement (R&R) Action Plan

There shall not be any displacement of people due to project as the project is implemented in the project site only. No further land acquisition required for the project; hence no (R&R) Action plan is required. There is no Land Acquisition.

3.13.5 Social infrastructure nearby project site

Nearest Habitation: Nearest Habitation is Iqbalpur (approx. 1.0 Km towards E), Sunehti Alapur (approx. 1.89 km towards W), Yusufpur (approx. 1.35 km towards N) etc. These Villages are densely populated and Nearest Railway Station is Iqbalpur Railway Station (approx. 1.77 Km towards NE) and Nearest Airport is Jolly Grant Airport (approx. 52.0 km towards NW).

Educational Facilities: The study area (of 10.0 km) has Primary School, Upper Primary School, Inter Collage are available at Iqbalpur. There are also private schools in the localities.

Medical Facilities: Hospitals are avialble in Bagwanpur (7.72 Km NE) & Roorkee (10.19 Km SE).

Religious facilities: Temple is also available in Iqbalpur.

Post office & Police Station: - Sub Post Office & Police Chowki is also available in Iqbalpur (approx. 1.05 km).

Social Setup:

The study area is dominated by General caste and other backward community; Agriculture is the predominant occupation however currently there is a wave of change of occupation. There by other worker are increasing in the study area. The immediate surroundings of the projects lack the amenities.

Traffic Survey and Projection for Common Biomedical Waste Treatment Facility, Haridwar

The seven days traffic survey has been conducted from 25.05.2023 to 31.05.2023 on the Metalled Road passing through adjacent to the project site. Average values have been used for traffic estimation. Manual of Standard & Specification for Two Laning of State Highways (IRC: SP:73-2007) has been used for traffic calculations and projections. A minimum 5% annual increase in the traffic is taken for the projection. Highest traffic volume however has been observed during working hours and returning hours i.e. 9:00-11:00 AM and 05:00-07:00 PM respectively due to movement of employees of the Mahalaksmi Sugar Mill. It is envisaged that the construction will be done in one year.

Types of Vehicle	No. Vehicles	PCU Factor	Equivalent PCU
Two Wheelers Scooter/Bikes	112	0.5	56
3 Wheeler Auto Rickshaw	40	0.5	20
Four Wheeler Car/Jeep	20	1.0	20
Six wheeler Buses/Truck	15	3.0	45
Heavy Vehicles	04	3.0	12
Total	**192**	**-**	**153**

Equivalent factor: recommended PCU factors for Various Types of Vehicles, The Indian Road Congress, 1990)

Composition of Existing Traffic Volume

Total Vehicles	No. of Vehicles		
	LMV	MMV	HMV
214	172	15	04
	% Composition		

	80.37	7.0	1.86

Level of Service (LoS)

The design service volume of single lane road in PCUs per day in plain area without paved shoulders (c=15000 pcu) has been adopted.

The following guidelines of IRC have been followed:

Table: Guidelines of IRC for Judging LOS Vs Performance

V/C	LOS	Performance
0.0-0.2	A	Excellent
0.2-0.4	B	Very Good
0.4-0.6	C	Good/Average
0.6-0.8	D	Below Average
0.8-1.0	E	Poor
1.0-1.2	F	Very Poor

Table: Design Service Volume in PCUs per day

Nature of Terrain	Design Service Volume in PCUs per day	
	without paved shoulder	with minimum 1.5 m paved shoulder
Plain	15,000	18,000
Rolling	11,000	13,000
Mountainous and Steep	7,000	9,000

(IRC:SP: 73-2007)

LoS in Existing Scenario = 214/15000 = 0.0142 (A-Excellent)

LoS after Construction of the Project = 250/15000 = 0.0166 (A-Excellent)

4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 General

Environmental Impact Assessment (EIA) is a planning tool generally accepted as an integral component of sound decision making. EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification, characterization and quantification of critical environmental impacts allow the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts. The aim is to ensure that potential environmental problems are foreseen and avoided at an early stage in planning cycle so as to preempt problems.

The EIA mechanism is applied to the project in the following order of priority project in the following order of priority:

- Avoid adverse environmental impact
- Minimize and control adverse environmental impact
- Mitigate adverse environmental impact

The environmental impact assessment has been performed to predict the quantitative and qualitative impaction the following broad environments which broadly describe the whole gamut of environment. Further there would be two phases of generation i.e. during the construction phase and the operational phase.

4.2 Potential Impacts

The potential significant environmental impacts associated with the project are grouped as below.

Air Environment

- Impacts on ambient air quality
- Impacts on ambient odor
- Impacts on ambient noise

Water Environment

- Impacts on surface& ground water quality

- Impacts on aquatic life

Land Environment

- Impacts on land use
- Impacts on soil fertility

Socio Economics

- Impacts on infrastructure
- Impacts on employment
- Indirect Impacts
- Impacts on public health and safety
- Impacts on aesthetics

4.3 Prediction of Impacts

The impact assessment is carried out for the following phases and presented in the following paragraphs.

- Impacts during development phase or construction phase
- Impacts during operation phase

4.4 Impacts during Development Phase or Construction Phase

4.4.1 Air Environment

The air environment may be described in terms of parameters of ambient air quality such as ground level concentration of particulate matter (PM_{10}) representing suspended particulates which are less than 10-micron size which easily get into our respiratory tracts. Further the particulate matter ($PM_{2.5}$) denotes that fraction of finer particulates which are deposited in our lungs and cause respiratory diseases and also affect metabolism.

All of the developmental activity viz. Construction work, operation of diesel driven equipment and machinery, excavations, loading and unloading of materials, haulage of materials, dumping and stacking of construction material and debris cause generation of fugitive dust particulates over the proposed area and in the neighborhood. Further movement of vehicles because both emission of exhaust gases and also wheel laden fugitive dust particulates. The fugitive particulate load generated daily depends upon the duration of construction activities which may be said to

be temporary lasting for a few months. After the completion of this phase all of the sources stated above stop functioning.

4.4.2 Gaseous Pollutants

The gaseous pollutants namely CO, SO_2, and NO_X released due to vehicular exhausts are noxious in nature. As said earlier, the construction phases are temporary and ceases after a few months. As such the load of gaseous pollutants generated shall be for a limited period of time. The deployment of transportation trucks for haulage of building materials and other machinery shall emit gaseous pollutants.

4.4.3 Noise Environment

The construction phase involves developmental activities and entails usage and deployment of machinery and equipment which would generate noise substantially. The assessment of the impacts of noise on the surrounding community depends upon:

- Characteristics of noise source (instantaneous, intermittent, or continuous in nature, with the latter contributing the least to noise pollution);
- There is no blasting or heavy machinery involved in the installation of incinerator hence there is no instantaneous source of noise pollution from the site.
- Intermittent source of noise shall be movement of vehicles used in construction activities. This shall be temporary in nature.

4.4.4 Water Environment

Sources of water pollution on building sites include: diesel and oil; paint, solvents, cleaners and other harmful chemicals; and construction debris and dirt. Silt and soil that runs into natural waterways turns them turbid, which restricts sunlight filtration and destroys aquatic life. Waste water will be generated from cleaning of vehicles, cleaning of equipments etc.

4.5 Impacts during Operation Phase

4.5.1 Air Environment

Generation of Gaseous pollutant due to incenration of the waste. During this phase, the sources of fugitive dust are due to movement of medical waste laden trucks to and fro the processing plant. Along with the vehicular pollution emissions from the stack of incinerator is be observed.

4.5.2 Air Pollution Impact Prediction through Modeling

Air quality modelling

Objective

Atmospheric modelling is used by air quality managers to make decisions on effective and efficient ways to implement the National Ambient Air Quality Standards (NAAQS) and improve air quality. Air quality modelling is done to estimate the relationship between sources of pollution and their effects on ambient air quality, predict the impacts from potential emission sources, and simulate ambient pollution concentrations under different policy scenarios. They are critical for determining the relative contributions from different sources, monitoring compliance of air quality regulations, and making policy decisions

The Air Quality Model

In order to estimate the ground level concentrations due to the emissions from the proposed project, EPA approved American Meteorological Society/Environmental Protection Agency Regulatory Model – AERMOD cloud 18 dispersion Model has been used. AERMOD View dispersion Model provides option to model emissions from a wide range of sources that are present at a typical industrial source complex. The model considers the sources and receptors in undulated terrain as well as plain terrain and the combination of both. The basis of the model is the steady state Gaussian Plume Equation, with modifications to model simple point source emissions from stacks that experience the effect of aerodynamic down wash due to nearby buildings, isolated vents, multiple vents, storage piles etc. AERMOD View dispersion model with the following options has been used to predict the cumulative ground level concentrations due to the proposed emissions. Area being rural, the rural dispersion parameters are considered as below:

- Predictions have been carried out to estimate concentration values over radial distance of 10 km around the sources.
- Cartesian receptor network has been considered.
- Emission rates from the sources were considered as constant during the entire period.
- The ground level concentrations computed were as in basis without any consideration of decay coefficient.
- Calm winds recorded during the study period were also taken into consideration.

- 24-hour mean meteorological data, extracted from the meteorological data collected during the study period as per guidelines of IMD/CPCB has been used to compute the mean ground level concentrations to study the impact of proposed activity.
- Stability class was evaluated based on wind direction fluctuation.
- The mathematical equations used for the dispersion modelling assumes that the earth surface acts as a perfect reflector of plume and physico-chemical processes such as dry and wet deposition and chemical transformation of pollutants are negligible.
- Washout by rain is not considered.
- Source of emission is continuous and at steady state.

Emission Calculation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. The general equation for emissions estimation is:

$$E = A \times EF \times (1- ER/100)$$

Where; E = emissions in (gm/sec); A = activity rate (Tonnes/Hr); EF = emission factor (Kg/Tonnes), and ER = Overall emission reduction efficiency, %

Sources of Pollution/Emission

Point Source:

1. DG Set of 1 x 65 KVA
2. Incinerator – 200 kg/hr

Emission rate of pollutants from operation of DG sets are computed based on research paper of Emission Inventory of Air Pollutants from Diesel Generator Used at Selected Locations in Jaipur City, India *by Suthar Gaurav et al.* International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES) Volume 4, Issue 12, December-2018.

Emission rate for Incinerator of the Bio Medical Waste is calculated based on the Source Apportionment Study by CPCB. As per the emission factors published in the above documents, the emission rate has been computed and is provided below**.**

S.No.	Source	Stack Height, m	Exit Velocity, m/s	Internal Diameter. m	Maximum Working Hours per day
1	Incinerator (200 Kg/Hr)	30	8.5	0.2	2
2	DG Set 62 KVA	15	5.5	0.1	2

- **Air Pollution Control Device**
  - Venturi Scrubber in Incinerator
  - Not Applicable as only DG sets will be operated as back-up power supply and the operation will be limited to max 2 hr per day when there will be no power supply.

Source	Avrg Fuel Consumption,	Emission Rate			
		PM10, g/sec	NOx, g/sec	SO2, g/sec	CO, g/sec
DG 65 KVA	6 L/Hrs	0.005	0.08	0.036	0.072
Incinerator	200 kg/hr	0.162	0.062	0.076	0.205

Quantitative estimation of impacts on air environment

An attempt has been made to predict the incremental rise of various ground level concentrations (GLCs) above the baseline status in respect of air pollution due to Incinerator and DG sets operations. The mathematical model used for predictions in the study is USEPA approved AERMOD View 10.0.1 software which is designed for point source, line source and area sources for the prediction of impacts due to Incinerator and DG set operations. For estimation of the GLC in worst case scenario, the Incinerator and DG Sets operations are assumed to be carried out on the flat terrain. The predicted GLC computed using AERMOD View developed by Lakes Environment model is plotted on isopleths and are shown in Figure given below.

Meteorological Data

The meteorological data recorded continuously during season of **Post-Monsoon Season (March, 2023 – May, 2023)** on hourly basis for wind speed, wind direction, relative humidity, precipitation and temperature and the same is processed to extract the 24-hour mean meteorological data as per the guidelines of IMD and MoEF for application of AERMOD cloud

Version 18 model. Stability classes computed for the mean hours is based on the guidelines issued by CPCB on modelling. Mixing heights representative of the region have been taken from the available published literature.

Stability Classification

Wind direction fluctuation method (CPCB PROBES/70/1997-1998) is adopted for hourly stability as determined by wind direction fluctuation method as suggested by Slade (1965).

$$\sigma_\Theta = Wdr/6$$

Wdr: the overall wind direction fluctuation or width of the wind direction in degrees, over the averaging period.

σ_Θ : the standard deviation of wind direction fluctuation.

The stability classes is as detailed below:

Slades Stability Classification based Wind direction fluctuation

Stability Class	σ_Θ (degree)
A (Extremely Unstable)	**>22.5**
B (Moderately Unstable)	**22.4-17.5**
C (Slightly Unstable)	**17.4-12.5**
D (Neutral)	**12.4-7.5**
E (Slightly Stable)	**7.4-3.5**
F (Stable)	**<3.5**

Dispersion Parameters

The area is classified as urban when more than 50% of land inside a circle of **3 km** radius around the source can be considered built up with heady or medium industrial, commercial or residential units. The site is located in **out of the city**, the area is considered **rural** and dispersion coefficient for **rural** are used in the modelling.

Table 4-1: Brigg`s Dispersion Parameters σy (m) and σz (m) (100m<x<10000m)

S.No.	Stability Class	σ_y(m)	σ_z(m)
For Rural Conditions			
1	A	$0.22x(1+0.0001x)^{-0.5}$	0.2x
2	B	$0.16x(1+0.0001x)^{-0.5}$	0.12x
3	C	$0.11x(1+0.0001x)^{-0.5}$	$0.08x(1+0.0002x)^{-0.5}$
4	D	$0.08x(1+0.0001x)^{-0.5}$	$0.06x(1+0.0015x)^{-0.5}$
5	E	$0.06x(1+0.0001x)^{-0.5}$	$0.03x(1+0.0003x)^{-1}$
6	F	$0.04x(1+0.0001x)^{-0.5}$	$0.016x(1+0.0003x)^{-1}$
For Urban Conditions			
1	A-B	$0.32x(1+0.0004x)^{-0.5}$	$0.24x(1+0.001x)^{-0.5}$
2	C	$0.22x(1+0.0004x)^{-0.5}$	0.20X
3	D	$0.16x(1+0.0004x)^{-0.5}$	$0.14x(1+0.0003x)^{-0.5}$
4	E-F	$0.11x(1+0.0004x)^{-0.5}$	0.08x(1+0.0015x)

Where x is the downwind distance in meters.

Mixing Height

As site specific mixing height were not available, mixing height based on CPCB publication, "Spatial Distribution of Hourly Mixing Depth over Indian Region", PROBES/88/2002-03 has been considered for model to establish the worst-case scenario.

Monthly Wind Speed and Wind Direction

The weather is one of the main factors affecting the air quality. Weather can help to clear away pollutants from atmosphere to improve air quality, or it can make air pollution extremely worse by helping to form highly polluted regions. The concentration of air pollutants in ambient air is governed by the meteorological parameters such as atmospheric wind speed, wind direction, relative humidity, and temperature. Rainfall can effectively remove atmospheric particulate pollutants, and the removal rate of PM_{10} is greater than the removal rate of $PM_{2.5}$. In general wind speed more than 7 m/s can lift dust. Heavier particles will settle near the source area, with the smaller ones settling farther away. The site-specific weather data has been collected by installation of weather monitoring station at site.

Table 4-1: Weather Monitoring Data of the Site

Months	Relative Humidity, %	Rainfall, mm	Mean Wind Speed, m/sec	Wind Directions (blowing from)	Avrg Temperature (degree Celsius)
March	49%	7	3.56	East	22.3
April	52%	0	3.42	East	23.6
May	60%	0	2.96	North East	25.7

Meteorological Parameters (March-May, 2023)			
Parameter	**Min. Value**	**Max. Value**	**Mean Value**
Temperature (°C)	12.3	31..2	26.55
Wind Speed (m/s)	1.6	14.5	3.25
Relative Humidity (%)	22	79	45
Solar Radiation (W/m2)	5000	5500	5300
Rainfall	Total rainfall (mm)	No. of rainy days	Average annual rainfall (mm)
	46	15	1152

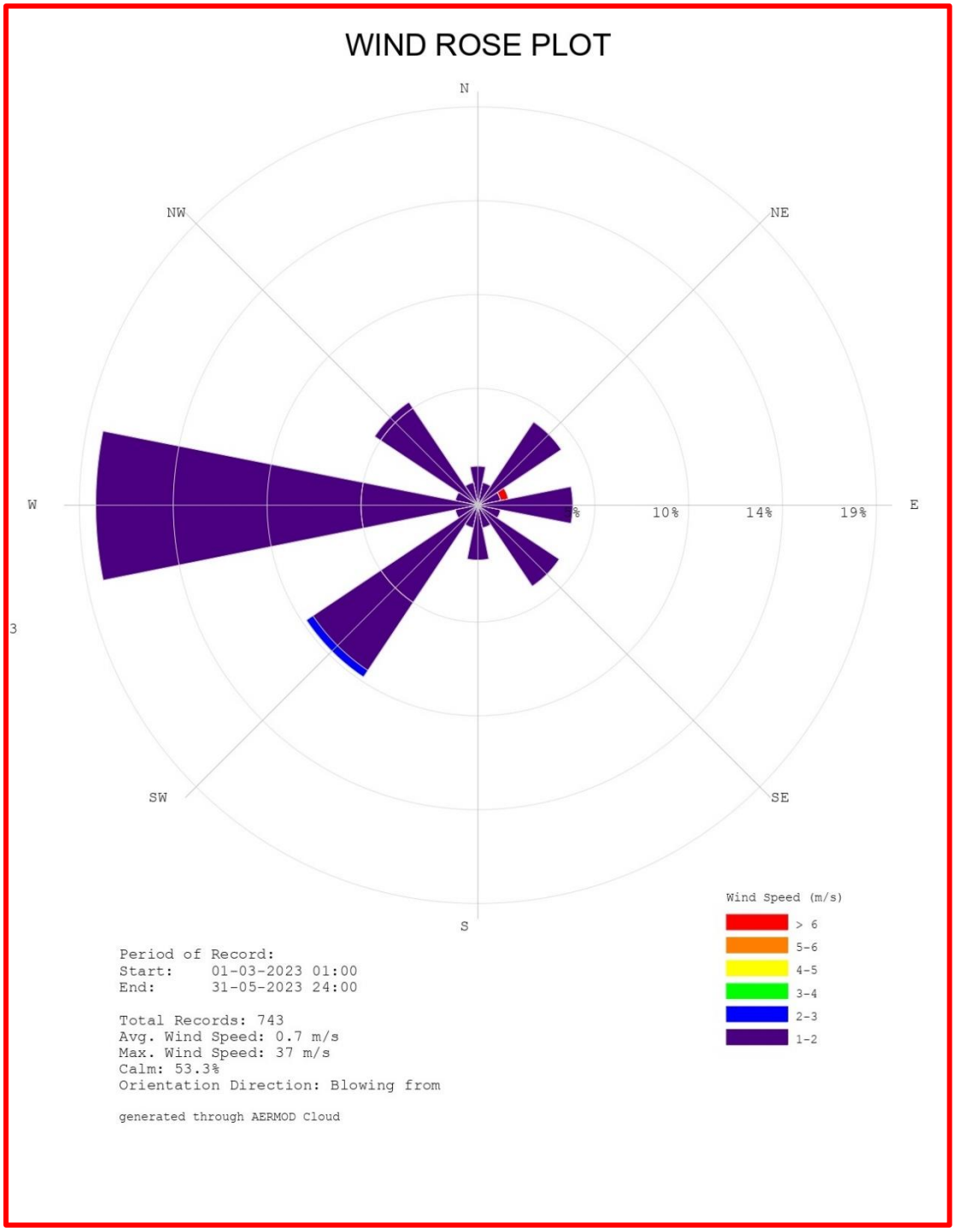


Figure 4-1: Windrose Data of the Site

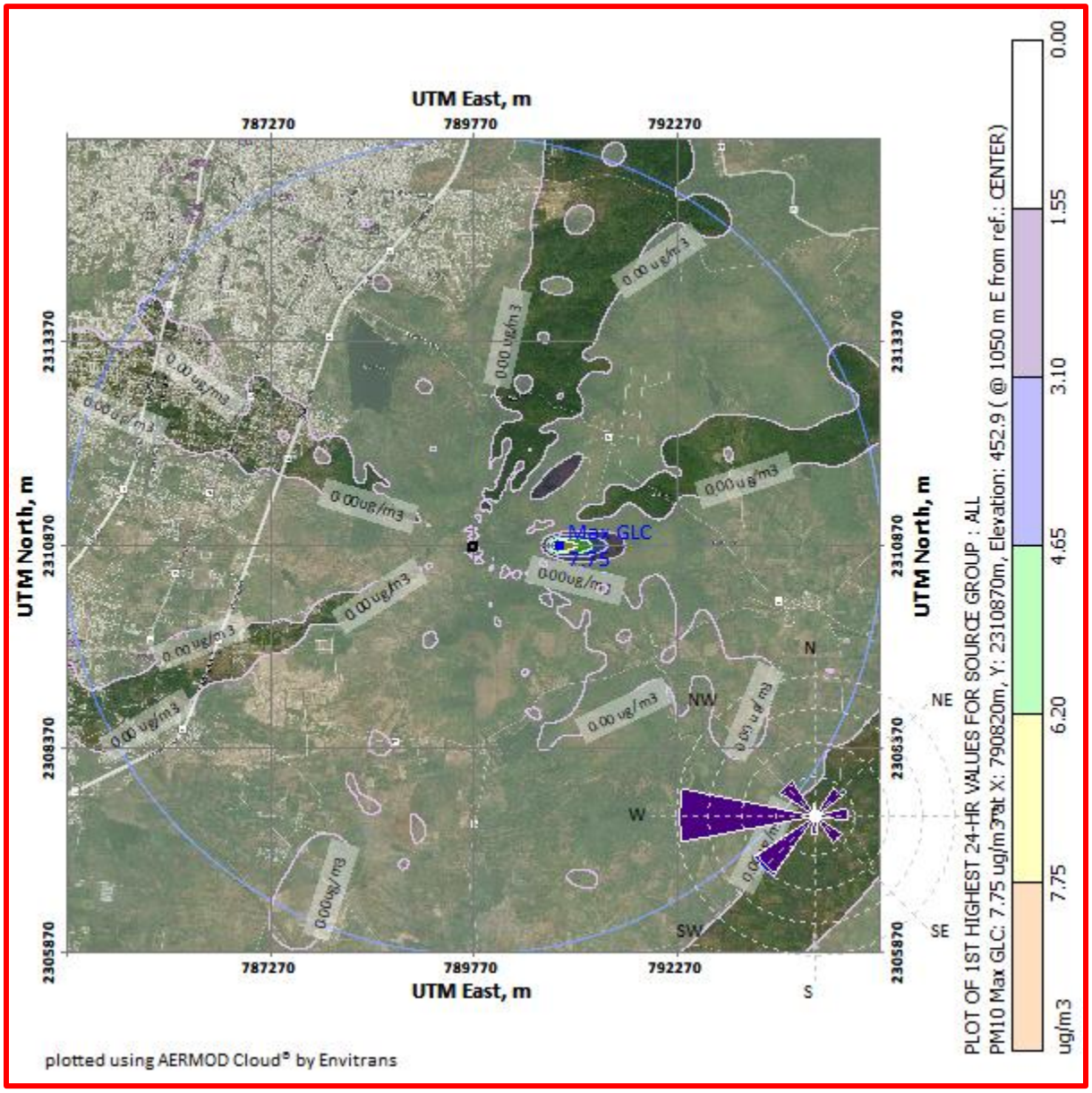


Figure 4-2: PM 10 Isopleth

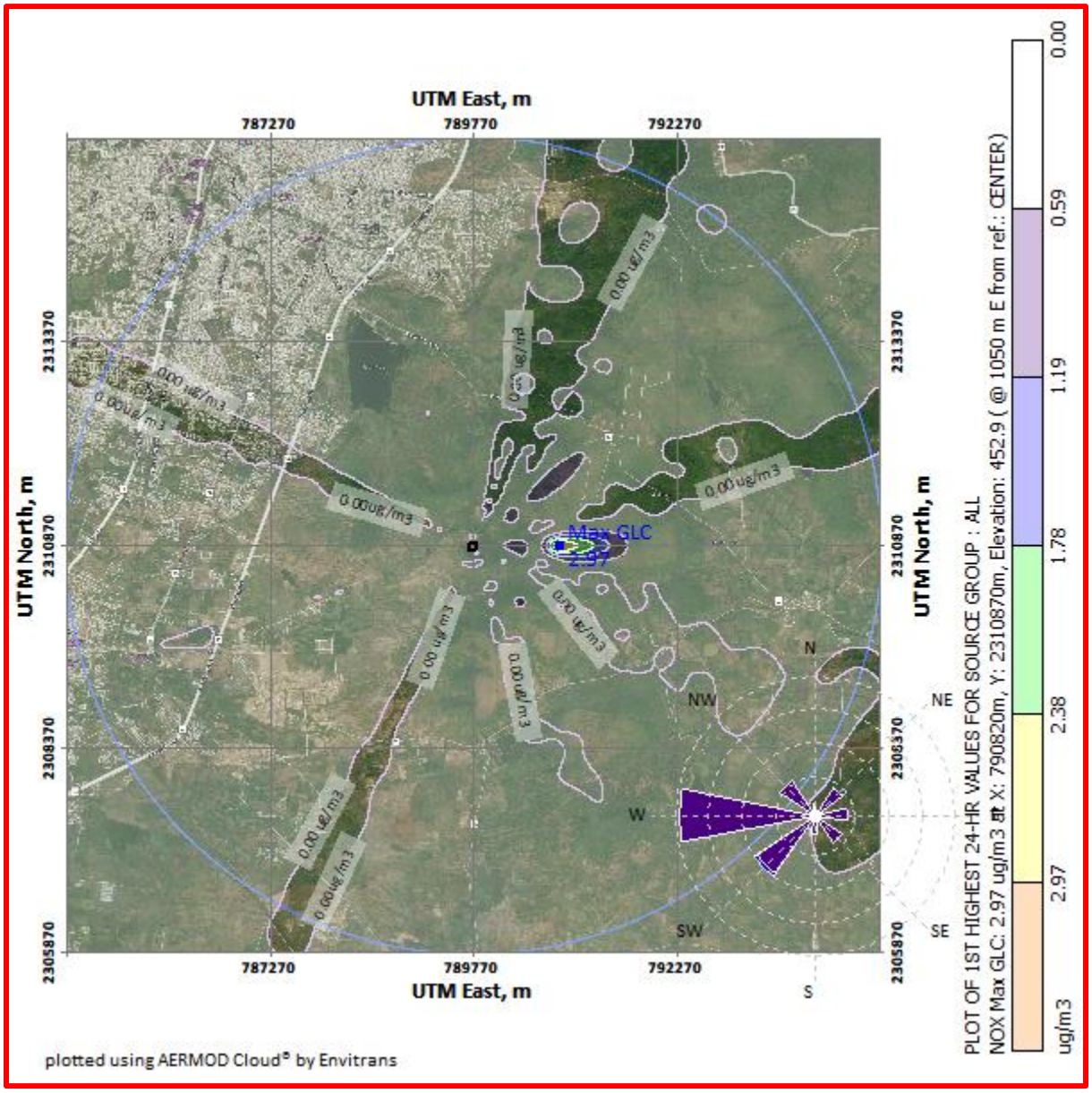


Figure 4-3: NO_X Isopleth

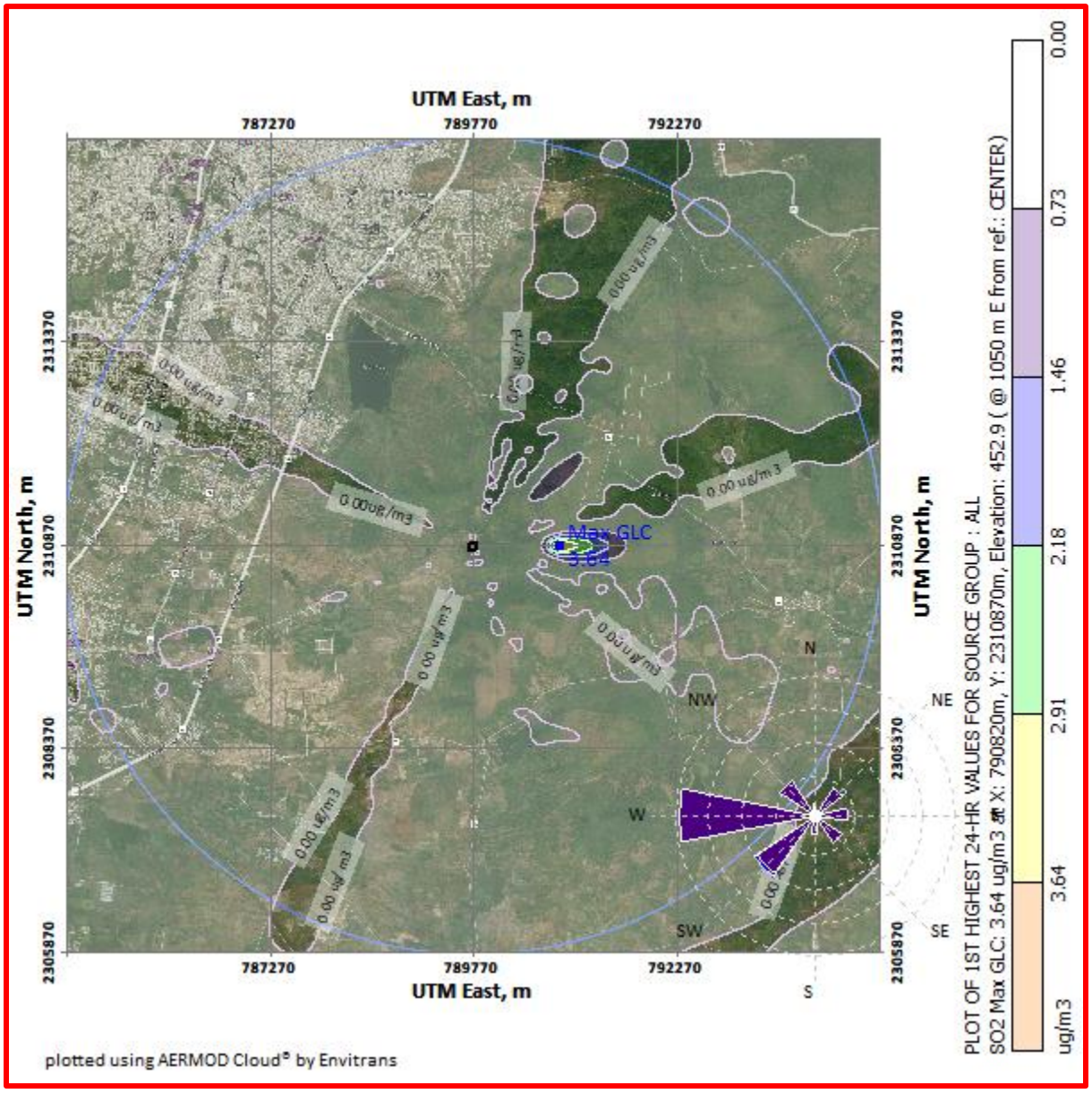


Figure 4 – 4 : SO_2 Isopleth

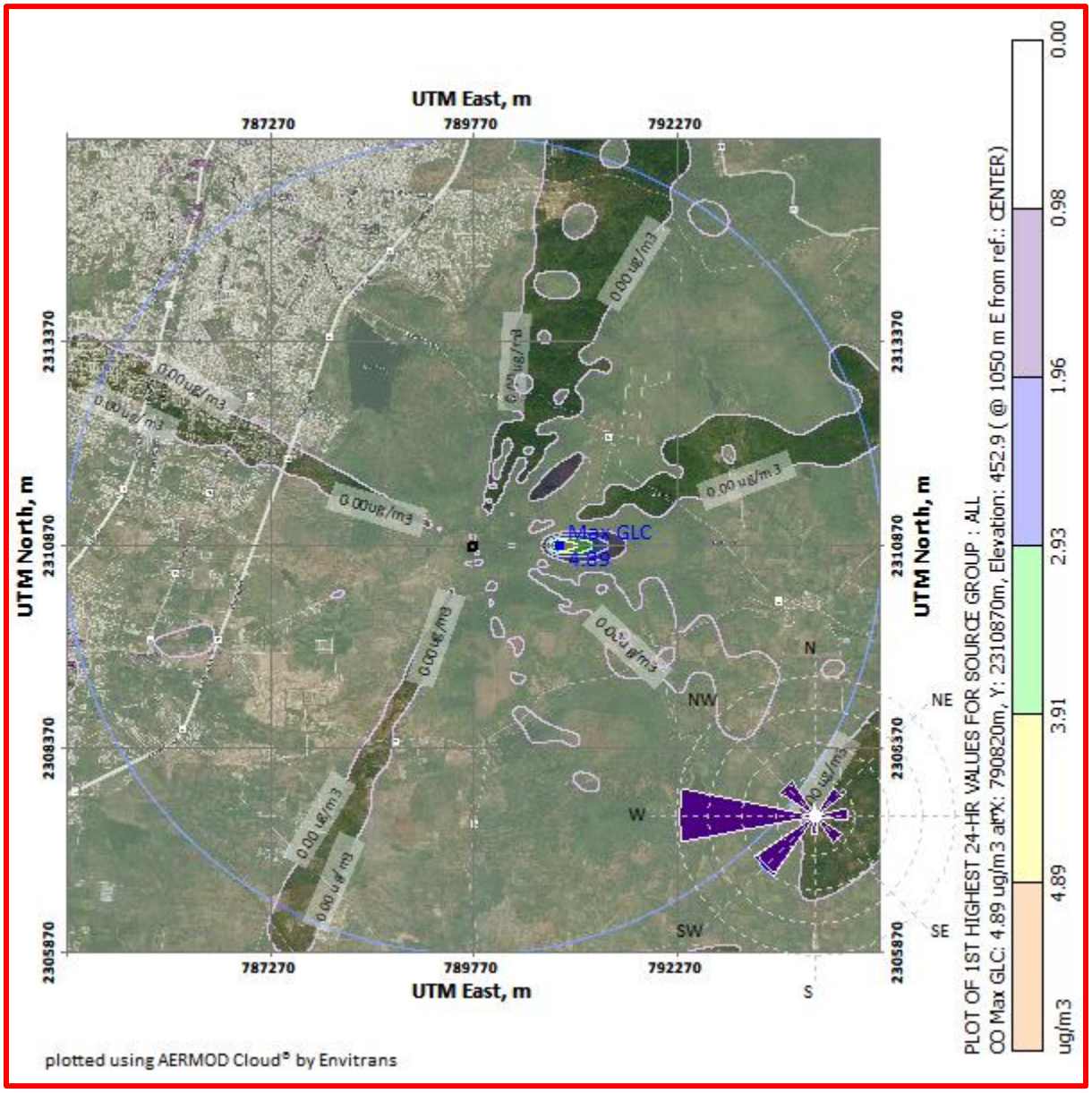


Figure 4-5: CO Isopleth

4.6 Mitigation of Impacts

4.6.1 Air Environment

4.6.2 Installation of ACPDS

Air pollution control devices are a series of devices that work to prevent a variety of different pollutants, both gaseous and solid, from entering the atmosphere primarily out of

industrial smokestacks. These control devices can be separated into two broad categories - devices that control the amount of particulate matter escaping into the environment and devices that control acidic gas emissions. It is important to understand that the extraction methods for each specific type of pollutant can differ, so the only the major methods are discussed. Although complex, these devices have shown to be effective in the past with the overall levels of emissions for many pollutants dropping with the implementation of these control devices.

Table 4-2: Air Pollution Sources, Fuel Consumption and Emission rate details

Source	Avrg Fuel Consumption,	Emission Rate			
		PM10, g/sec	NOx, g/sec	SO2, g/sec	CO, g/sec
DG 65 KVA	6 L/Hrs	0.005	0.08	0.036	0.072
Incinerator	200 kg/hr	0.162	0.062	0.076	0.205

In the proposed project ventruri scrubbers are to be used for mitigation of the impact to be caused by installation of incinerator.

4.6.3 Venturi Scrubber

A **venturi scrubber** is designed to effectively use the energy from the inlet gas stream to atomize the liquid being used to scrub the gas stream. This type of technology is a part of the group of air pollution controls collectively referred to as wet scrubbers.

4.6.4 Process description

A **venturi scrubber/quenching** consists of a converging section, a throat (the narrowest part of the venture tube) and a diffuser. The dust/gas mix flows through the venturi tube and reaches top speed in the throat section. Thereafter, the mixture passes into the diffuser where the speed drops again. Liquid is added to the gas flow either in the throat section or prior to it. Intensive mixing takes place between the gas and the liquid in the throat section of the venture tube. Due to the high speed realized by the gas and liquid, water is released in fine water droplets.

The venturi scrubber itself has a low volume. The dimensions of the installation are primarily determined by the droplet separator, which can be a few times larger than the scrubber.

Venturi scrubbers can be used to remove small particles (< 1 μm) from a gas stream. However, they can also be used for larger particles, though energy use is relatively high in such cases. Even at very high pressure drops, some types of dust cannot be separated. In some venturis it is possible to vary the width of the throat section, thus allowing the separator to be adjusted for varying flow volumes – thus retaining a high yield.

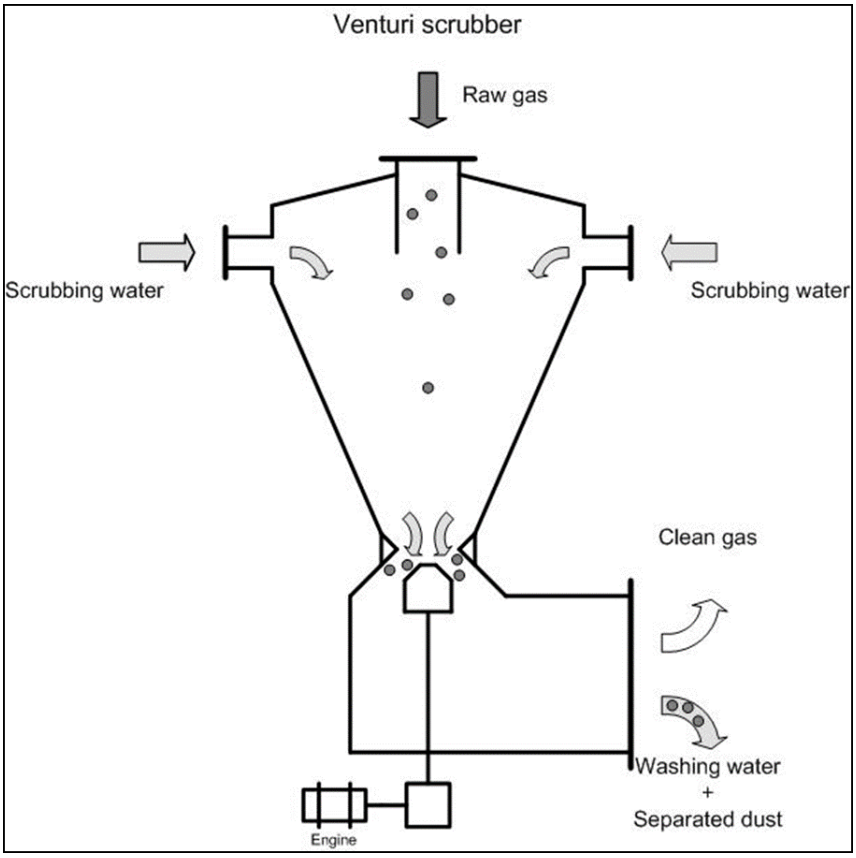


Figure 4-6: Design of Venturi Scrubber

4.7 Gaseous Pollutants

The use of Bharat Stage –IV compliant diesel machinery shall reduce the air pollution in various qualitative and quantitative aspects effectively. Also it shall ensure lesser consumption of diesel which shall be cost effective too.

4.7.1 Noise Environment

The following measures shall enable to minimize and control noise pollution due to operations in the landfill site.

- Periodic maintenance of the machineries and equipment as well as the haul trucks/tractors involved shall be done as per the manual requirement.
- The operators, semiskilled workers and drivers of the vehicles and machinery involved shall be trained for the job requirements and their skills shall be updated and monitored regularly for smoother functioning for maintaining clean environment.
- A dense green belt with fast growing floral species as recommended by CPCB with climatologically adaptability shall be developed along the periphery of the landfill site.
- The development of the green belt shall be such that bushes and shrubs shall be placed inwards towards the site while the taller species shall be placed on the outer area towards the boundary. This shall ensure development of a barrier both for noise and dust particulates. The fully developed green belt shall present an appealing landscape and would be scientific also in purpose.

Also the natural wall will act as a barrier for noise. As there are no major sources of noise pollution critical impacts to neighboring communities and wild animals is not envisaged

4.7.2 Water Environment

The wastewater discharge from various operations from venturi scrubbers, cleaning of cleaning of equipments ,cleaning of vehicles and usage of water in kitchen and toilets will be discharged either in public sewer or will be used for landscaping only after processing through proper effluent treatment plant.

Waste water (4.75 KLD) is being generated from the Industrial Process will be subjected to Proposed ETP (Capacity- 10.0 KLD). Treated water from (3.90 KLD) will be reused in scrubber for cooling purpose and green belt purpose.

The entire system shall be a zero-discharge system in terms of wastewater discharge from the process as recirculated through ETP.

Domestic Wastewater shall be treated in a soak pit/septic tank.

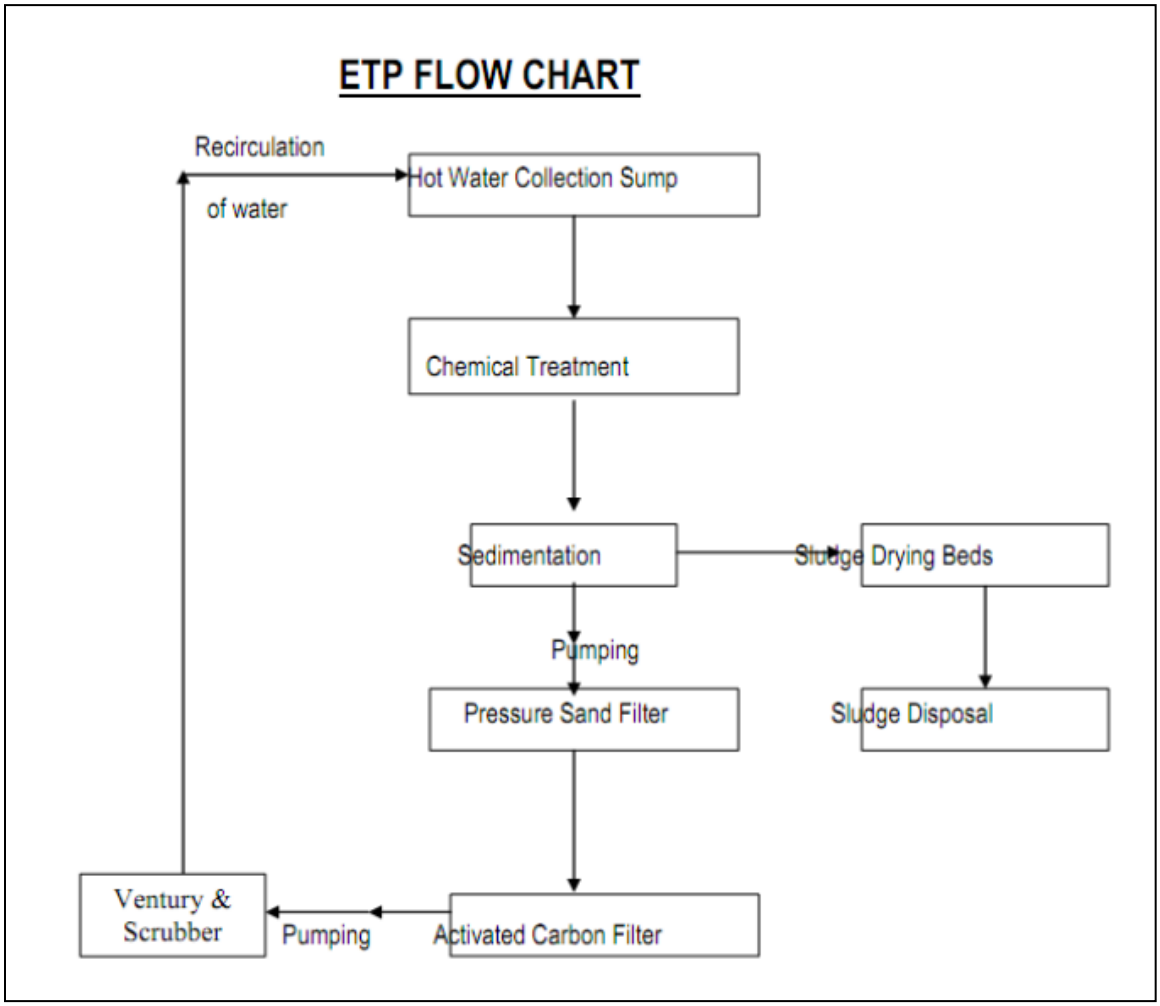


Figure 4-4: Schematic Flow Diagram of Proposed STP cum ETP (10.0 KLPD)

4.8 Waste Generation and Its Management

Solid Waste Details

Table 4-2: Details of Solid waste

Total No. of Employees	20
Assuming per capita solid waste generation rate as 0.2 kg/capita/day	
Quantity of solid waste generated	4.0 kg/day
Organic solid waste: 60 % of the total waste	2.40 kg/day
Inorganic solid waste : 40 % of the total waste	1.60 kg/day
Disposal of domestic solid waste	Domestic wastes are segregated at source, collected in bins and composted.

The domestic wastes (4.0 kg/day approx.) will be segregated at source and collected in bins & disposed as per CPCB Norms.

Ash from incinerator (5.0 MTPA approx.) and flue gas cleaning residue will be send to TSDF / Co processing industries.

4.8.1 Hazardous Waste Generation and Its Management

Table 4-3: Hazardous Waste Generation and Its Management

Sl. No.	Source	Quantity of hazardous waste Generated (Approx.)	Category according to Schedule I of hazardous waste	Treatment/ Disposal
1.	Spent Oil from DG set	2.0 MTPA	5.1	Handed over to authorized recyclers/re-processors
2.	Discarded Containers /Barrels	100 Nos./Annum	33.1	Handed over to authorized recyclers/re-processors
3.	Sludge from Wet Scrubbers	1.0 MTPA	37.1	Send to TSDF / Co processing industries.
4.	Ash from incinerator and flue gas cleaning residue	5.0 MTPA	37.2	Send to TSDF / Co processing industries.

4.9 Ecology and Biodiversity

There is no notified/protected ecologically sensitive area including national park, sanctuary, Elephant/Tiger reserves existing in the study area. The impact due to proposed activity on the ecological parameters like natural vegetation, cropping pattern and aquatic life, forests and species diversity is as summarized below.

The site of proposed Common Biomedical waste treatment facility, which is converted in a non-agriculture land and there will not be any cutting of the plantation at the site. During construction phase, due to generation of fugitive dust emission there will be slight impact on natural vegetation of the surrounding area. Emission shall be within limit by incorporating EMP provisions. Therefore, the adverse impact over any of the ecological components of the environment is negligible.

Since the proposed project activity is on non-agricultural land, it is not likely to alter the crop production and pattern of the area, either during the construction phase or the operation phase. Further, the necessary environmental protection measures will be planned under EMP e.g. air pollution control systems designed to take care of even emergency releases of the gaseous pollutants like PM, SO_2 and NO_2 regular environmental surveillance, etc; so as not to have any short-term or cumulative effect on the crops and the natural vegetation of the area.

The details of Flora/Fauna species and the wildlife habitat in the area covering 10 km radius have been collected to determine the existence of rare and/ or endangered species. There is no reserved forest, national park or sanctuary within 10 km radius of the plant.

4.10 Land Environment

Potential impacts on land environment due to the identified activities are given below:

- Change in Land Use Pattern
- Change in people‘s activity due to changed land-use
- Nuisance effect

As the project site is on non-agriculture land so impact on land use shall be of no significance. However, positive impact will be there as project proponent will provide the employment to the workers from nearby villages, which will further affect (positively) the occupational structure of the Area.

4.10.1.1 Mitigation Measures

- Necessary efforts will be made during preparation of site to minimize disruption of current land use to the extent possible.

- Proper restoration of site will be carried out to bring the physical terrain, soils and vegetation, as closely possible, to their original condition.
- Temporary new approach roads can be constructed and existing roads can be improved, if required, for smooth and hassle free movement of personnel as well as machines and machineries.
- Optimization of land requirement through proper site layout design will be basic criteria at the design phase.

5 ANALYSIS OF ALTERNATIVE

The proposal is for setting up of Common Biomedical Waste Treatment and Disposal Facility (CBWTF) includes Incinerator, Autoclave, Shredder and Effluent Treatment Plant at Khasra No. 724, Kunja (Bahadarpur), Bhagwanpur Haridwar, Uttarakhand, by M/s ECON Waste Solution. It is proposed to utilize 0.8320 ha land for setting up of Biomedical Waste Treatment Facility. Proposed project of setting up of the Common Bio-medical Waste Treatment Facility for treatment of 5 tones per day of bio medical waste, includes Incinerator, Autoclave, Shredder, Storage and Effluent Treatment Facility. The proposed project is meeting the guidelines of CBWTF issued by MoEFCC.

5.1 Site Selection

Environmentally sound management of biomedical wastes would require common bio medical waste management facilities for health care facilities spread all over the country, as it is not possible to have waste management facility for each unit. Hence common facilities become more necessary in the wake of our country, which either have no funds or space for development of biomedical waste management facility. The proposed project is going to be established in Khasra No. 724, Village – Kunja (Bahadarpur), Tehsil Bahgwanpur, District Haridwar and the land was leased by M/s ECON Waste Solution and was diverted for the purpose of biomedical waste treatment facility, so no alternate sites were considered. The proposed project site is meeting site selection criteria of CPCB guidelines. The following areas have to excluded or rejected (knock out Criteria) for this type of industries.

1. Areas with unstable geological features like unstable or weak soils; organic soil, soft clay or clay-sand mixtures, soils that lose strength with compaction or with wetting, clays with a shrink-swell character, sand subjected to subsidence and hydraulic influence.
2. Subsidence: e.g. owing to subsurface mines, water, oil or gas withdrawal or solution prone subsurface.
3. Wet lands.
4. Historical migration zones.
5. Flood prone areas
6. Natural depression and valleys where water contamination is likely

7. Areas of ground water recharge and extremely high water table zone
8. Unique habitation areas, close to national parks with scenic beauty and formerly used landfills
9. Areas with high population, unique archaeological, historical, paleontogical and religious interests,
10. Agricultural and forests lands and existing dump sites,
11. Atmospheric conditions that would prevent safe disposal of an accidental release
12. Major natural hazards, e.g. volcanic activity, seismic disturbance, etc.
13. Sensitive locations, e.g. storing flammable or explosive materials, airports
14. An unfavorable local hydro-geological situation, e.g. springs or drinking water well within very close proximity to the chosen area
15. Extremely bad access i.e. no existing access roads to the selected site which may involve Long distance more than 5 km from main roads.
16. Great differences in altitude between the area of waste collection and the selected site.

6 ENVIRONMENTAL MONITORING PROGRAM

6.1 Introduction

An environmental monitoring plan provides a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works. An environmental monitoring program is important as it provides useful information and helps to:

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

6.2 Need for Environmental Monitoring

- Verify and support compliance with applicable Central & State environmental laws, regulations, permits, authorization, consent to operate, protocols and orders.
- Monitoring is essential because it gives a final signal about the success of treatment.
- Establish baselines and charaterize trends in the physical, chemical, and biological condition of environmental media / matrix.
- Identify potential environmental problems and evaluate the need for remedial actions or measures to mitigate the problems.
- Detect, characterize, and report unplanned releases.
- Evaluate the effectiveness of flue gas from incinerator & leachate treatment and control, and pollution abatement programs.
- Determine compliance with commitments made in environmental impact statements, Form V – environmental statements, assessments

- ❖ EMS- ISO: 14001, safety analysis reports, or other official documents or for due diligence.

M/s ECON Waste Solution is established with the objective to prevent environment pollution hazard and to observe existing laws on environment and pollution control.

M/s ECON Waste Solution has adequate qualified and experienced staffs and NABL accredited lab for monitoring of environmental parameters.

6.3 Aim of Environmental Monitoring

During operation of the proposed CBWTF, environmental monitoring of the following parameter shall be carried out:

1) Air quality
2) Water & waste water quality
3) Noise levels
4) Soil quality

To evaluate the effectiveness of environmental management programme, regular monitoring of important environmental parameters will be taken up to find out any deterioration in environmental quality. Monitoring of the proposed project will be regularly conducted. The schedule, duration & parameters to be monitored are given in **Table 6.1.**

Table 6-1: Monitoring Schedule of Environmental Parameters

Sr. No.	Particulars	Duration of Sampling	Important Monitoring Parameters
1	Air Pollution and Meteorology		
	Air Quality		
	A. Stack Emission		
		Once in a every three month	Respirable Particulate Matter (PM10),Fine particulate (PM2.5)Sulphur dioxide (SO2), Oxides of nitrogen (NOx), Hydro Cloric acid (HCl). Dioxin and Furon once in a two years
	B. Ambient Air	Online monitoring	Particulate Matter (PM10) & Particulate

Sr. No.	Particulars	Duration of Sampling	Important Monitoring Parameters
	Quality		Matter (PM2.5)
	-	Once in a Six month	Respirable Particulate Matter (PM10),Fine particulate (PM2.5)Sulphur dioxide (SO2), Oxides of nitrogen (NOx),
2.	Water Environment		
	A. Ground Water		
	-	Once in a season	pH, Colour, TDS, TSS,Conductivity, Turbidity, TOC, Sulphates,Chlorides, Color, Total Hardness (as CaCO3),Total Alkalinity (as CaCO3),TKL, Chlorides (as Cl), Nitrate, (as NO3), Fluoride, Lead (as Pb), Cadmium (as Cd), Copper (Cu), total Chromium (as Cr), Mercury (as Hg),Nickel (as Ni), Cyanide (as CN),Manganese (as Mn), Iron (as Fe), Zinc (as Zn), BOD, COD, and Pesticides (Organo Chlorine, Organo Nitrogen, Synthetic Pyrethrold, Carbamates)
	B. Surface Water		
	-	Once in a season	pH, Colour, TDS, TSS,Conductivity, Turbidity, TOC, Sulphates,Chlorides, Color, Total Hardness (as CaCO3),Total Alkalinity (as CaCO3),TKL, Chlorides (as Cl), Nitrate, (as NO3), Fluoride, Lead (as Pb), Cadmium (as Cd), Copper (Cu), total Chromium (as Cr), Mercury (as Hg),Nickel (as Ni), Cyanide (as CN),Manganese (as Mn), Iron (as Fe), Zinc (as Zn),BOD, COD, and Pesticides (Organo Chlorine, Organo Nitrogen, Synthetic Pyrethrold, Carbamates)

Sr. No.	Particulars	Duration of Sampling	Important Monitoring Parameters
3	Noise Environment		
	Noise	Once in a Six month	Noise level in dB(A)leq
4.	Soil Environment		
	Soil at project site	Once in six months at project site	Analysis of pH, TDS, Conductivity, TOC,Fluoride, Lead (as Pb), Cadmium (as Cd), Copper (Cu), Total Chromium (as Cr), Mercury (as Hg),Nickel (as Ni), Cyanide (as CN),Manganese (as Mn), Arsenic (as As), Zinc (as Zn), Poly Aromatic Hydrocarbon (as PAH)

7 ADDITIONAL STUDIES

7.1 Public Hearing

In compliance to provision of the EIA notification dated 14.9.2006, draft EIA has been submitted to Uttarakhand State Pollution Control to conduct Public hearing for this project.

7.2 Risk Assessment and Disaster Management Plan

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions). On the other hand, risk analysis deals with identification and computation of consequence and risks. Risk analysis follows an extensive hazard analysis. This requires a thorough knowledge of probability of failure, credible accident scenario, vulnerability of population to exposure etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies. It provides basis for preparation of site and off-site emergency plan and also to incorporate safety measures.

Biomedical Waste Treatment and allied activities within the premises of the Common Biomedical Waste Treatment Facility (CBWTF), are associated with several potential hazards to both the employees and the public. A worker in a CBWTF site should be able to work under conditions, which are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. This is possible only when there is adequate safety in CBWTF site.

As per Biomedical waste management rules, 2016 every occupier of a health care establishment (HCE) shall either set up requisite bio-medical waste treatment facilities on site or ensure requisite treatment of the bio-medical waste at an approved common treatment facility. No untreated bio-medical waste shall be kept stored beyond a period of 48 hours.

Following additional studies have been included in this report to support environment impact assessment and environment management plan for the sustainability of the natural environment.

- Risk assessment
- Disaster Management Plan
- On site and off site emergency action plan

7.2.1 Objective of the Study

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

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

7.2.2 Methodology of Risk Assessment

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

Risk = Severity of event (Hazard) x Exposure

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

- Provide the information required to identify major hazard installations;
- Carry out hazard assessment;
- Report to the authorities on the results of the hazard assessment;
- Set up an emergency plan;
- Take measures to improve plant safety.

7.2.3 Identification of Hazard

The first step in risk assessment is to identify the types of adverse health effects that can be caused by exposure to infectious waste and operation risk during incineration and autoclaving. Facility would be to collect and dispose infectious bio-medical waste through shredding, autoclaving and incineration. which has the potential to cause harm to humans, animals, or the environment, either by virtue of its intrinsic property or through interaction with other factors. The potential hazards associated with the facility are primarily classified into:

Biological Hazard:

a. Health hazard due to handling of Infectious waste
b. Injury from handling sharps, needles broken glassware, etc.

Accident Hazard:

a. During transportation of Biomedical Waste
b. During operation of Incinerator, autoclave, shredder

7.3 Biomedical Waste:

The waste produced by hospitals is known as 'biomedical waste'. This waste is different from all other waste, mainly because of its hazardous nature. Since this waste is directly generated from the human body and animals, it is the content more than the quantity which makes it dangerous and risky. Hospitals are institutions that form a part of the category of emergency services. They are frequented by people from every layer of the society. Despite technological advancement, and the progress made in terms of knowledge, there has been no reduction in the amount or form of waste produced by hospitals. Strict prohibition of reuse of medical equipment only adds to the problem. Naturally, this has led to an increase in the use of disposable medical supplies, causing an increase in the quantity of biomedical waste. The hazardous nature of biomedical waste came to the limelight in the 1980s and the 1990s. Till then, it was not considered a life-threatening issue. In the 1980s and 1990s, the exposure to HIV and Hepatitis B virus increased the awareness of biomedical waste. It also brought forth the potential risks involved in bio-medical waste. Not only is biomedical waste a risk to the society and the environment, but people who collect, segregate and dispose it are at potential risk from this waste too. Needles, blades and other sharp instruments that are not disposed of properly or not disinfected can infect them or harm them. Also, the high temperatures and toxic gases released during waste disposal pose a health hazard

to the workers. Surprisingly, 80% out of the total quantity of biomedical waste is non-hazardous. Only 15% is harmful or infectious. If biomedical waste is allowed to mix with municipal solid waste and dumped in the garbage bins meant for other waste, then the entire mass becomes infectious and can pose a potential risk to the nearby residents. Since this will be disposed of at landfills, the environment will also be harmed. If incinerators are not operated properly, environmental degradation is inevitable. Considering the hazardous nature of biomedical waste and the risks associated with it, the Ministry of Environment and Forests notified new the Biomedical Waste Management Rules in 2016 superseding earlier notifications. The BMW Rules, clearly define various terms including 'biomedical waste', 'occupier' and biomedical waste treatment facility. They cover important areas like treatment and disposal, segregation, packaging, transportation and storage of biomedical waste. They clearly state that the government of every state will establish a prescribed authority.

7.3.1 Effective Biomedical waste disposal at CBWTF can be ensured by:

- Training the hospital staff on safe biomedical waste handling practices
- Segregating and storing on a regular basis and not as and when needed.
- Making it mandatory for all healthcare facilities to register with the CBWTF for effective biomedical waste management and disposal.
- Ensuring that biomedical waste is not mixed with other waste as it damages the equipment used for its disposal.
- Transporting biomedical waste to the disposal plant during the night to avoid heavy traffic and crowded places.
- Monitoring hospitals and also CBWTF periodically (CPCB & PCB) to ensure proper biomedical waste handling and disposal.

Risk Management at CBWTF Segregation refers to the basic separation of different categories of waste generated at source and thereby reducing the risks as well as cost of handling and disposal. Segregation is the most crucial step in biomedical waste management. Effective segregation alone can ensure effective bio-medical waste management. The BMWs must be segregated in accordance to guidelines laid down under schedule 1 of BMW Rules, 2006.

7.3.2 How does segregation help?

- Segregation reduces the amount of waste needs special handling and treatment
- Effective segregation process prevents the mixture of medical waste like sharps with the general municipal waste.
- Prevents illegally reuse of certain components of medical waste like used syringes, needles and other plastics.
- Provides an opportunity for recycling certain components of medical waste like plastics after proper disinfection.
- Recycled plastic material can be used for non-food grade applications.
- Of the general waste, the biodegradable waste can be composted within the hospital premises and can be used for gardening purposes.
- Recycling is a good environmental practice, which can also double as a revenue generating activity.
- Reduces the cost of treatment and disposal (80 per cent of a hospital's waste is general waste, which does not require special treatment, provided it is not contaminated with other infectious waste) Proper labeling of bins The bins and bags should carry the biohazard symbol indicating the nature of waste to the patients and public. Label shall be non-washable and prominently visible.

Collection

The collection of biomedical waste involves use of different types of container from various sources of biomedical wastes like Operation Theatre, laboratory, wards, kitchen, corridor etc. The containers/ bins should be placed in such a way that 100 % collection is achieved. Sharps must always be kept in puncture-proof containers to avoid injuries and infection to the workers handling them. Storage once collection occurs then biomedical waste is stored in a proper place. Segregated wastes of different categories need to be collected in identifiable containers. The duration of storage should not exceed for 8- 10 hrs in big hospitals (more than 250 bedded) and 24 hrs in nursing homes. Each container may be clearly labeled to show the ward or room where it is kept. The reason for this labeling is that it may be necessary to trace the waste back to its source. Besides this, storage area should be marked with a caution sign.

Transportation

The waste should be transported for treatment either in trolleys or in covered wheelbarrow. Manual loading should be avoided as far as for as possible. The bags / Container containing

BMWs should be tied/ lidded before transportation. Before transporting the bag containing BMWs, it should be accompanied with a signed document by Nurse/ Doctor mentioning date, shift, quantity and destination. Special vehicles must be used so as to prevent access to, and direct contact with, the waste by the transportation operators, the scavengers and the public. The transport containers should be properly enclosed. The effects of traffic accidents should be considered in the design, and the driver must be trained in the procedures he must follow in case of an accidental spillage. It should also be possible to wash the interior of the containers thoroughly. Personnel safety devices the use of protective gears should be made mandatory for all the personnel handling waste.

Gloves:

Heavy-duty rubber gloves should be used for waste handling by the waste retrievers. This should be bright yellow in color. After handling the waste, the gloves should be washed twice. The gloves should be washed after every use with carbolic soap and a disinfectant. The size should fit the operator.

Aprons, gowns, suits or other apparels:

Apparel is worn to prevent contamination of clothing and protect skin. It could be made of cloth or impermeable material such as plastic. People working in incinerator chambers should have gowns or suits made of non-inflammable material.

Masks:

Various types of masks, goggles, and face shields are worn alone or in combination, to provide a protective barrier. It is mandatory for personnel working in the incinerator chamber to wear a mask covering both nose and mouth, preferably a gas mask with filters.

Boots:

Leg coverings, boots or shoe-covers provide greater protection to the skin when splashes or large quantities of infected waste have to be handled. The boots should be rubber-soled and anti-skid type. They should cover the leg up to the ankle.

Cleaning Devices

Brooms:

The broom shall be a minimum of 1.2 m long, such that the worker need not stoop to sweep. The diameter of the broom should be convenient to handle. The brush of the broom shall be soft or hard depending on the type of flooring.

Dustpans:

The dustpans should be used to collect the dust from the sweeping operations. They may be either of plastic or enameled metal. They should be free of ribs and should have smooth contours, to prevent dust from sticking to the surface. They should be washed with disinfectants and dried before every use.

Mops:

Mops with long handles must be used for swabbing the floor. They shall be of either the cloth or the rubber variety. The mop has to be replaced depending on the wear and tear. The mechanical-screw type of mop is convenient for squeezing out the water.

Vacuum cleaners:

Domestic vacuum cleaners or industrial vacuum cleaners can be used depending on the size of the rooms.

Storage Devices

Dustbins:

It is very important to assess the quantity of waste generated at each point. Dustbins should be of such capacity that they do not overflow between each cycle of waste collection. Dustbins should be cleaned after every cycle of clearance of waste with disinfectants. Dustbins can be lined with plastic bags, which are chlorine-free, and color coded as per the law. Handling devices Trolleys the use of trolleys will facilitate the removal of infectious waste at the source itself, instead of adding a new category of waste.

Wheelbarrows:

Wheelbarrows are used to transfer the waste from the point source to the collection centers. There are two types of wheelbarrow – covered and open. Wheelbarrows are made of steel and provided with two wheels and a handle. Care should be taken not to directly dump waste into it. Only packed waste (in plastic bags) should be carried. Care should also be taken not to allow liquid waste from spilling into the wheelbarrow, as it will corrode. These are ideal for transferring debris within the institution. Wheelbarrows also come in various sizes depending on the utility.

Chutes:

Chutes are vertical conduits provided for easy transportation of refuse vertically in case of institutions with more than two floors. Chutes should be fabricated from stainless steel. It should

have a self-closing lid. These chutes should be fumigated everyday with formaldehyde vapors. The contaminated linen (contaminated with blood and or other body fluids) from each floor should be bundled in soiled linen or in plastic bags before ejecting into the chute. Alternately, elevators with mechanical winches or electrical winches can be provided to bring down waste containers from each floor. Chutes are necessary to avoid horizontal transport of waste thereby minimizing the routing of the waste within the premises and hence reducing the risk of secondary contamination.

7.2 Occupational Health Hazards

The health hazards due to improper waste management can not only affect the occupants in institutions, but also spread in the vicinity of the institutions. Occupational health concerns exist for janitorial arid laundry workers, nurses, emergency medical personnel, and refuse workers. Injuries from sharps and exposure to harmful chemical waste and radioactive waste also cause health hazards to employees in institutions generating bio-medical waste. The problem of occupational health hazards due to bio-medical waste is not publicized as there is lack of information. Hence, the Bio-Medical Waste Management Rules 2016 prescribe a form to report such incidences in order to develop a database. There is plenty of scope for research in this field. Proper management of waste can solve the problem of occupational hazards to a large extent.

The health hazards due to improper bio medical waste management can affect:

- The occupants in institutions and spread in the vicinity of the institutions
- People happened to be in contact with the institution like laundry workers, nurses, emergency medical personnel, and refuse workers.
- Risks of infections outside hospital for waste handlers, scavengers and (eventually) the general public
- Risks associated with hazardous chemicals, drugs, being handled by persons handling wastes at all levels
- Injuries from sharps and exposure to harmful chemical waste and radioactive waste also cause health hazards to employees.

Management of bio medical waste for refuse workers:

Employees who handle medical waste are considered to have occupational exposure. In general, the employers require to develop exposure control plans, to adopt engineering controls and work

practices that minimize exposures, to provide hand washing facilities and personal protective equipment, to provide training to workers, to provide hepatitis B vaccines free of charge, to provide medical evaluation and follow-up to exposed workers, and to keep medical and training records.

- Employers are required to employ "engineering and workplace controls" wherever possible to minimize or eliminate employee exposure.
- Engineering controls either remove the hazard or isolate the worker from exposure. An example of an engineering control is the use of a ventilated cab on earth-moving equipment to protect workers from dust and aerosols.
- Employers are required to examine, maintain, and replace engineering controls on a regular basis to insure their effectiveness.
- Personal Protective Equipment Appropriate personal protective equipment must be used to reduce risk of worker exposure.
- Employers must make readily available at no cost to employees appropriate specialized clothing or equipment to protect against exposure to blood and other potentially infectious materials.
- Personal protective equipment must prevent such materials from passing through to an employee's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time that the equipment is in use.
- Personal protective equipment consists of, but is not limited to, gloves, face shields, masks, and eye protection, gowns, aprons, and similar items.
- Employers must ensure that appropriate personal protective equipment is used and used correctly.
- Employers must also see to it that personal protective equipment is properly cleaned, laundered, repaired, replaced, or disposed as needed, at no cost to the employee.

The employer must ensure that employees observe precautions for handling and using personal protective equipment, including:

- removal of garments penetrated by blood and other infectious material as soon as possible;
- placing contaminated protective equipment in designated areas or containers for storing, washing, decontaminating, or discarding each day or shift;
- Replacing gloves if torn, punctured, contaminated, or if their ability to function as a barrier is compromised;
- Utility gloves may be decontaminate for re-use if the integrity of the glove is not compromised. However, they must be discarded if they are cracked, peeling, torn, etc.;
- Wearing appropriate face and eye protection such as goggles, glasses with solid side shields or chin-length face shields when splashes, sprays, spatters, or droplets of infectious materials pose a hazard to the eyes, nose, or mouth.

Hand washing and Hygiene

- Employers must provide hand washing facilities that are readily accessible to all employees. When this is not feasible, they must provide antiseptic towelettes.
- Employers must ensure that employees wash their hands as soon as possible after removing gloves and other personal protective equipment, or after contact with potentially infectious material.

7.4 Disposal Methods for Medical Waste at Health Care Facilities

- The rules provide requirements for handling contaminated sharps, including a requirement that they be placed in closed, puncture-resistant, leak proof, color-coded (or biohazard-labeled) containers prior to disposal. If the container can leak, it must be placed in a second closed, leak proof container.
- Blood and other potentially infectious material (other than sharps) must be placed in leak proof, color-coded (or biohazard-labeled) container before it leaves the facility. If outside contamination occurs, or if the container is punctured, it must be placed in another leak proof, labeled or color-coded container.

- Disposal of medical wastes must be in accordance with all applicable federal, state, and local regulations.
- Training all persons with a potential for exposure must be provided with adequate training and information including general explanation of the modes of transmission, symptoms, epidemiology, warning signals relating to possible exposure, and procedures to follow if exposure occurs.
- Hepatitis B Vaccine Covered employers must make available, free of charge, and at a reasonable time and place, the hepatitis B vaccine and vaccination series to all employees who are at risk of occupational exposure.
- If an Exposure Incident Occurs Employees should immediately report exposure incidents. The employer is responsible for establishing the procedure for evaluating exposure incidents.

Recordkeeping

- The employer must keep medical records and records of training sessions. Medical records must be kept confidential (though an employee and his or her representative may see and copy his own record on request) and must be maintained for thirty (30) years after employment has ended.
- Training records, including the dates, content, names and qualifications of trainers, and names and job titles of trainees, must be kept for three (3) years.

Safe work practices to be followed by every worker in the bio medical facility:

- Each waste handling facility should have standard operating procedures (SOPs) for accepting, rejecting, and handling medical waste
- Follow your employer's SOPs and your supervisor's instructions about reporting and handling medical wastes.
- Be alert to potential hazards.
- Wear person protective equipment under circumstances in which you might be exposed. Boots should have steel toes and puncture-resistant soles.
- 6" lace-up boots provide added protection for the ankles.

- Gloves should be worn whenever the hands may come in contact with hazards; leather provides better protection than rubber against punctures.
- Arms and other skin surfaces should be covered whenever the skin might be exposed to infectious agents.
- Safety glasses and hard hats may also provide protection to the head and face from splashes.
- Special equipment, such as respirators, face shields, dust masks, boot covers, or impervious clothing may be necessary if a spill occurs, if splashing or splattering is expected, or if another unusual hazard arises.
- Cover all cuts, abrasions, and other areas of non-intact skin while on duty.
- Avoid physical contact with medical wastes, whether they are in red bags or sharps containers or not.
- If you are required to move these items-for example, to separate them for pickup-use a shovel or other implement.
- Never handle any wastes with your bare hands.
- Be aware of the possible presence of medical wastes when handling all wastes and when cleaning all machinery and equipment, and try to avoid contact.
- In particular, be aware that sharps can become stuck in the wheels and tracks of landfill vehicles, and can pose hazards to operators and maintenance workers.
- Where possible, use some implement or cleaning method other than your hands.
- If you do have to use your hands to clean or maintain equipment, make sure that you are wearing gloves that minimize the chance of being cut, and NEVER REACH WHERE YOU CAN'T SEE.
- Avoid handling personal items, like pens, combs, etc., while wearing gloves.
- Always wash your hands after removing your gloves, even if the gloves have not been cut or punctured.
- Always wash before eating, drinking, smoking, or putting anything in your mouth, and before leaving work.
- Change your clothes and boots immediately after work so that you do not contaminate family members.

- If you come in contact with infectious waste (for example, if you are splashed with blood or blood-containing bodily fluids), wash your hands and any exposed skin thoroughly in warm water and soap, or in waterless antiseptic cleaner, if soap and water are unavailable.
- Remove clothing, boots, and gloves that have been in contact with infectious waste as soon as possible, taking care to avoid contact with exposed skin surfaces. Use gloves to remove other items of clothing.
- The risk of disease from clothing soiled with medical waste is very low, but it should still be handled as little as possible. While wearing gloves, place it in a leak proof bag prior to cleaning. Soiled clothing should be handled with gloves and laundered according to manufacturer's instructions. Boots and leather goods may be brush-scrubbed with soap and hot water to remove contamination.

Report All Exposures Immediately

With proper preventative care, safe work practices, prompt reporting of exposures, and post-exposure medical attention and follow-up, there is little likelihood that medical waste will harm you on the job.

7.4 Disaster Management

Since times immemorial India has been highly prone to natural calamities.

Disasters are characterized as:

- They are disruptive to individuals and communities.
- They are not part of day to day experience and are outside normal life expectations.
- They are unpredictable in occurrence and effects can be of sudden onset.
- They require a response for which normal local resources may be inadequate.
- They have a wide range of effects and impacts on the human and physical environment.

Disaster Management Cycle

Three major functional areas were recognized as necessary components of a comprehensive approach; prevention, response and recovery. Without these areas, the key responsibilities of agencies include:

Planning: - The analysis of requirements and the development of strategies for resource utilization.

Preparedness: - The establishment of structures, development of systems and testing and evaluation by organizations of their capacity to perform their allotted roles

Co-ordination:- The bringing together of organizations and resources to ensure.

Objectives

Disaster Management Plan is a comprehensive plan, which optimally utilizes men, material and available resources to prevent loss to lives and minimizes loss to property. It ensures fastest approach for rescue and rehabilitation. Disaster Management Plan guides the entire machinery engaged in relief operation and induces courage amongst the community to face the eventuality boldly.

The key objectives of the Disaster Management Plan are:

- To improve the preparedness for disaster through risk assessment and vulnerability analysis.
- To evolve a suitable mitigation strategy so as to minimize the impact of disaster in terms of men and material loss.
- To give professional guidance to the relief machinery engaged in relief operations.
- To create awareness amongst the community to face the disaster in case of an eventuality.
- To involve the voluntary organizations & NGO's in awareness creation and in relief operations.
- To enable quick restoration of the public service system affected by the disaster.
- To prevent the spread of post-disaster epidemics.

Identification and Prioritization of Hazards

- Earthquake
- Terrorist Attack
- Fire
- Chemical Hazards.
- Flood
- Accidents (Road, Railways, Air, Building Collapse)
- Road Blockade

7.2.1 Disaster Management Strategy

Optimum strategy is to be followed in accordance with the comprehensive District Disaster Management Plan to combat the effects of the disaster and to minimize the loss of life and property. Different stakeholders from district administration, public, NGO sector, civil defense, interest groups are required to play a major role in disaster mitigation. Broadly it has been divided into three major strategies viz Pre-Disaster Phase, Impact Phase and Post Disaster Phase.

1. Pre Disaster Phase- Preparedness in "No Disaster Situation"

In the Pre Disaster Phase – prevention, Mitigation and Preparedness activities are undertaken. The key activities are:-

- Formation of the District Disaster Management Committee.
- Formulation of District Disaster Management Plan for running year.
- Risk Assessment and Vulnerability Analysis.
- Resource Inventory.
- Allocation of responsibilities to the individual actors/Groups/Institutions/Organizations.
- Training and capacity building etc.

2. Impact Phase- Emergency Relief Measures

This phase includes measures taken immediately after the disaster.

The key activities are:-

- Rescue operation/Evacuation by teams (already identified) and providing basic infrastructure and movement to rescue centers.

- Functioning of District Control Room (DCR) & other Sub Divisional/Block/Tehsil/Line Departmental Control Rooms.
- Coordination meeting with officials at District Control Room at each 12 hours interval to take stock of the situation.
- Management of Rescue Shelters
- Monitoring Disaster Management by ensuring a line of control through Police & Paramilitary forces, Civil Defense, Fire services, Civilians, PSUs, NGOs etc
- Administration of Relief

3. Post Disaster Phase- Damage Assessment and Long term relief.

All measures at this stage aim at speedy return of the affected areas to normalcy and to mitigate the long-term consequence of the disaster.

The key activities are:-

- Assessment & enumeration of damage.
- Developing a Reconstruction and Rehabilitation plan.
- Monitoring Relief Operation organized by outside agencies/ UN Agencies/ Red Cross/ NGOs/ PSUs/ other states etc through District Administration.
- Restoration of Communication- Roads, Railways, Electronic Communication etc.
- Maintenance of Law & Order.
- Provision of Medical facilities, Minimum sanitation, drinking water, free kitchen etc.
- Removal of debris and disposal of carcasses.
- Meeting officers of both District level and Field level in every 24 hours to take stock of the situation.
- Collection of Information and submission of daily situation report to Government through District Collector.
- Documentation of the entire event – Black & white/ Audio & Video.

In disaster situations, a quick rescue and relief mission is inevitable; however damage can be considerable minimized if adequate preparedness levels are achieved. Indeed, it has been noticed

in the past that as and when attention has been given to adequate preparedness measures, the loss to life and property has considerably reduced.

The team members & workers will be trained according to the identified natural disaster by an experienced training professional so that loss of lives and property is at its minimum at operational as well as construction phase.

7.3 Social Impact Assessment

The impacts of development projects occur in different forms. While significant benefits result for the society, the project area people may often bear the brunt of adverse impacts. This can happen, for example, when they are forced to relocate to make way for such interventions. There is now a growing concern over the fate of the displaced people. This has given rise to the need to understand beforehand the implications of adverse project impacts so that mitigation plans could be put in place in advance.

In the current project of biomedical waste plant the major benefit to the society will be in the form of proper disposal of infectious bio medical waste i.e. in public of city beautiful will be safe against the harmful infectious waste that can cause serious epidemic to the society.

Along with the safe guarding against the threat of bio medical waste various employment opportunities will be generated from the implementation of the project like plant operators, drivers, direct and in direct employment opportunities.

8 PROJECT BENEFITS

8.1 Physical Infrastructure

The beneficial impact of proposed project on the civic amenities will be substantial after the commencement of project activities. The basic requirement of the community needs will be strengthened by extending healthcare to the community, building/strengthening of existing roads in the area which will help in uplifting the living standards of local communities.

8.2 Employment Opportunities

The project will create opportunities for employment. Skilled and unskilled manpower will be needed. Secondary jobs are also bound to be generated to provide day-to-day needs and services to the work force. This will also temporarily increase the demand for essential daily utilities in the local market. Due to this proposed project, relevant to this project other job opportunities may generate which will improve the socio economic status of the area. Neighboring villagers of the project will get its benefits more by giving preference to them in relation to direct employment associated with the various project activities. Construction and operation phase of the proposed project will involve a certain number of laborers, contractors and construction workers. There is a possibility that local people will be engaged for this purpose. The operation phase will involve a number of skilled and unskilled workers.

The total 20 manpower will be required for this project. There is a possibility that local people will be engaged for this purpose to the extent possible and hence improve the existing employment scenario of the region. First preference will give to localize people for all kind of required employment in the project and especially for unskilled employment the company will take localize people.

8.3 Socio-Economic Development Activities

An obligation, beyond that required by the law and economics, for a firm to pursue long term goals that are good for society the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as that of the local community and society at large. The basic amenities viz. roads, transportation, electricity, proper sanitation, medical facilities etc will be developed as far

as possible; and overall the proposed project will change/improve the socio-economic conditions of the area.

8.4 Corporate Social Responsibility (CSR)

The Company shall continue to have among its objectives the promotion and growth of the national economy through increased productivity, effective utilization of material, manpower resources and continued application of modern scientific and managerial techniques, in keeping with the national aspiration; and the company shall continue to be mindful of its social and moral responsibilities to consumers, employees, shareholders, society and the local community. The company shall earmarks ~ 2% of total project cost for social development and welfare measures in the surrounding villages like education, health facility, infrastructure facilities, etc, this fund shall be utilized over a period of 5 years.

9 ENVIRONMENT COST & BENEFIT ANALYSIS

9.1 Environmental Cost and Benefit Analysis

The upcoming project will generate direct and indirect employment opportunities for the local people. The project will create employment including skilled as well as semi-skilled staff directly or indirectly. The secondary employment in the form of providing services to the employed manpower will also be developed in the neighboring villages.

The organization will also provide the helping hand in the development of the nearby villages by arranging regular medical checkup camp for the employees.

The project will generate a fair amount of direct, indirect and induced employment in the study region. The local economy will receive a boost due to employee spending and services generated by applicant.

10 ENVIRONMENTAL MANAGEMENT PLAN

10.1 Introduction

An environmental management plan (EMP) has been prepared for the proposed facility, to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of this project on various environmental parameters. This plan will also facilitate monitoring of environmental parameters. Preparation of EMP is required for the formulation, implementation and monitoring of environmental protection measure. EMP includes schemes for proper and scientific treatment and disposal mechanism for air, liquid and solid hazardous pollutants. Apart from this, green belt development, safety aspect of the workers, noise control, fire protection etc. are also included in it. The various components of the EMP are outlined in subsequent sections.

10.2 Purpose of Environmental Management Plan

Various purposes of the environmental management plan are:

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

10.3 Details of Environmental Management Plan

10.4 During Construction Phase

Air Environment

Construction phase will be for a short period and hence the impacts will also be for a short and temporary period. During construction activities, mainly emission of dust and gases from

movement of vehicles and construction activity is expected. However, following measures will be taken to reduce / contain such emissions:

- Water will be sprinkled on loose top soil to prevent re-suspension of dust into ambient air due to movement of vehicles etc.
- Separate civil construction material storage yard will be created within the site and it will be enclosed.
- Transport vehicles and construction equipments / machineries will be properly maintained to reduce air emissions.
- Vehicles and equipments will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations
- Exhaust vent of D.G. set will be kept at proper height to ensure quick dispersal of gaseous emissions
- All construction workers will be provided appropriate PPEs like dust mask, ear plug,

10.5 Water Environment

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

10.6 Solid Waste

Main solid waste generation during construction phase will be construction debris like rubble, brick bats, steel scrap, wooden scrap, sand, gravel etc. However, these materials are inert in nature and will not result into leaching of any substance or constituent. These materials will be properly sorted and will be used within premises for filling of low lying areas. Wooden scrap, steel scrap will be given to scrap dealers. On completion of civil work, all debris etc. will be completely removed from the site to avoid any incompatibility with future use.

The end products of incineration ie ash shall be disposed through authorized TSDF .The autoclaved plastic waste shall sent to registered recycler strictly according to laws and under expert supervision.

10.7 Noise Environment

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

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

10.8 Land Environment

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

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

ECOLOGY

Proposed facility will not involve any trees cutting exercise so, there will be no major impact on ecology is anticipated.

10.9 Socio-Economic

As there will be no temporary housing colony for construction workers, neither socio - economic impact due to the same is envisaged. Overall socio - economic effect of construction phase will be positive due to direct and indirect employment opportunity for the local livings. Local people will be employed for construction work to the maximum extent possible.

10.10 During Operational Phase

Air Environment

The air pollutants in the plant may be classified broadly into particulate matter like dust, fumes etc. and gases like Sulphur dioxide, Nitrogen oxide and Hydrogen chloride etc. The measure to control the air pollution will ensure the ambient air quality standards as laid down by Central Pollution Control Board for industrial areas. The system proposed for air pollution control will provide acceptable environment condition in the working areas and abate air pollution in the surrounding area of the plant. The technological equipment and processes have been selected with the above objectives. Depending on quality of emission from different sources, suitable air pollution control system will be provided. The chimney height will be as per CPCB norms to ensure ground level concentration of different pollutants within permissible limit. Once the hopper lid and enclosure door is closed, shredder operates as a closed system. This also avoids any dust generation etc.

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

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

- Idle running of vehicles will be minimized during material loading / unloading operations.

10.10.1 Control and Monitoring of Secondary Fugitive Emissions

Fugitive emissions from the proposed facility would be insignificant as there will be air pollution due to activities like handling of biomedical waste, transfer points of biomedical waste and movement of vehicles. These operations generate a few quantity of dust. Good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc., would considerably reduce fugitive dust. For effective prevention and control of fugitive emissions has implemented following:

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

10.10.2 Water Environment

Total water requirement for the proposed facility would be 11 KLD which will be sourced from ground water. Water conservation measures shall be taken to optimize the fresh water requirement. Moreover, record of water consumption for different usages shall be maintained.

10.10.3 Noise Environment

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

- Noise generating sources and their platforms will be maintained properly to minimize noise vibrations generated by them.
- Personnel working near the noisy machines in different plant locations, will be provided with well designed ear muffs / plugs (effective noise reduction 10-15 dBA)
- Green belt will be developed to act as a noise barrier.

- Noise barriers / shields in the form of walls, beams will be provided around the units wherever found feasible.
- Training to personnel will be imparted to generate awareness about effects of noise and usage of protective gears.

10.10.4 Land Environment

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

10.10.5 Solid Waste

Solid wastes shall be generated in the form of Incineration ash from Incinerator, ETP sludge from ETP process and used oil from the plant utility. Following steps shall be taken;

- Incineration ash from incinerator will be disposed to the nearest authorized TSDF site.
- Incineration ash and ETP sludge will be sent to authorized TSDF site
- Used oil will be properly stored and it will be re-used as lubricants in the machineries within the premises only.
- Record of solid waste generation and disposal shall be maintained.
- All Necessary precaution shall be taken during handling, loading and unloading of solid waste.

Socio - Economic Environment

Management Plan for the socio-economic aspects can be prepared by managing all the other aspects like Air pollution, water pollution, Noise pollution, etc. When all pollutions will be managed properly and socio economic status of the area will be improved through CSR activities then only socio-economic environment will be managed properly**.**

General Considerations

For good housekeeping of the proposed facility, following measures will be planned:

- Maintaining cleanliness of roads to prevent accumulation of dust and waste material.
- Inculcating positive attitude among employees for good house-keeping.

- Maintaining hygienic conditions in canteens, near drinking water source and toilets.

Recycle/reuse/recover: Wastewater generated from the proposed facility shall be reutilized in the gardening and green belt development after giving suitable treatment. The Incineration ash shall be disposed to nearest authorized TSDF site.

Energy conservation: Reduction in usage of traditional light bulbs with Light Emitted Diode (ELDs) means reduction in usage energy consumption. Usage of Solar energy at different locations in the plant like parking light, roadside light etc. will be explored.

10.11 Environmental Management Cell

In addition to preparing an EMP, it is also necessary to have a permanent organizational set up to ensure its effective implementation. Hence, proposed facility will create a team consisting of officers from various departments to co-ordinate the activities concerned with management for reporting of noncompliance / violations of environmental norms and implementation of the environmental control measures. This team will undertake the activity of monitoring the stack emissions, ambient air quality, noise level, etc. either departmentally or by appointing external agencies wherever necessary. Regular monitoring of environmental parameters will be carried-out to find out any deterioration in environmental quality and also to take corrective steps, if required, through respective internal departments. The Environmental Management Cell will also collect data about health of workers, green belt development etc. EMC will have qualified employees for hazardous operations and monitoring of the occupational injury to works as well as impact on the worker.

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

- Checking of safety related operating conditions.
- Visual inspection of safety equipments.
- Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed.

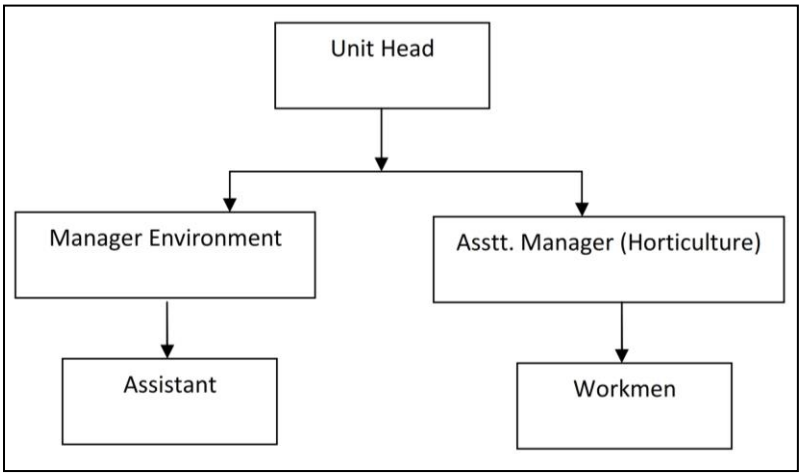
Other responsibilities of the cell will include followings:

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

The mange mental manpower will comprise of the following:

The Company already has the technocrats and specializes people in the respective field of management of Common Bio Medical Waste Treatment Facility are as below:

Table 10-1: Details of Organizational Setup



Similarly, beside of the above, the Company is already having the existing operational staff and would deploy other technical and qualified manpower i.e. engineers and Supervisors for the operation & monitoring of the plant sections during the up-gradation and installation of the incinerator plant at Common Bio Medical Waste Treatment Facility.

10.12 Budgetary Provisions for EMP

Adequate budgetary provisions have been made by project proponent Management for execution of environmental management plans. The details of capital and recurring (per annum) budget earmarked for pollution control / monitoring equipment; operation and maintenance of pollution control facilities, for greenbelt development and maintenance.

Table 10-2: Cost for EMP during construction phase

Sr. No.	Particulars	Approx. Capital Cost (Lac)	Approx. Recurring Cost (Lac)	Items Covered
1.	Wind breaking curtains	2.0	0.5	Wind breaking walls at vulnerable areas
2.	Sprinklers for suppression of dust	2.0	0.5	Sprinklers, Pipeline
	Total	**4.0**	**1.0**	

Table 10-3: Cost for EMP during Operational phase

Sr. No.	Particulars	Approx. Capital Cost (Lac)	Approx. Recurring Cost (Lac)
1.	APCD (Ventury Scrubber)/quenching	18.00	5.0
2.	Environmental Pollution Abatement (STP cum ETP, Solid waste, HW etc.)	10.00	8.0
3.	Green Belt	3.00	1.0
4.	Environmental monitoring	2.0	1.0
5.	Occupational Health & Safety	5.0	3.0
	Total	**38.0**	**18.0**

11 SUMMARY AND CONCLUSION

11.1 Project Details

Medical care is vital for our life and health, but the waste generated from medical activities presents a real problem. Improper management of waste generated in health care facilities causes a direct health impact on the community, health care workers, and the environment. Indiscriminate disposal of biomedical waste (BMW) or hospital waste and exposure to such waste pose serious threats to the environment and human health; hence, such waste requires specific treatment and management prior to its final disposal. Awareness about the need of BMW management among the health care personnel is of paramount importance.

11.2 Project Requirement

The general break down of the requirement of the project is as follows.

Table 11-1: Project Requirements

1.	Total area of the Plant	0.8320Ha
2.	Capital Cost	Rs. 2.0 Crores
3.	Location	Khasra No. 724, Kunja (Bahadarpur), Bhagwanpur Haridwar
4.	Coordinates of the Site	Latitude: 29°52'31.49"N Longitude: 77°47'6.12"E
5.	Water Requirement/Source	
	Water Requirement (KLD)	Total – 11.00 KLD Fresh – 7.10 KLD Recycled – 3.90 KLD
	Source of water	Ground water

11.2.1 Waste Water Generation

Entire waste water generated from the facility will be treated through proposed ETP and treated water will be use development of internal green belt development purposed to follow zero discharge concept.

11.2.2 Air Emission & Air Pollution Control Measures

The air emission from the proposed facility would be SPM, SO_2, NO_X and HCl from Incinerator stack. To control air emission Venturi scrubber as a pollution control system with adequate stack height will be installed.

11.2.3 Solid Waste Generation & Disposal

Incineration ash, used oil and ETP sludge will be generated from proposed facility. Used oil will be re-used as a lubricant in the machineries within the premises only. Incineration ash and ETP sludge will be sent to authorize land filling site.

11.2.4 Baseline Environment

The baseline environmental quality of Air, water, soil, noise, socioeconomic status and ecology has been assessed in the period of 1st March, 2023 to 31st May, 2023 in a study area of 10 km radial distance from the project site

The ambient air quality monitoring was carried at 8 locations to monitor PM10, PM2.5, SO2 and NOx concentration, which are found well below the NAAQS of CPCB.

Total 8 nos. of ground, one surface water samples & one drinking water sample were collected from the study area. The result of the all water sample collected shows that the water quality of the area is good. Values of the parameters found within the permissible limit of Indian standards/specifications for Drinking water.

Background noise levels were measured at 8 locations. Noise levels found within norms at all the location. Land use within 10 km radius of the study area has been determined with the help of satellite imagery, and broadly consists of settlements, Industrial land, Tank/River, land with scrub, land without scrub, area and predominant land use.

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

The total population of the study area was as per 109704 as per census 2011. All the villages were having almost all the infrastructure facilities like, educational, drinking, sanitation, health, etc.

11.2.5 Environmental Impacts during Construction Phase

During construction phase there will be minor reversible impact envisage on the air, water and noise environment.

11.2.6 Environmental Impact during Operation Phase & Mitigation Measures

Due to this proposed project, there will be minor increment in the air pollution due to the air emissions like, PM, SO2, NOx and HCl from the stake attached to incinerator facility. Entire waste water generated from the process will be reused for the internal green belt development to follow Zero discharge concept. Solid waste generated in the form of incineration ash, used oil and ETP sludge will be disposed as per guideline to reduce impact on soil environment.

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

11.3 Corporate Social Responsibility (CSR)

Rs. 4 Lakhs which is 2% of total project cost has been allotted for social development and welfare measures like education, health facility, infrastructure facilities, etc, this fund shall be utilized over a period of 5 years.

11.4 Environmental Management Plan

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

Company has committed to implement all the pollution control measures to protect the surrounding environment. The project can definitely improve the regional, state and national environment and reduce health hazards. Projects like this will certainly improve the living standard of local people. The implementation of this project will definitely improve the physical and social infrastructure of the surrounding area.

12 DISCLOSURE OF CONSULTANTS

12.1 Introduction

The Final EIA/EMP Report for Environmental Clearance for Proposed Common Biomedical Waste Treatment Facility by M/s ECON Waste Solution, Khasra No. 724, Kunja (Bahadarpur), Bhagwanpur Haridwar, Uttarakhand has been prepared by Environment Management Division of M/s India Glycols Limited, Kashipur. The company has a team of dedicated and well-experienced professional including Engineers, Technologists and Environmentalists with in-depth knowledge and profound experience in the field of Environment Management. The company was accredited by NABET, QCI for the EIA consultancy services & the details are as follows:

Table 12-1: Brief details of the Consultants

Name of the Consultant	Environment Management Division of M/s India Glycols Limited, Kashipur
Address	A- 1 Industrial Area, Bazpur Road, Kashipur, Uttarakhand. Email: chakreshpathak84@gmail.com Tel: 9855405264
Accreditation Date	06/18/2021
Accreditation Validity	19/07/2024
Certificate Number	NABET/EIA/2124/IA0078

Name of the Laboratory	Econ Laboratory & Consultant Pvt Ltd.
Laboratory Address	Vill.: Khabarwala, P.O.: Jaintanwala, Near, Garhi Cantt, Dehradun
E-mail	uk@econlaboratory.com
Website	http://www.econlaboratory.com/

12.2 EIA Team

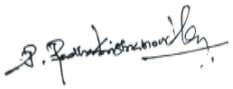
The EIA Team engaged in the preparation of EIA report consist of professionals with multidisciplinary skills and relevant experience required for undertaking the projects. This EIA/EMP report has been prepared under the guidance of the following Coordinator & Functional Area Experts.

EIA Coordinator: Muzaffar Ahmed
Signature:

Date: - 30-07-2023

Functional Area Experts Engaged:

S. No.	Functional Area	Name of the experts	Involvement Period and Task	Signature
1.	SHW	Mr. Mayur Sharma (Team Member)	Inventory of Municipal Solid Waste, suggesting treatment options viz; organic waste convertor technology.	
2.	SC	Mr. Deepak Sati	Proposing the soil management practices during construction and operation phase of project.	
3.	AP	Dr. Chakresh Pathak	Collected the meteorological data and AAQ data through secondary sources and suggested air pollution control station around Core and Buffer Zone.	
4.	NV	Dr. Chakresh Pathak (Noise Only) & Mr. Sarang Khati	Collected the ambient noise data through secondary sources and suggested Noise pollution control measures during both phases of project	 

5.	AQ	Mr. Sarang Khati	Prediction of air pollution and its management.	
6.	WP	Mr. Jitendra K Jawla	Estimating water requirements based on population, suggesting wastewater treatment/disposal schemes and developed the plan for rain water harvesting	
7.	LU	Mr. Radhakrishnamoorthy Periyaswamy	Collection of secondary data as well as drafting of report with respect to Geological Aspect.	
8.	Geo		Collection of secondary data as well as drafting of report with respect to Geological Aspect.	
9.	HG		Collection of secondary data as well as drafting of report with respect to Hydro-geological condition in around the study.	
10.	EB	Mr. Deepak Sati	Generating the ground truthing ecological assessment with secondary data from different departments, earmarking rare and endangered species.	
11.	SE	Mr. Rajveer Singh Yadav & Dr. Aditya Gautam	Collected the primary and Secondary data, livestock inventory/ impacts, identified village-wise amenities/ needs.	
12.	RH	Dr. Rajeev Kumar Sharma	Identification of hazards materials, Fire accidents from Diesel storage and lethality damages, DMP and EPP for onsite &	

			offsite were provided	

Team Members:

Sr. No	Name of the Team Members	EC/FAE/TM	Functional Area
1.	Mr. Rahul Kumar	TM	SE
2.	Mr. Mayur Sharma	TM	EB & SHW
3.	Mr. Shashikant Sharma	TM	EB

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION/AUTHORIZED PERSON

I, Sudhir Agarwal, hereby, confirm that the above-mentioned experts prepared the final EIA Report for the proposed Proposed Common Biomedical waste Treatment Facility by **M/s ECON Waste Solution at Khasra No. 724, Village – Kunja (Bahadarpur), Thesil Bhagwanpur, District – Haridwar, State – Uttarakhand.**

I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

Date: 30.07.2023

Signature:

Name: Sudhir Agarwal

Designation: Executive Director

Name of the EIA Consultant Organization: Environment Management Division of M/s India Glycols Limited, Kashipur

The accreditation certificate by NABET, QCI for M/s India Glycols Limited and Notification of MoEF&CC recognized laboratory engaged are presented below in Figure 12.1 & 12.2 respectively.

Quality Council of India

National Accreditation Board for Education & Training

Certificate of Accreditation

Environmental Management Division of India Glycols Ltd.

A- 1 Industrial Area, Bazpur Road, Kashipur, Udham Singh Nagar, Uttarakhand-244713

Accredited as Category – 'B' organization under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations: Version 3 for preparing EIA/EMP reports in the following sectors:

Sl. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals -opencast mining only	1	1 (a) (i)	B
2.	Thermal power plants	4	1 (d)	B
3.	Synthetic organic chemicals industry	21	5 (f)	A
4.	Distilleries	22	5 (g)	A
5.	Bio-medical waste treatment facilities	32A	7 (da)	B
6.	Building and construction projects	38	8 (a)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IA AC Minutes dated June 1, 2021 and supplementary assessment minutes dated August 13, 2021 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1979 dated September 24, 2021. The accreditation needs to be renewed before the expiry date by Environmental Management Division of India Glycols Ltd., Kashipur following due process of assessment.

Sr. Director, NABET	*Certificate No.*	*Valid till*
Dated: September 24, 2021	**NABET/EIA/2124/IA0078**	**July 19, 2024**

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.