2026

Environmental Impact Assessment Report

Incineration Plant by THQ Hospital Kot Chutta

Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan

Submitted By:

Mr. Arshad Hussain

Prepared By:

Enviro Stewards Co. (Pvt) Ltd

akmal@envirostewardspk.com 0301-1199600 www.envirostewardspk.com

Address: 4-C Sultan Town, Raiwind Road, Lahore

DISCLAIMER

The data was based on the originality of the project site shown by the project proponent/ stakeholders/ promoters, provided maps, verbal communications and all other related documents. The authenticity of supra-mentioned relies with the proponent/ stakeholders/ promoters, not with the environmental consultant. The EIA / IEE report can't be negotiated in any court of law.

ENVIRO STEWARDS CO.(PVT) LTD.

Representative: EIA & IEE Team

Table of Contents

EXECUTIVE SUMMARY

The executive summary is an outline of the key outcomes in EIA (Environmental Impact Assessment). The proponent intends to install the incineration plant by the name of **Incineration plant by THQ Hospital Kot Chutta** within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan over an area of 1800 SFT. The total estimated cost of this project is 21 million PKR. The purpose of this project is to incinerate hospital waste including laboratory waste in order to avoid disease and unhealthy environment. The method of managing hospital waste using incineration is a popular and recommended technology. The consultant company for this project is Enviro Stewards Company (Pvt.) Limited.

According to projects categorization for environmental assessment studies, the proposed project falls under **Schedule II** (list of projects requiring an EIA), **Category G** (Waste Storage and Disposal) & **Sub-sector 2** (Waste Incinerators & autoclaves) as per Review of IEE and EIA Regulations 2022 made under section 12 of Punjab Environment Protection Act 1997 (Amended 2012), under which the Environmental Impact Assessment (EIA) for the proposed project is mandatory for getting Environmental Approval.

This project falls into the category of EIA (Environmental Impact Assessment) which presents a detailed account of the foreseeable environmental and social impacts likely to emanate from the extension of the proposed project. The EIA (Environment Impact Assessment) report is prepared to assess the potential impacts likely to occur from the project's entire life cycle on the local environmental quality and communities. The assessment produced a list of impacts and mitigation measures for the project to undertake to minimize the detrimental impacts on the environment and communities nearby.

Title and location of the project

The proponent intends the installation of **Incineration plant by THQ Hospital Kot Chutta** within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan over an area of 1800 SFT**.**

Name of the Proponent

The detail of the proponent is given below:

Table 1 Proponent detail

Details of the Proponent

Proponent name	Mr. Arshad Hussain S/O Ch Mumtaz Ahmad
Address	House No. 150, Block E, DG Khan

Detail of the Consultant

The details of the consultant preparing report are given below:

Table 2 Consultants Detail

Details of the Consultant	
Company name	Enviro Stewards Company (Private) Limited
Address	4-C Sultan Town, Raiwind Road, Lahore.
Contact	0301-1199600

The consultant team preparing the EIA report is given in annexure.

Brief outline of the Project

Table 3 Brief outline of the project

Title of the Project	Incineration plant by THQ Hospital Kot Chutta
Proponent	Mr. Arshad Hussain S/O Ch Mumtaz Ahmad
Total Area	1800 SFT
Location of the project	Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan.
GPS Location	29.87865N, 70.64548E (Google map is attached to A3 size with file)
Cost of the project	21 million
Capacity of the project	50 Kg/hour
Fuel	LPG/ Natural Gas
Waste type	Hospital Waste
Current status of the project	Open Land
Manpower	Construction: 8-10 Persons
	Operation: 4-6 Persons

The project involves the installation, commissioning, and operation of a 50 Kg/hour capacity incinerator at the Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan. The contractor will oversee the installation and trial run of the incinerator, while trained THQ Kot Chutta personnel will manage its day-to-day operations.

The facility layout includes several dedicated spaces such as an operator room (12’ x 12’), a 5-foot-wide lobby, an incinerator room (26’6’’ x 15’), a washroom (4’ x 5’), a yellow waste room (12’ x 12’), and a main hall (45’9’’ x 28’6’’), with access through a 10-foot main gate.

The incinerator is capable of operating on both liquefied petroleum gas (LPG) and natural gas. It is specifically designed to handle biomedical infectious waste, laboratory waste, and sharps. The primary combustion chamber reaches temperatures up to 1200°C to ensure complete breakdown of hazardous compounds. It is lined with high-quality refractory bricks and features a curved hot hearth floor. Combustion is supported by regulated air input and modulated gas burners, which are equipped with flame viewports and monitored by thermocouples for temperature control.

The secondary chamber further processes residual combustible solids from the primary chamber. Its design ensures extended residence time of flue gases in an oxygen-rich and turbulent environment to achieve complete combustion. A gas burner in this chamber maintains the high temperature, and air delivery is automatically adjusted to maintain an optimal oxygen level of around 6%, aided by sensors located at the chamber outlet. Like the primary chamber, it is internally lined with insulating refractory materials to enhance thermal efficiency.

A third chamber, known as the air dilution chamber, mixes the incinerator’s exhaust gases with fresh air to reduce concentrations of pollutants such as carbon monoxide, nitrogen oxides, and volatile organic compounds. Additionally, the system includes an integrated wet scrubber that treats exhaust gases using water to neutralize harmful pollutants like sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter before atmospheric release. Overall, the incineration system is designed for high combustion efficiency and environmental safety. The detailed design and technical specification is given in the chapter of project description.

Environmental Impact and Recommended Mitigation Measures:

Major Impacts

The summary of the major impacts is given below:

During Construction Phase:

- Dust emissions from excavation, leveling, and movement of construction vehicles and material.
- Elevated noise levels from the operation of construction machinery and equipment.
- Disturbance of topsoil and potential erosion due to digging, leveling, and heavy machinery use.
- Construction debris such as packaging materials, metal scrap, concrete, and unused materials.
- Risk of contamination from accidental spillage of fuels, lubricants, and construction chemicals.
- Potential injuries to workers due to equipment operation, working at heights, and manual handling.
- Increased movement of construction vehicles may affect local traffic and access routes.
- Temporary change in site appearance due to machinery, stockpiles, and active work zones.
- Potential inconvenience to nearby residents from noise, dust, and vehicle movement.

During Operational Phase:

- Release of gases such as NOx, SOx, CO, dioxins, and particulate matter from incineration process.
- Production of ash requiring safe handling, storage, and disposal to avoid secondary contamination.
- Possible odor from hospital waste including laboratory waste storage and handling if not managed properly.
- Potential exposure to infectious waste and emissions may lead to disease transmission and respiratory issues if proper safety measures are not followed.
- Noise from incinerator equipment, exhaust fans, and material handling during operation.
- Wastewater from wet scrubber treatment system required proper handling.

- Risks associated with exposure to waste, high temperatures, and emissions without proper PPE.
- Slight alteration in landscape due to operational infrastructure like chimneys and machinery.
- Health & safety issue of nearby community because of the operational of incinerator.
- Emissions, noise, and spillage risk from vehicles transporting hospital waste including laboratory waste to the facility.

Mitigation Measures

The possible mitigation measures of potential environmental impacts resulting during construction and operational phase of the project are given below:

During Construction Phase:

- Provide Personal Protective Equipment (PPE) such as helmets, gloves, safety boots, masks, and hearing protection to all site workers, and enforce its proper use.
- Conduct health and safety orientation sessions and periodic safety training, especially for new workers and those involved in hazardous tasks.
- Install safety signage and maintain restricted access zones to prevent unauthorized entry into restricted areas.
- Maintain a well-stocked first aid facility with trained first responders available at all times on-site.
- Ensure safe storage and handling of construction chemicals, fuels, and lubricants to prevent accidental exposure or spillage.
- Implement a sanitation and hygiene plan including clean drinking water, toilets, and proper waste disposal for workers to minimize disease risks.

During Operational Phase:

- Enforce the use of PPE for incinerator operators and waste handlers, including respirators, face shields, and protective clothing to reduce exposure to pathogens and toxic emissions.
- Ensure all hospital waste including laboratory waste is segregated, handled, and loaded into the incinerator in a controlled, enclosed environment to prevent cross-contamination.
- Keep waste transport containers sealed and leak-proof, and clean them regularly to prevent pathogen spread.

- Operate and maintain air pollution control equipment, like wet scrubbers and air dilution chambers, to minimize the release of harmful emissions and to protect the nearby community from its harmful emissions.
- Properly manage and handle the wastewater comes from wet scrubber and ash as residual left after incineration. There will be the STP which include MBR technique for waste water treatment.
- Ash pit will be constructed near the incinerator to dispose of the residual ash.
- Schedule routine health checkups and vaccination drives for operational staff working in high-risk areas.
- Conduct regular training sessions on safe waste handling procedures, emergency response, spill management, and personal hygiene practices.

Environmental Management Plan and Proposed Monitoring

The purpose of the Environmental Mitigation Plan (EMP) is to minimize the potential environmental impacts due to the project. The EMP reflects the commitment of Incineration plant by THQ Hospital Kot Chutta at Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan to safeguard the environment as well as the surrounding population.

The EMP provides a delivery mechanism to address the adverse environmental impacts, to enhance the project's benefits and to introduce standards of best practices to be adopted for all phases of the project. The total Environmental Monitoring Cost is approximately 528,000 PKR. The detailed Environmental Management Plan and Environmental Monitoring Plan is provided in EMMP chapter.

Conclusion and Recommendations

On the basis of the overall impact assessment, more specifically, the nature and magnitude of the residual environmental impacts identified during the present EIA, it is concluded that Incineration plant by THQ Hospital Kot Chutta Project within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan is likely to cause environmental impacts during its constructional and operational phase. However, these impacts can be mitigated, providing that the proposed project activities are carried out, as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

The project will positively contribute to the reduction of infectious diseases spreading among the community, giving a platform for the proper destruction of infectious waste. There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

1 INTRODUCTION

1.1 Background

Waste management is a critical environmental concern worldwide, particularly for hazardous and hospital waste including laboratory waste. Incineration is a widely used thermal treatment technology for reducing waste volume and neutralizing harmful substances. In Pakistan, improper disposal of medical and hazardous waste poses severe environmental and public health risks. To address this issue, incineration plants are established to ensure safe and efficient waste disposal, adhering to national and international regulations.

1.2 Purpose of the Report

This report has been prepared to conform to the requirements of the Punjab Environmental Protection Act, 1997 (Amended 2012), which states that:

"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an Initial Environmental Examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof."

The proponent feels its social, moral, and legal obligation to protect the environment. It is in this context that the company initiated the process of gaining Environmental Approval from the Punjab EPA. According to the direction, as detailed in the preceding para under "Introduction" this EIA (Environmental Impact Assessment) is being submitted for issuance of the said Environmental Approval in compliance with the Punjab Environmental Protection Act -1997 (Amended 2012) Section 12. The proponent affirms that environmental management order will prevail both during construction and regular operation in accordance with the Punjab Environment Quality Standards (PEQS).

The EIA (Environmental Impact Assessment) report considers socio economic, physical, and environmental, land use, forestry, crops, water bodies, biodiversity (flora and fauna), heritage, and other relevant aspects associated with the project itself and the area around the project. The report also describes mitigation measures that will be adopted to undo environmental impacts on any segment of the environment, i.e., human health and environmental health around the project site both during installation and normal operation of the project. The report provides relevant information, as required under the officially approved format, to help the decision makers before issuing the desired environmental approval.

1.3 Incineration

Incineration is the process of controlled combustion of waste materials at high temperatures, typically between **850°C and 1200°C**, to convert organic substances into ash, flue gases, and heat. This method is particularly effective for destroying hazardous and infectious waste, preventing the spread of diseases and environmental contamination.

1.4 Incineration Plant

An **incineration plant** is a facility designed for the controlled burning of waste materials. It consists of multiple components, including:

- Waste Feeding System **–** Receives and segregates waste for controlled incineration.
- Combustion Chamber **–** Burns waste at high temperatures to ensure complete decomposition.
- Flue Gas Treatment System – Filters and neutralizes emissions to comply with environmental regulations.
- Ash Handling System – Collects and disposes of residual ash safely.
  Bottom Ash (MWBA): Bottom ash is the coarse, non-combustible residue that remains at the bottom of the incinerator's combustion chamber after the waste has been burned.
  Fly Ash (MWFA): Fly ash is the fine, powdery ash that is carried with the exhaust gases produced during combustion.
- Energy Recovery Unit (Optional) **–** Captures heat energy for electricity generation or district heating.

1.5 Purpose of the Incineration Plant

The establishment of an incineration plant serves several environmental and public health objectives, including:

- **Safe Disposal of Hazardous Waste**
  Eliminating infectious, pharmaceutical, and pathological waste.
- **Reduction in Waste Volume**
  Minimizing the space required for landfill disposal.
- **Emission Control**
  Treating gases before release to prevent air pollution.
- **Disease Prevention**
  Destroying pathogens and harmful substances in hospital waste including laboratory waste .

- **Resource Recovery (Optional)**
  Utilizing heat for energy production where feasible.

1.6 Screening of the project

According to projects categorization for environmental assessment studies, the proposed project falls under **Schedule II** (list of projects requiring an EIA), **Category G** (Waste Storage and Disposal) & **Sub-sector 2 (**Waste Incinerators & autoclaves) as per Review of IEE and EIA Regulations 2022*)* made under section 12 of Punjab Environment Protection Act 1997 (Amended 2012) under which the Environmental Impact Assessment (EIA) for the proposed project is mandatory for getting Environmental Approval.

1.7 Scoping of the project

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping exercise includes the following indispensable tasks.

1.7.1 Spatial and temporal boundaries of the project:

The project site is located at Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan. The project site occupies 1800 SFT.

The Installation of the Incinerator will be completed in approximately 3-4 weeks, and the impacts of the construction phase will be very short term.

Similarly, the magnitude of impacts will also be low in nature due to the construction phase only requiring small machinery. The spatial and temporal boundary during the operational phase of the project will be long term as the project is to destroy hazard & non-hazards waste.

The scope of EIA of Incineration plant by THQ Hospital Kot Chutta is as follows:

- The identification and assessment of all major and minor impacts during pre-construction, construction and operational phases
- Identification of all significant impacts that may require detailed assessment
- Propose mitigation measures to minimize, eliminate or compensate the potential adverse impacts that may arise during pre-construction, construction, and operational phases of the project.
- Public consultation with all the stakeholders of the proposed project

- Preparation of Environmental Management Plan
- Conclusions and recommendations

Preparation of an Environmental Report for submission to Punjab Environmental Protection Agency.

1.8 Identification of the project and proponent

Table 4 Detail of proponent and project

Details of the Proponent & Project	
Proponent name	Mr. Arshad Hussain S/O Ch Mumtaz Ahmad
Proponent designation	Proponent
Address of the proponent	House No. 150, Block E, DG Khan
Project title	Incineration plant by THQ Hospital Kot Chutta
Location of the project	Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan.
Purpose of the project	The purpose of the proposed project is to incinerate hospital waste including laboratory waste etc.
Type of waste	Hospital Waste
Incinerator Capacity	50 Kg/hour

1.9 Consultant Details

The proponent has engaged M/s Enviro stewards Company (Pvt.) Limited to conduct the EIA study of a foresaid project in accordance with guidelines issued by EPA. For this purpose, M/s Enviro stewards Company (Pvt.) Limited has engaged a group of professionals which comprises of environmental specialists, environmental engineers, and chemical engineers. The details of the consultants are given below:

Table 5 Consultant detail

Details of the Consultant	
Company name	Enviro Stewards Company (Private) Limited
Address	4-C Sultan Town, Raiwind Road, Lahore.
Contact No.	0301-1199600

1.10 Nature, Size & Location of the project

The proponent intends to construct a facility for the management of hospital waste including laboratory waste by "Incineration plant by THQ Hospital Kot Chutta" at Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan over an area of 1800 SFT. The coordinates of the project site are **29.87865N, 70.64548E.**

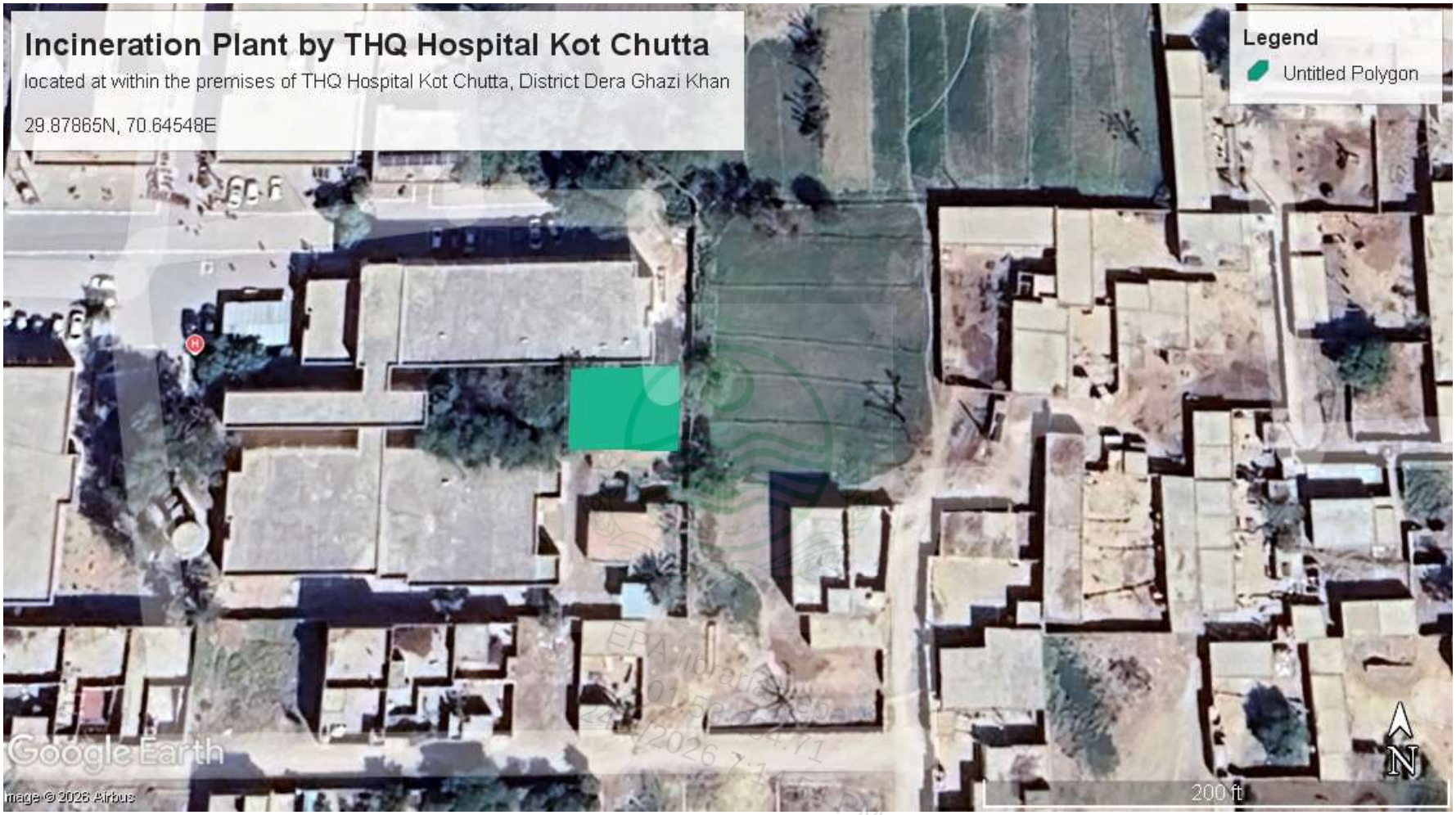


Figure 1 Map of the project site

1.11 Organization of the EIA Report

This report has been structured in the following manner:

Executive Summary

Overall description of the Environmental Impact Assessment (EIA) Report of the proposed project.

Chapter 1: Introduction

Provides an overall introduction to the project.

Chapter 2: Policy, Legislation, Legal & Administrative Framework

Describes the regulatory framework of Punjab on the environment and its implications for the project.

Chapter 3: Project Alternatives

Details the potential alternatives that were considered during the design phase.

Chapter 4: Project Description

Provides the description of the proposed project, its layout plan and associated activities, project process details and utility requirements.

Chapter 5: Description of the Environment

Provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the physical, ecological, and socio-economic resources land of the project area and surroundings.

Chapter 6: Impact Analysis and Mitigation Measures

Details the potential environmental and social impacts of the proposed project on the different features of the micro and macro-environment.

Chapter 7: Environmental Management & Monitoring Plan (EMMP)

Explains the mitigation measures proposed for the project in order to minimize the impacts to acceptable limits. It also describes the implementation of mitigation measures on the ground and monitoring of environmental parameters against likely environmental impacts.

Chapter 8: Stakeholder Consultation

Describes details of discussions held with the stakeholders.

Chapter 9: Conclusion & Recommendations

Summarizes the report and presents its conclusions.

Annexure: Containing supporting information.

1.12 Summary of Methodologies and Activities to Conduct EIA

Table 6 Summary of methodologies and activities

Objectives		Activities
• To gain a comprehensive understanding of the planned activities. • To gather equipment-specific details and specifications. • To collect information on alternatives and best construction practices. • To establish the foundation for impact identification and evaluation. • To define baseline conditions for various parameters. • To comprehend and characterize the nature and extent of potential impacts. • To serve as the foundation for developing a mitigation plan. • To consolidate all relevant information into a single document. • To prepare and submit the final report.	Review of proposed alternatives ↓ Information on baseline Conditions ↓ Impact Assessment ↓ EIA Report	• Meetings and discussions • Collection of baseline data • Review of secondary data • Public consultation with the community and stakeholders. • Analysis of data • Identification of impacts • Evaluation of impacts • Preparation of Environmental Management Plan • Compilation and finalization of the report • Feedback. • Approval of EIA Report

2 POLICY, LEGISLATION, LEGAL & ADMINISTRATIVE FRAMEWORK

2.1 General Overview

This section deals with the current policy as well as legal and administrative framework related to carrying out EIA (Environmental Impact Assessment) of various projects. Several laws exist in Pakistan, containing several clauses concerning protection of the environment. Like other Projects, this project is also required to go through an Environmental Assessment for getting a NOC under Section 12 of the Punjab Environmental Protection Act – 1997 (Amended 2012).

According to environmental laws of the country development projects must undergo the process of Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) to predict and mitigate the impacts of the development at an early stage.

2.2 Screening/Category of the project

According to projects categorization for environmental assessment studies, the proposed project falls under Schedule II (list of projects requiring an EIA), Category G (Waste Storage and Disposal) & Sub-sector 2 (Waste Incinerators & autoclaves) as per Review of IEE and EIA Regulations 2022 made under section 12 of Punjab Environment Protection Act 1997 (Amended 2012), under which the Environmental Impact Assessment (EIA) for the proposed project is mandatory for getting Environmental Approval. Details of the process description are given in Chapter 05 under the heading process description.

2.3 Existing Regulation and Framework

This EIA study has been carried out in the light of the policy guidelines for the preparation of IEE/EIA Reports under the procedure and practices formulated by the Provincial Environmental Protection Agency (EPA).

2.4 Relevant Legal / Institutional Framework

The applicable laws for the environmental study of the project are briefly given below. The proponent of the project will abide by the applicable laws and regulations.

2.4.1 National Conservation Strategy, 1992

On March 1, 1992, the Cabinet of Pakistan approved the National Conservation Strategy. It describes the stark reality of the country's deteriorating resource base and its implications for what is still largely a natural resource-based economy. It sets forth the beginnings of a plan to integrate environmental concerns into virtually every aspect of Pakistani economic life. The

strategy has three overriding objectives: conservation of natural resources, sustainable development, and improved efficiency in the use and management of resources.

2.4.2 PEPO 1983, PEPA 1997 (Amended 2012)

In 1983, the Government of Pakistan issued an Environmental Protection Ordinance (EPO), which was replaced by the Pakistan Environmental Protection Act (PEPA) 1997, through an Act of Parliament. Now the PEPA 1997 has been replaced by Punjab Environmental Protection Act 1997 (Amended 2012) on 18th April 2012.

Under Sec. 8 of Environment Protection Ordinance (EPO) 1983, it was necessary to carry out EIA/IEE for all development projects, but there were no EIA/IEE regulations under that ordinance.

Under section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012) it is mandatory to take an Environmental Approval Environmental Protection Agency for commencement of any construction of project.

2.4.3 National Environmental Policy 2005

The Government of Pakistan (GOP) has notified National Environmental Policy 2005, for different projects/aspects in which guidelines/priorities have been given to undertake the projects having significant environmental impacts.

2.4.4 Review of EIA and IEE Regulations 2022

The GOP has issued Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2022, to review the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Reports.

2.4.5 Guidelines for the Preparation and Review of Environmental Reports, 1997

The GOP has also framed guidelines for the preparation and review of IEE/EIA of projects in various developmental sectors.

2.4.6 Punjab Environmental Quality Standards (PEQS)

According to Punjab Environmental Protection Act, 1997 (Amended 2012), Punjab Environmental Quality Standards (PEQS) were established for municipal and industrial effluents and air emissions.

2.4.7 Guidelines for Sensitive and Critical Areas

GOP issued Guidelines for Sensitive and Critical Areas in October 1997. The objective of the guideline is to provide guidance to project proponents and other stakeholders in the environmental assessment process, so that the projects are planned and sited in a way that protects the values of sensitive and critical areas.

2.4.8 Policy and procedures for the Filing, Review and Approval of Environmental Assessments, November-1997

Environmental Assessment is the Primary means of managing the approval of new development proposals in Pakistan. Environmental Assessment allows for the systematic examination of proposals, clear procedures which provide for the interests of relevant Government Departments and other stakeholders to carefully consider.

2.4.9 Guidelines for Public Consultation, Pakistan Environmental Protection Agency October 1997

This guideline is part of a package of regulations and guidelines which include:

- Punjab Environmental Protection Act, 1997 (Amended 2012)
- Policy and Procedures for filing, review, and approval of environmental assessments
- Guidelines for the preparation and review of Environmental Reports
- Guidelines for sensitive and critical areas
- Punjab Environmental Quality Standards (PEQS)

2.4.10 Punjab Wildlife Protection Act, 1974

This act was framed in 1974 by the province Punjab and is about of protection and conservation of Wildlife.

2.4.11 Forest Act, 1927

This act was filmed in 1927. The Forest Act, 1927 is still the basic charter for the forest departments in Pakistan. This law empowers provincial governments to manage forest areas.

2.4.12 Explosive Act, 1884

This act deals with explosives in prohibiting either absolutely or subject to conditions, the manufacture, possession, or importation of any explosive which is so dangerous in character that, in the opinion of the appropriate Government, it is expedient for public safety to issue the notification.

2.4.13 Punjab Local Government Ordinance, 2022

Schedules 4 and 8 of this Ordinance pertain to environmental pollution. Under the Ordinance, the local councils are authorized to restrict projects causing pollution to air, water, or land. They may also initiate schemes for improving the environment.

2.4.14 Pakistan Penal Code, 1860

This defines the penalties for violations concerning pollution of air, water bodies and land. Sections 268 to 291 are about offences affecting public health. The offences relating to public Health safety and environment are as under.

Sec 268: Public Nuisance

Sec 269: Negligent act likely to spread infection of disease dangerous to life.

Sec 270: Malignant act likely to spread infection of disease dangerous to life.

Sec 278: Making atmosphere noxious to health.

Sec 284: Negligent conduct with respect to poisonous substance.

Sec 290: Punishment for public nuisance in cases not otherwise provided for.

Sec 291: Continuance of nuisance after injunction to discontinue.

2.4.15 Punjab Land Use Rules 2009

In January 2009 the Punjab Government notified "Punjab Land Use Rules 2009" for the clarification of Lahore Master Plan. In these rules permissible land use according to area type is defined.

2.4.16 Antiquities Act 1975

The law relates to protection of Antiquities, monuments, National &International heritage. Compliance with this Act is mandatory for the Installation of Generators. Under section 22 of

the Act no development plan or scheme or new construction can be done within distance of 200ft from the boundary of the monuments/ National Heritage. There is no historical Site or monuments in the proximity of the project.

2.4.17 Solid Waste Management Rules 2005

The Solid Waste Management Department, CDGF, has notified these rules for proper waste management.

2.4.18 Labor Law

The labor laws apply on child labor and measuring instruments.

2.4.19 Safety & Civil Defense Laws

The civil defense laws provide details about safety, fire protection and civil defense.

2.4.20 Guidelines for Critical and Sensitive Area

These guidelines have been prepared under section 12 of Punjab Environmental Protection Act 1997 (Amended 2012) for protection and safety of critical and sensitive localities.

3 PROJECT ALTERNATIVES

Alternatives are recommended and examined to determine the best method of achieving project objectives, while minimizing environmental impacts. Alternatives are explored to determine the most effective method for achieving project objectives while minimizing environmental impacts. In an Environmental Impact Assessment (EIA), evaluating alternatives helps identify practicable strategies that can eliminate or reduce negative environmental effects.

This section examines the project alternatives considered for the proposed site. A thorough analysis ensures that the most suitable management and technology options are selected, balancing economic, environmental, and health & safety considerations.

3.1 No Project Option:

If we consider no project option, then we will lose all positive impacts associated with the project; like compliance of rules, infection control, reduction in the spread of Hepatitis B and C and the adjoining areas, loss of potential employment and business opportunity. Above all, there will not be appropriate disposal of hospital waste, which would proliferate the infectious diseases associated with the improper disposal of hospital waste. The "No Project Option" does not appear reasonable considering the above facts. However, the expected negative environmental impacts can be minimized by adopting appropriate mitigation measures.

3.2 Build as Proposed:

The aim of the project is to install the incinerator within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan. The incinerator will be installed within the premises of the THQ Kot Chutta because the infectious hospital waste including laboratory waste must be disposed of as soon as possible of its generation. Therefore, build as proposed is the best option. However, the negative impacts due to the project construction and operation can be mitigated, minimized, controlled, or eliminated if the proposed mitigation measures, as suggested in the EIA report, are effectively implemented.

3.3 Site Alternatives

The chosen location for the establishment of proposed project, named as Incineration plant by THQ Hospital Kot Chutta, matches perfectly with the requirement as the land is open land and within the hospital premises.

The site for the proposed project is suitable, making it easy and accessible to destroy infectious waste within 24 hours without being proliferated during transportation, resulting in less spread of infections and savings on transportation.

3.4 Technology Alternatives

Various technologies can be used for the treatment of hospital waste including: Incineration, Autoclaving, Microwaving, Deep Burial

These methods aim to ensure safe and effective disposal while minimizing environmental and health risks. Incineration is widely practiced worldwide for treating infectious waste. However, other alternatives, such as autoclaving, microwaving, and deep burial, can also be evaluated to determine the most suitable option. A comparative analysis of these technologies is provided below:

3.4.1 Incineration

Incineration is a high-temperature combustion process that effectively reduces infectious and hazardous waste to ash and gases. This method requires fuel and oxygen for complete combustion, and in some cases, the waste itself provides sufficient energy for burning. Incineration is particularly effective for treating hospital waste including laboratory waste . It significantly reduces the volume of waste, ensuring safe disposal while preventing the spread of infections.

Table 7 Pros & Cons of Incinerator

Advantages:	Disadvantages:
• Effective for treating almost all types of waste. • Reduces waste volume significantly. • Destroys infectious agents, ensuring complete disinfection. • Generates energy in the form of heat or power. • Controls emissions using pollution control devices such as filters and scrubbers. • Reduces environmental contamination compared to open burning.	• High capital, operational, and maintenance costs. • Requires skilled personnel for operation and maintenance. • Emits pollutants such as dioxins, heavy metals, and acid gases if pollution control devices are not installed. • Requires continuous waste supply to maintain combustion efficiency. • Needs high temperatures

3.4.2 Steam Autoclaving

Steam autoclaving is a widely used non-incineration method for treating hospital waste including laboratory waste . It utilizes pressurized steam and heat to decontaminate waste, destroying microorganisms and pathogens. Autoclaving is typically used in hospitals for sterilizing instruments and can also be applied for hospital waste including laboratory waste treatment.

Table 8 Pros & Limitations of Steam Autoclaving

Advantages:	Limitations
• Effective for most types of hospital waste including laboratory waste . • Produces fewer emissions compared to incineration. • Lower capital and operational costs. • Easier to operate and maintain. • Waste can be safely landfilled after treatment.	• Cannot treat pathological, chemotherapy, or radioactive waste. • May produce offensive odors. • Waste may still require shredding or further treatment before disposal. • Requires proper waste segregation to ensure treatment efficiency

3.4.3 Microwave Treatment

Microwave technology uses shredding, steam, and electromagnetic radiation to disinfect waste. This method ensures uniform heating of the waste, effectively destroying pathogens without generating harmful combustion by-products.

Table 9 Pros & Limitations of Microwave

Advantages:	Limitations
• No toxic air emissions, reducing environmental impact. • No need for additional pollution control devices. • Reduces risk of injuries from needles and sharp waste. • Automated operation, reducing manual handling.	• Not suitable for industrial, chemical, or radioactive waste. • Requires shredding before treatment, increasing operational steps. • Not a co-generation process like incineration

3.4.4 Deep Burial

Deep burial involves the disposal of infectious waste in specially designated burial pits. The waste is covered with soil or lime to prevent contamination and scavenging. This method is generally used in areas where incineration and other treatment technologies are not feasible.

Table 10 Pros & Limitations of Deep burial

Advantages:	Limitations
• Simple and cost-effective disposal method. • Provides long-term isolation of hazardous waste. • Reduces environmental contamination when properly managed.	• Risk of groundwater contamination if not properly sited. • Requires dedicated land, which may not be available in urban areas. • Waste remains in the environment for an extended period. • Regulatory restrictions on burial sites may limit its use.

3.4.5 Conclusion

After the evaluation of the benefits and drawbacks of all the alternatives explained above, also on the basis of many local factors, the final choice is incineration. Incineration is the best choice for treating hazardous & non-hazardous waste for the following reasons:

- High efficiency in volume reduction and disinfection.
- Capability to handle almost all types of waste.
- Regulatory approval for incineration under Waste Management Guidelines.
- Occupational health and safety benefits compared to other methods.
- Availability of space for plant installation at the waste generation site.
- Cost-effectiveness in areas where landfilling is not feasible.

3.5 Environmental Alternative

The unit site is located in an area which is away from any biodiversity including forestry, wildlife, migratory birds, flora and fauna, fishery. There is no cultural or any other heritage in the project area. There is no environmental sensitivity in the project area. These factors are also strongly supportive of the proposed project site. After completion of construction, proper landscaping will be done.

3.6 Economic Alternative

The design of the incinerator is economically efficient. Tree plantation will be done that will reduce the temperature of the area and act as noise barrier. There will be maximum use of day light and also LED lights will be installed to minimize electricity consumption. Job opportunities for the local person as well as for the skilled person. The economy rate of the project site will also increase. The cumulative effect of this type of project with proper SOPs would result in improved waste management and improved environmental conditions.

4 PROJECT DISCRIPTION

4.1 Overview

The proponent intends to install incineration plant within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan over an area of 1800 SFT. This is necessitated by the increased demand for proper waste disposal and the desire for maintenance of a clean environment. The plant has been designed to install environment friendly incinerator at the said location. The Incinerator capacity to incinerate the hospital waste would be 50 Kg/hour.

4.2 Type & Category of the project

The proposed project is Incineration plant by THQ Hospital Kot Chutta which falls under **Schedule II** (list of projects requiring an EIA), **Category G** (Waste Storage and Disposal) & **Sub-sector 2** (Waste Incinerators & autoclaves) as per Review of IEE and EIA Regulations 2022 made under section 12 of Punjab Environment Protection Act 1997 (Amended 2012).

4.3 Objective of the project

The objectives of the aforesaid project are given below:

- To reduce the infectious hospital waste including laboratory waste
- Properly manage the waste to improve the environmental health
- To reduce the volume of hospital waste including laboratory waste , minimizing storage
- To promote cleaner practices and complete combustion of waste
- Safer management of Hospital Waste within the hospital premises

4.4 Project location & site layout

The project site is located at within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan , which is accessed by the Jinnah Road. The Google map of the project site is given below in Figure 2.

The coordinates of the project site are **29.87865N, 70.64548E.**

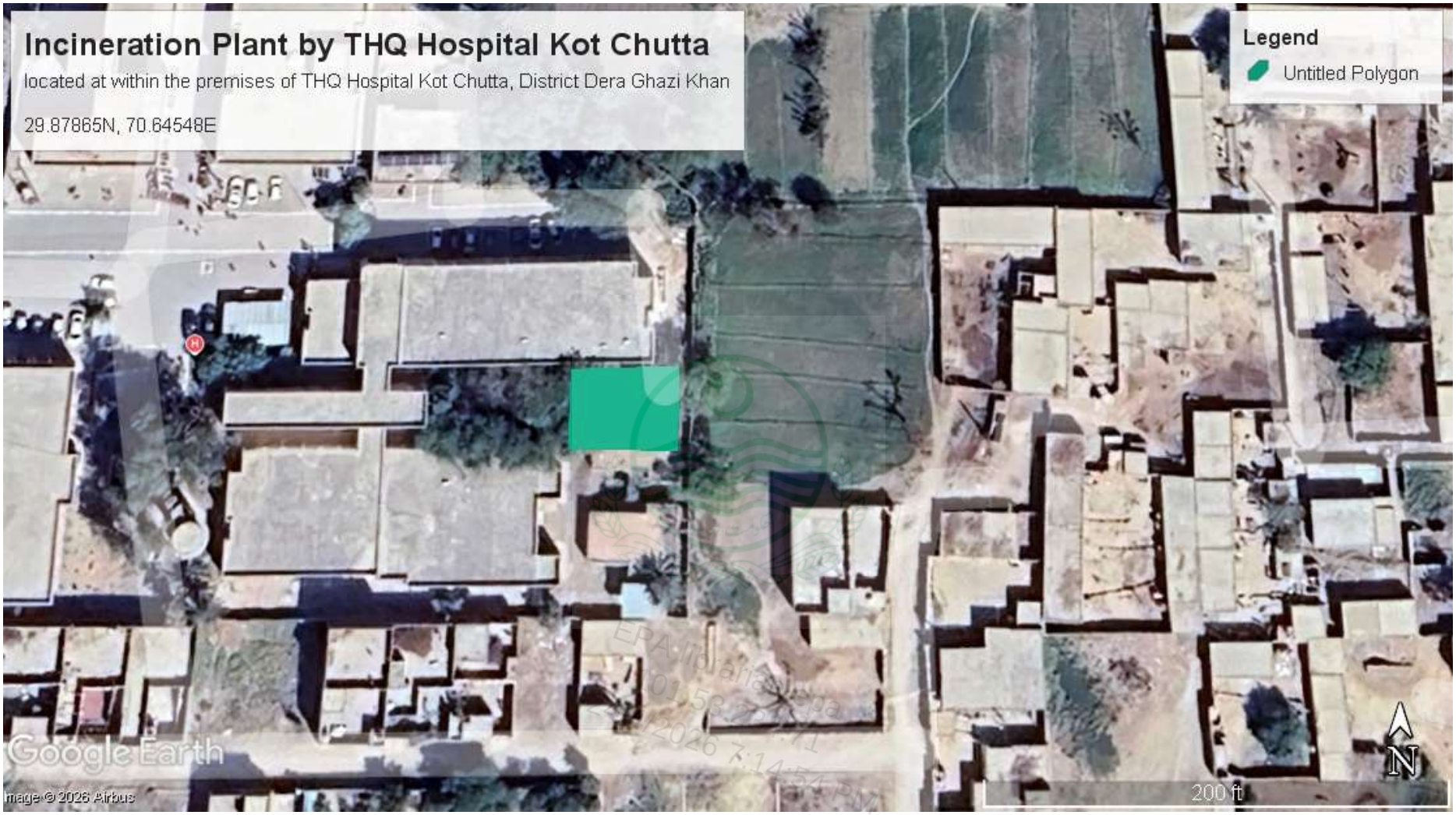
4.5 Vegetation features of the site

The project site has no vegetation cover; however, there are various species of trees surrounding the project side which will not be cut during construction. In fact it will act as

buffer and THQ Kot Chutta is also actively working on enhancing its environment through more plantation activities. No tree will be cut due to the project as the site for the incinerator will be on the vacant land.

4.6 Land use of the site

The land selected for the project is currently open land and there is no activity going on.


Incineration Plant by THQ Hospital Kot Chutta
located at within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan
29.87865N, 70.64548E
Legend
Untitled Polygon
Google Earth
Image © 2026 Airbus
200 ft
N

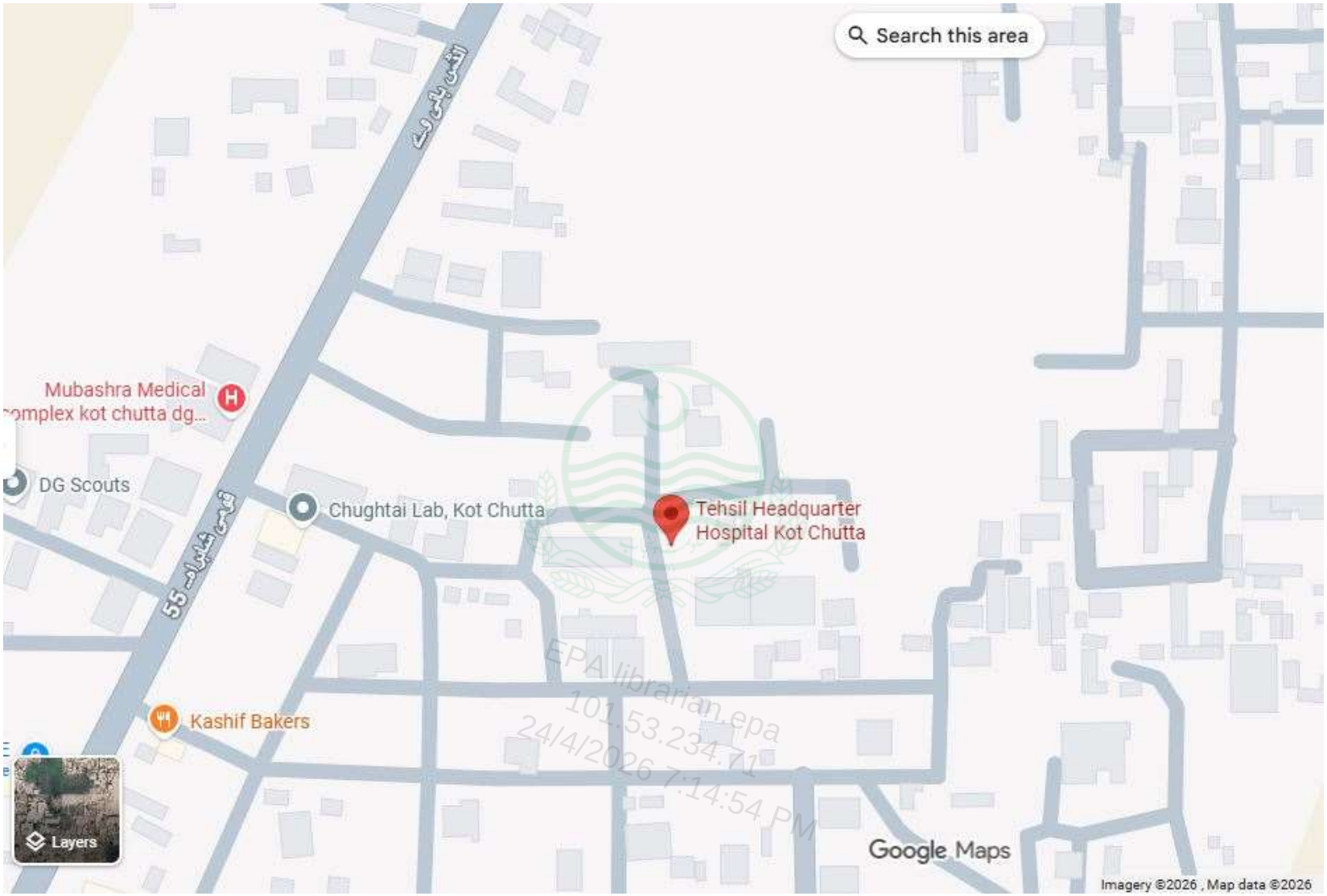


Figure 2 Project Site

4.7 Description of the project

The project consists of the installation, commissioning, and operation of a 50 Kg/hour incinerator. The contractor will install and test run the incinerator; however, the operation of the incinerator will be carried out by the trained operating staff of THQ Kot Chutta.

There will be an operator room (12' x 12'), lobby 5' wide and incinerator room (26'6''x 15'), washroom (4' x 5'), yellow waste room (12'x12'), a hall of (45'9'' x 28'6'') along with 10' main gate.

4.7.1 Incinerator:

The technical specification of the incinerator has been provided hereunder:

Incinerator Model: (MEI 50)

Fuel Options: The incinerator can operate on Liquefied petroleum gas (LPG) and Natural Gas.
Type of waste: Hospital Waste (Medical Waste)

The **primary chamber** is designed to burn infectious wastes at high temperatures. The primary chamber consists of a gas burner which is used to provide ignition and sustains combustion. Waste loading will take place at the highest temperature of 1200ºC to favour complete combustion and breakdown of hazardous compounds. The infectious waste will burn and convert into ash during a 24-hour period, after which the burned ash will be further treated in the secondary chamber. Only with this arrangement can a high-capacity burn process happen. The movement of waste throughout the machine removes any potential cold spots, agitates the waste and allowing for immensely high combustion efficiency.

The primary chamber will be lined throughout with fully insulating refractory high-quality brick materials. The floor of the incinerator curved hot hearth arrangement falling away from a high-level insulated charging door. The pyrolytic combustion process would be assisted by the introduction of combustion air at a controlled, regulated rate; combustion air would be distributed across the load and primary chamber. The burners would be configured to fire on natural gas with LPG as a reserve system and would have a fully modulating temperature control action. Each burner will have a visual window to view the burner flame, and temperatures will be monitored with temperature thermocouples.

The **secondary chamber** is used to incinerate the combustible solids generated from the primary chamber at high temperatures. The secondary chamber is designed in such a way that

the residence time of the flue gases is extended to ensure thorough combustion. A gas burner is also provided in the secondary chamber to maintain a high temperature.

Having a similar rectangular construction to that of the primary chamber with the hot hearth connecting the two chambers. The secondary after chamber would have an integrated combustion air delivery would be modulated via an automatic servo to allow controlled levels to be introduced to maintain an oxygen level of around 6%. The air control would be interfaced with monitoring equipment located at the chamber outlet.

The secondary chamber would be internally lined with fully insulating refractory materials in order to minimize the heat losses and maximize the heat recovery potential. It would be configured to ensure thorough destruction and treatment of the combustion process flue gas by ensuring that it is subjected to sufficient temperature in the oxygen-rich and turbulent environment.

The third chamber is **air dilution chamber** which It works by mixing exhaust gases from the incinerator with fresh air to lower the concentration of pollutants (like carbon monoxide, nitrogen oxides, or volatile organic compounds) to acceptable levels.

The incineration system is equipped with an integrated **wet scrubber** designed to treat the exhaust gases before their release into the atmosphere. This wet scrubber uses water to effectively capture and neutralize harmful pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter from the gas stream.

Technical Specification of Wet Scrubber System

Table 11 Technical specification of wet scrubber

Technical Specification	
Air Flow	Up to 70,000 CFM
Efficiency	Up to 99.99 % capturing efficiency
MOC	Mild Steel/ SS 304/ SS 316/ FRP/ PP/ PVC
Finish	Powder coated / Matt finish
Power	3 Phase

4.8 Technical specification & design of the incinerator:

The manufacturer of incinerator are M/s MED Engineering. The technical information of the incinerator is given below:

ANNEXURE A - SCOPE OF WORK (SOW)

As a turn-key project the incinerators shall be installed in complete respect with full functionality at 04 identified medical facilities at district level. This shall comprise of a hospital grade Incinerators including Wet Scrubber along with allied accessories and operational training for proper disposal of infectious solid hospital waste materials. The units shall be of high performance with smokeless emissions for ensuring clean environment.

Sr. #	Description	Qty
Lot-1	**Medical Waste Incinerator** **Model: MEI-50** **Burning Capacity: 50Kg/Hr** **Manufacturer:** **M/s Med Engineering** **ISO:9001:2015 & ISO:13485:2016 Certified**	**04**

Product Features

The Incinerator represents a well-proven means of disposing of a wide variety of wastes quickly and efficiently without the emission of visible fly ash odor or smoke.

The unit is package type and controlled air type with four chambers (primary chamber, Secondary chamber, air dilution chamber & wet scrubber) hearth chamber, control panel, and chimney, specially designed to enhance the retention time. The retention time of the unit is 02 seconds at minimum 1200-1400°C within the combustion zone. Free standing type unit only requires a flat concrete base / foundation.

The chambers of the incinerator are equipped with temperature / time controlled ignition burners. The burners include a set of blower fan, initiation transformer, initiation sensor, flame sensor & micro controller card. The feeding chamber burner is set to turn on / off automatically while maintaining the temperature between 850 -1000 °C. The secondary chamber burner is set to turn on automatically when the temperature gets below 1200-1400°C.

Main components

Primary / Combustion Chamber
Secondary / Post combustion Chamber
Air Dilution Chamber
Wet Scrubber
Control Panel
ID Fan
Chimney

Primary Chamber

Dimensions of Primary Chamber 4 x 5 x 5 feet (W x L x H)
Temperature of Primary Chamber 850 - 1000 °C
Chamber Plat thickness font & Back plate 8mm approx.
Chamber Plat thickness side plates 6mm approx.
Control with Digital Temperature meters

Secondary Chamber

Dimensions of Primary Chamber 4 x 3 x 5 feet (W x L x H)
Temperature of Primary Chamber 1200 - 1400 °C
Chamber Plat thickness side plates 6mm approx.
Control with Digital Temperature meters
Control with Digital Temperature meters

Fuel

Fuel to be used City Gas/Diesel/Furnace oil
Warm-up time: 30 Minutes approx.
Refractory: High Alumna Cast-able 46% AL2 O3

Page 7 of 10

Air Dilution System
The dilution air fan reduces the concentration of contaminating, usually Carbon Dioxide (CO2) or Nitrogen Oxide (NOx), in plant emissions by injecting fresh air into the airstream between the operations and exhaust. Air Dilution Chamber is used for to cool the exhaust gases. Base Plate Covered with insulation Bricks & Inside coated with ceramic wool temp resistance up to 1600 Deg. C.
Integrated cooling fans.
Chamber Plate Thickness 4mm.

Wet Scrubber showering system:
Wet Scrubber complete construction from stainless steel sheet 304L grade with 5 mm thick
Wet Scrubber Dimensions:
Design: Square Type Unit.
Water Pump: Compatible with the requirement
Wet Scrubbing Showering System installed to provide clean smoke emission with smoke rotation track.

ID Fan
ID Suction Fan constructed of heavy duty mild steel sheet with heavy duty ID suction fan. Suction ID Fan motor; Integrated with inverter variable control

Chimney
Chimney constructed of heavy duty mild steel sheet
Flange Plate Thickness: 10 mm
Chimney Plate Thickness: 4mm
Chimney Height: 32 Ft from ground level / as per requirement.
Chimney Dia.: 18" Fitted with Heavy Duty Shilling Wires.

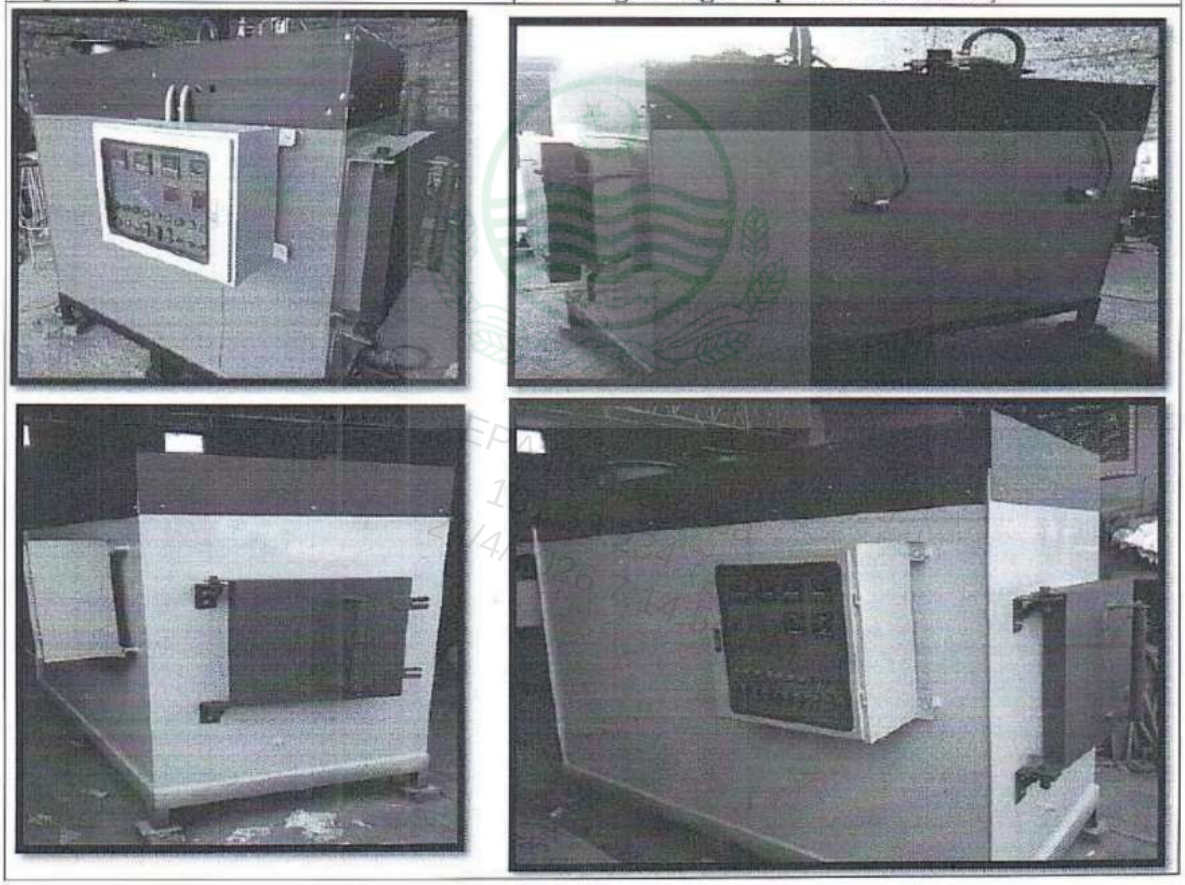
Control panel
Consisting of followings: -
Power Switch ON /OFF
All electrical, Temperature control switches & gauges.
Emergency Shutdown button.
Burners & Blowers push control switch.
Installed power electric voltage: 3 phase: 440v

Finish/Paint:
Complete body paint with best quality high temperature / heat resistance epoxy paint two layer

TECHNICAL DATA	
Burning Capacity	50 kg/hour
Model:	MEI-50
Incinerator Type	Dual Chamber
Incinerator Design	Controlled Air type
Waste Type	Hospital Waste, municipal waste (Solid/Liquid)
Combustion Principal Type	Pyrolytic combustion technology
Warm-uptime	30 Min Approx.
Primary Combustion Chamber	Yes
Secondary Combustion Chamber	Yes
Refractory Thickness	200 mm
Burners	03
Burners	GAS/LPG/Diesel fired / Dual Type (Please specify)
Blowers	04 numbers
Cooling Chamber / air dilution	Mild steel 4 mm thickness
Wet Scrubber	Stainless steel 304L Grade 4mm thickness
Power Requirement	5-6KW

Page 8 of 10

Fuel Type	Diesel Oil/Natural Gas/LPG
Oil Tank Capacity (if oil is used)	Diesel / Oil Tank capacity: 250 liters approx.
Oil Consumption (Diesel)	8-12 liters per hr. approx.
Burner	Diesel /Gas fired
Refractory Withstand Temperature	Up-to 1800 0C
Chimney Length	Approx 32 ft. from the ground level
Control Panel	Yes to regulate the operation
Temperature Monitor	Yes
Residence Time	2 seconds Retention time minimum
Primary Chamber Temperature	850 -1000°C
Secondary Chamber Temperature	1200 -1400°C
Manufacturing & Emissions	As per PEPA, NEQS Standards accredited with Pakistan Environmental Protection Agencies.
Transportation & Assembling at Site	Med Engineering is having expertise and experience for the supply, installation, services & maintenance for the same through our technically skilled staff
Supervision/Commission/Training	Med Engineering will provide commissioning, training upto end user satisfaction level.
Warranty Period	**12 Month**
Operating/Maintenance Manual	Med Engineering shall provide with delivery



The design/layout of the incinerator is given in the Figure 3.

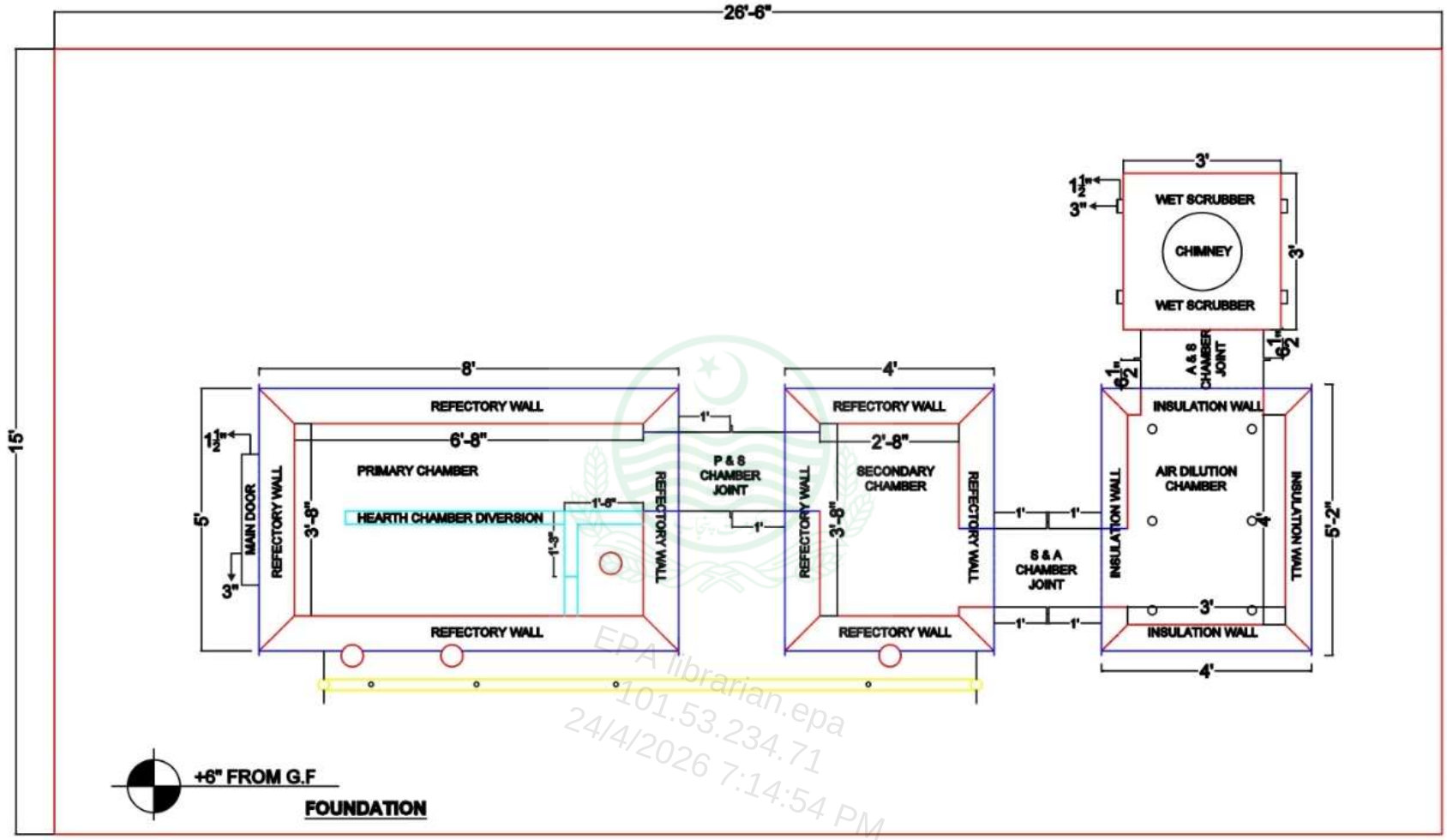


Figure 3 Layout of the incinerator

4.9 General Process Description:

The **incineration process** involves the controlled combustion of waste materials at high temperatures to reduce their volume, weight, and environmental impact. The process begins when waste is loaded into the incinerator's combustion chamber, where it is subjected to intense heat, typically between 800°C and 1,200°C.

1. **Waste Storage and Feed Preparation:** Waste materials are stored in a designated area to ensure proper segregation and safe handling. The waste is then prepared for combustion, which may involve shredding, compacting, or drying to ensure uniformity and optimize combustion efficiency. Depending on the type of waste, pre-treatment steps required to remove hazardous materials or prepare the waste for safe incineration.

1. **Primary Combustion**: In the first phase, waste is subjected to high heat, causing it to break down into gases and ash. The combustion process occurs in the presence of oxygen, which helps to burn organic material, such as plastics, paper, and biological waste, into carbon dioxide (CO_2) and water vapor (H_2O).
2. **Secondary Combustion**: After the waste has undergone primary combustion, the remaining gases are further treated in a secondary combustion chamber. Here, the gases are exposed to even higher temperatures to ensure the complete destruction of harmful compounds, such as dioxins, furans, and unburned organic material.
3. **Air Dilution Chamber**: Following secondary combustion, the gases pass through an air dilution chamber, where fresh air is introduced to the exhaust stream. This process **dilutes** the remaining pollutants, lowering their concentration and ensuring that any trace contaminants, such as carbon monoxide (CO) or nitrogen oxides (NO_x), are within acceptable limits before being released into the atmosphere.
4. **Pollution Control**: The exhaust gases then flow through pollution control devices, such as a wet scrubber, to remove pollutants like sulfur dioxide (SO_2), particulates, and volatile organic compounds (VOCs). The scrubber uses water or chemicals to neutralize and absorb harmful substances, further ensuring that the emissions meet stringent environmental standards.

5. **Ash Removal**: The remaining solid residue, or **ash**, will be collected and dispose of in the ash pit.

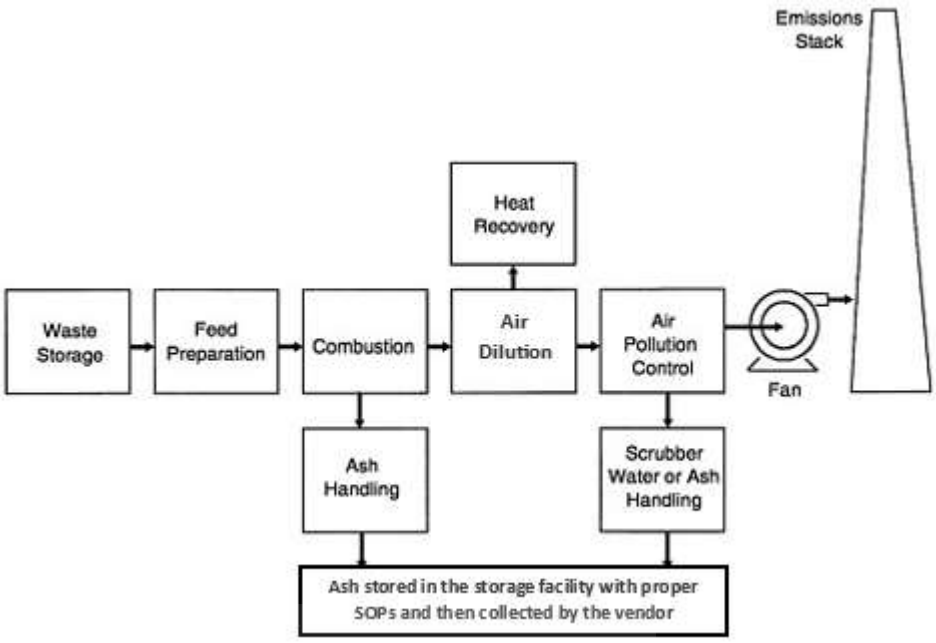


Figure 4 General process diagram

4.10 Detail of professional and general staff requirement:

The staff required during the operation of the incinerator is as follow:

Table 12 Staff requirement

Professionals Staff	
Designation	No's
Incinerator Operator	1
EHS Office / Environmental Compliance Officer	1
Laboratory Technician	1
General Staff	
Cleaning & Waste Handling Workers	2
Security Personnel	1
Total Staff	**6**

4.11 Cost & magnitude of the project

The total estimated cost of the project is 21 million PKR. The total cost also includes environmental budget cost that is 819,800 PKR.

Table 13 Cost & magnitude of the project

Description	Rupees (Million)
Infrastructure Cost	Lump Sum
Machinery Cost (including incinerator, wet scrubber, wastewater treatment)	
Environmental Budget	
Total Cost	**21 million**

4.12 Schedule of Implementation

The installation and commissioning of the facility & incinerator will be completed in 2 months.

Table 14 Schedule of implementation

Activities	1st Week	2nd Week	3rd Week	4th Week
Provision of utilities at the project site				
Civil works for incinerator room, supervisor room and yellow room				
Placement of incinerator				
Assembly of Main Unit with loading system, scrubber system, installation of PLC with electric works, installation of a chimney, connection with utilities and test fire				
Training of staff on operation and maintenance of incinerator				
Submission of Installation Report to THQ KOT CHUTTA				

4.13 Incineration Waste Management:

4.13.1 Pollution Control Devices (Wet Scrubber):

To treat the exhaust gases before their release into the atmosphere. Wet scrubber will be installed. The wet scrubber uses water to effectively capture and neutralize harmful pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter from the gas stream.

4.13.2 Ash Management:

The ash will be collected and dispose of in the ash pit of size 12ft x 8 ft. Ash pi will be lined with concrete or HDPE to prevent leachate . Will be covered to avoid rain and air dispersal. Also it will be accessible for periodic ash removal.

4.13.3 Wastewater Management:

The wastewater generation from the wet scrubber will be 80-100 L in an hour. For the wastewater that will come from the wet scrubber, a sewage treatment plant which mainly includes the membrane bioreactor treatment technique, will be used. It will ensure the fly ash removal and all other pollutants removal including heavy metals to keep the environment clean and safe.

Water Supply

There is no need of the borehole well(s) for extracting groundwater because there is already a ground water extraction well available for the water usage in THQ Kot Chutta. Same water supply will be used for the water required during the construction/installation and operational phase of the incinerator project.

Use of Drugs and Narcotics

Drugs and narcotics are strictly prohibited during working hours in working area. Smoking will be only allowed at rest timings at properly isolated places.

Personnel Protective Equipment

Following Personnel Protective equipment will be provided to the workers for their safety during construction and operational phase as per the requirement of specific activity:

- Heat-Resistant Clothing
- Safety Helmets
- Safety Gloves
- Eye Protection
- Respiratory Protection.
- Safety Footwear
- Ear Protection
- High-Visibility Clothing
- Chemical Resistant Clothing
- Fall Protection
- General Safety Equipment: This may include first aid kits, fire extinguishers, and emergency showers or eyewash stations for quick response to accidents or exposure incidents.

4.14 Land acquisition

The incinerator is being installed at the site that proponent owns his self. The project site is free from all encumbrances. Therefore, there is no issue of land acquisition or resettlement of the community due to the project.

4.15 Restoration & rehabilitation plan

Upon completion of the construction activities and the installation of the incinerator, the project site will be cleaned from all kinds of construction debris. After the removal of the construction materials from the project site, the ground will be levelled, and the plantation of trees and grass will be carried out and maintained during the operational phase of the project.

4.16 Government Approvals

Presently, the only approval required is from Punjab Environmental Protection Agency to start construction and installation of this state-of-the-art waste management technology to work for the appropriate disposal of hospital waste including laboratory waste , resulting in control over the spread of infectious diseases.

5 DESCRIPTION OF ENVIRONMENT

An environmental baseline study is intended to establish a database against which potential impacts can be predicted and managed subsequently. The EIA of the project covers a comprehensive description of the project area, including regional resources which are expected to be affected by the project, as well as those which are not expected to be directly affected by the construction and operation of the project.

A site visit was conducted to survey the field area for collection of relevant data. Interviews were conducted with the public and stakeholders of the project area to seek the public opinion on the implementation of the project. Various Governmental and Non-Governmental Organizations (NGOs) were also visited for the collection of relevant data and their views on the project were recorded for incorporation into the EIA report. The environmental impacts of any activity or process will be assessed based on deviation from the baseline or normal situation. The following components form part of the baseline:

- Physical Environment
- Ecological Environment
- Socioeconomic Environment

5.1 Physical Environment

The following section provides an overview of the information on physical environment of the proposed Project study area collected from primary as well as secondary sources. The major parameters covered include Physiographic and Topography, Geology, Soil, Seismicity, Climate and Meteorology, Ambient Air & Noise, Water Resources, Solid Waste, and Land Use.

5.1.1 Topography

Dera Ghazi Khan District is located in the southwestern part of Punjab, Pakistan. The district lies approximately between 29° 15ˡ to 31° 15ˡ north latitudes and 69° 55ˡ to 70° 45ˡ east longitudes, with an average elevation of about 125–150 m above mean sea level in the plains, gradually rising westward toward the mountains. It is bounded on the east by the Indus River, which separates it from Muzaffargarh District and Layyah District, while the southern boundary meets Rajanpur District. To the west, the district is bordered by the rugged foothills of the Sulaiman Range, forming a natural boundary with Balochistan.

The district extends from the fertile alluvial plains of the Indus basin in the east to arid piedmont and mountainous terrain in the west, giving it diverse physiographic characteristics. The eastern part consists of flat, irrigated floodplains formed by Indus alluvium, while the western zone includes gravelly uplands and seasonal hill torrents locally known as rod-kohs descending from the Sulaiman Mountains. Numerous dry channels and flood streams dissect the landscape, influencing agriculture, irrigation patterns, and settlement distribution across the district

5.1.2 Geology

The capital Dera Ghazi Khan is located approximately 430 km from Lahore and about 100 km from Multan. The district is bounded to the east by the Indus River, which separates it from Muzaffargarh District and Layyah District. To the south lies Rajanpur District, while Taunsa Tehsil and parts of Dera Ismail Khan District border the district toward the north. The western boundary is formed by the foothills of the Sulaiman Range, separating the district from Balochistan.

5.1.3 Soil

Generally, the soils of Dera Ghazi Khan District are fertile in the eastern plains and support a wide variety of agricultural crops due to the availability of irrigation from the Indus River and canal systems. The soils of the district mainly range from sandy loam to clayey loam in the cultivated areas, while the western piedmont and foothill zones consist of coarse, gravelly, and sandy soils deposited by seasonal hill torrents descending from the Sulaiman Range.

Some tracts, particularly toward the western and southwestern parts of the district, contain sandy and semi-arid soils that are less developed but still suitable for drought-resistant crops such as wheat, gram, and fodder crops when moisture is available. The alluvial soils of the Indus floodplain are highly productive and support major crops including cotton, wheat, sugarcane, and vegetables. The overall soil fertility, combined with a hot semi-arid climate, supports natural vegetation mainly composed of short grasses, shrubs, and scrubby plants adapted to dry environmental conditions.

5.1.4 Seicmic Activity

The district belongs to zone 2A of the Seismic Zone Map of Pakistan, which means there will be minor to no damage to property due to earthquakes.

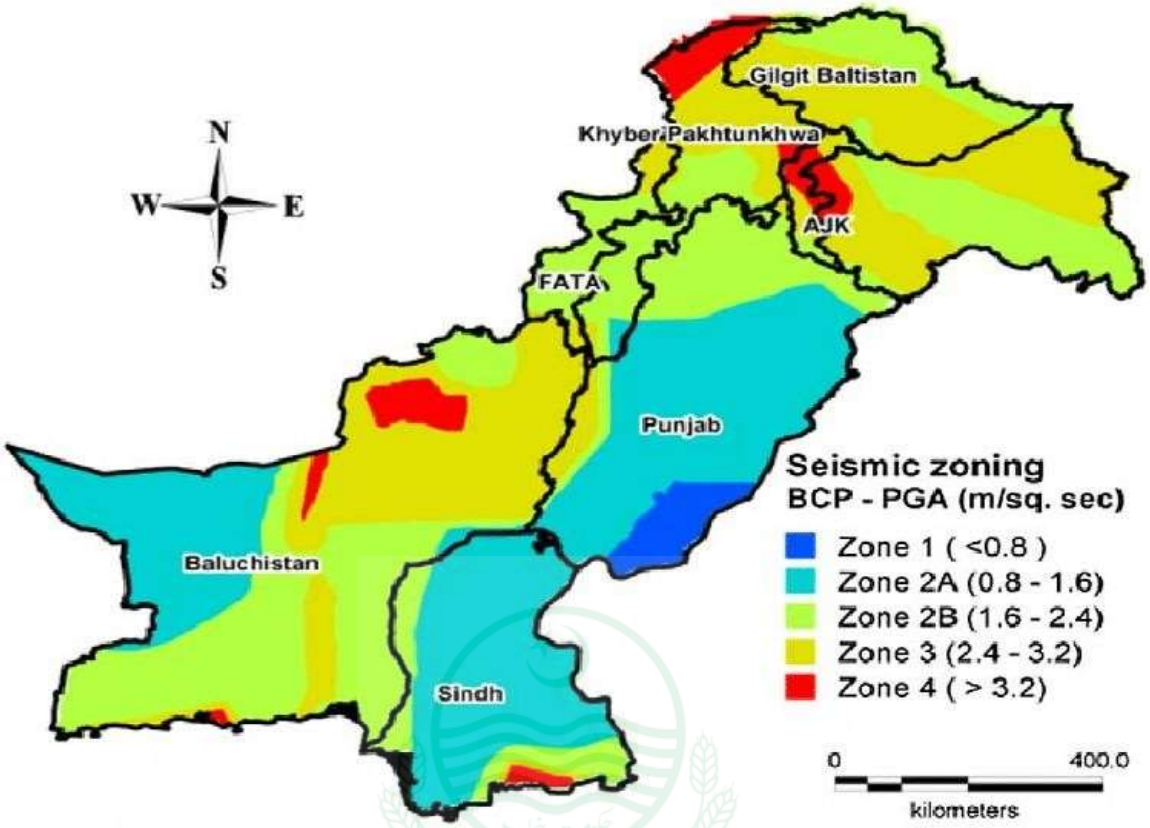


Figure 5 Seismic Zone of Pakistan

5.1.5 Climate

The district has a hot and semi-arid climate; more precisely, it fluctuates between desert climate (in the sandy areas near the dry Sukh Beas) and humid climate. The climate tends to have hot¾sometimes extremely hot¾summers and mild winters.

Temperature

The summer starts from April and continues till October. May, June, and July are the hottest months. The mean maximum and minimum temperatures during summer are 40 °C and 27 °C respectively. The temperatures can go up to 47 °C during summer. The winter season begins in November and continues till March, with January being the coldest month. The mean maximum and minimum temperatures during this month are 22 °C and 7 °C respectively.

The irrigation network in the district has affected the climate of the district such that the frequency of dust storms has reduced, and the severity of the heat has also lessened.

Based on annual weather averages for D.G Khan, the best month to go for holiday is January and February. The temperature hovers around 14°c.

The table below displays max and min temperature and rain data for the whole year as an average taken from last 12+ years of historical data for D.G Khan.

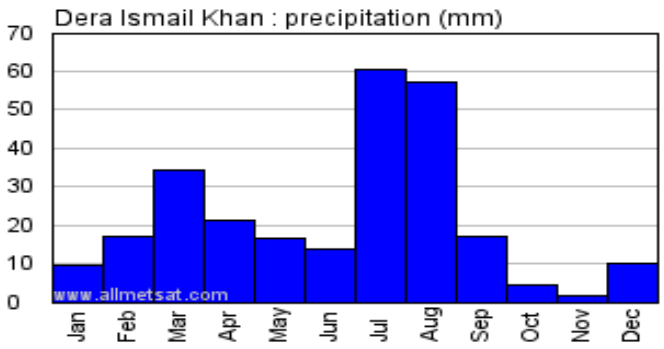
Table 15 Average Weather in Dera Ghazi Khan

Month	Day	Night	Rain Days
January	21°c	9°c	2
February	25°c	12°c	2
March	31°c	16°c	4
April	37°c	23°c	4
May	42°c	28°c	5
June	43°c	32°c	5
July	40°c	31°c	11
August	38°c	30°c	9
September	38°c	27°c	5
October	36°c	23°c	2
November	29°c	17°c	1
December	23°c	11°c	1

Average Weather in D.G Khan in April

The weather averages for the month of April, temperature averages around 37°c and at night it feels like 23°c. In April, D.G Khan gets on an average 18.88mm of rain and approximately 4 rainy days in the month. Humidity is close to 25%.

Average Rainfall



Graph 1 Average rainfall

5.1.6 Ground Water

Currently, the primary source of clean water in D.G Khan is groundwater, which meets the requirements for domestic, industrial, and commercial use. Groundwater is extracted through tube wells installed in the region, typically at depths of around 600 feet

In the study area, the D.G Khan Municipal Corporation oversees a comprehensive network of pipelines that supply water to the residents. The municipality operates a number of tube wells and has set up water filtration plants to ensure the provision of pure and hygienic water. These filtration plants are well-maintained and operational. The average daily water supply in D.G Khan is approximately 36.41 million gallons per day (MGD), which meets the daily demand of around 34.14 MGD.

5.1.7 Surface Water Hydrology

The primary surface water resources in D.G Khan include the Sutlej River, which flows nearby, and irrigation canals such as the D.G Khan Canal and various distributaries that branch from it. These water sources play a significant role in meeting the agricultural and domestic water needs of the district.

5.2 Ecological Environment

Following is the description of the baseline ecological environment of the area.

5.2.1 Flora

The major **flora** of the district includes shisham (*Dalbergio sissoo*), babul (*Acacia nilotica*), eucalyptus (*Eucalyptus cineraria*), mulberry or toot (*Morus alba*), simal or silk cotton (*Bombax cieba*), sirin (*Albezia lebbek*), red gum tree or sufaida (*Eucalyptus camaldulensis*), neem (*Azardirachta indica*), mesquite (*Prosopis juliflora*), jand (*Prosopis spicigera*), vann or peelu/ tooth brush tree (*Salavadora oleoides*), okan or karir (*Capparis aphylla*), kikar (*Acacia Arabica*), pipal (*Ficus religiosa*), bargad or banyan (*Ficus benghlensis*), bakain or Persian lilac

(*Melia azedarach*), frash (*Tamarix articulata*), lasura (*Cordia myxa*), talwar phali (*Oroxylum indicum*), amaltas (*Cassia fistula*), arjun (*Terminalia arjuna*), sukh chain (*Pongamia pinnata*), mahogany (*Swietenia macrophylla*), phulai (*Acacia modesta*), jungle jalebi (*Pithecellobium dulce*), gulhar or cluster fig (*Ficus racemosa*), sohanjna or drumstick tree (*Moringa oleifera*), haar singhar or night jasmine (*Nyctanthes arbor-tristis*), dhamna (*Grewia optiva*), and ber (*zizyphus nummalaria*).

Some **shrubs** grown in the district include timber or fern leaf acacia (*Acacia filicoides*), jawain or camel thorn (*Alhagi maurorum*), lani or salt bush (*Atriplex canescens*), shamshad or boxwood (*Buxus papillosa*), katkaranj or fever nut (*Caesalpinia bonduc*), kasondi or coffee weed (*Cassia occidentalis*), canicha or prickly sesban (*Sesbania bispinosa*), niazbo or basil (*Ocimum basilicum*), lajwanti or touch-me-not (*Mimosa pudica*), and khip or broom bush (*Leptadenia pyrotechnica*).

Some of the **grasses** found in the district include khabbal (*Cynodon dactylon*), dab (*Desmostachya bipinnata*), murat (*Panicum turgidum*), nut grass or mutha (*Cyperus rotundus*), and Indian Sandbur (*Cenchrus biflorus*).

5.2.2 Fauna

The fauna of the forests of the district includes jackals, hog deer, wolves, fox, wild boar, jungle cat, fishing cat, small Indian civet, smooth-coated otter, Bengal fox, mongoose, hare, and porcupines.

The Chichawatni Forests host a large variety of birds, which include Indian tree pie, white backed vulture, common myna, little green bee-eater, various varieties of doves, parakeets, fantail flycatcher, lapwings, black drongo, robin, sunbird, spotted owlets, black and grey partridges, babblers, shrikes, bulbul, cuckoo, koel, starlings, pheasants, house crow, house sparrow, black myna, honey buzzard, hoopoe, lark, and little egret.

The reptilian and amphibian fauna includes viper snakes, various varieties of lizards, common frogs, and toads.

5.2.3 Endangered Species

No endangered flora and fauna were found in the project area.

5.2.4 Protected Areas

As per field visits and consultations with wildlife and forest departments, the proposed project area does not fall in any protected area i.e. Game Reserves, National Parks, Wildlife Sanctuaries, or Forest areas, etc.

5.3 Socio-economic Information

The objectives of the given study are outlined as follow:

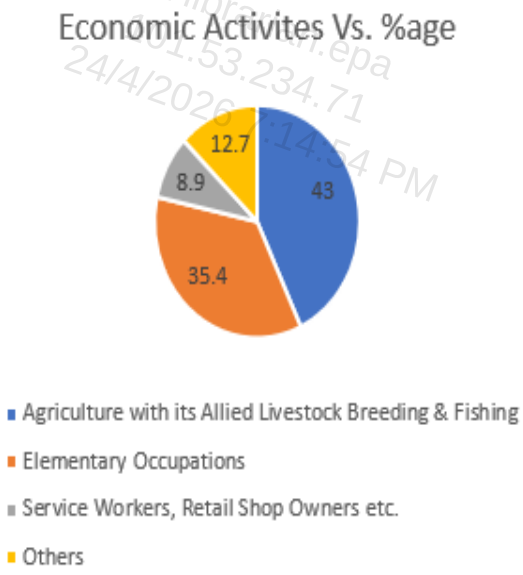
- To carry out the assessment of social impact. Acquire socioeconomic data to evaluate and identify the project interventions.
- Assess needs of community related environmental concerns.
- To assess adverse and beneficial socioeconomic and health impacts of the activity.
- To suggest remedial measures and solutions to improve socio economic conditions.
- To analyze socio economic conditions of community, with special reference to environment and conservation of natural resources

5.3.1 Demographic Profile

The total population of D.G Khan district is 2517,560 persons. Out of which the male population is 50.9%, and female population is 49.1%. The urban population is 20.5%.

5.3.2 Economic Condition

The major activities in the D.G Khan district are agriculture, workshops, retail and others.



Graph 2 Economic Activities

5.3.3 Agriculture; D.G Khan District

The district belongs to the cotton/ wheat zone of Punjab and is thus known for its good quality cotton and wheat.

Agriculture with its allied livestock breeding and fishing is the most important economic activity of the district.

The main crops grown in the district include sugarcane, wheat, rice, maze, cotton, guar seed, bajra, moong, masoor, maash, jowar, rapeseed, mustard, sunflower, barley, gram, groundnut, sesanum, sugarbeet, linseed, sunn hemp, and castor seed.

Major fruits grown in the district are citrus, guavas, mangoes, pomegranate, leechee, phalsa, bananas, dates, jaamun, ber, and mulberry.

Major vegetables are potatoes, onions, cauliflower, tomatoes, turnips, peas, carrots, garlic, chilies, okra, coriander, spinach, bottle gourd, pumpkin, radish, bitter gourd, capsicum (bell pepper) and tori.

5.3.4 Religion

The population of Pakpattan is over 99% Muslim.

5.3.5 Languages and Major Castes

Punjabi and Urdu are spoken in the city. Main castes are chishty, Rehmani, LAK, Chadhar, Jatt, Tagga, Ansari, Butt,Dulu, Sayal, Kamboh, Bhadru, Mughal, Dogar, Sanpal, Gujjar, Arain, Rajput, Tajra, Hiraj and Shaikh Awan.

5.4 Quality of Life Values

5.4.1 Health Facilities

Medical facilities are readily accessible in the city in a 100-kilometer radius, being the district headquarters and due to its importance as a military headquarters. Quraishi Hospital is one of the main hospitals in the area.

5.4.2 Customs

The people are very much concerned about castes and beliefs, visiting shrines is common among them.

5.4.3 Electric Supply

WAPDA power supply is available at the site.

5.4.4 Telephone Facilities

Both Landline and Cellular telephone facilities are present in the project area.

5.4.5 Educational Facilities

There are few educational facilities present in the vicinity of the project area. Most of the educational institutes are far away from the project site like around 5km radius.

5.5 Site Suitability

As the site is within the premises of the project, no relocation is required for the establishment of current project. The site is not fall in environmental sensitive area and all commodities are at a suitable distance from project site as they will not impact by the construction activities even locals will get more benefits and job opportunities. No replacement, relocation or rehabilitation are required for the development of the above-said project.

5.6 Project Response

90% of the respondents believed this project should be implemented. Implementation of the project will create labor opportunities for locals, and it will help to improve the economic conditions of the area. The respondents also provided mitigation measures like certified contractors must be hired, proper plantation should be done, proper procedures should be followed etc. They said, if mitigation measures are implemented, they would have no objection.

6 IMPACT ANALYSIS AND MITIGATION MEASURES

This chapter provides a comprehensive screening of the potential environmental impacts associated with the proposed incinerator project, focusing on both the positive and negative consequences of its implementation. It identifies the specific aspects of the environment that could be affected, including air quality, water resources, noise, and community well-being. In addition, the chapter includes a detailed analysis of the stakeholders' views and concerns regarding the project, considering the perspectives of local communities, regulatory authorities, and other affected parties.

The significance of each identified impact is assessed based on its severity, duration, and likelihood, allowing for a clear understanding of the potential consequences on the environment and human health. Based on this analysis, the chapter outlines targeted mitigation measures designed to minimize, if not entirely eliminate, the adverse impacts associated with the proposed activities. These measures are crafted to ensure that the project complies with environmental regulations and operates in an environmentally sustainable manner, while addressing the concerns of stakeholders and maintaining public trust.

6.1 Environmental screening of the proposed project

To examine the environmental impact of the project, and Environmental Screening Matrix has been developed as part of the present EIA study that focuses on the potential environmental impacts of the project during the .

6.1.1 Risk Assessment of the project

A Matrix has been prepared for the identification of different environmental impacts and their associated risks or benefits. The Matrix also presents the mitigation measures or environmental enhancement measures for the identified impacts and the change in risk after the mitigation techniques have been adopted.

Risk Assessment

Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood X Consequence

The likelihood is further classified and relatively valued into:

Almost Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

- Almost Certain: Will undoubtedly happen/recur on a frequent basis.
- Likely: Will probably happen/recur, but it is not a persisting issue/circumstance.
- Possible: Might happen or recur occasionally
- Unlikely: Do not expect it to happen/recur, but it may do so.
- Rare: This will probably never happen/recur.

The consequence is further classified and relatively valued into:

Catastrophic (5), Major (4), Moderate (3), Minor (2), Insignificant (1).

- Catastrophic: Impact on a larger area and highly sensitive receptors.
- Major: Impact on a large area and slightly sensitive receptors.
- Moderate: Impact on a small area with few receptors.
- Minor: Impact on a very small area with almost no receptors.
- Insignificant: Almost no impact.

Risk Analysis Matrix

Table 16 Risk Analysis Matrix

Likelihood	Consequences				
	Catastrophic (5)	Major (4)	Moderate (3)	Minor (2)	Insignificant (1)
Almost Certain (5)	25	20	15	10	5
Likely (4)	20	16	12	8	4
Possible (3)	15	12	9	6	3
Unlikely (2)	10	8	6	4	2
Rare (1)	5	4	3	2	1

Based on the related values in above table following risk impact categories are identified.

- Extreme/Very High Risk (score 20-25): require more intensive mitigation measures
- High Risk (score 10-19): Will have a large impact which requires specific mitigations
- Medium Risk (score 5-9): Will have a small impact that can be mitigated easily
- Low Risk (score 1-4): Professional judgment

With the help of risk assessment, we will get the significance environmental impacts associated to the proposed project and their risk level. Then proposed mitigation measures will help to minimize the supposed impacts of this proposed project.

Risk Assessment for Construction Phase								
Hazard/Activity	**Potential Environmental and Social Impact**	**Risk Assessment**			**Mitigation Measures**	**Risk Assessment after taking measures**		
		Likelihood	**Consequence**	**Risk Level**		**Likelihood**	**Consequence**	**Risk Level**
Operation of heavy machinery	Accidents/injuries to workers	4	4	16	Strict enforcement of PPE use, training sessions, on-site supervision, and safety signage.	3	2	6
Excavation and site leveling	Soil erosion, dust generation, loss of vegetation	3	3	9	Use of water sprinkling, proper scheduling and dust barriers. There is no cutting of trees will done. Tree plantation will also be carried out.	2	2	4
Material storage and handling	Fire hazard, spillage	3	4	12	Safe storage practices, flammable material isolation, and fire extinguishers at accessible points.	2	3	6
Use of construction chemicals	Water/soil contamination	2	4	8	Store chemicals in bounded areas, proper labeling, and trained handling.	2	2	4
Noise from machinery	Noise pollution affecting workers	4	2	8	Use of silencers, restrict working hours, and provide ear protection.	2	2	4
Waste generation	Environmental pollution	4	4	12	Segregation, reuse where possible, and proper disposal.	3	2	6
Construction activity near public	Community disturbance	2	3	6	Community consultation, signage for awareness, and traffic control if needed.	1	2	2
Manual handling of materials	Musculoskeletal injuries	3	3	9	Training on proper lifting techniques and use of lifting equipment.	2	2	4

Risk Assessment for Operational Phase									
Hazard/Activity	**Potential Environmental and Social Impact**	**Risk Assessment**			**Mitigation Measures**	**Risk Assessment after taking measures**			
		Likelihood	**Consequence**	**Risk Level**		**Likelihood**	**Consequence**	**Risk Level**	
Operation of incinerator	Air pollution and health risks	4	4	16	Installation of air emission control device e.g. Wet scrubber, monitor emissions regularly, and provide PPE.	3	3	9	
Air emissions (from stack)	Health hazards, environmental contamination	4	3	12	Installation of air emission control device e.g. Wet scrubber, monitor air quality, and have health and safety measures.	2	3	6	
Ash handling and disposal	Potential risk of spills, improper disposal	3	3	9	Proper handling and disposal protocols, spill containment.	2	2	4	
Noise from incinerator	Noise pollution affecting nearby areas	3	2	6	Use soundproofing materials, restrict operating hours if necessary.	2	1	2	
Wastewater	Potential wastewater contamination	3	4	12	Recycling of treated water, monitoring of scrubber performance.	2	3	6	
Waste generation during operation	Environmental pollution if not managed properly	3	3	9	Proper waste segregation, recycling, and safe disposal.	3	2	6	
Safety Hazard, Public Health & Nuisance	Contamination due to improper handling	4	4	16	Protected fencing around the construction area.	2	2	4	
Maintenance and repair of incinerator	Injury during maintenance	3	3	9	Regular inspection, maintenance protocols, and staff training.	2	2	4	

6.1.2 Impact Analysis of the project

6.1.3 Pre-Construction Phase

Land Use and Aesthetic Impact

- **Impact**: The project site is located on open land, and there are no historical, heritage, or religious sites nearby. The project involves no tree cutting or significant vegetation removal. As the land is vacant, the direct impact on land use is minimal. However, the presence of the construction site might alter the visual appeal of the surrounding area temporarily, as it will introduce industrial activity.
- **Mitigation**:
    - Implement boundary walls and vegetative screening (trees, shrubs) to blend the project with its surroundings and reduce visual disruption.
    - Consider landscaping or green buffer zones to improve the aesthetic quality around the facility.
    - Limit the height and structure of the incinerator to minimize visual intrusion.
    - Inform the surrounding community about the purpose and expected duration of the construction to ease any concerns.

Site Preparation Activities

- **Impact**: Site preparation will involve machinery use, which could lead to soil compaction, dust generation, and noise. Although the site is open land, minor disturbance to the surface can occur as the construction area is cleared and leveled. This may have a temporary effect on the local environment, including dust pollution in the air and noise pollution.
- **Mitigation**:
    - Water spraying should be used frequently to control dust during soil clearing, excavation, or leveling.
    - Limit work hours to the daytime to reduce the noise impact on surrounding areas, particularly for residential zones.
    - Restrict the movement of construction vehicles to designated routes to reduce unnecessary soil compaction and disturbance.
    - Install temporary noise barriers or buffers where feasible, especially if construction is near sensitive receptors (e.g., residential areas).

- Employ dust management strategies, such as covering sand, soil, or other materials in transit to avoid dust emissions.

Potential Soil Erosion

- **Impact**: During the site preparation, especially if there is extensive soil disturbance, there is a risk of soil erosion, particularly in areas with loose, sandy, or exposed soil.
- **Mitigation**:
  - Implement erosion control methods such as installing silt fences or temporary barriers around the site to limit the runoff of sediments into surrounding areas.
  - Conduct soil stabilization methods where needed, such as mulching or applying erosion control blankets.
  - Plan and design the site preparation to minimize large-scale land disturbance and keep excavation to a necessary minimum.

Biodiversity and Habitat Disturbance

- **Impact**: Although no trees are being cut, the site may support minor vegetation or habitat for small fauna, which could be disturbed or displaced during construction.
- **Mitigation**:
  - Conduct a thorough pre-construction survey of the flora and fauna present on-site to identify any sensitive species or habitats.
  - If any significant flora or fauna is identified, consult with local environmental authorities to develop a relocation or mitigation strategy.
  - Avoid unnecessary disturbance to nearby ecosystems, especially if any water bodies or habitats exist close to the construction site.
  - Implement measures like creating buffer zones and preventing vehicle movement into sensitive areas.

6.1.4 Construction Phase

Air Quality

- **Impact**: Construction activities, including site preparation, transportation of materials, and machinery operation, will lead to emissions of particulate matter (dust) and exhaust gases from vehicles and equipment. Dust generation during excavation, demolition, or

movement of construction materials can negatively affect local air quality and cause respiratory discomfort for workers and the surrounding community.

- **Mitigation**:
    - Use water sprays or dust suppressants regularly to minimize airborne dust during construction.
    - Limit the construction activities that generate dust, such as excavation, to non-peak hours or times when wind conditions are favorable.
    - Ensure all construction vehicles and machinery are regularly maintained to minimize exhaust emissions.
    - Use well-maintained equipment with pollution control devices such as mufflers or particulate filters to limit emissions.
    - Keep material stockpiles covered to prevent dust generation and stabilize materials in transport.

Noise Pollution

- **Impact**: Noise from heavy machinery, construction vehicles, and general construction activities will be generated during the construction phase. This noise could affect local residents, workers, and wildlife in the vicinity, leading to annoyance, sleep disturbance, and potential hearing damage for workers if proper safety measures are not in place.
- **Mitigation**:
    - Limit noisy operations to designated working hours (e.g., 8:00 AM to 6:00 PM) to minimize disturbances during nighttime.
    - Use sound barriers or enclosures around noisy equipment, especially near sensitive receptors such as residential areas or schools.
    - Regularly maintain machinery to ensure it operates efficiently and produces less noise.
    - Ensure workers are provided with Personal Protective Equipment (PPE), such as earplugs, to protect them from excessive noise exposure.

Water Resources and wastewater

- **Impact**: Construction activities may require significant water for dust suppression, mixing concrete, and other purposes. There is also the risk of accidental spills of fuel

or oil, which could contaminate local water resources if not managed properly. Domestic water will be produce.

- **Mitigation**:
    - Ensure that all water usage for construction is within legal and environmental guidelines to prevent over-extraction of local water sources.
    - Establish a temporary water storage and distribution system to manage construction water usage efficiently.
    - Store fuel, oil, and chemicals in contained areas to prevent accidental leaks or spills from reaching water bodies.
    - Wastewater will be dispose of in the existing wastewater drain and the quantity of wastewater will be negligible.
    - Use spill containment systems and have spill kits available at strategic locations to address accidental releases of hazardous materials.
    - Develop and implement a stormwater management plan to prevent runoff from the site from contaminating nearby water resources.
    - Ensure that wastewater generated from construction activities is either treated or disposed of in an authorized manner to prevent contamination.

Solid Waste Generation

- **Impact**: During construction, waste such as packaging materials, scrap metal, concrete, and other construction debris will be generated. Improper waste management can lead to pollution and environmental degradation.
- **Mitigation**:
    - Implement a waste management plan for the segregation of waste at source. Separate recyclable materials (metal, paper, plastic) from non-recyclable waste.
    - Designate specific areas for the temporary storage of waste, ensuring that hazardous materials are securely contained.
    - Recycle construction debris where possible, such as using crushed concrete for filling or reusing metal scrap.
    - Ensure that non-recyclable waste is disposed of in an environmentally safe manner, in accordance with local waste management regulations.
    - Periodically remove waste from the site to prevent accumulation and mitigate any environmental impact.

Worker Health and Safety

- **Impact**: Construction workers will face potential risks such as accidents, injuries from heavy machinery, falls, or exposure to hazardous materials. The construction phase will involve various tasks that require careful handling of equipment and materials to ensure workers' safety.
- **Mitigation**:
    - Implement a comprehensive health and safety management plan for all workers involved in the construction process, ensuring compliance with international and national health and safety standards.
    - Provide Personal Protective Equipment (PPE), including helmets, gloves, steel-toed boots, ear protection, and safety goggles to all construction workers.
    - Regularly train workers on safety protocols, emergency procedures, and the correct handling of hazardous materials.
    - Install clear safety signage on-site to alert workers and visitors of any potential hazards.
    - Ensure that first-aid kits and trained medical personnel are available on-site for emergencies.
    - Monitor the work environment regularly for hazards such as excessive noise, heat, or airborne dust and provide mitigating measures as necessary.

Traffic and Transportation

- **Impact**: Construction-related traffic can increase congestion, especially in areas near the construction site. There will be an increase in the number of heavy trucks and machinery moving to and from the site, which could cause delays and increase the risk of accidents.
- **Mitigation**:
    - Coordinate with local authorities to plan and manage traffic around the construction site, especially during peak hours.
    - Designate specific routes for construction vehicles to minimize disruption to the local community.
    - Implement traffic control measures such as signage, flaggers, and temporary traffic lights if necessary.

- Ensure that vehicles are regularly maintained to prevent accidents caused by equipment failure.
- Limit construction traffic during peak hours or times of high traffic to avoid congestion.
- Schedule deliveries of construction materials during off-peak hours to minimize disruptions to local traffic.

Soil Erosion and Sediment Control

- **Impact**: Excavation and site grading could lead to soil erosion, especially in areas where vegetation is disturbed. This could result in sediment being carried away by rainfall into nearby water bodies, impacting water quality.
- **Mitigation**:
  - Implement erosion control measures, such as silt fences or sediment basins, to control runoff and prevent soil erosion.
  - Stabilize exposed soil immediately with vegetation or temporary covers to prevent erosion.
  - Divert surface runoff away from areas under construction to minimize erosion and sedimentation in surrounding areas.
  - Monitor erosion control measures regularly to ensure their effectiveness and make adjustments as needed.

6.1.5 Operational Phase

Air Emissions

- **Impact**: The incinerator will produce air emissions during its operation, primarily from the combustion process. These emissions may include gases such as carbon dioxide (CO2), nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter, dioxins, furans, and other trace compounds. These pollutants could have adverse effects on local air quality, human health, and the environment if not properly managed.
- **Mitigation**:
  - Installation of a high-efficiency wet scrubber system to capture and neutralize pollutants such as acidic gases, particulates, and volatile organic compounds (VOCs) from the exhaust gases.

- Ensure the incinerator's operation adheres to national and international air quality standards, including the Punjab Environmental Quality Standards (PEQS) for air emissions.
- Implementation of an air dilution chamber after the secondary combustion chamber to further reduce the concentration of pollutants before the gases are released into the atmosphere.
- Regular monitoring of stack emissions to ensure compliance with environmental regulations and the proper functioning of pollution control systems.
- Perform routine maintenance and optimization of the incineration process to minimize emissions.

Wastewater Generation

- **Impact**: The operational phase will generate wastewater primarily from the wet scrubber system, which is used to treat exhaust gases. The scrubber water may contain dissolved pollutants such as heavy metals, ash, and other harmful compounds. If untreated, this wastewater could contaminate local water resources.
- **Mitigation**:
  - The wastewater generation from the wet scrubber will be 80-100 L in an hour. For the wastewater that will come from the wet scrubber, a sewage treatment plant which mainly includes the membrane bioreactor treatment technique, will be used.
  - It will ensure the fly ash removal and all other pollutants removal including heavy metals to keep the environment clean and safe.
  - Periodic testing of water quality.

Solid Waste Management (Ash Disposal)

- **Impact**: Incineration will produce residual ash, which may contain toxic substances, heavy metals, and other contaminants. Improper handling or disposal of ash could lead to soil and water pollution.
- **Mitigation**:

- To manage and safely dispose of the residual ash generated from the incineration process, a properly designed ash pit will be constructed on-site. The ash pit will have the following specifications and features:
- The ash will be 3-5 percent of the waste that will be incinerated so approximately 12 ft (L) × 8 ft (W) is adequate size for storing ash generated over a 30-day operational cycle.
- The pit will be lined with impervious material (such as reinforced concrete or high-density polyethylene (HDPE)) to prevent soil and groundwater contamination through leachate.
- The pit will be covered with a lid or protective roofing to prevent rainwater ingress and wind dispersion of ash particles.
- Designed to allow safe and efficient access for the manual or mechanical removal of ash at regular intervals.
- The ash pit will be regularly inspected and maintained to ensure structural integrity and environmental compliance.
- This measure will mitigate the risk of soil and groundwater contamination, minimize air quality impacts from fugitive ash, and ensure compliance with local environmental standards for waste handling and disposal.

Occupational Health and Safety

- **Impact**: Workers involved in the operation of the incinerator could be exposed to potential health risks such as exposure to high temperatures, hazardous chemicals, and pollutants released during incineration. Prolonged exposure could lead to respiratory issues, burns, or other health problems.
- **Mitigation**:
  - Provide all operational staff with appropriate Personal Protective Equipment (PPE), including heat-resistant gloves, protective clothing, face shields, and respiratory protection.
  - Installation effective ventilation systems in the facility to ensure that workers are not exposed to hazardous fumes or gases.
  - Implement regular safety training programs to ensure workers are familiar with safety protocols and emergency procedures.
  - Maintain first-aid facilities and ensure medical support is available on-site for any accidents or health emergencies.

- Conduct regular health and safety audits to assess potential risks and ensure compliance with workplace safety regulations.

Odor and Noise

- **Impact**: The operation of the incinerator may lead to the emission of odors from the waste being incinerated, and noise from the equipment, which could disturb nearby residents or workers.
- **Mitigation**:
  - Proper sealing of the waste storage area will help to contain odors before they are incinerated.
  - Regular maintenance of the incinerator to ensure efficient combustion and minimize odors during operation.
  - Install noise barriers or enclosures around equipment that generates excessive noise, such as fans or compressors.
  - Ensure that all incinerator components, including combustion chambers, air dilution chambers, and scrubbers, are operating optimally to minimize noise generation.

Resource Consumption

- **Impact**: The incinerator will consume fuel and electricity during its operation. The operational phase may also require significant water usage for the wet scrubber and other processes. Overconsumption of these resources could lead to increased operational costs and environmental impacts.
- **Mitigation**:
  - Optimize fuel use by ensuring that the incinerator is designed to operate at maximum efficiency, with combustion controls in place to minimize excess fuel consumption.
  - Consider the use of **renewable energy** sources, such as solar or wind, for auxiliary power needs where feasible.
  - Implement water conservation measures, such as the reuse of scrubber water, to minimize the overall water consumption.
  - Monitor resource consumption regularly to ensure that energy, water, and fuel are being used efficiently and sustainably.

7 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMMP)

A comprehensive management plan is necessary to implement the recommendations and suggestions for environmental protection included in chapter. The objective of the Environmental Management and Monitoring Plan (EMMP) is to address all the major environmental issues and provide a framework for the implementation of the proposed mitigation measures during the construction and operational phases of the project. The proper implementation of the EMP will ensure that all the adverse environmental impacts identified in the EIA report are adequately mitigated, either totally prevented or minimized to an acceptable level and required actions to achieve those objectives are successfully adopted by the concerned institutions or regulatory agencies.

For effective environmental management, the management of the project should assign the necessary responsibilities to its Health, Safety and Environment team, which should be responsible for environmental monitoring of the project.

7.1 Objectives of Environment Management Program

The EMMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to introduce standards of good practice to be adopted for all project works. The EMMP has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponent for the implementation of EMMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project.
- Outlining mitigation measures required for avoiding or minimizing potential impacts assessed in the EIA report.
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA report.
- Defining the requirements for communication, documentation, training and monitoring, management, and implementation of the mitigation measures.

Environment Management Plan for Pre-Construction Phase			
Environmental Parameter	**Potential Impact**	**Mitigation Measures**	**Implementation Responsibility**
Land Use and Aesthetics	Alteration in land character and potential visual disturbance	- Clearly define and demarcate the construction area to avoid unnecessary land disturbance. - Construct a boundary wall or secure fencing around the project site. - Develop vegetative screening (e.g., plantation of local shrubs or trees) along the site boundary to minimize visual impact.	THQ KOT CHUTTA
Soil and Dust	Soil compaction and dust emissions from initial leveling or equipment movement	- Use of construction machinery should be minimized and restricted to designated paths to prevent widespread compaction. - Employ regular water sprinkling on exposed surfaces and dry areas to control dust. - Limit the number of trips by heavy vehicles and maintain speed limits to reduce soil disturbance and dust.	THQ KOT CHUTTA
Community Concerns	Possible objections or confusion among locals	- Conduct public consultations with local stakeholders to inform them about the project scope and benefits. - Display project details, timelines, and contact information on a signboard at the entrance of the site. - Set up a formal grievance redress mechanism and appoint a contact person to address public concerns quickly.	THQ KOT CHUTTA
Noise	Elevated noise from machinery used for land preparation	- Use modern, well-maintained, low-noise construction machinery and equipment. - Limit noisy operations to daytime hours only (e.g., 8 am to 6 pm) to reduce disturbance. - Notify local residents in advance if particularly noisy activities are expected.	THQ KOT CHUTTA

Environment Management Plan for Construction Phase			
Environmental Parameter	**Potential Impact**	**Mitigation Measures**	**Implementation Responsibility**
Air Quality	Dust generation and exhaust emissions from construction machinery and material handling	- Regular water sprinkling at construction sites, unpaved roads, and material stockpiles. - Cover loose materials (e.g., sand, cement) during storage and transport. - Use fuel-efficient, well-maintained machinery and prohibit burning of waste materials on-site. - Monitor ambient air quality periodically.	THQ KOT CHUTTA
Noise Pollution	Elevated noise levels from equipment and construction operations	- Use soundproof or low-noise equipment and install mufflers/silencers on generators and machines. - Schedule construction activities during daytime (e.g., 8 am to 6 pm) and avoid night-time work. - Erect temporary noise barriers if the site is close to sensitive receptors (e.g., schools, clinics).	THQ KOT CHUTTA
Water Use & Wastewater	Minor use of freshwater and risk of spills from fuel or chemicals, generation of domestic wastewater	- Use water efficiently; avoid wastage through leaks or overflow. - Domestic wastewater will be negligible in amount and will be dispose of in the existing wastewater drain. - Store fuel, oil, and chemicals in secure, impermeable containers away from water sources. - Provide spill containment kits and train staff in spill management.	THQ KOT CHUTTA
Solid Waste Management	Generation of construction debris,	- Segregate waste at the source into reusable, recyclable, and non-recyclable categories. - Reuse excavated soil and materials wherever feasible.	THQ KOT CHUTTA

	packaging, and general waste	- Contract authorized recyclers and municipal services for proper disposal. - Maintain a clean and organized worksite.	
Worker Health & Safety	Injuries from machinery, equipment, and manual tasks	- Provide adequate and suitable Personal Protective Equipment (PPE) to all workers (helmets, gloves, boots, masks). - Conduct regular safety training and toolbox talks. - Ensure presence of a first aid kit and trained personnel. - Enforce safety protocols and supervision.	THQ KOT CHUTTA
Traffic and Access	Increased traffic, risk of accidents near site entrance	- Plan delivery schedules to avoid peak traffic hours. - Install warning signs and flagmen to control vehicle movement near site. - Create designated parking and loading/unloading zones. - Coordinate with local authorities for temporary traffic arrangements if needed.	THQ KOT CHUTTA

Environment Management Plan for Operational Phase			
Environmental Parameter	**Potential Impact**	**Mitigation Measures**	**Implementation Responsibility**
Air Emissions	Release of pollutants (CO_2, NO_x, SO_x, dioxins, furans) from incineration	- Use a dual-chamber incinerator with complete combustion. - Ensure secondary chamber temperature >850°C for dioxin/furan destruction. - Operate a high-efficiency wet scrubber to remove acid gases and particulates. - Install air dilution chamber post-treatment for safer exhaust. - Comply with PEQS limits and conduct periodic stack monitoring.	THQ Hospital Kot Chutta
Wastewater Management	Scrubber effluent containing neutralized pollutants; domestic sewage	- The wastewater generation from the wet scrubber will be 80-100 L in an hour. For the wastewater that will come from the wet scrubber, a sewage treatment plant which mainly includes the membrane bioreactor treatment technique, will be used. It will ensure the fly ash removal and all other pollutants removal including heavy metals to keep the environment clean and safe. - Periodic testing of water quality.	THQ Hospital Kot Chutta
Ash and Residue Disposal	Generation of incinerator bottom ash and residues	- To manage and safely dispose of the residual ash generated from the incineration process, a properly designed ash pit will be constructed on-site near the incinerator. The ash pit will be covered and concrete made to avoid any leachate production and smell. - Keep ash pit away from water bodies and human activity.	THQ Hospital Kot Chutta
Odor and Noise	Odor from waste handling; operational noise from machinery	- Ensure proper waste feed preparation (dry, sealed containers) and daily disposal. - Maintain waste storage area with ventilation and tight sealing. - Schedule regular maintenance of incinerator and auxiliary systems to reduce mechanical noise. - Use silencers and acoustic barriers if required.	THQ Hospital Kot Chutta

Occupational Health & Safety	Exposure to heat, fumes, and pathogens for operating staff	- Provide appropriate PPE (e.g., masks, gloves, heat-resistant suits). - Conduct routine health checks for workers. - Install emergency shower and eyewash stations, first aid kits, and fire extinguishers. - Train workers on SOPs, emergency procedures, and proper handling of hospital waste including laboratory waste .	THQ Hospital Kot Chutta
Energy and Fuel Consumption	Use of fuel for combustion and electricity for equipment	- Install energy-efficient burners and regularly maintain them for optimal performance. - Investigate feasibility of solar panels or energy recovery systems in future. - Monitor energy use and fuel efficiency metrics.	THQ Hospital Kot Chutta

7.2 Environmental Monitoring Plan

The Environmental Monitoring Plan for this proposed project is given as follow:

Environmental Monitoring Plan					
Environmental Aspect	**Management Measure**	**Monitoring Parameter**	**Frequency of Monitoring**	**Responsible Party**	**Remarks**
Pre-Construction Phase					
Land Use and Aesthetic Impact	Use of boundary walls and vegetative screening to minimize visual impacts.	Aesthetic impact, site clearance	Before construction	THQ Hospital Kot Chutta	Ensure proper land preparation, no trees cut.
Site Preparation and Soil Disturbance	Minimize excavation and soil compaction. Implement dust suppression techniques such as watering the site.	Dust levels, soil compaction	Weekly during preparation	THQ Hospital Kot Chutta	Ensure compliance with dust control measures.
Noise and Vibration	Use noise barriers and limit working hours to daytime.	Noise levels	Daily during preparation	THQ Hospital Kot Chutta	Ensure compliance with noise standards.
Construction Phase					
Air Quality	Control emissions from machinery through regular maintenance and water spraying.	Dust levels, emission quality (NOx, SOx)	Quarterly	THQ Hospital Kot Chutta	Ensure air quality standards are met (PEQS).
Waste Generation	Segregate construction waste and recycle where possible.	Volume of waste generated, recycling rates	Quarterly	THQ Hospital Kot Chutta	Waste should be properly sorted and disposed of.
Water Resources	Prevent wastewater runoff through proper site drainage and containment of fuels/oils.	Water usage, spill incidents	Quarterly	THQ Hospital Kot Chutta	Ensure no contamination of local water sources.

Noise Pollution	Limit noisy activities to daylight hours; use soundproof equipment where necessary.	Noise levels	Quarterly	THQ Hospital Kot Chutta	Compliance with local noise standards.
Worker Health and Safety	Provide PPE, ensure proper safety training and first aid facilities.	Number of accidents/injuries	Quarterly	THQ Hospital Kot Chutta	Safety protocols to be strictly followed.
Operational Phase					
Air Emissions	Install high-efficiency wet scrubber; regular maintenance of incinerator.	Emission levels (CO2, NOx, dioxins, furans)	Quarterly	THQ Hospital Kot Chutta	Regular checks to comply with PEQS standards.
Wastewater Generation	Safely handle the wastewater, for which membrane bioreactor will be used	Scrubber water quality (pH, TSS)	Quarterly	THQ Hospital Kot Chutta	Ensure treated water meets discharge standards.
Ash Disposal	Store ash in a covered, lined and concrete made ash pit.	Volume of ash stored, disposal method	Quarterly	THQ Hospital Kot Chutta	Ensure compliance with hospital waste including laboratory waste disposal regulations.
Odor and Noise	Proper sealing of waste storage area; regular maintenance of equipment.	Odor levels, noise levels	Quarterly	THQ Hospital Kot Chutta	Maintain odor and noise levels within acceptable limits.
Occupational Health and Safety	Provide PPE, conduct regular training, ensure proper ventilation and alarms.	Number of incidents, equipment functionality	Quarterly	THQ Hospital Kot Chutta	Regular health and safety audits.
Resource Consumption	Optimize fuel and electricity usage; explore renewable energy options.	Fuel and electricity consumption	Quarterly	THQ Hospital Kot Chutta	Implement energy-saving measures to minimize resource use.

7.3 Estimated cost for environmental monitoring plan

Table 17Estimated cost for environmental monitoring plan

Environmental Monitoring Activities	Quantity (No. of Samples x No. of locations x Frequency)	Unit Cost specification	Cost (PKR)
Ambient air quality monitoring Quarterly basis on one location for 1 year	4	@ 30,000 per sample	120,000
Ambient water quality monitoring Quarterly basis on one location for 1 year	4	@ 10,000 per sample	40,000
Noise levels, quarterly basis for 1 year	4	@ 2000 per sample	8,000
Monthly Stack Emission Monitoring quarterly basis for 1 years	12	@ 30,000 per sample	360,000
Total			528,000

7.4 Plantation Plan:

In line with the environmental protection objectives and to improve the visual aesthetics and microclimate of the project area, a comprehensive plantation plan has been developed. This plan is particularly important as the project involves the installation of a hospital waste including laboratory waste incinerator, which requires a green buffer to minimize visual, air, and noise impacts. The plantation will also aid in dust suppression, improve local biodiversity, and contribute to carbon sequestration.

Considering the project's location species that are native or well-adapted to the local climatic and soil conditions have been selected. These include a mix of shade trees, ornamental plants, shrubs, and ground cover to ensure ecological balance, aesthetic enhancement, and environmental sustainability. The selected plants are cost-effective, low-maintenance, and suitable for institutional landscapes.

Below is the proposed plantation:

Table 18 Proposed plantation

Plant Category	Plant Type / Examples	No. of Plants	Avg. Unit Rate (PKR)	Total Cost (PKR)
Shade Trees	Sukh Chain, Amaltas, Neem, Kachnar	300	150	45,000
Ornamental Trees	Bottlebrush, Alstonia, Gulmohar	100	250	25,000
Shrubs	Murraya, Bougainvillea, Chandni, Hibiscus	304	75	22,800
Climbers	Jasmine, Money Plant	50	80	4,000
Ground Cover/Grass	Lawn grass (turf) or Lemon Grass (500 sq ft)	500 SFT	30/ SFT	15,000
Total Cost				141,800

7.5 Training of Workers

One of the most important mechanisms for the enhancement of the project's overall environmental performance will be the implementation of a program of environmental training for the project personnel and the Contractor's team.

Environmental training will form part of the ongoing environmental management of the project. It will help to ensure that Proponent's environmental policies and principles are followed. The proponent will be expected to implement a formalized training program. Lump-sum fees of Rs. 100,000/= should be kept for the training management plan.

Suggested components of an environmental training program may be as follows:

- Promotion of environmental protection measures in company literature, broadsheets, posters, project updates, etc.
- Provision of guidance notes on environmental protection to contractor/s.
- Clear signs at worksites highlighting prohibited activities (discarding of wastes, smoking).
- Clear signs indicating sanitary disposal areas, safe drinking water sources, etc.

7.5.1 Training schedule

A training log will be maintained by the management of the project proponent.

Important training under the spectrum needs to include:

- Training on firefighting and safety management
- Training on environmental safeguards and compliance

- Staff training on environmental monitoring and reporting
- Training on occupational health and safety measures.

Table 19 Training Schedule

Participants	Date, Time & Location	Training Topics	Schedule	Responsible Authority
Staff of Incineration plant by THQ Hospital Kot Chutta and the contractor	As specified	✓ Introduction to project EIA and EMMP ✓ EMMP communication, documentation, monitoring and reporting requirements	Every month	Project Manager
All site personnel	As specified	✓ Site induction training on HSE system and requirements at Incinerating Site ✓ Environmental sensitivities of the project area ✓ Communication of environmental problems to corresponding officials ✓ Waste disposal	After every week	Project Manager
Drivers	As specified	✓ Road safety ✓ Road restrictions ✓ Vehicle restrictions ✓ Waste disposal ✓ Defensive driving	After every 3 months	Project Manager
Camp Staff	As specified	✓ Camp operations ✓ Waste disposal ✓ Good housekeeping	Monthly	Project Manager

7.6 Environmental Budget:

The cost required to implement the mitigation measures effectively is important for the sustainability of the project both in the construction and operational phases of project. The cost of solid and wastewater management is already added in the cost breakdown previously.

Table 20 Environmental Budget

Activity	Basis	Cost (PKR)
Environmental Monitoring Cost	Ambient Air Noise and Water Quality Monitoring Plus Stack Emission	528,000
Plantation Plan	Implementation of plantation plan	141,800
Health and Safety of Workers	For 6 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets and Provision of dustbins, warning tap safety cones, safety signboards and water sprinkling	50,000
Cost of Environmental Training	Implementation of training	100,000
Total		**819,800**

7.7 Ash Management Plan:

Types of Ash Generated:

- **Bottom Ash**: Coarse, non-combustible residue that remains at the bottom of the incinerator after the combustion process.
- **Fly Ash**: Fine particulate matter that is captured from the exhaust gases after combustion, often containing toxic compounds like heavy metals and dioxins.

2. Collection Mechanism:

- **Bottom Ash**: Collected through the ash discharge system directly from the furnace's base into designated collection containers. The ash will be cooled before being stored to prevent any risk of fire.
- **Fly Ash**: Captured through air pollution control systems, that is **wet scrubber**. The fly ash will be separated from the flue gases and collected in sealed containers to avoid dispersal into the air.

3. Storage and Handling:

- To manage and safely dispose of the residual ash generated from the incineration process, a properly designed ash pit will be constructed on-site near the incinerator. The ash pit will be covered and concrete made to avoid any leachate production and smell. Keep ash pit away from water bodies and human activity.

5. Waste Minimization:

- **Recycling Opportunities**: If any portion of the bottom ash is suitable for recycling (such as for use in construction materials or road foundations), it will be redirected for recycling instead of disposal.
- **Waste Segregation**: All ash will be carefully segregated at the point of generation to prevent contamination, ensuring proper disposal methods are followed for each type.

7.8 De-commissioning Phase Plan:

The marks the end of the incinerator's operational life. During this stage, all equipment and associated infrastructure, including the incinerator unit, scrubbers, ducting, chimneys, and storage tanks, will be systematically dismantled and removed from the site.

Activities will include disconnection of utilities, safe removal of hazardous components, and disposal of residual waste materials. Any hazardous or potentially contaminated components will be handled in accordance with national hazardous waste regulations to prevent environmental pollution. Dust and noise generated during dismantling will be minimized using appropriate control measures such as water spraying and noise-suppressing equipment.

Once all structures will be removed, the site will be restored to its original or an approved condition through grading, cleaning, and landscaping, ensuring it poses no residual risk to the environment or public health. Occupational safety will be strictly observed throughout the process, with trained personnel and protective equipment in place.

7.9 Environmental Management Team

Following functionaries will be involved in the implementation of EMMP:

- , as the proponent of the project, Environmental Management Plan during construction as well as operation stage.
- Project contractor(s) as executors of the EMMP during the construction phase of the project.

- Operational & Maintenance (O&M) and the Health, Safety and Environment team of the project as an executor of the EMMP during the operational phase of the project.
- Punjab Environmental Protection Agency (EPA) as Government Agency to review and monitor the implementation of remedial and mitigation measures as given in EIA.

7.9.1 Responsibilities of functionaries

Specific responsibilities of key role players are illustrated hereunder:

7.9.2 Responsibilities of management of project

Management of the project Incineration plant by THQ Hospital Kot Chutta will be responsible for the environmental management and supervisory affairs during the project activities. Environmental personnel designated by the management of the project will look after the environmental related issues during the project activities. The responsibilities of environmental personnel are as follows:

- Monitoring progress of the project as per planned schedule of activities.
- Exercising oversight over the implementation of environmental mitigation measures by the contractor.
- Documenting the experience in the implementation of the environmental process.
- Preparing training materials and implementing programs.
- Maintaining interfaces with the other lined departments / stakeholders.
- Reporting to the management of the project on the status of EMMP implementation.

7.9.3 Responsibilities of project contractor

Contractor appointed for the commissioning of the project including the auxiliary facilities is responsible for:

- Implementation of all provisions of the EMMP and with any environmental and other codes of conduct required by the project.
- Provision of proper Personal Protective Equipment (PPE) to the workers and train them for their proper use.

7.9.4 Responsibilities of EPA

To review and monitor the implementation of remedial and mitigation measures as given in the EIA.

7.10 Equipment Maintenance Details

The proposed project is to Incineration plant by THQ Hospital Kot Chutta by the title **"Incineration plant by THQ Hospital Kot Chutta"** located at Within the premises of THQ Hospital Kot Chutta, District Dera Ghazi Khan over an area of 1800 SFT. All chambers, machines, equipment and vehicles must be properly maintained so that workers are not in danger. Construction regulations require inspections of vehicles, tools, machines and equipment before use. We must always be aware that maintenance tasks themselves are potentially hazardous and can result in injury.

The successful maintenance program is:

- Well organized and scheduled
- Controls hazards
- Defines operational procedures
- Trains key personnel

8 STAKEHOLDER CONSULTATION

Stakeholder consultation is a critical component in the environmental assessment process for the proposed project. It fosters communication among diverse groups, facilitating information exchange, feedback collection, and collaborative decision-making.

8.1 Benefits and Objectives of Stakeholder Consultation

Engaging with stakeholders offers several advantages, including improved project understanding, identification of environmental concerns, and incorporation of local insights into project planning. Key objectives include:

- **Enhancing Understanding:** Clarifying the project's aims and potential impacts to ensure stakeholders are well-informed.
- **Addressing Concerns**: Identifying and resolving stakeholder issues to prevent opposition and build consensus.
- **Building Trust:** Establishing a foundation of trust and cooperation between the project Proponent and stakeholders.
- **Informed Decision-Making:** Leveraging stakeholder input to make informed decisions regarding project design and implementation.

8.2 Identification and Classification of Stakeholders

A comprehensive stakeholder identification process was undertaken to recognize all parties with a personal stake in the project, classified as:

- **Industries:** Businesses and institutions directly affected or influential to the project outcome.
- **Local Communities:** Residents and groups in proximity to the project site are likely to experience its direct impact.

8.3 Methodology for Consultation

The consultation process involved a dynamic exchange of ideas through discussions, meetings, and field visits, aimed at:

- **Scoping Sessions:** Initial meetings to define project scope and identify key stakeholder concerns.

- **Focus Group Discussions:** In-depth conversations with local communities and government representatives to gather detailed feedback.
- **Location-Based Meetings:** Engagements held at various sites to ensure broad stakeholder participation and input.

This stakeholder consultation process underscores the project's commitment to environmental stewardship, community engagement, and sustainable development. By incorporating stakeholder feedback into the process, the project aims to achieve a balance between development objectives and environmental conservation, fostering positive relationships with all affected parties.

8.4 Views, Concerns, and Suggestions of Various Stakeholders

The major socio-economic concerns and problems of the affected persons of various communities have been given in tabulated from along with their main concerns and remarks. Community showed a lot of concerns; a few are being mentioned here:

- Removal of shrubs and trees should be avoided, if any, to the extent possible in the case of clearance green zones should be established within the facility.
- Indigenous trees around the facility should be planted to control air pollution and as the compensation of construction activity.
- The project will become the source of income for local to earn their livelihood easily and honorably, so locals should be preferred.
- For the solid waste management and waste disposal, proper disposal techniques should be adopted.
- Water spraying/sprinkling should be done on the regular basis during construction phase to avoid dust emissions.
- Employment opportunities will be generated and locals should be hired on the priority basis.
- The air pollution is one of the major impacts from which Punjab is being affected at the large scale. So, ambient air quality should be monitored regularly and air pollution expected to generate from the operation should be mitigated.
- Good relations with the local communities will be promoted by encouraging
- Contractor to provide opportunities for skilled and unskilled employment to the locals as well as on-job training.

- Noise generated activities should be carried out during day hours.

8.5 Environmental Management Team and Experts

Sr. #	Managers	Responsibilities
1.	**Contract Manager**	• Implementation of EMP • Environmental issues identification during pre-construction phase. • Communication EMP to all employees.
2.	**Contractor**	• Ensure that the control measures identified during environmental surveys are implemented as they are relevant to their work/visit. • Ensure that the project management team is notified of any non-conformance of control measures or environmental incidents where the environment has been put at risk.
3.	**Site Manager**	• Ensure site material and safe handling of hazardous waste. • Controlled access arrangement to avoid hazards. • Emergency egress arrangements to avoid any unfortunate incident. • First aid facilities/services should be readily available on-site.
4.	**Site HSE Advisor**	• Ensure good standards of workmanship. • Engaged health and safety to devise site waste management plan to be followed and implemented. • Daily checks & weekly checks. • Regular consultation with workers.
5.	**Site Environment Advisor**	• According to legislation and consent develop EMP. • Ensure application of EMP. • Conduct regular site inspection.
6.	**Public Contact Officer**	• First point of contact for members of the public. • Arrange and manage public forums. • Maintain relation with stakeholder

8.6 The Responsible Authority for EMP Implementation

The successful implementation of the Environmental Management Plan (EMP) is a pivotal aspect of ensuring the environmental integrity and sustainability of the proposed unit. The ultimate responsibility for overseeing and ensuring the effective execution of the EMP lies with the project Proponent.

Appointment of an HSE/Project Manager

To facilitate this, the project Proponent will appoint a Health, Safety, and Environment (HSE)/Project Manager possessing the necessary qualifications and expertise. This individual will assume the role of Environmental Manager, tasked with the comprehensive management of all health, safety, and environmental conditions as per the Punjab Environmental Quality Standards (PEQS).

Responsibilities of the HSE/Project Manager

As Environmental Manager, the HSE/Project Manager's responsibilities will encompass a broad spectrum of duties, designed to ensure that the project not only complies with all relevant environmental regulations but also adopts best practices in environmental stewardship.

8.7 Environmental Practitioners and Experts

Consultation with Environmental Practitioners and experts was done, and the following comments and suggestions were noticed.

Table 21 Environmental Consultant Team

Sr. No.	Name	Designation	Comment/ Suggestions
1.	Sara Fatima	Senior Environmentalist	• She said that the project will have a positive impact on the economy, but its construction should be done in an environmentally friendly way. • Basic facilities should be provided to local community
2.	Zia Ur Rehman Farooqi	Ph.D. Scholar Environmental Sciences	• Tree plantation in designated green zones should be conducted.

			• Proper disposal of the solid waste • HSE management measures should be adopted and implemented effectively
3.	Dr. Hina Ahmed Malik	Ph. D Environmental Sciences	• He said that locals should be preferred for employment. • Value addition of area. Proper mitigation measures must be adopted while construction and operation of this project
4.	Engr. Kanza Fatima	Environmental Engineer	• Waste must be collected and disposed of properly. • Ensure the use of PPE's during the operational activities. • Wastewater should be treated. • Ensure the tree plantation
5.	Engr. Aleeza Kanwal	Environmental Specialist	• Health and safety department and trained people should be there in case of any emergency. • Ensure maintenance of incinerator
6.	Engr. M. Bilal	Environmental Engineer	• Should be ensured that the pollution abatement technique

8.8 Other Departments and Agencies

Following officers of government departments were consulted by the socio-environmental team of the consultants and concerned details about the project were noted down through personal interviews, group meetings, etc, in their offices, for instance.

Sr. No.	Designation	Concerns
1.	**Environment Protection Department (EPD)**	
	General Manager	• Solid waste should be managed in Environmentally friendly manner. • Wastewater should be treated effectively & approval should be acquired from concerned agency before disposing off in nearby drain. • HSE* at the site should be managed effectively. • No impact is being foreseen due to the selected location. • Locals should be given job opportunity.
	Environmental Inspector	
2.	**Social Welfare Department (SWD)**	
	Deputy Director Officer	• Final goods should be affordable for the locals. • The proposed product should facilitate locals and they should be economical. • Job opportunities should be given to the locals. • Wages should be given according to the work assigned to them. • Life insurance of the workers should be given as well as all the facilities should be given as per labor laws.
3.	**Irrigation Department**	
	Subdivision	Following comments were suggested: • Untreated wastewater should not be disposed of in the nearby drains without proper treatment. • Beneficial as job opportunities will be available to the residents.
	Executive Engineer	

4.	Forest Department	
	District Forest Officer	Following recommendation were suggested by the forest department: • Plantation and landscape activities should be conducted on a broader scale. • Proper drainage system must be available at site

8.9 Key finding of the consultation

The study findings depict that people perceive overall positive social impacts by development of the Incineration plant by THQ Hospital Kot Chutta. Their attitude towards the construction of the said project is highly positive with the expectation that locals are provided with jobs especially where unskilled labor is required. Majority of the people is convinced for positive sign for the management of hazardous & non-hazardous waste. However, they want to carry out the project activities with proper mitigation measures.

9 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The construction of the said project for the disposal & management of hospital waste is a critical environmental management solution aimed at ensuring the safe and effective disposal of hazardous healthcare waste. This project is designed with a focus on minimizing environmental risks through careful planning, stringent monitoring, and the application of appropriate mitigation measures.

The environmental impact assessment (EIA) has highlighted several potential impacts during the pre-construction, construction, and operational phases, including air quality deterioration, noise pollution, soil contamination, and water quality impacts. However, with the implementation of comprehensive mitigation measures, such as the use of wet scrubbers for air pollution control, proper wastewater treatment, safe storage and handling of materials, and noise reduction strategies, the environmental risks can be significantly minimized. Additionally, the project aims to adopt best practices in waste management, ensuring that ash and other waste are appropriately handled and disposed of in collaboration with licensed hospital waste including laboratory waste management companies.

The environmental management and monitoring plan (EMMP) includes specific strategies to monitor the project's impacts and compliance throughout its lifecycle. Regular monitoring of air, water, and noise quality, as well as the ongoing training of personnel, will help ensure the effectiveness of these mitigation measures.

The cost estimates for environmental measures, including the installation of pollution control systems, monitoring activities, and waste management strategies, have been identified and incorporated into the environmental budget. The budget outlines both the upfront and operational costs associated with maintaining environmental safeguards, ensuring the sustainability of the project’s environmental performance.

Through the careful application of the mitigation strategies outlined in this report, the project is expected to meet regulatory requirements and contribute to the sustainable management of waste in the region. The incinerator will play a vital role in preventing the spread of infectious diseases while ensuring minimal environmental impact.

9.2 Recommendations

1. **Strict Adherence to Environmental Regulations:** The project should ensure continuous compliance with local, national, and international environmental regulations concerning air and water quality, waste disposal, and noise control. Regular reviews of these regulations should be conducted to adapt to any changes or new requirements.
2. **Enhanced Waste Management Protocols:** It is recommended to implement additional waste segregation strategies within the hospital before waste is sent to the incinerator. Proper segregation will help optimize the waste incineration process, reduce the amount of ash produced, and improve overall efficiency.
3. **Regular Monitoring and Auditing:** Continuous environmental monitoring should be carried out, with regular audits to assess the effectiveness of the mitigation measures. The monitoring should include periodic testing of air and water quality, as well as noise levels at surrounding locations. Any deviations from regulatory limits should trigger immediate corrective actions.
4. **Staff Training and Capacity Building:** The hospital staff and the incinerator operation team should undergo regular training on environmental awareness, proper waste handling techniques, and emergency response protocols. This will ensure that they are well-equipped to deal with any potential environmental risks or incidents that may arise during the project.
5. **Continuous Maintenance of Pollution Control Systems:** To ensure the long-term effectiveness of pollution control measures, it is crucial that all environmental control systems, including wet scrubbers and wastewater treatment systems, be regularly maintained. This maintenance should be included in the operational budget and conducted as per the manufacturer's recommendations.
6. **Engagement with Local Communities:** While the project site is not located near any sensitive heritage or ecological areas, it is still advisable to engage with the local community throughout the project lifecycle. This will help address any concerns and ensure that the project maintains transparency and social responsibility.
7. **Site Restoration and Landscaping:** Post-operation, the project site should undergo proper restoration. This includes landscaping and planting native vegetation to restore the area's ecological balance. The plantation plan should focus on native species that

require minimal water and maintenance, contributing to the overall sustainability of the project.

8. **Periodic Review of Environmental Management Plans:** As part of the ongoing commitment to environmental responsibility, the environmental management and monitoring plans should be reviewed periodically, especially after the first year of operation. This review should incorporate lessons learned, changes in environmental conditions, and updated regulations.

9.3 Final Remarks:

In conclusion, this project offers an environmentally sound solution for the disposal of hospital waste including laboratory waste, contributing to public health and environmental sustainability. By adhering to the recommendations provided, the project will minimize environmental risks while ensuring that the waste management needs of the locality are met efficiently and effectively. Continuous monitoring, effective mitigation measures, and community engagement will ensure the success and sustainability of the project, benefitting the surrounding environment.

10 ANNEXURE

GLOSSARY

Air pollution: Air is a composition of several gases, mostly nitrogen and oxygen and smaller amounts of water vapour, carbon dioxide, argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways.

Ambient air quality: Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution.

Carbon dioxide (CO2): A colourless gas that is naturally produced by animals and people in the exhaled air and the decay of plants.

Carbon monoxide: A highly poisonous, odourless, tasteless and colourless gas that is formed when carbon material burns without enough oxygen.

Climate: The pattern of weather in a particular region over a set period of time.

Hospital waste including laboratory waste : Hospital waste including laboratory waste is the term used for waste generated from healthcare and similar activities that may pose a risk of infection, e.g. bandages, swabs.

Conservation: Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non action (such as not letting taps run unnecessarily).

Deforestation: The reduction of trees in a wood or forest due to natural forces or human activity such as burning or logging.

Effluent: Liquid wastes such as sewage and liquid waste from industries.

Energy efficiency: Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes.

EIA: An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies.

EMP: An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.

Fauna: The animals of a particular region, habitat, or geological period.

Flora: The plants of a particular region, habitat, or geological period.

Habitat: The area occupied by a community or species (a group of animals or plants), such as a forest floor, desert or seashore.

Initial Environmental Examination: Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring.

Landfill: A site that is specially designed to dispose of waste and operates with a license granted by the Environmental Protection Agency (EPA).

PEQS: The Punjab Environmental Quality Standards (PEQS) are quality standards to regulate the air emissions and effluents of industry and other big polluters.

Noise Pollution: Noises that disturb the environment and people's ability to enjoy it, for example, continually sounding house alarms, loud music, air conditioning or other electrical units and aircraft or motor engines.

Seismology: The branch of science is concerned with earthquakes and related phenomena.

Topography: The arrangement of the natural and artificial physical features of an area.

11 TERMS OF REFERENCES

Terms of References (TOR) for the Environmental Impact Assessment (EIA) process are designed to ensure compliance with the regulatory framework and facilitate a thorough review of the project's environmental implications. These terms are outlined as follows:

- **Review Fee Payment:**

As stipulated in Regulation 7 of the Review of IEE and EIA Regulations, 2022, the proponent is required to submit a nonrefundable review fee to the Environmental Protection Agency (EPA) at the time of submitting the IEE/EIA report. The specific amount of this fee is determined by the rates specified in Schedule III of the regulations.

- **Submission of Required Documents:**

The proponent must provide all necessary documents and details essential for the completion of the EIA report. This includes, but is not limited to, technical studies, environmental impact analyses, mitigation strategies, and any other information pertinent to assessing the project's environmental footprint.

- **Financial Responsibility for Fines and Penalties:**

The proponent shall bear full responsibility for any fines or penalties levied by the EPA Punjab or the Environment Tribunal. This includes violations of environmental standards, non-compliance with regulatory requirements, or any other infractions identified during the review or implementation phases of the project.

- **Accuracy and Validity of Information:**

The proponent is responsible for ensuring the correctness and validity of all information and documents provided to the consultant for onward submission to EPA Punjab. The consultant facilitating the EIA process will not bear any responsibility for inaccuracies or omissions in the information supplied by the proponent. It is imperative that the proponent conducts thorough due diligence to guarantee that all submitted materials accurately reflect the project's potential environmental impacts and proposed mitigation measures.

These Terms of References are critical to ensuring that the EIA process is conducted in a transparent, accurate, and regulatory-compliant manner. Adherence to these terms will facilitate a comprehensive environmental review of the project, enabling informed decision-making by

the EPA Punjab and contributing to the sustainable development and environmental stewardship goals of the region.

In Incineration plant by THQ Hospital Kot Chutta

Proponent

Mr. Arshad Hussain S/O Ch Mumtaz Ahmad

Consultants

Enviro Stewards Co. (Pvt.) Ltd

LIST OF INDIVIDUALS AND THEIR FEEDBACKS

Sr.#	Name	Concerns
1	Arslan Nawab	During the survey in the study area the following concerns of the local community were noted: Air pollution should be controlled effectively, such as emissions generated from power generating activities. Chemicals should be stored and handled properly only authorized people should be allowed near the chemical storage area. Locals should be preferred for the job opportunities. Wastewater should be treated prior to final disposal in the nearby drain. Solid waste should be managed effectively by adopting the standard practices of the area. Cleanliness of the area should be ensured. An effective EMMP should be designed and enforced with true spirit. Health of the workers should be ensured. Planation should be carried out at extensive scale. Construction activity should be carried out during the daytime. Noisy activities should be confined.
2	Nadir Khan	
3	Kareem Iqbal	
4	Muhammad Akhtar	
5	Zeeshan Sahib (Amin)	
6	Muhammad Arif	
7	Muhammad Adnan	
8	Shahbaz Khan	
9	Waseem Ahmed	
10	Rab Nawaz	
11	Allah Yar	
12	Ahmed Saeed	
13	Muhammad Jabbar	
14	Muhammad Ramzan	
15	Kamran Ali Khan	

LIST OF NAMES, QUALIFICATIONS AND ROLES OF TEAM MEMBERS CARRYING OUT THE IEE/EIA STUDY

Sr. No.	Team Members	Designation	Qualification & Experience	Tasks Performed
1.	Miss Sara Fatima	CEO	PH D Scholar in Environmental Sciences Working experience in Enviro Stewards is 4.5 years	* Overall coordination and supervision of the EIA study. * Ensure EPA compliance in methodology and reporting. * Final review of EIA documentation. * Lead communication with regulatory authorities and stakeholders
2.	Mr. Zia ur Rehman Farooqi	Environmental Scientist	Ph.D. in Environmental Sciences (Scholar) More than 3 years of Experience in Enviro Stewards	* Technical input in impact identification and prediction * Assist in scoping and mitigation measures * Support development of Environmental Management Plan (EMP)
3.	Hafiz Zeeshan Safder	M.Sc. Analytical Chemistry	Masters in Analytical Chemistry 2 Years of working experience in Enviro Stewards	* Field data collection for environmental baseline (air, water, soil, noise) * Assist in public consultation and stakeholder engagement * Assist in evaluating physical, biological, and socio-economic
4.	Miss Aleeza Kanwal	Environmental Specialist	BSc Environmental Engineering 2 years working experience	* Support preparation of EIA report * Contribute to impact assessment, mitigation measures of the proposed project * Assist in EMP and monitoring plan preparation
5.	Miss Kanza Fatima	Environmental Engineer	BSc Environmental Engineering 2 years working experience	* Assist in the baseline data collection * Support in conducting Socio Economic survey and public consultation.