ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
WASTE INCINERATION PLANT

Final Report **August - 2024**

EMC Pakistan
Private Limited

ZEPHYR
WASTE SOLUTIONS
FOR LIFE ON EARTH

Environmental Impact Assessment (EIA)

Waste Incineration Plant
SITE, Sukkur

Final Report
August, 2024
Ref: EIA/12/08/24

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EXECUTIVE SUMMARY

This report presents the findings of the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd for the proposed waste Incineration plant facility at SITE area, Sukkur. The proponent of the proposed Project is ***Zephyr Waste Solutions***. The Environmental Impact Assessment (EIA) of the Proposed project has been carried out in compliance with the mandatory requirement of Section 17 of Sindh Environmental Protection Act, 2014 which requires that:

"No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof."

The objective of the project is to construct an incineration facility, which after completion will provide services to incinerate the Industrial hazadous waste & medical waste. The project aims for safe disposal of medical and industrial hazardous waste.

The proposed project comprises of a incinerator, to be installed and operationed at Plot No. C-20 SITE area, Sukkur.

The salient features of the project are as under:

Table ES 1.1: Project Details	
General	
Project Title	Waste Incineration Plant
Project Location	Plot No.C-20 Site Area, Sukkur
Proponent	M/s Zephyr Waste Solutions.
Total Area of Plot	1 acre
Current status of the project	Design Phase
Plant Specifications	
Burning Capacity	150 kg/hr
Operational Hours	08 Hrs/Day
Chimney Height	35'
Design Temperature of Incinerator	600°C to 1000°C-Primary 1000°C to 1400°C-Secondary
Combustion Air System	1x11 Burner Air Excess Air for Burning
Cooling System	Through Natural Air
Ignition System	LPG Autopilot
Wet scrubber	Yes
Number of Chamber	02 Chambers
Fuel	Furnace Oil
Type of waste to be Incinerated	Solid/Liquid Waste
Ancillary facilities	Storage area, admin,

Project site is located in SITE area. Nearby entitites include Prime Trader, WAPDA Grid StationShaheen Flour Mill, FMC Warehouse, Topsun Groups warehouse, SS Flour Mill, RK Rice and Flour Mill, etc.

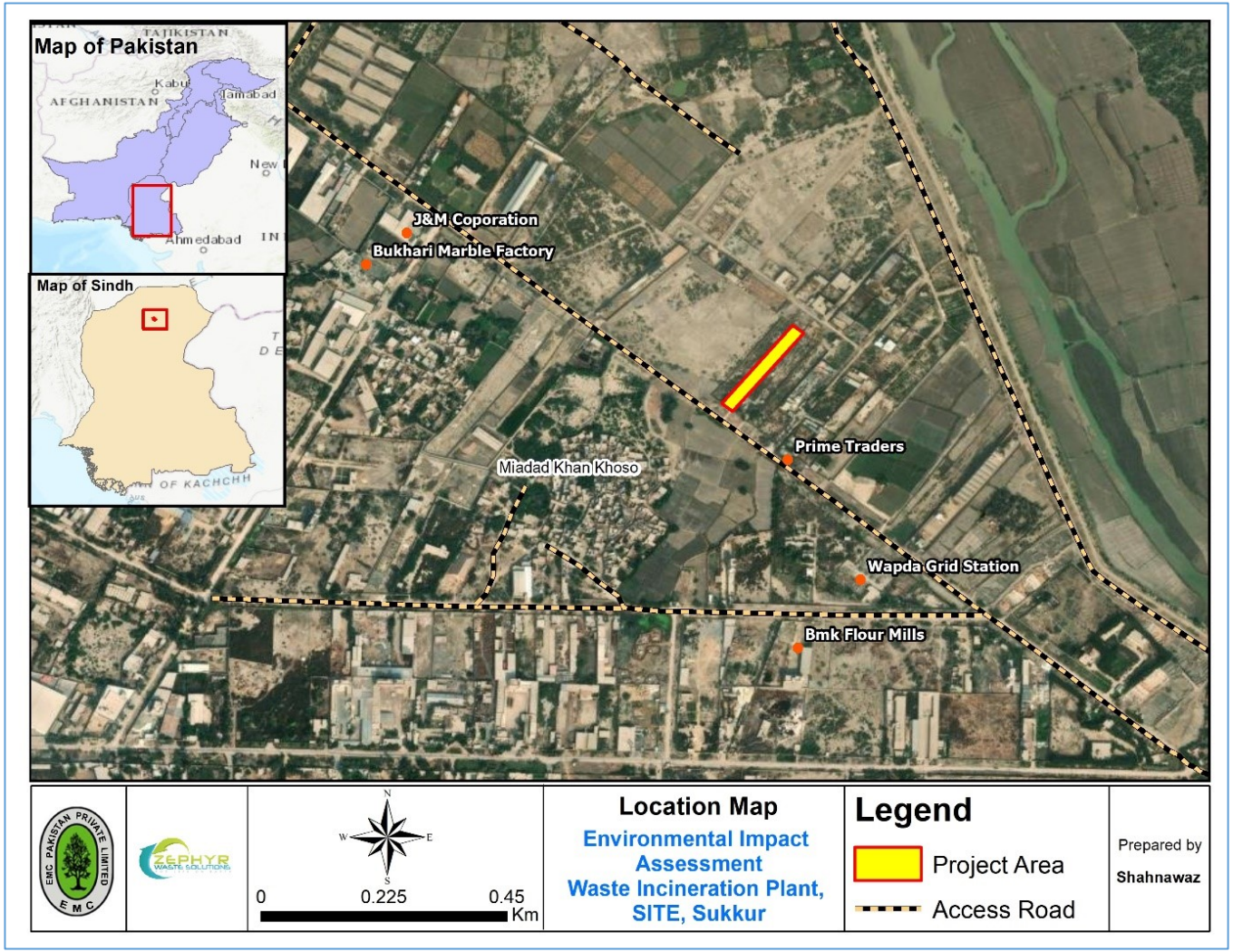

Figure ES-1: Location Map of proposed project area

The baseline conditions of the project area were studied based on the results of the investigations conducted by the field study team as well as through studying available materials and literature. Ambient air monitoring, and noise level Monitoring of the project area was also carried out through EPA approved laboratory. Results of the air and noise monitoring are within SEQS.

The likely adverse environmental impacts during the construction phase will include the following: degradation of soil, soil erosion due to improper disposal of excavated materials and construction waste; spillages of hazardous substances during the construction; pollution of groundwater resources and soil by construction run-offs; use of temporary construction sites (access roads, camps, machinery sites, storage facilities, etc.); temporary air pollution related to increased truck traffic during the construction, release of dust from digging -loading works and heavy machinery operation; noise and vibration disturbances; occupational hazards during construction works.

The likely adverse environmental impacts during the operation phase include: emissions to atmosphere associated with the waste incineration, dumper truck movements and operation of standby power generators due to emission of pollutants originated during burning of fuel; impacts on water and soil as a result of improper waste management including ash management and discharge of wastewater without treatment.

The measures specifically developed for the construction phase of the project include: construction materials storage, monitoring of these sites closely so that they do not expand unduly during construction; compacting the top surface of access roads and worksites to facilitate water runoff and avoid flooding the area; conduct dust-depressing measures aimed at prevention of air pollution; use closed/covered trucks for transportation of loose construction materials; regular check of proper technical conditions of machinery and equipment; disposal of excavated materials and construction waste in agreed disposal sites; ban the disposal of waste into water channels. Where possible; restoration to original conditions of the landscape after completion of construction works; use of appropriate safety equipment by the personnel involved in construction works.

Mitigation measures proposed for the operation phase include: follow standard operating procedures for incinerator operations, focusing on type of waste to be incinerated, ensuring that temperature in primary and secondary chamber is as per specifications, ensuring the effective operation of emission controls, use of wet scrubber, regular maintenance of all machinery and equipments, Regular monitoring of air emissions to check compliance with SEQS, ash management, wastewater treatment before disposal, ensure presence and working condition of fire-fighting equipment. The bottom ash will either be sent for utilization in cement and road making or will be disposed in authorized disposal sites. The project will provide a consolidated platform for the safe disposal of medical and hazardous waste.

The project is not expected to have long-term significant or irreversible negative environmental impacts neither at the construction nor at operation phase. There are no specially protected areas or threatened or endangered endemic species in the project area.

The likely adverse impacts mentioned above can be prevented, minimized and additional loads on natural resources can be minimized by timely and due implementation of mitigation measures provided in the Environmental Management Plan (EMP). To ensure effective implementation of EMP, environmental monitoring plan has also been developed for each phase of the project.

In summary, based on the findings of this assessment there is no reason why the facility proposed for the site should not be authorized, contingent on the mitigations and monitoring for potential environmental and socio-economic impacts as outlined in the EIA and EMP being implemented.

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Chapter 1 INTRODUCTION

1.1 General

This Report presents the findings of the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd for the proposed Incinerator, to be installed and operated, with a capacity of 150kg/hr/incinerator facility at Plot No. C-20, SITE area, Sukkur. The EIA study has been conducted in compliance with the mandatory requirements of Section 17 of the Sindh Environmental Protection Act, 2014 and the rules & regulations framed thereunder.

Environmental Impact Assessment is a planning tool accepted as an integral component of sound decision-making. The purpose of EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activities before action is taken. Early identification and characterization of critical environmental impacts allow the public and the government to form a view about the environmental acceptability of the proposed development project and what conditions should apply to mitigate, reduce or compensate those risks and impacts.

Field surveys were conducted in the study area by EMC Pakistan Pvt. Limited team, which included environmentalists, sociologists, and ecologists. Field data collection included observational surveys, consultations, and meetings for data collection with government departments, Communities, and ground verification of available secondary information. Secondary information was collected from proponent in-house sources, Government Departments, and NGOs. Applicable international guidelines, conventions, and environmental assessment procedures prepared by the Sindh EPA have been gone through while preparing this document.

1.1.1 Project Proponent

M/s Zephyr Waste Solutions.
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Email: info@zephyrwaste.com

1.2 EIA Consultant

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Website: www.emc.com.pk
Email: mail@emc.com.pk; info@emc.com.pk

1.3 Zephyr Waste Solutions – The Proponent

Zephyr Waste Solutions (ZWS) is a leading waste management company in Pakistan. Established in 2007, ZWS offers services that encompass waste management through its entire lifespan, starting with source minimization, to its recycling, and appropriate treatment and disposal. ZWS is built around the 3R concept: Reduce, Reuse and Recycle. ZWS is led by a team of highly experienced professionals from multidisciplinary backgrounds, primarily consisting of environmental engineers and scientists, health and safety professionals and trainers, logistics experts and waste specialists. Additionally, ZWS has close contact with chemical and industry experts who guide the team in case of dealing with special wastes. Zephyr Waste Solutions (ZWS) is an approved service provider for Collection, Transportation, Storage, and Disposal of Hazardous and Non-Hazardous Waste by various Environmental Protection Agencies Pakistan. ZWS has the following valid certifications: ISO 9001:2015; ISO 14001:2015; ISO 45001:2018

Vision and Mission

To bring about a complete transformation in waste management services available in Pakistan by offering our clients a customized and one-window waste management solution, ensuring adherence to all relevant international standards, guidelines and best management practices, in addition to all mandatory national legislation; ensuringasafe, clean and green environment forall, ultimately helping our countrymeet its Sustainable Development Goals (SDG) towards a circular economy.

1.4 Project Need

Increasing industrialization and waste management challenges in Sukkkur has necessitated the need of more waste management facilities in the city. Incineration as a waste management facility is capable of treating all types of solid waste, including hazardous and non-hazardous hospital, municipal and, industrial waste. Incineration facility is more effective in waste management as compared to other alternatives because it can reduce the volume of waste to 95-97%. Presently, there is no planned landfill facility in the SITE division, although it is planned to be developed. In the absence of a planned landfill site, alternative waste management practices like Autoclaving and Chemical Treatment are not possible as these alternatives do not reduce the volume of the waste generated. For open dumping of the waste, incineration is the only feasible option available for hazardous and non-hazardous management.

Waste is an unavoidable by-product of most human activity. Economic development and rising living standards in the city have led to the increase in the quantity and complexity of generated waste, whilst industrial diversification and the provision of expanded health-care facilities have added substantial quantities of industrial hazardous waste and biomedical waste into the waste stream with potentially severe environmental and human health consequences. Sukkur is unable to manage medical waste by applying scientific methods. Hospital waste is simply mixed with municipal waste in roadside collection bins and disposed of similarly which is not acceptable. Hazardous, hospital and industrial waste are being treated as ordinary wastes.

The installation and operation of an waste incinerator facility in Sukkur is conceptualized by the proponent based on the intention to aid the local industry and the public sector to manage the hazardous and non-hazardous waste of the city. It will increase the infrastructural capacity of the city to manage the increasing issue of solid waste management. Moreover, several industrial and hospital facilities in Sukkur requires proper disposal of hazardous and non-hazardous waste. The proposed commercial incineration facility will not only help to meet the environmental regulations under the Sindh Environmental Protection Act, 2014 but also aid the economic and industrial base of Sukkur to be environmentally and social responsible.

1.5 The Project at a Glance

The proposed project involves construction/installation and operation of Waste Incineration Plant. The project land is rented by Zephyr Waste Solutions from M/s GUL Enterprises. The project will provide a consolidated platform for safe disposal of hazardous industrial waste and medical waste.

The salient features of the project are as under:

Table 1.1: Project Details	
General	
Project Title	Waste Incineration Plant
Project Location	Plot No.C-20 Site Area, Sukkur
Proponent	M/s Zephyr Waste Solutions.
Total Area of Plot	1 acre
Current status of the project	Design Phase
Plant Specifications	
Burning Capacity	150 kg/hr
Operational Hours	08 Hrs/Day
Chimney Height	35’
Design Temperature of Incinerator	600°C to 1000°C-Primary 1000°C to 1400°C-Secondary
Combustion Air System	1x11 Burner Air Excess Air for Burning
Cooling System	Through Natural Air
Ignition System	LPG Autopilot
Wet scrubber	Yes
Number of Chamber	02 Chambers
Fuel	Furnace oil
Type of waste to be Incinerated	Solid/Liquid Waste
Ancillary facilities	Storage area, admin,

1.6 Project Location

The proposed project site is located at Plot No.C-20, SITE Area, Sukkur. The project land is rented by Zephyr Waste Solutions from M/s GUL Enterprises.

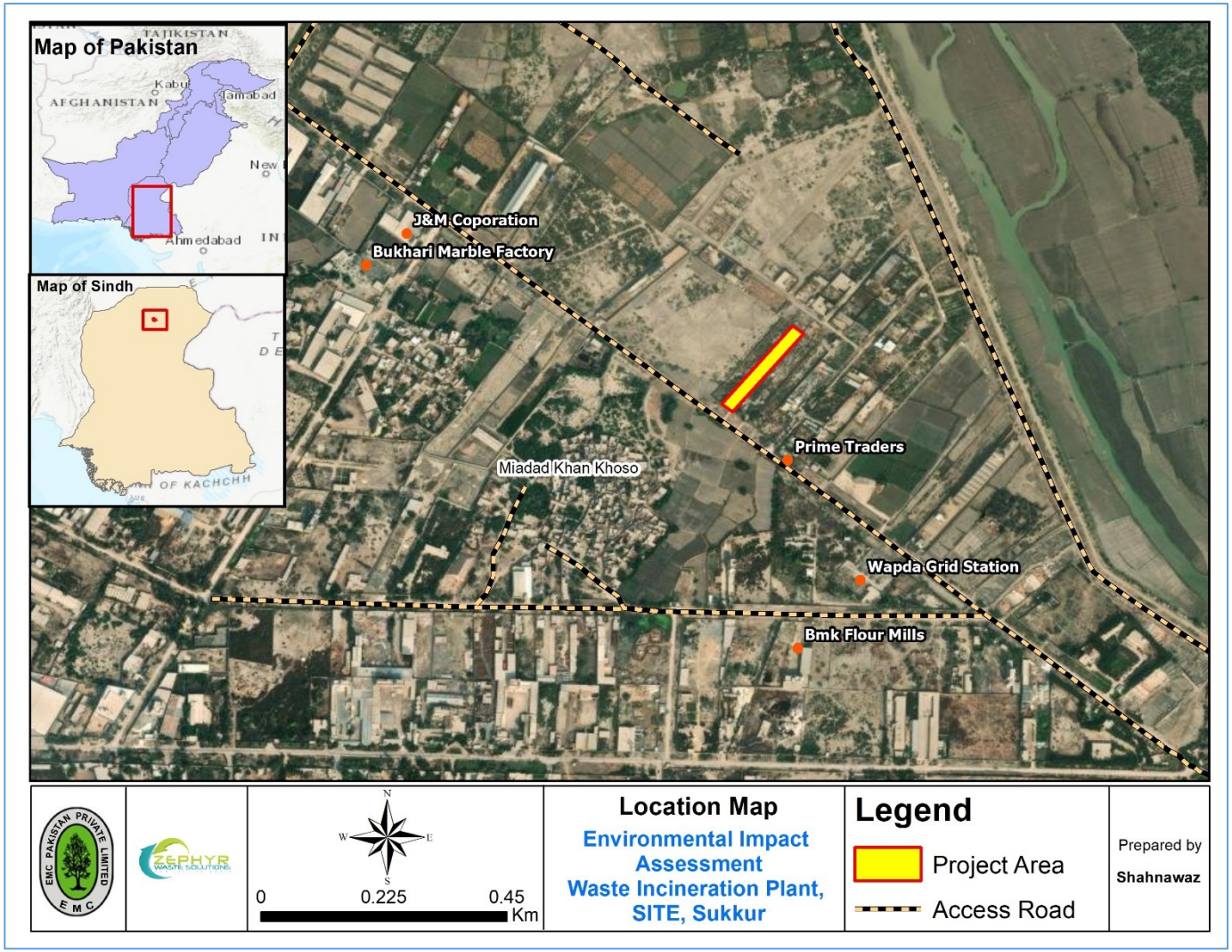

Figure 1.1: Project Location

1.7 Need of EIA Study

Environmental Impact Assessment of Incinerator Plant facility with an operational capacity of 150 kg/hr has been carried out in compliance with the mandatory requirement of Section 17 of Sindh Environmental Protection Act (SEPA), 2014, which requires that:

"No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof."

This Environmental Impact Assessment report presents the evaluation of environmental impacts of the construction and operation of the proposed Incinerator project.

1.8 Project Categorization

qSindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 categorize projects into three separate schedules depending on whether a project requires an Environmental Checklist (Schedule-I) or an IEE (Schedule-II) or EIA (Schedule III). The Regulations also require that all projects located in environmentally sensitive areas need submission of an EIA.

On the basis of the nature and scope of project, it has been accordingly categorized into Schedule-III

Schedule-III, (EIA Project)

Category H: Waste Disposal and treatment

Sub category: 1. Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration units, etc.)

Therefore, an EIA has been undertaken for the proposed incinerator Plant.

1.9 Scope and Objectives of the EIA Study

The main objectives of the Environmental Impact Assessment (EIA) study are to:

- Describe the project & all the activities to be carried out during the life of the project, including design, construction, operation, or any other activities relating to the project.
- Describe the key components of the microenvironment & macro environment of the project area.
- Identify, analyze and evaluate the type and extent of likely potential environmental and social impacts with emphasis on significant beneficial/adverse effects the proposed Project will cause on the existing biological, physical, and socio-economic environments of the project area.

- Recommend mitigation measures and strategies to minimize or avoid adverse environmental and social impacts, including monitoring plans for implementing the mitigation measures.
- Environmental Management Plan for sustainable construction and operation of the project is developed which forms an essential part of the EIA report.
- Fulfill the legal requirements of section 17 of SEP Act, 2014.
- Assist planners and decision-makers in evaluating the project's feasibility based on its potential environmental impacts.

1.10 Methodology of EIA

Environmental Impact Assessment (EIA) is a systematic process that identifies and evaluates the potential impacts (positive and negative) that a proposed project may have on the biophysical and socio-economic environment. It identifies mitigation measures that need to be implemented in order to avoid, minimize, or reduce the negative impacts and also identifies measures to enhance positive impacts. The EIA is not a fully linear process, but one where several stages are carried out in parallel and where the assumptions and conclusions are revisited and modified as the project progresses. The following sections provide additional detail regarding the key stages in this EIA process. These stages are:

1.10.1 Obtaining Project Specific Data

This was the very first step to embark on the study initiated through meetings held with the officials of Proponent. In the meetings, discussions were made to clarify the nature and extent of the project in environmental perspectives. Basic information of proposed project activities was collected from the proponent was analyzed by the experts to comprehend the project & to assess its influence on the environment.

1.10.2 Literature Review

While the project details were being acquired, a desktop study was also initiated simultaneously to draft environmental baseline information of the project area. The desktop study comprised literature review, collection of updated authenticated published/printed data on the physical, ecological, and social environment related to the focused area. The same was also used to delineate the scope of surveys, which would then form the basis of environmental assessment.

1.10.3 Stakeholder Consultation

Stakeholder consultations were held to involve the public in the decision-making process and to have a fair interaction with all community groups and to assure them that every attempt would be made to reduce the negative impacts of the project, and that adequate remedial measures would be taken to recompense the loss of the affected persons if any.

1.10.4 Reconnaissance and Detailed Surveys

Preliminary surveys of project location were organized by EMC Pakistan Pvt. Ltd., in which experts visited the area and assessed the physical scenario in order to plan various detailed

studies. The relevant surveys were carried out under the supervision of environmental experts. A preliminary socio-economic evaluation was also undertaken. This was followed by detailed and comprehensive surveys that were carried out in order to investigate various domains of environment and socio-economic sector to highlight various issues and concerns that may lead to the identification of aspects and subsequent assessment of impacts.

A detailed environmental baseline survey was conducted to collect primary data in the Project surrounding to identify sensitive receptors. The primary data were examined and compared with secondary data available from earlier environmental studies in the region. The scope of the survey included the collection of information on the following key aspects:

Collection of environmental and social baseline data of the project area, including the following items:

- Climate and Rainfall
- Air Quality
- Noise Quality
- Land and Soil
- Geology
- Hydrology
- Vegetation
- Fauna
- Geomorphology
- Administrative Division
- Nearby settlements
- Socio-Economic Activities
- Land use
- Infrastructure & Social Services

1.10.5 Aspects Identification

The EIA process requires the development of an inventory of all possible environmental and socio-economic aspects. The aspects provide the basis of categorization and evaluation of impacts and their likelihood to occurrence due to the materialization of the project. Aspects are those which are the causes of positive and negative impacts. Those aspects are primarily associated with activities performed during the construction and operation phases of the project.

1.10.6 Impact Assessment & Mitigation Measures

Based on the developed aspects inventory, experts analyzed the aspects for their logical outcome as potential impacts on the physical, ecological, and social environment. These impacts have been identified, assessed, and weighed for different activities during construction, commissioning, and operational phases of the project. Mitigation measures were also proposed for various activities of projects in order to minimize the potential impacts during the life span of the project.

1.10.7 Environmental Management & Monitoring Plan

In the light of impacts identified and mitigations proposed, an Environmental Management Plan (EMP) has been developed, which has a pivotal role in assigning tasks to personnel for the environmental management and implementation of mitigation measures as well as to monitor its effectiveness throughout the life cycle of the project. It also provided monitoring plans/procedures to be followed for checking and compliance maintenance of environmental quality and legal requirements through suggested mitigation measures.

1.10.8 Documentation Review & Conclusion

This is the final step to complete the environmental assessment and compile all the work done in the shape of a report. Report writing started just after the initiation of environmental assessment. The report has been written by experts of EMC and compiled by the office staff in coordination with the experts. At the end of the study, the entire report is reviewed by the team leader followed by recommendations and conclusion in the light of the assessment.

1.10.9 Report Structure

The EIA report has been structured on the standard format prescribed by the EPA. The Report has been presented in the following sections:

Chapter 1: Provides an overview of the project and objectives, scope, approach and methodology adopted for the study;

Chapter 2: Provides an overall description of project activities;

Chapter 3: Gives an overview of policy and legislation along with international guidelines relevant to the project

Chapter 4: Provides description of the microenvironment and macro environment of the project area. This chapter contains the description of the physical environment, socio-economic condition, and built environment of the area.

Chapter 5: Provides details of stakeholder consultation and the issues and concerns raised by the stakeholders and interested parties.

Chapter 6: Describes the potential environmental and social impacts of the proposed Project. General and project-specific guidelines were used to assess the potential environmental impacts at the various stages - designing, construction, and operations of the project.

Chapter 7: Presents the Environmental Management Plan and Monitoring Program for the project

Chapter 8: Summarizes the report and presents its conclusions.

1.11 Study Team

Table 1.2: List of EIA Study Team

S. No	Names	Positions
1.	Mr. Syed Nadeem Arif	Project Manager
2.	Mr. Syed M. Omer Arif	Environmental Engineer
3.	Mr. Muhammad Haseeb	Environmental Specialist
4.	Mr. Shayan Ansari	Environmental Engineer
5.	Mr. Muhammad Muddasir	Environmental Scientist
6.	Mr. Fahad	Environmentalist
7.	Mr.Ehtisham Ahmed	Sociologist
8.	Mr. Shehryar Saleem	Field Social Staff
9.	Mr. Athar Adil	Field Sampling Staff

Chapter 2 PROJECT DESCRIPTION

2.1 The Project

The proposed incinerator project comprises an incineration plant facility to be constructed/installed and operated on Plot No.C-20, SITE Area, Sukkur. The project land is taken on rent by Zephyr Waste Solutions from M/s GUL Enterprises.

2.2 Project Location

Siting of the Incinerator Plant at measuring 1 acre situated in SITE Area, Sukkur, by M/s Zephyr Waste Solutions therefore duly authorized.

Nearby entitites include Prime Trader, WAPDA Grid Station, Shaheen Flour Mill, FMC Warehouse, Topsun Groups warehouse, SS Flour Mill, RK Rice and Flour Mill, etc.

2.3 Project Details

The salient features of the project are as under:

Table 2.1: Project Details	
General	
Project Title	Waste Incineration Plant
Project Location	Plot No.C-20 Site Area, Sukkur
Proponent	M/s Zephyr Waste Solutions.
Total Area of Plot	1 acre
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Cooling System	Through Natural Air
Ignition System	LPG Autopilot
Wet scrubber	Yes
Number of Chamber	02 Chambers
Fuel	Furnace oil
Type of waste to be Incinerated	Solid/Liquid Waste
Ancillary facilities	Storage area, admin,

Main components of the Incinerator plants include;

- Primary & Secondary Chamber
- Heat Sheild
- Dilution Damper
- Charging Door
- Exhaust Fan

- Charging Drum (Double Safety)
- Ignition Burner
- Rotary Cup Burner
- Control Panel
- Burner Air Damper
- Furnace Air Damper

2.4 Incineration Process

Waste from different sources (medical waste, hazardous industrial waste) will be transported to the project site via covered trucks in safe manner. If segregation required, liquid waste will be segregated and may be mixed with saw dust and left to dry. Once the waste is dried, it will be collected in bags and trolleys and feed in combustion chamber for complete burning of waste. A detailed process flow chart is presented below.

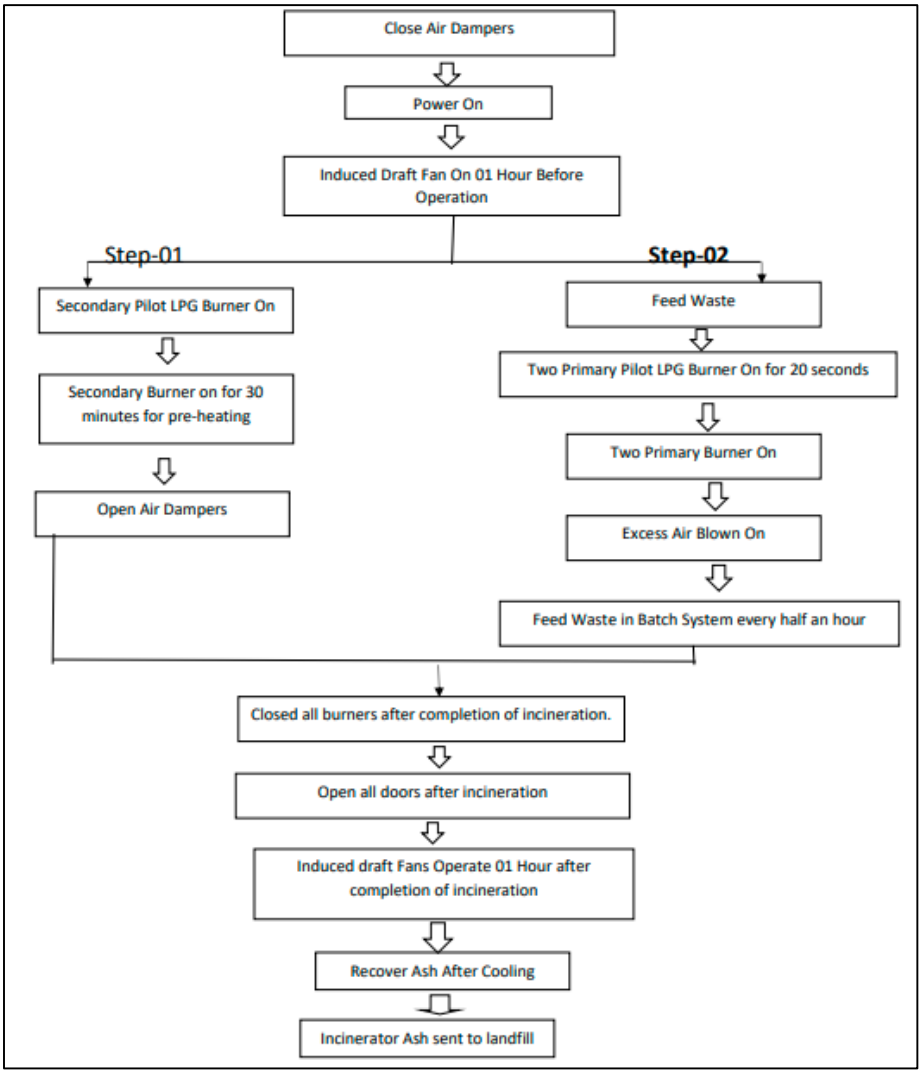


Figure 2.2: Incineration Process Flow Chart

Recyclable waste material such as empty drums, cartons and packaging will be recovered from waste.

2.5 Construction and Installation Activities

Typical Construction and installation activities will include;

- Land clearance and leveling
- Excavation for foundation
- Waste storage area development
- Masonry work for Incinerator plant installation
- Installation/construction of Incinerator plant and its ancillary facilities and Mechanical and electrical works.
- Landscaping
- Restoration

2.6 Work force

During operational phase around 03 personnel will be employed for the daily operations. Local workforce will be preferred for general construction work. The technical staff for installation of incinerator will use daily outback option.

2.7 Utilities Requirements

2.7.1 Electricity

The power requirement of the entire premises is fulfilled by SEPCO. An average electricity consumption of the facility is 150 kW per day.

2.7.2 Water Consumption

The only source of water is ground water. The water requirement of incineration plant will be 250 to 600 gallon/Day.

2.7.3 Fuel Consumption

Furnace oil will be used as fuel at the incineration plant and its estimated consumption will be -20US Gallon/Hr for Burners. While LPG Gas will be used for ignition purpose (0.01Kg/Day).

2.8 Approvals

Approvals are in process. The NOC for land use from SITE Limited Sukkur is **Annexed**.

2.9 Project Alternatives

Identification and assessment of feasible alternatives to project design and implementation is among the main components of Environmental Impact Assessment procedures. Alternatives illustrate and contrast the environmental implications and consequences of different options available to achieve the proposed objective. In this way, both the proponent and the authorities who must consider granting the authorization, are put in a position where all involved are able to make informed choices or decisions.

Selection of preferred alternative is based on scores of factors including cost, schedule of delivery, environmental and social impact and the cost for their redressal. The drivers that affect potential alternative options and scenarios include: availability of project sites, current technologies; design changes that need to be introduced, operational situation, capital & recurrent costs, environmental & social issues, their potential impacts, and costs of mitigation. The "No Project" alternative situation is taken into account to demonstrate the need of the Project. In consideration of the different drivers, potential alternatives within the Project are restricted to the following aspects:

- No Project Option
- Project Alternatives
  - Technology selection
  - Availability of site and infrastructure
  - Availability of appropriate energy source

No Project Alternative

No project alternative would mean that this project is not executed and the plan for waste incinerator facility is scrapped. However, safe disposal of hazardous industrial and medical waste remains a major problem in Sukkur. The increasing demand of environmentally safe disposal of hazardous nature will not be completely met if the project is not implemented. The No project alternative does not hold ground because it would mean keeping the populace exposed to toxic waste as proper incineration and waste recovery facilities are not provided.

Project Location

The project is located within an industrial area, away from urban centers. Therefore it provides an optimal opportunity to incinerate the waste in shortest possible time and avoid additional impact to environment and people and by minimizing long distance transportation.

Availability of energy sources

The industrial area has availability of electricity, gas and water supply as the project would use from the amount sanctioned to the facility.

Technological Alternatives

Moving Grate Incinerator

The moving grate enables the movement of waste through the combustion chamber to be optimized to allow a more efficient and complete combustion. A single moving grate incinerator can handle up to 35 metric tons (39 short tons) of waste per hour, and can operate 8,000 hours per year with only one scheduled stop for inspection and maintenance of about one month's duration. The waste is introduced by a waste crane through the "throat" at one end of the grate, from where it moves down over the descending grate to the ash pit in the other end. Here the ash is removed through a water lock. The holes in the grate elements supplying the primary combustion air are visible. Part of the combustion air (primary combustion air) is

supplied through the grate from below through holes in grate elements. This air flow also has the purpose of cooling the grate itself. Cooling is important for the mechanical strength of the grate, and many moving grates are also water-cooled internally. Moving grate incinerators are primarily used for the incineration of Municipal Solid Waste (MSW).

Pollution Control Technologies

Particulate is collected by particle filtration, most often electrostatic precipitators (ESP) and/or baghouse filters. The Baghouse filters are generally very efficient for collecting fine particles.

Acid gas scrubbers are used to remove hydrochloric acid, nitric acid, hydrofluoric acid, mercury, lead and other heavy metals. The efficiency of removal will depend on the specific equipment, the chemical composition of the waste, the design of the plant, the chemistry of reagents, and the ability of plant operators optimize these conditions, which may conflict for different pollutants. For example, mercury removal by wet scrubbers is considered coincidental and may be less than 50%. Basic scrubbers remove sulfur dioxide, forming gypsum by reaction with lime.

Sulfur dioxide may also be removed by dry desulfurization by injection limestone slurry into the flue gas before the particle filtration.

NOx is either reduced by catalytic reduction with ammonia in a catalytic converter (selective catalytic reduction, SCR) or by a high-temperature reaction with ammonia in the furnace (selective non-catalytic reduction, SNCR). Urea may be substituted for ammonia as the reducing reagent but must be supplied earlier in the process so that it can hydrolyze into ammonia. Substitution of urea can reduce costs and potential hazards associated with storage of anhydrous ammonia. Heavy metals are often adsorbed on injected active carbon powder, which is collected by particle filtration.

Chapter 3 LEGISLATIVE & ADMINISTRATIVE FRAMEWORK

3.1 Introduction

This chapter provides synopsis of policies, legislation, and guidelines that may have relevance to the project. The proponent of this project will comprehensively follow the relevant requirements of the policy documents and legislative framework as well as those recommendations as described in the national and international guidelines. Many of those guidelines have been incorporated in the mitigation measures and the Environmental Management Plan (EMP) which has been formulated for the better environmental management.

The principle law in this regard prior to 18th amendment in the constitution of Pakistan was the Pakistan Environmental Protection Act (PEPA), 1997 that was enacted on 6th December 1997 with the objective of "protection, conservation, rehabilitation and improvement of environment for the prevention and control of pollution, and promotion of sustainable development". Guidelines were also prepared by the Pakistan EPA back in 1997 for the preparation of IEE/EIA report as well as sectorial guidelines.

After 18th Amendment the subject of Environment is being dealt at provincial levels. All provinces have enacted their own environmental Acts. Key legislations governing the current EIA study include the Sindh Environmental Protection Act, 2014, Sindh Environmental Protection Agency (Environmental Assessment) Regulations 2021, Sindh Environmental Quality Standards 2016, policies and several laws on conservation of nature.

The proponent will be required to adhere to the relevant requirements of the policies and legislation during the installation and operations phases of project; which have all been incorporated into the EMP.

3.2 National Environmental Policy & Plan

3.2.1 National Conservation Strategy

The National Conservation Strategy (NCS) is the primary policy document of the Government of Pakistan (GoP) on national environmental issues. The Strategy approved by the Federal Cabinet in March 1992 was also recognized by International Financial Institutions, principally the World Bank. The NCS had identified 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage. It had also recommended immediate attention to the stated core areas in order to preserve the environment of Pakistan.

A mid-term review of the NCS in 2000 concluded that achievements under the NCS were primarily awareness raising and institutional building rather than meaningful improvement of the environment and natural resources and that the NCS was neither designed nor adequately focused as a national sustainable development strategy (GoP), November 2002. Thus, the need for a more focused National Environmental Action Plan (NEAP) was formulated and approved by the Pakistan Environmental Protection Council in 2001 to practically improve the national

environment with emphasis on poverty reduction, and economic as well as sustainable development.

NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that would safeguard public health, promote sustainable livelihoods and enhance the quality of life for the people of Pakistan.

The GoP and United Nations Development Program (UNDP) have jointly initiated an umbrella support Program called the NEAP-Support Program that was signed in October 2001 and implemented in 2002. The development objective supported by NEAP-Support Program is environmental sustainability and poverty reduction in the context of economic growth. The objectives of new policy has total 171 guidelines on sectoral and cross sectoral issues. The objectives of new policy include assurance of sustainable development and safeguard of natural wealth of country. The following are the approved Sectoral Guidelines:

- Water Supply and Management.
- Air Quality and Noise.
- Waste Management.
- Forestry.
- Biodiversity and Protected Areas.
- Climate Change and Ozone Depletion.
- Energy Efficiency and Renewable.
- Agriculture and Livestock.
- Multilateral Environmental Agreements.

3.2.2 National Environmental Policy 2005

The National Environmental Policy provides an overreaching framework for addressing the environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, and loss of biodiversity, desertification, natural disasters and climatic change.

It also gives direction for addressing the cross-sectional issues as well as the underlying causes of environmental degradation and meeting international obligations.

National Environmental Policy, while recognizing the goals and objectives of the National Conservation Strategy, National Environmental Action Plan and other existing environment related national policies, strategies and action plans, provide broad guidelines to the Federal Government, Provincial Governments, Federally Administrated, Territories and Local Governments for addressing environmental concerns and ensuring effective management for their environmental resources.

The National Environmental Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life for the citizens through sustainable development.

3.2.3 Biodiversity Action Plan, 2000

The key to protection of the biological heritage of Pakistan lies in the involvement of local people and in the support provided by competent institutions for conservation and sustainable use. The Government of Pakistan has recognized the importance of these measures in the preparation of National Conservation Strategy and in becoming a signatory to, and ratifying, the Convention on Biological Diversity (CBD) in 1994. Developing the Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss.

3.2.4 National Climate Change Policy 2012

The National Climate Change Policy provides a framework for addressing the issues that Pakistan faces or will face in future due to the changing climate. The main objectives of Pakistan's climate change policy include:

- To pursue sustained economic growth by appropriately addressing the challenges of climate change;
- To integrate climate change policy with other interrelated national policies;
- To focus on pro-poor gender sensitive adaptation while also promoting mitigation to the extent possible in a cost-effective manner;
- To ensure Water Security, Food Security and Energy Security of the country in the face of challenges posed by climate change;
- To minimize the risks arising from expected increase in frequency and intensity of extreme weather events: floods, droughts, tropical storms etc.;
- To strengthen inter-ministerial decision making and coordination mechanism on climate change;
- To facilitate effective use of the opportunities, particularly financial, available both nationally and internationally;
- To foster the development of appropriate economic incentives to encourage public and private sector investment in adaptation measures;
- To enhance the awareness, skill and institutional capacity of relevant stakeholders;
- To promote conservation of natural resources and long-term sustainability.

3.3 National Legislations

3.3.1 Pakistan Penal Code, 1860[1]

Section XIV of PPC deals with the offences affecting the public health, safety, convenience, decency and morals. Person may be guilty of public nuisance if his act or omission causes common injury, danger or annoyance to the public or results in spread of infection of diseases dangerous to life. The section also deals with environmental pollution.

[1] *Pakistan Penal Code (XLV of 1860) 6th October 1860*

Provisions under this Act relating to environment are no longer being enforced after promulgation of the Pakistan Environmental Protection Act, 1997. However, pollution offences can still be tried under the Pakistan Penal Code, 1860.

3.3.2 Antiquities Act, 1975[2]

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest and national monuments etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain such articles of archaeological significance.

There are no structures of historical or cultural significance within or immediately neighboring the project site.

3.3.3 Land Acquisition Act, 1894[3]

This Act provides law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be made on account of such acquisitions. The law provides details of various peculiarities involved in acquisition of land such as preliminary investigation, objection to acquisition, declaration of intended acquisition, enquiry This Act provides law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be made on account of such acquisitions. The law provides details of various peculiarities involved in acquisition of land such as preliminary investigation, objection to acquisition, declaration of intended acquisition, enquiry into measurements, value & claims, taking possession, reference to court and procedure thereon, apportionment of compensation, payment, temporary occupation of land, acquisition of land for companies, disputes resolutions, penalties and exemptions etc. This Act has 55 sections addressing different areas. Such as section 4(2) mentions that it shall be lawful for any official authorized by the Collector to enter upon and survey, to dig or to do all other acts necessary to ascertain that whether the land is adapted for such purpose.

3.4 Provincial/Local Legislations

3.4.1 Sindh Environmental Protection Act 2014

The Sindh Environmental Protection Act, 2014 (2014 Act) was passed by the Sindh Assembly on February 24, 2014. The 2014 Act is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. The 2014 Act envisages protection, improvement, conservation & rehabilitation of environment of Sindh with the help of legal action against polluters and green awakening of communities. It equally lays emphasis for the preservation of the natural resources of Sindh and to adopt ways and means for restoring the balance in its eco-system by avoiding all types of environmental hazards. The 2014 Act is

[2] *Act VII of 1976(Gazette of Pakistan, Extraordinary, Part 1, 14th January, 1976*
[3] The Land Acquisition Act 1894 (Act of 1894)

applicable to a broad range of issues and extends to air, water, industrial liquid effluent, marine, and noise pollution, as well as to the handling of hazardous wastes.

The following articles of the SEPA 2014 have a direct bearing on the proposed Project:

- **Article 11(1):** 'Subject to the provisions of this Act and the rules and regulations therein, no person shall discharge or emit or allow the discharge or emission of any effluent, waste, pollutant, noise or any other matter that may cause or likely cause pollution or adverse environmental effects, as defined in Section 2 of this Act, in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards…'
- **Article 11(2):** 'All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other Standards established under section 6(1)(g)(i); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.'
- Section 11(3): Monitoring and analysis under sub-section (1) and (2), shall be acceptable only when carried out by the Environmental Laboratory certified by the Agency as prescribed in the rules.

All stipulated tests will be regularly performed from designated laboratories approved by Sindh EPA.

- **Article 14 (1):** 'Subject to the provisions of this Act and the rules and regulations, no person shall cause any act, deed or any activity', including;
  - (b) disposal of solid and hazardous wastes at unauthorized places as prescribed;
  - I dumping of wastes or hazardous substances into coastal waters and inland water bodies; and
  - (d) release of emissions or discharges from industrial or commercial operations as prescribed.
- **Article 15 (1):** 'Subject to the provisions of this Act, no person shall operate or manufacture a motor vehicle or class of vehicles from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Sindh Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6'.
- **Article 17(1):** 'No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental assessment, and has obtained from the Agency approval in respect thereof'
- **Article 17(2):** The agency shall;
  - a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental assessment by the proponent; or
  - (b) review the environmental assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental assessment as being contrary to environmental objectives.

- **Article 17(3):** 'Every review of an environment impact assessment shall be carried out with public participation and, subject to the provisions of this Act, after full disclosure of the particulars of the project'.
- **Article 17(4):** 'The Agency shall communicate its approval or otherwise within a period of two months from the date that the initial environmental examination is filed, and within a period of four months from the date that the environmental assessment is filed complete in all respects in accordance with the regulations, failing which the initial environmental examination or, as the case may be, the environmental assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations'.
- **Article 20(1):** 'The Agency shall from time to time require the person in charge of a project to furnish, within such period as may be specified, an environmental audit or environmental review report or environmental management plan containing a comprehensive appraisal of the environmental aspects of the project'.
- **Article 20(2):** The report of a project prepared under sub-section (1) shall include:
  - (a) analysis of the predicted qualitative and quantitative impact of the project as compared to the actual impact;
  - (b) evaluation of the efficacy of the preventive, mitigation and compensatory measures taken with respect to the project; aI(c) Recommendations for further minimizing or mitigating the adverse environmental impact of the project.
- **Article 20(3):** 'Based on its review of the environmental audit report, the Agency may, after giving the person in charge of the project an opportunity of being heard, direct that specified mitigation and compensatory measures be adopted within a specified time period and may also, where necessary, modify the approval granted by it under section 17'.
- **Section 31(1):** The Agency shall cause relevant details of any proposed project regarding which an Environmental Assessment has been received to be published, along with an invitation to the public to furnish their comments thereon within a specified period. (2) In accordance with such procedure as may be prescribed, the Agency shall hold public hearings to receive additional comments and hear oral submissions. (3) All comments received under sub-sections (1) and (2) shall be duly considered by the Agency while reviewing the environmental assessment or strategic impact assessment, and decision or action taken thereon shall be communicated to the persons who have furnished the said comments.
  - A number of rules and regulations have been promulgated under the SEPA 2014. These are:
  - Environmental Samples Rules, 2014
  - Pollution Charge for Industry (Calculation and Collection) Rules, 2014
  - Provincial Sustainable Development Fund Board (Procedure) Rules, 2001
  - The Sindh Environmental Quality Standard (Self-Monitoring and Reporting by Industry) Rule, 2014
  - Sindh Environmental Protection Agency (Review of IEE and EIA), Regulations 2014
  - Sindh Environmental Quality Standards.

There is a long list of legislation that falls in the category of or is relevant to environmental law. Some of the more important ones are:

- Sindh Wildlife Protection Preservation Conservation and Management Act, 2020
- The Antiquities Act, 1975
- Sindh Cultural Heritage (Preservation) Act, 1994
- Land Acquisition Act, 1894
- Factories Act, 1934
- Electricity Act, 1910
- Boilers Act, 1923
- Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997.

3.4.2 Relevant Organization

Administration on environment has been divided into federal and provincial government. International issues such as the environmental policy and regulation has been managed by Ministry of Climate Change. On the other hand, national environmental matter has been managed by provincial government. In Sindh province, Sind EPA has been responsible for the provincial matters. All of the environmental technical issues such as IEE/EIA, monitoring, enforcement of law/environmental quality standards are headed by Director General of Sindh EPA.

3.4.3 Environmental Protection Council (EPC)

It has been formed consisting of Chief Minister as Chairman with Minister in charge of Environment Protection Department, Addl. Chief Secretary, Planning & Development Department, Government of Sindh and Secretaries of Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Livestock & Fisheries Forest & Wildlife, Energy, Education Departments Government of Sindh and Divisional Commissioners of Sindh. Non-official members are also included (i.e. representatives of Chamber of Commerce & Industry and from medical or legal professions etc.) along with DG, EPA & two Members of Provincial Assembly also form part of EPC.

The functions and powers of EPC include coordination & supervision of provisions of Act, approving provincial environmental & sustainable development policies & SEQS, provide guidance for protection & conservation, consider annual Sindh Environmental Report, deal with interprovincial and federal provincial issues, provide guidance for bio safety and assist Federal Government in implementation of various provisions of UN Conventions.

3.4.4 Sindh Environmental Protection Agency (SEPA)

SEPA would be headed by Director General (DG) with the aim to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made there under. The Agency shall have technical and legal staff and may form advisory committees.

The Agency shall administer and implement the provisions of this Act and rules and regulations. It shall also prepare environmental policies, take measures for implementation of environmental policies, prepare Sindh Environment Report and prepare or revise Sindh Environmental Quality Standards. SEPA shall also establish systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation research, inspection and audit to prevent and control pollution and to estimate the costs of cleaning up pollution and rehabilitating the environment and sustainable development. SEPA would also take measures for protection of environment such as to promote research; issues licenses for dealing with hazardous substances, certify laboratories, identify need for or initiate legislation, specify safeguards etc. SEPA would also encourage public awareness and education regarding environmental issues.

SEPA would have powers to enter or inspect under a search warrant issued by Environmental Protection Tribunal or a Court search at any time, any land or building etc. where there are reasonable grounds to believe that an offence under this Act has been or is being or likely to be committed. SEPA may also take samples, arrange for testing or confiscate any article in discharge of their duties.

3.4.5 Sindh EPA (Environmental Assessment) Regulations 2021

SEPA Regulations 2021 categorize projects into three separate schedules depending on whether a project requires an Environmental Checklist (Schedule-I) or an IEE (Schedule-II) or EIA (Schedule III). The Regulations also require that all projects located in environmentally sensitive areas need submission of an EIA.

On the basis of the nature and scope of project, it has been accordingly categorized into Schedule-III

Schedule-III, (EIA Project)

Category H Waste Disposal and treatment

Sub category: 1. Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration units, etc.)

Therefore, an EIA has been undertaken for the proposed incinerator Plant.

3.4.6 Sindh Environmental Quality Standards

On June 28, 2016, the Sindh Environmental Industrial Waste Water, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Air, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015 have been notified by Sindh EPA.

Table 3.1- shows SEQS for ambient air.

Table 3.1: Sindh Environmental Quality Standard for Ambient Air			
Pollutant	**Time-weighted average**	**Concentration in Ambient Air**	**Method of Measurement**
Sulfur Dioxide (SO_2)	Annual Average*	80 µg/m^3	Ultraviolet Fluorescence Method
	24 hours**	120 µg/m^3	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	40 µg/m^3	
Oxides of Nitrogen as (NO_2)	Annual Average*	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	80 µg/m^3	
Ozone (O_3)	1 hour	130 µg/m^3	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m^3	High volume Sampling, (Average flow rate not less than 1.1m^3/minute)
	24 hours**	500 µg/m^3	
Respirable Particulate Matter (PM_{10})	Annual Average*	120 µg/m^3	B Ray absorption method
	24 hours**	150 µg/m^3	
Respirable Particulate Matter ($PM_{2.5}$)	Annual Average*	40 µg/m^3 ***	B Ray absorption method
	24 hours**	75 µg/m^3	
Lead (Pb)	Annual Average*	1 µg/m^3	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 µg/m^3	
Carbon Monoxide (CO)	8hours**	5 mg/m^3	Non Dispersive Infra Red (NDIR) method
	1hours	10 mg/m^3	
***Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.**			
****24 hourly / 8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.**			
***** or 9 µg/m^3 plus baseline, whichever is low**			

Table 3.2 shows the standards for motor vehicle noise.

Table 3.2: The Motor Vehicle Ordinance (1965) and Roles (1969)		
Parameter	**Standards (maximum permissible limit)**	**Measuring method**
Noise	85dB(A)	Sound-meter at 7.5meter from the source

Table 3.3 shows the proposed national environmental quality standard for noise.

Table 3.3: Sindh Environmental Quality Standard for Noise			
S. No.	Category of Area / Zone	Effective from 1st January, 2015	
		Limit it in dB(A) Leq*	
		Day Time	Night Time
1	Residential area (A)	55	45
2	Commercial area (B)	65	55
3	IndustrialIea (C)	75	65
4	Silence Zone (D)	50	45
Note: 1	Day time hours: 6.00 a. m to 10.00 p. m		
2	Night time hours: 10.00 p. m to 6.00p. m		
3	Silence zone; Zone which are declared as such by competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.		
4	Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.		
*dB(A)Leq	Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.		

The SEQS for effluents are shown in Table 3.4.

Table 3.4: Sindh Environmental Quality Standard for Municipal & Liquid Industrial Effluents					
S. #	Parameter	Into Inland Waters	Into Sewage Treatment	Into Sea	unit
1	Temperature or Temp. increase	<3	<3	<3	^{o}C
2	pH value (H^{+})	6-9	6-9	6-9	
3	Biological Oxygen Demand $(BOD)_5$ at 20°C	80	250	80	mg/l
4	Chemical Oxygen Demand (COD)	150	400	400	mg/l
5	Total Suspended Solids (TSS)	200	400	200	mg/l
6	Total Dissolved Solids (TDS)	3500	3500	3500	mg/l
7	Oil and Grease	10	10	10	mg/l
8	Phenolic Compounds (as Phenol)	0.1	0.3	0.3	mg/l
9	Chloride (as Cl^{-})	1000	1000	SC	mg/l
10	Fluoride (as F^{-})	10	10	10	mg/l

Table 3.4: Sindh Environmental Quality Standard for Municipal & Liquid Industrial Effluents					
S. #	**Parameter**	**Into Inland Waters**	**Into Sewage Treatment**	**Into Sea**	**unit**
11	Cyanide (as CN^-) total	1.0	1.0	1.0	mg/l
12	An-ionic detergents (as MBAS)	20	20	20	mg/l
13	Sulphate (SO_4^{2-})	600	1000	SC	mg/l
14	Sulphide (S^{2-})	1.0	1.0	1.0	mg/l
15	Ammonia (NH_3)	40	40	40	mg/l
16	Pesticides	0.15	0.15	0.15	mg/l
17	Cadmium	0.1	0.1	0.1	mg/l
18	Chromium (trivalent and hexavalent)	1.0	1.0	1.0	mg/l
19	Copper	1.0	1.0	1.0	mg/l
20	Lead	0.5	0.5	0.5	mg/l
21	Mercury	0.01	0.01	0.01	mg/l
22	Selenium	0.5	0.5	0.5	mg/l
23	Nickel	1.0	1.0	1.0	mg/l
24	Silver	1.0	1.0	1.0	mg/l
25	Total toxic metals	2.0	2.0	2.0	mg/l
26	Zinc	5.0	5.0	5.0	mg/l
27	Arsenic	1.0	1.0	1.0	mg/l
28	Barium	1.5	1.5	1.5	mg/l
29	Iron	8.0	8.0	8.0	mg/l
30	Manganese	1.5	1.5	1.5	mg/l
31	Boron	6.0	6.0	6.0	mg/l
32	Chlorine	1.0	1.0	1.0	mg/l

The SEQS for drinking water are shown in table 3.5

Table 3.5: Sindh Environmental Quality Standards for Drinking Waters (mg/l)

S.#	Properties / Parameters	Standard Values for Pakistan	S.#	Properties / Parameters	Standard Values for Pakistan
Bacterial			**Chemical**		
1	All water intended for drinking (E.Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Essential Inorganics (mg/liter)		
			3	Aluminum (Al) mg/l	≤ 0.2
			4	Antimony (Sb)	≤ 0.005
2	Treated water entering the distribution system (25xponenor thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	5	Arsenic (As)	≤ 0.05
			6	Barium (Ba)	0.7
			7	Boron (B)	0.3
3	Treated water in the distribution system (E.25xponenor thermo tolerant coliform and total coliform bacteria)	Must not be Detectable in any 100 ml sample. In case of large supplies, where sufficient samples are examined, must not be resent in 95% of the samples taken throughout any 12-month period.	8	Cadmium (Cd)	0.01
			9	Chloride (Cl-)	< 250
			10	Chromium (Cr)	≤ 0.05
			11	Copper (Cu)	2
			Organic (mg/L)		
			12	Phenolic compounds	<0.0002
			Toxic Inorganics (mg/liter)		
			13	Cyanide (CN)-	≤ 0.05
			14	Fluoride (F)	≤ 1.5
			15	Lead (Pb)	≤ 0.05
			16	Manganese (Mn)	≤ 0.5
Physical			17	Mercury (Hg)	≤ 0.001
4	Color	< 15 TCU	18	Nickel (Ni)	≤ 0.02
5	Taste	Non objectionable/ Acceptable	19	Nitrate (NO_3)-	≤ 50
6	Odor	Non objectionable/ Acceptable	20	Nitrite (NO_2)-	≤ 3
7	Turbidity	< 5 NTU	21	Selenium (Se)	≤ 0.01
8	Total Hardness as $CaCO_3$	< 500 mg/l	22	Residual Chlorine	0.2-0.5 At consumer end 0.5-1.5 at source
9	TDS	<1000			
10	pH	6.5-8.5			
Radioactive					
11	Alpha Emitters bq/L	0.1	23	Zinc (Zn)	5.0
12	Beta emitters	1			

3.4.7 Self-Monitoring and Reporting by Industry Rules, 2014

These rules classify the industrial units for monitoring and reporting their liquid effluent and gaseous emissions into three and two categories respectively. According to each category they define the priority parameters to be monitored and reported to SEPA according to a specific

frequency based on working conditions. This monitoring and reporting are in addition to the monitoring conditions as required by the conditions of approval of EIA/IEE. The sampling for testing must be carried out according to Environmental Samples Rules, 2014 and be sent to SEPA certified environmental testing laboratories.

3.4.8 Hazardous Substance Rule, 2014

These Rules were notified to streamline procedures for issuance of licenses to industries / businesses that generate hazardous waste, safety precautions for workers and devices them methods for the removal of hazardous wastes in an environmentally friendly manner. The rules also specify procedures to be adopted for import, transport and disposal of hazardous waste; and identify two hundred and forty-three hazardous substances and synthetic chemicals.

The rules also specify the requirement of obtaining license from Sindh EPA for the import, transport, storage and disposal of hazardous substances as specified in the rules.

3.4.9 The Sindh Hospital Waste Management Rules, 2014

In exercise of the powers granted under section 36 of Sindh Environmental Protection Act, 2014, the Sindh EPA published the Sindh Hospital Waste Management Rules, 2014 on 16th December 2014. Key provisions of the rules relevant to the project are as follows;

3. **Responsibility for waste management**.- Every hospital owner, occupier, operator shall be responsible for the management of the hospital waste generated by it till its final disposal in accordance with the provision of the Act and these rules.

4. **Hospital Waste Management Plan**.- (1). A Hospital Waste Management Plan shall be based on internationally or nationally recognized environmental management practices, standards, which shall efficiently and effectively address the hospital waste. (2) The Hospital Waste Management Plan shall include –

a) waste management points for every ward and department, indicating each point, location on the basis of risk assessment;
b) the categories of waste being generated in accordance with Schedule-I.
c) quantity of each waste category;
d) details of the types, numbers of containers, waste bags and trolley required annually;
e) schedule and frequency of waste collection from each ward and department;
f) effective arrangements for onsite and off-site transportation of waste as provided in Schedule-I and II;
g) contingency plans for storage or disposal of risk waste in the event of breakdowns of hospital waste facility, or of maintenance or collection arrangements;
h) training courses and programmes on waste management;

(3) The Waste Management Plan shall be regularly monitored, reviewed, revised and updated and submitted to the Agency on annual basis.

5. **Waste segregation**.- Risk waste shall be separated from non-risk waste at the point where the waste is generated by a doctor, nurse, or other person as per Hospital Waste Management Plan and Schedule-I.

6. **Waste collection**.- Waste shall be collected in accordance with the Schedule-I and II.

7. **Waste storage**.- (1) A separate central storage facility shall be established within the Hospital with the details provided in Hospital Waste Management Plan

8. **Waste Treatment**; (1) On recognition of the type and nature of the waste material and the organisms in the waste, risk waste shall be inactivated or rendered safe before final disposal by a suitable thermal, chemical, irradiation incineration, filtration or other treatment method, or by a combination of such prescribed and effective methods guided by validated and monitoring procedures.

9. **Waste disposal**.-(1) Risk waste shall be disposed of in accordance to the procedure provided in Schedule-I. (2) The operator, occupier, owner of the Hospital waste disposal and treatment facility shall obtain approval from the Agency under the section 17.

3.4.10 Sindh Solid Waste Management Board Act, 2014

The SSWMB Act, 2014 enacted to establish a board for collection and disposal of all solid waste, to arrange effective delivery of sanitation services, to provide pollution free environment and to deal with other relevant matters. The Board established under the Act headed by the Chief Minister or his nominee and constitutes of thirteen other ex officio members of other relevant departments.

The Act was promulgated to establish a board for collection and disposal of all solid waste, to arrange effective delivery of sanitation services, to provide pollution free environment and to deal with other relevant matters.

3.4.11 Sindh Wildlife Protection, Preservation, Conservation and Management Act, 2020

This Act provides for the preservation, protection, conservation and management of wildlife by the formation and management of protected areas and prohibition of hunting of wildlife species declared protected under the Act.

The Act also provides classifications of the protected areas; national parks, wildlife sanctuaries, game reserves and private game reserves, community game reserves. Activities such as hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park. Wildlife sanctuaries are areas that have been set aside as undisturbed breeding grounds and cultivation and grazing is prohibited in the demarked areas. Nobody is allowed to reside in a wildlife sanctuary and entrance for the general public is by special dispensation. However, these restrictions may be relaxed for scientific purpose or betterment of the respective area on the discretion of the governing authority in exceptional circumstances. Game reserves are designated as areas where hunting and shooting is not allowed except under special permits.

The project site does not fall in under any protected area.

3.4.12 Sindh Cultural Heritage (Preservation) Act, 1994

The Sindh Cultural Heritage (Preservation) Act, 1994 is the provincial law for the protection of cultural heritage. Its objectives are similar to those of the Antiquity Act, 1975.

None of the sites protected under this law has been identified in the vicinity/microenvironment of the project site.

3.5 Environment Related National and International Guidelines

3.5.1 Pakistan Environmental Assessment Procedures, 1997

The Pakistan Environmental Protection Agency prepared the Pakistan Environmental Assessment Procedures in 1997. They are based on much of the existing work done by international donor agencies and Non-Governmental Organizations (NGOs). The package of regulations prepared by PEPA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Guidelines for Public Consultation
- Guidelines for Sensitive and Critical Areas; and
- Sectorial Guidelines

3.5.2 World Bank Guidelines on Environment

The principal World Bank publications that contain environmental guidelines are listed below.

- Environmental Assessment Operational Policy 4.01.Washington, DC, USA. World Bank 1999.Environmental Assessment Sourcebook: Policies, Procedures, and Cross-Sectoral Issues.
- World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991,Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.
- Environmental Health and Safety (EHS) guidelines, International Finance Corporation (IFC) World Bank Group, 2007.
- The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested. The Sourcebook also highlights concerns in social impact assessment, and emphasizes the need to incorporate socio-economic issues in EIA exercises.

3.5.3 IFC- Environmental, Health, and Safety Guidelines

The EHS guidelines published by IFC are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during construction, operation, and decommissioning phase of a project or facility. The relevant industry specific IFC guideline for the proposed project is the EHS Guidelines for Gas Distribution Systems.

Environmental issues associated with the construction and maintenance activities may include, among others, noise and vibration, soil erosion, and threats to biodiversity, including habitat alteration and impacts to wildlife.

Examples of the impacts addressed in the General EHS Guidelines include:

- Construction site waste generation;
- Soil erosion and sediment control from materials sourcing areas and site preparation activities;
- Fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles);
- Noise from heavy equipment and truck traffic;
- Potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities.

Environmental issues during the construction phase include the following:

- Terrestrial habitat alteration.
- Hazardous materials.

3.5.4 IFC- Environmental, Health, and Safety Guidelines for Waste Management Facilities[4]

The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and hospital waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physico-chemical and biological treatment; and incineration projects.

Hazardous wastes may be so defined because they share the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics which may pose a potential risk to human health or the environment if improperly managed.

[4] https://www.ifc.org/wps/wcm/connect/b8d0bf00488658d4b732f76a6515bb18/wastemgmt.pdf?MOD=AJPERES

Chapter 4 DESCRIPTION OF ENVIRONMENT

4.1 Introduction

In order to carry out environmental assessment study, it is first necessary to demarcate the existing environmental feature in and around the proposed project, on the existing environment. This section therefore describes the environmental and socioeconomic conditions of the project area covering information on physical, biological and socio-economic aspects of the macro-environment as well as the microenvironment of proposed project site. Information for this section was collected from a variety of sources, including published literature, reports of other studies conducted in the area by the EMC and archives of the experts, consultations with institutions, and field surveys conducted for this study by the team of EMC. The physical environment of proposed site has been described in this study with respect to the airshed, watershed, geology, soil characteristics and seismicity. Baseline data on the airshed describe the climatic conditions and quality of air in the microenvironment and macroenvironment and characterize the airshed in terms of level of pollution, viz. unpolluted, polluted or grossly polluted. Similarly, baseline data on watershed describe the hydrology and quality of surface and groundwater as well as water availability. Data on Geology, geomorphology, soil characteristics and seismicity are needed to evaluate the terrestrial resources with respect to quality of minerals and soil characteristics particularly stability.

4.2 Microenvironment of the Project Area

Nearby entitites include Prime Trader, WAPDA Grid StationShaheen Flour Mill, FMC Warehouse, Topsun Groups warehouse, SS Flour Mill, RK Rice and Flour Mill, etc.

Figure 4.1: Photographs from Microenvironment

Project Site

Unpaved access road to projet site

4.3 Physical Environment

The physical environment of project site has been described here with respect to the terrestrial environment, watershed and air shed. Detailed description of the physical resources existing in the area is stated in the following sections. Major areas covered under physical resources are; topography, geology, soil conditions, climate, surface and ground water resources and seismology. Most of the information is collected from the secondary resources. Other studies and reports were referred and reviewed for the verification of information. The climatic condition, geology and topography of Sukkur has been described as the macro-environment of the project site.

4.3.1 Meteorology and Climatic

4.3.1.2 *Temperature*

The Sukkur District experiences extreme temperatures. The hot season lasts for 3 months, from mid of April to start of August, with an average daily high temperature above 40°C. The hottest month of the year at Sukkur Airport is June, with an average high of 44°C and low of 29°C.

The cool season lasts for 2 months, from December to mid of February, with an average daily high temperature below 27°C. The coldest month of the year at Sukkur Airport is January, with an average low of 8°C and high of 23°C.

Interpretation of the available meteorological data shows that the project area experiences extreme hot temperatures where mean daily maximum temperatures can go up to 45°C and even beyond due to the direction of sea breeze. The climate of the area is extreme and is characterized by hot summers and moderately cold winters. According to available meteorological information..

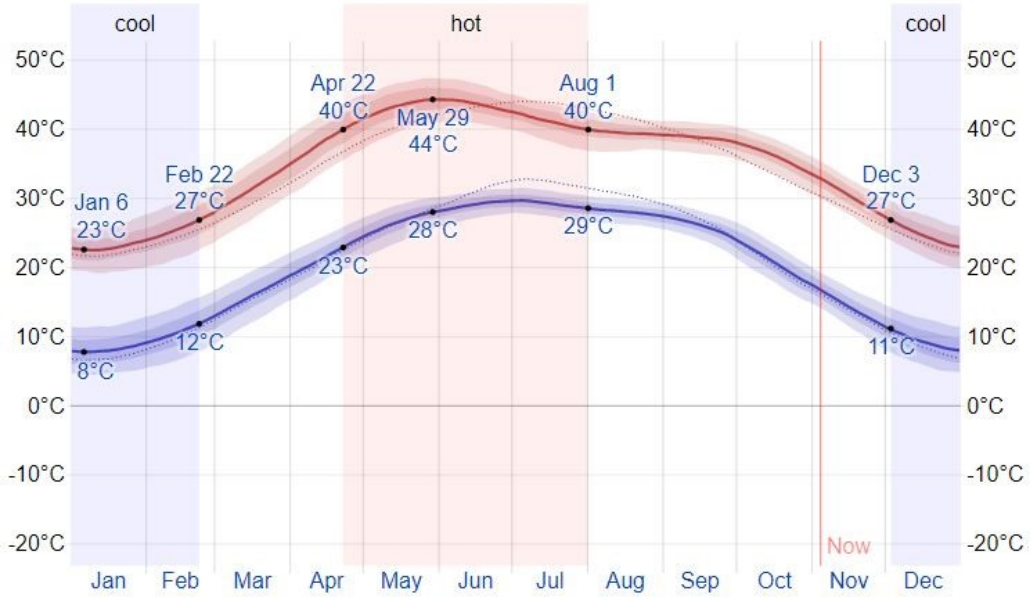


Figure 4.1: The daily average high (red line) and low (blue line) temperature. The thin dotted lines are the corresponding average perceived temperatures. (Source: www.weatherspark.com)

4.3.1.2 *Rainfall*

The rainy period of the year lasts for 1 months, from start of July to end of August, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain at Sukkur Airport is July, with an average rainfall of 16 millimeters.

The rainy period of the year lasts for 1 months, from July to end August, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain at Sukkur Airport is July.

end of August to July. The month with the least rain at Sukkur Airport is October, with an average rainfall of 1 millimeter. The rainless period of the year lasts for 10 months, from

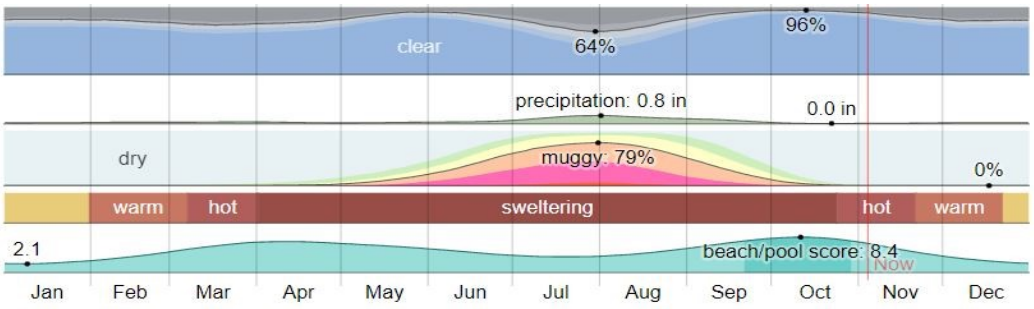


Figure 4.2: The average rainfall (Source: www.weatherspark.com)

4.3.1.3 *Humidity*

Sukkur experiences extreme seasonal variation in the perceived humidity. The humid period of the year lasts for 3 months, from end of May to mid of September, during which time the comfort level is humidity, oppressive, or miserable at least 20% of the time. The month with the most humidity days at Sukkur Airport is July, with 22 days that are humid or worse.

The least humidity day of the year is 1st February, when humidity conditions are essentially unheard of.

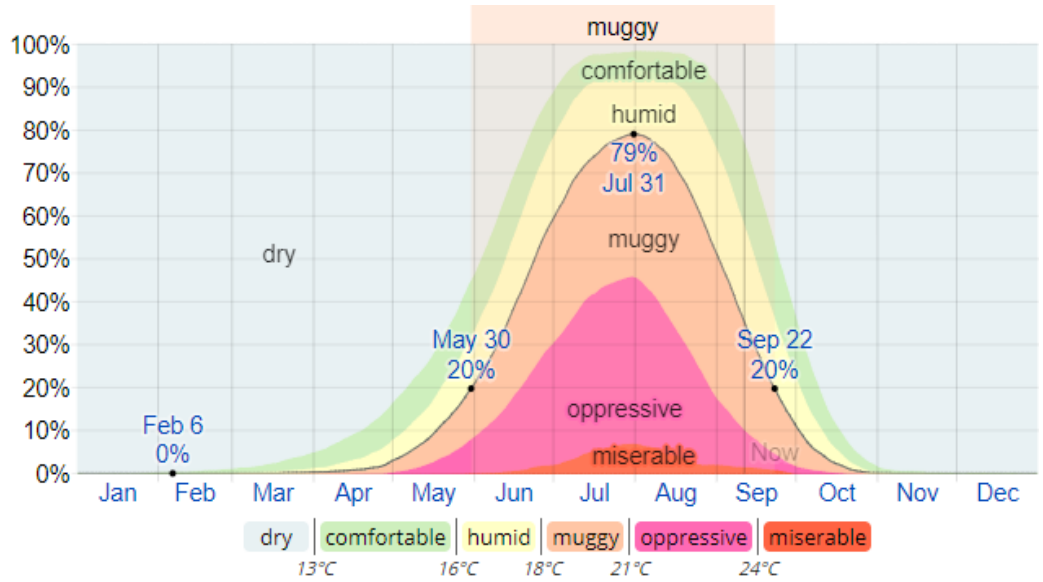


Figure 4.3: Humidity comfort levels, categorized by dew point. (Source: www.weatherspark.com)

4.3.1.4 *Wind*

The average hourly wind speed in Sukkur experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 3 months, from mid of May to mid of September, with average wind speeds of more than 3.6 meters per second. The windiest day of the year is end of June, with an average hourly wind speed of 5.1 meters per second.

The calmer time of year lasts for 8 months, from start of September to mid of May. The calmest day of the year is start of November, with an average hourly wind speed of 2.2 meters per second.

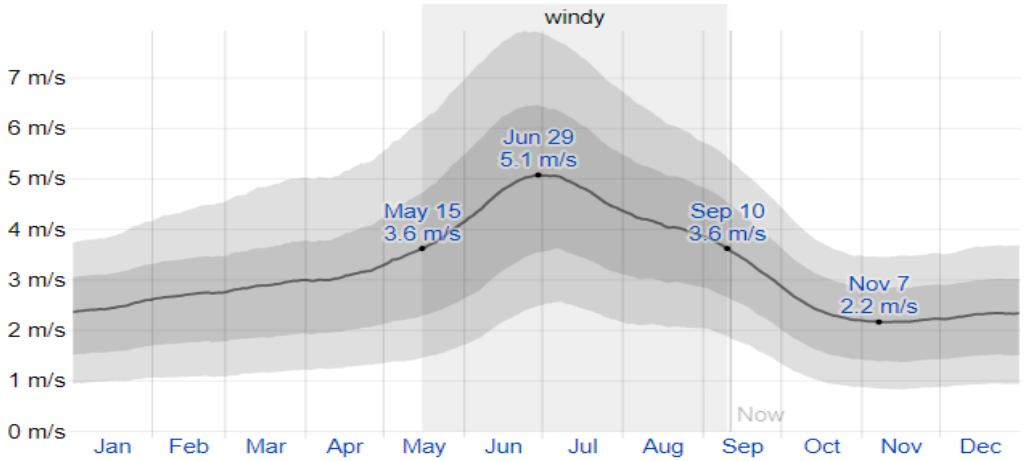


Figure 4.4: The average of mean hourly wind speeds (dark gray line). (Source: www.weatherspark.com)

The wind is most often from the north for 2 weeks, from start of March to end of March for 2 weeks, from mid of November to start of December, with a peak percentage of 34% to end of November. The wind is most often from the south for 7.4 months, from March 26 to November 7, with a peak percentage of 83% on July 5. The wind is most often from the east

for 2.0 weeks, from November 7 to November 21 and for 3.0 months, from December 6 to March 7, with a peak percentage of 31% on November 20.

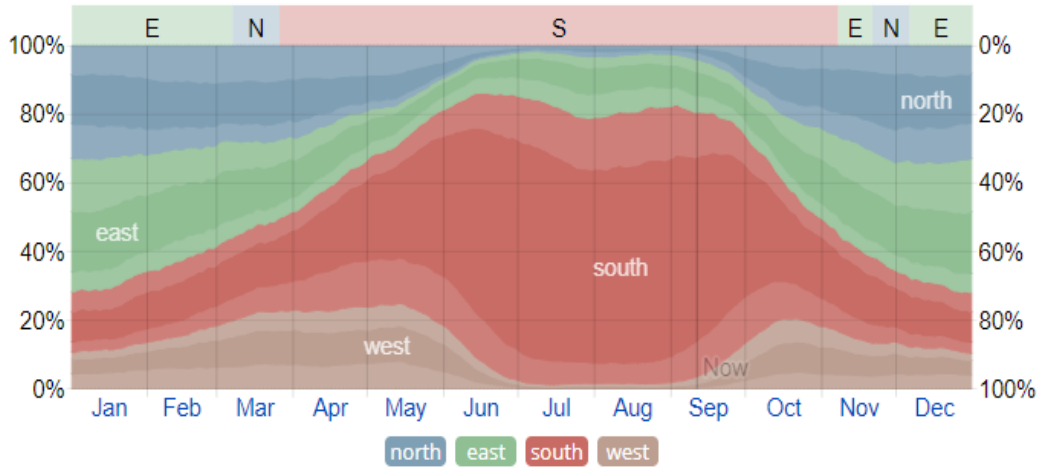
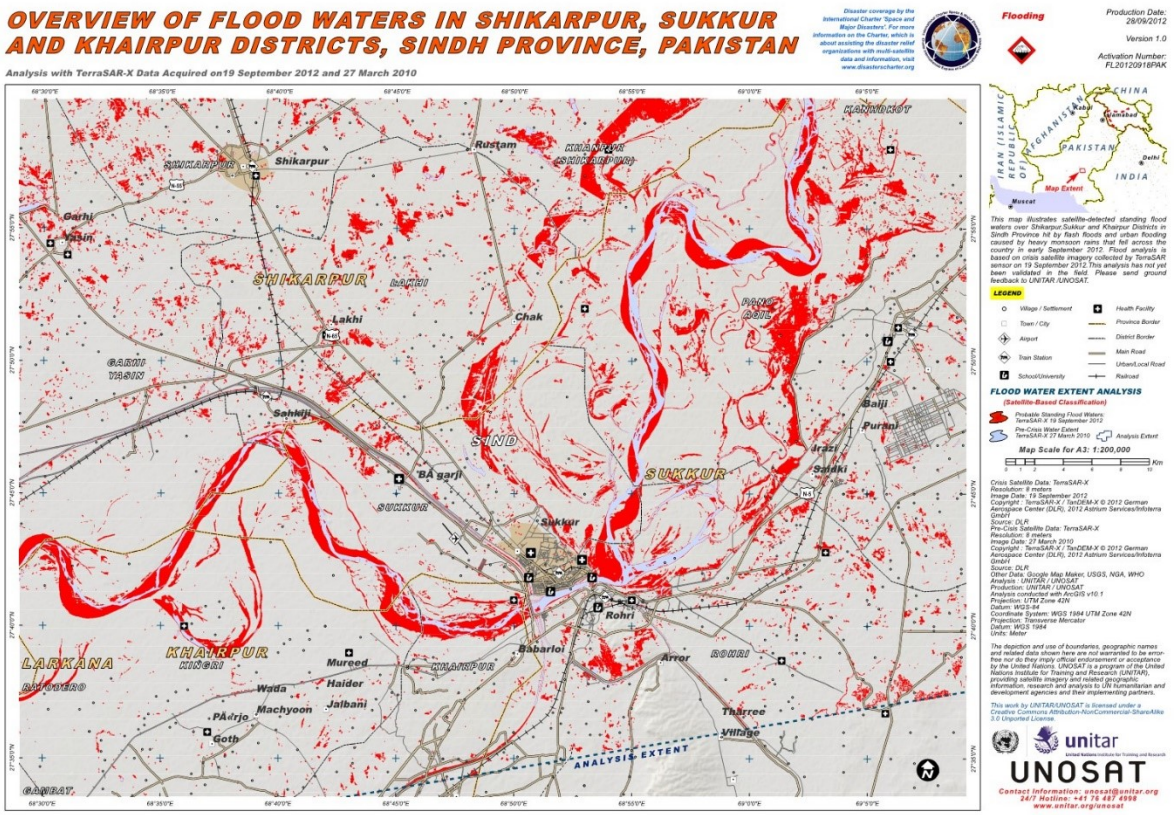


Figure 4.5: Mean Wind direction. (Source: www.weatherspark.com)

4.3.2 Flood Risk



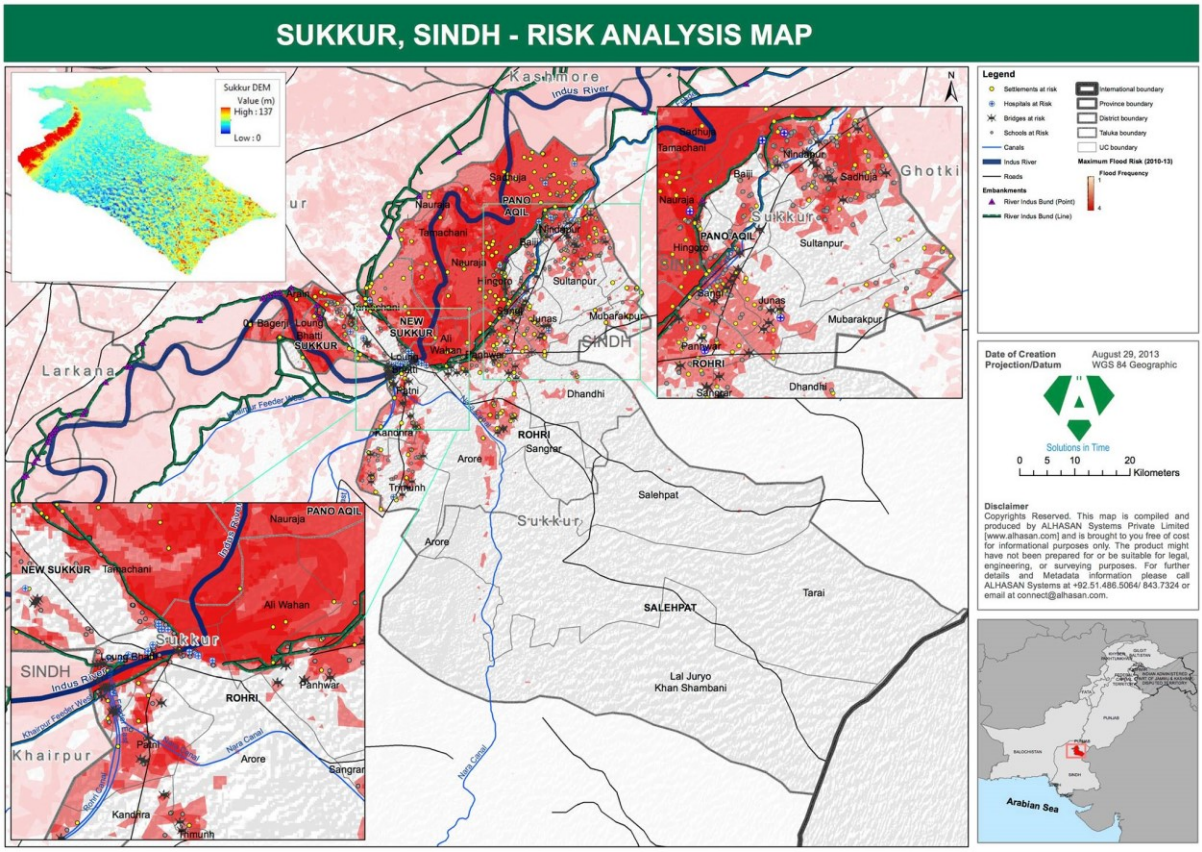


Figure 4.6: Risk Analysis Map

4.4 Ambient Air & Noise Level

An ambient air monitoring study and noise monitoring were conducted in the microenvironment of the proposed project site. The results of ambient air quality and noise monitoring are presented below:

Parameter	Unit	Monitoring Duration	Average Obtained Concentration	SEQS	LDL-Limits	Methodology/Instrument
Carbon Monoxide (CO)	mg/m^3	08 Hours	0.68	5.0	0.0	Non-Dispersive Intra Red (NDIR)
Nitrogen oxide (NO)	µg/m^3	24 Hours	14.5	40.0	0.0	Chemiluminescence
Nitrogen Dioxide (NO_2)	µg/m^3	24 Hours	18.0	80.0	0.0	
Sulphur Dioxide (SO_2)	µg/m^3	24 Hours	22.9	120.0	0.0	Ultraviolet Fluorescence Method
Ozone (O_3)	µg/m^3	01 Hour	21.1	130.0	0.0	Non-Dispersive UV Absorption Method

Particulate Matter (PM_{10})	µg/m³	24 Hours	136.0	150.0	10.0	β Ray Absorption Method
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	51.5	75.0	2.5	
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	321.5	500.0	1.0	
Lead	µg/m3	24 Hours	ND	1.5	-	ASS Method

Results of monitoring show that average concentration of pollutants are within SEQS limits.

Noise monitoring was conducted at project site. Results are in compliance with the SEQS Limits.

NOISE TEST REPORT				
S.NO.	**LOCATION/SOURCE**	**SEQS Limits : *75dB(A) *Leq**		
		Noise Level Readings		
		Minimum	**Maximum**	**Average**
1	Right corner of the Project Area, Front side	56.9	59.3	58.1
2	Left corner of the Project Area, Front side	57.2	58.6	57.9
3	Right corner of the Project Area, back side	55.5	56.1	55.8
4	Left corner of the Project Area, back side	58.2	59.0	58.6

Figure 4.3: Pictorial Evidence of Ambient Air & Noise Monitoring at Project Site

4.5 Geology and Sub-Surface Characteristics

Geology: Topographically, the district Sukkur may be divided into two broad parts. Fertile plain in the western half and desert in the eastern half separated by the Rohri Hills. With the exception of the low limestone hills running from the town of Rohri towards the south, and on the west of Nara Canal. The rest of the area of the district in the western half, is flat and level plain. The hills vary in elevation from 100 to 125 meters. There are four prominent hills namely, Adam Shah hills near Sukkur, Kalka hills at Aror, Laheri hills at Rohri and Shadi Shaheed hills at Kandahra. The eastern half of the district is a wasteland. It consists of barren tract of clay and ridges of sand hills covered with caper and thorn jungle.

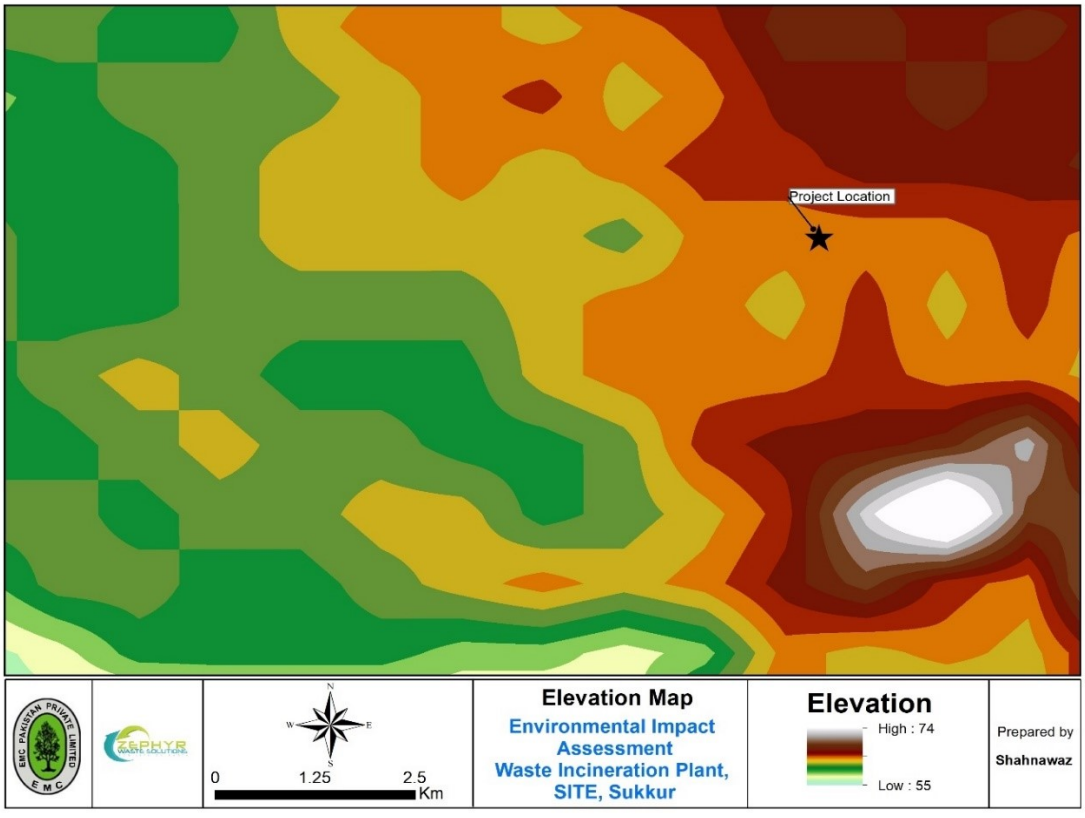


Fig 4.7: Elevation map of Project Area

4.5.1 Hydrology

4.5.1.1 *Surface Water*

The irrigation system of Sindh is entirely dependent on the River Indus for supplies of water downstream of the area. Riverine tract of the River Indus occupies a special significance in the ecology of Sindh. The hydrograph of the river is strongly seasonal with a long low water season between October and March and a high-water season between April and September – driven primarily by snowmelt in the upper catchment and monsoon rainfall. The river usually peaks in mid-August or early September. The river carries large sediment loads due to widespread and rapid erosion in its upper catchments. It is estimated that about 1 billion m3 of sediment is deposited in its floodplain each year. Because of this continuing deposition, the river has developed natural levees along its length.

Expansion of agriculture and subsequent industrial development led to the need for conserving water for agriculture purpose and power generation through construction of reservoirs on the River Indus and its tributaries with associated irrigation canal networks. A number of Dams, head works barrages and diversion canals have been constructed on Indus and its tributaries from 1886 to 1993. The first barrage on the Indus was commissioned in 1932 (Sukkur Barrage) followed by Kotri (Ghulam Muhammad barrage) and Guddu in 1955 and 1962 respectively (Osmani, 2003). Indus River and Irrigation canals from Sukkur Barrage are the source of water in the macro environment i.e., district Khairpur and Sukkur. Six canals take off from Sukkur barrage for irrigation purposes. These include Dadu Canal, Nara Canal, Rohri Canal, Rice Canal, N.W Canal and Kirthar Canal.

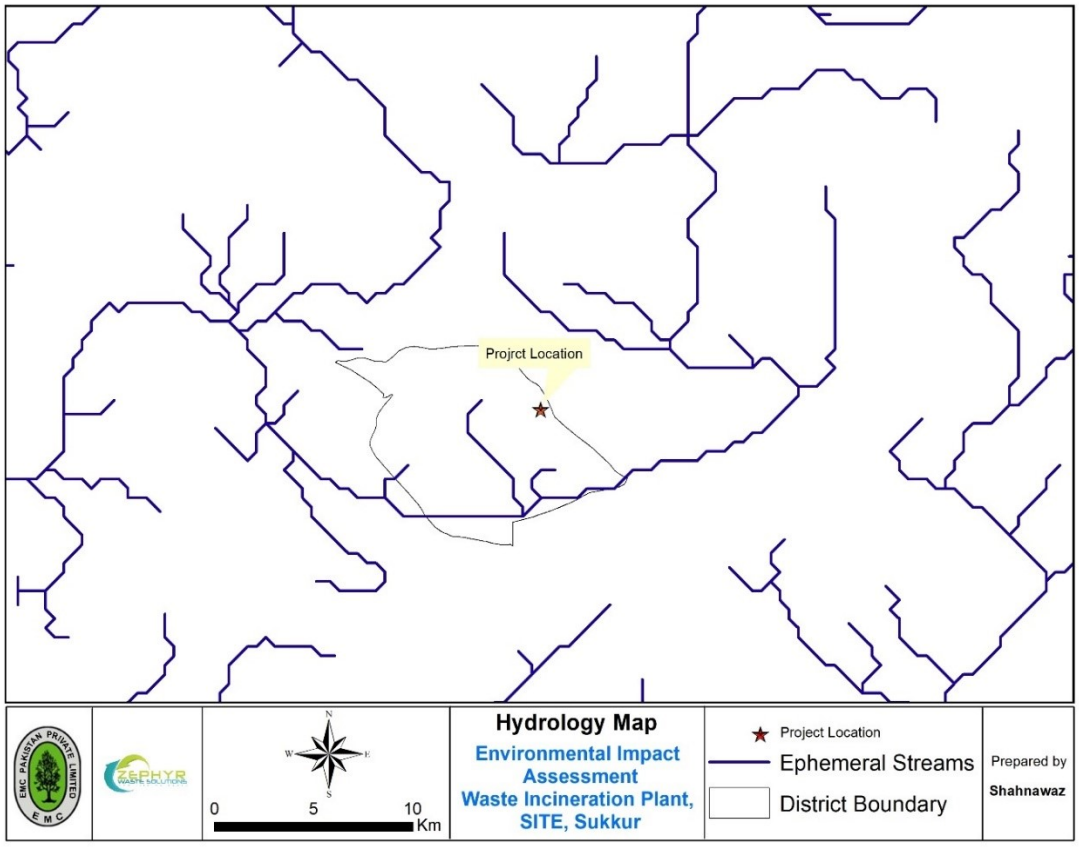


Fig 4.8: Hydrology map of Project Area

4.5.1.2 *Groundwater*

Pakistan's groundwater resources comprise a vast aquifer underlying the Indus Basin, recharged by the river flows, irrigation water and precipitation. The distribution of groundwater within the Indus Basin is non-uniform with majority of freshwater concentrated in Punjab. In Punjab, about 79% of the area and in Sindh, about 28% of the area is underlain by fresh groundwater (IUCN 1992). In Sindh, fresh water invariably occurred in areas where river had its courses during the past 800 years. Between Tando Mohammad Khan and Bulri where river was consistently flowing from 13th to 18th centuries, fresh water is present in shallow depth of about 15m to 18m. Generally, ground water becomes saline downstream of Hyderabad. This is thought to be because of the recent shift (in terms of geological times) of the Arabian Sea which used to be further southwards until Hyderabad some 12000 years ago. The areas with saline groundwater show higher concentration of chlorine compared to carbonates and bicarbonates suggesting that some millennia ago the area was submerged into seawater. Though meandering of the river Indus had diluted the brackish water, but 800 years of deserting by the Indus River had allowed saline water down below to displace fresh water of Indus River by various processes including sea water encroachment, surface water evaporation and dilution.

The water table along canals and Indus ranges from 20ft to 25ft with a gradient generally oriented southward. Groundwater for domestic consumption is abstracted through shallow hand pumps.

Water Quality

The Water sampling was conducted during the reconnaissance survey of the project site for Incineration plant. During the survey 02 ground water samples were taken, one from the village and other from project site and a surface water sample was taken from Kirthar Canal and analyzed at SEPA approved Laboratory. Water Quality Result and location coordinates are given in table below.

Table 4.1: Coordinates of the Water sampling locations

S No.	Sample ID	Location	Coordinates
1	Ground Water-1	Project Site	27°43'42.83"N 68°51'20.20"E
2	Ground Water-2	Village	27°43'29.27"N 68°51'36.56"E
Surface Water samples			
1	Surface Water	Kirthar Canal	27°41'55.72"N 68°50'38.50"E

Table 4.2: Surface Water Test Report

S. No.	Parameters	Units	27°41'55.72"N 68°50'38.50"E
			Results
1	pH value	-	6.9
2	Chemical Oxygen Demand (COD)	mg/L	10.3
3	Biochemical Oxygen Demand (BOD)5 at 200C	mg/L	06

4	Total Suspended Solids (TSS)	mg/L	86
5	Total Dissolved Solids (TDS)	mg/L	117.2
6	Oil & Grease	mg/L	0.7
7	Fluoride (as F-)	mg/L	0.31
8	Chloride (as Cl-)	mg/L	48.1
9	Total Hardness (as CaCO3)	mg/L	58.3
10	Turbidity	NTU	3.1

Because there is no standard defined in SEQS for surface water sample therefore, the analysis results have not been compared with any standard value. All the Parameters are in acceptable limits for the sample taken from Kirthar Canal Outfall.

Table 4.3: Ground Water Test Report

S. No.	Parameters	Standards	Units	27°43'42.83"N 68°51'20.20"E	27°43'29.27"N 68°51'36.56"E
		SSDWQ - LIMITS		Results	Results
1	pH value	6.5-8.5	-	7.43	7.5
2	Total Dissolved Solids(TDS)	<1000	mg/L	1398*	667
3	Total Hardness(as CaCO3)	<500	mg/L	452	210
4	Turbidity	<5	NTU	0.31	0.21
5	Nitrate(NO3)	<50	mg/L	0.31	0.27
6	Nitrite(NO2)	<3	mg/L	0.041	0.03
7	Phenolic compounds(as phenol)	<0.002	mg/L	BDL	BDL
8	Chloride(as Cl-)	<250	mg/L	401	144
9	Fluoride(as F-)	<1.5	mg/L	0.02	0.02
Mircobiological Analysis Reports					
28	Total Coliform	0cfu/100ml	cfu	>50*	>30*
29	Fecal Coliform	0cfu/100ml	cfu	>35*	>10*
30	Escherichia Coli(E-Coli)	0cfu/100ml	cfu	>20*	>15*

Analysis results of groundwater samples from the project site and the village show that pH, total hardness, turbidity, nitrate, nitrite, phenolic compounds, and fluoride levels are within the prescribed SSDWQ limits. However, Total Dissolved Solids (TDS) and chloride levels at the project site exceed the standard limits. Additionally, coliforms, including total coliforms, fecal coliforms, and Escherichia Coli, have been detected in groundwater samples from both the project site and the village, indicating potential microbial contamination. Reported depth of the groundwater from where the samples were collected is approx. 50ft.

Water sampling photographs	
	
	

4.5.2 Geography

Covering a total area of 300 km2, Sukkur is located between 27° 42′ 22″ N latitude and 68 ° 50′ 54″ E longitudes and its elevation, high above sea level, is 220 ft (67 m). The city is situated in the Sukkur District, along the western bank of the Indus River, directly across from the historic city of Rohri. Indus River flows on the north-western side of the Sukkur district. Sukkur is the narrowest part of the Indus River course.

4.5.3 Seismicity

The project area falls in Seismic Zone – 2A (Figure 4.11). Zone – 2A is the largest zone with respect to area, but it has the lesser seismic activity. It covers most parts of Punjab and Sindh western part of Balochistan. In the south it covers the coastal areas of Sindh where a few but significant historical earthquakes are found; however, there are generally fewer earthquakes in this zone.

Figure 4.9: Seismicity & Natural Disasters- Pakistan, 1990-2000

4.6 Biological Environment

4.6.1 Flora

Flora of the Project Area falls in the scrub Dry Tropical Thorn Forest Zone. This is the natural vegetation of the Indus Basin. It has the capacity to survive and grow in areas with extremely high temperatures and low precipitation.

Main trees in the Project Area and in urban area of District Sukkur are Date palm (Phoenix dactylifera), Acacia nilotica (Keekar), Eucalyptus camaldulensis (Safaida), Phoenix dactylifera (Date Palm), Dalbergia sissoo (Shisham), Azadirachta indica (Neem), Salvadora oleoides (Peelu) and Ficus religiosa (Peeple).

Among the grasses; Arislida depressa (Lumb), Eleusine compressa (Chemmer), lasiurus sindicus (Gorkha) and Saccharum bengalensis (Kana) are found in the Project Area .

Figure 4.10: Status of vegetation at the Project Site

4.6.1.1. Reserve Forests / National Parks

The Project area is now highly urbanized and industrialized and as such lacks reserved forests, national parks or game sanctuaries. However, man-created plantations comprising of ornamental and shade species are common in Sukkur city.

4.6.2 Fauna

Changes in land use has significantly altered the status of fauna in the project area. Animal life in the project area macroenvironment have been constraint with human habitations within agriculture areas, as well as the urban centers. Scavengers are attracted to the garbage dumps for food. Common Crow and House Sparrows are common in the project area and city. Large populations of Pigeons breed in urban houses. Kites, Crows, Mynas, House Sparrows, and Alexandrine Parakeets breed in the urban areas. Usually, Shisham and Acacia trees are planted alongside the roads and canals. Mostly Doves breed on such trees.

4.6.2.1. Mammals

The only mammals found in the area are domesticated animals, such as buffaloes, cattle, sheep, goats, camels, donkeys, dogs, cats etc.

4.6.2.2. Birds

The bird communities found in the area include a variety of residential birds, such as house crow (Coruus splendens), common mynah (Acridotheres tristis), red-vented bulbul (Pycnonotus cafer), ringdove (Streptopelia decaocto) and pigeon (Columba livia). The less urbanized areas host less common local or migrant species of Bee-eaters, Woodpeckers, Parakeets, Warblers and Thrushes.

4.7 Socio-economic Status of the Macroenvironment

This social baseline chapter provides a detailed review of the socio-economic conditions for the proposed project. The socio-economic profile is based on a literature review and several consultations with primary stakeholders and secondary stakeholders. The purpose of this social baseline is to provide a comprehensive overview of the social and cultural context of the district Sukkur which will help in identification of the positive and negative impacts of the project on the local community and contribute to providing plausible mitigation measures that can become part of the Social Management Plan. With respect to the secondary sources, latest government publications based on national, provincial and sectoral census surveys and reports from NGOs and development agencies were used to establish the macro-environment of the project area. Both quantitative and qualitative data available at the district level was used to provide a comprehensive overview of the major socio-economic parameters: demography, ethnicity, poverty, economy, education, health, utilities and the like.

The major secondary sources used to develop the baseline include the Population Census-2017, Provincial Development Statistics (Sindh), Pakistan Social and Living Standards Measurements (PSLM) Report, Provincial Agricultural Statistics (Sindh) and the Planning Commission's Multi-Dimensional Poverty Index report.

4.6.2 Macro Environment

Administrative Context

The proposed project involves the installation and operation of an incineration facility by "Zephyr Waste Solution" located at Plot No. C-20, SITE area, Sukkur. The facility will have a capacity of 150 kg/hr and aims to address the increasing waste management challenges in the region. The project falls under the administrative jurisdiction of District Sukkur, Sindh.

Sukkur district comprises of 5 tehsils, 63 union councils and 260 Mauzas. Pano Aqil is the most populated taluka of the district and is known for having one of the largest military cantonments of the country. Shikarpur and Ghotki were previously a part of District Sukkur.

Table 4.4:District with Tehsils & Union Councils

District	Area / Sq. Kms	Tehsils	Union Councils	Number of Mauzas/Deh
Sukkur	5,165	5	63	260

Source: PBS (Govt. of Pakistan – 2017 Census)

The population development of Sukkur according to Population Census 2023 is 1,639,897 (headcounts), detailed analysis is not yet uploaded on PBS website therefore population analysis of 2017 is utilized in the report

Demography

Sukkur is a less populated district with a total population of 1,487,903. The average annual growth rate between 1998 and 2017 census has been 2.49%. A total of 263,042 households

have been reported in the district in the 2017 census, a majority of which are based in the rural part of the district. The sex ratio of district Sukkur is 109.9 indicating 109 males per 100 females.

Table 4.5: District Population by Gender and Rural/Urban							
Administrative Units	House Holds	Population – 2017				Sex Ratio 2017	1998-2017
		Male	Female	Trans-gender	All Sexes		Average Annual Growth Rate
Sukkur	263,042	776,259	711,587	57	1,487,903	109.09	2.49
Rural	135,906	399,295	368,485	8	767,788	108.36	2.86
Urban	127,136	376,964	343,102	49	720,115	109.87	2.13
Source: PBS (Provisional Results of Census - 2017)							

District Sukkur is rural by its characteristics as majority of the population resides in rural areas.

Multi-Dimensional Poverty Index

The Multi-Dimensional Poverty Index (MPI) was developed in 2010 as an alternative to the traditional measures of poverty that are based on household income and consumption. Developed through collaboration of UNDP's Human Development Office and the Oxford Poverty and Human Development Initiative (OPHI), the Multi-Dimensional Poverty Index (MPI) incorporates other measures of poverty including education, health and various standards of living. Two main components, the 'Incidence' (H) of poverty and the 'Intensity' (A) of poverty are multiplied to come up with the MPI of a certain geographical area. The incidence of poverty is the percentage of people who are categorized as multi-dimensionally poor or the poverty headcount. The intensity of poverty is the weighted average of all MPI indicators in which people are classified as poor or deprived.

In 2015, with the support of UNDP and OPHI, the Planning Commission estimated national, provincial and district-level MPIs based on Pakistan's Social and Living Standards Measurement Survey Data (2014-15). Based on these datasets, a comparison of the MPI for the entire Sindh Province and the MPI values for project districts in Sindh is presented in Table 4.3. According to these MPI estimations, poverty is higher than the provincial average in other districts except Sukkur. Moreover, except for Sukkur, both the poverty headcount and the intensity of poverty data indicate that more than half of the district populations are categorized as 'poor' and considered 'deprived' in at least 50% of the socio-economic indicators

Table 4.6: Multidimensional Poverty Index of Project District in Sindh				
S. No	Regions	MPI	Incidence (H)	Intensity (A)
1	Sukkur	0.197	39.5%	50.0%
2	Sindh	0.231	43.1%	53.5%

Source: UNDP Report Multi-Dimensional Poverty in Pakistan 2015

Ethnic and Religious Diversity

District Sukkur is composed of pre-dominantly Sindhi speaking people, however Urdu speaking, Punjabi, Pathan and Balochis also inhabit the district. A significant Muhajir (migrants) community is residing in this district, particularly in the city of Sukkur. This community is mainly associated with business and trade in this district. Islam is the major religion of this district as the population is Muslim followed by Hindus and Christians are very few. Major clans of this district are Syed, Arain Mahar, Soomro, Memon, Mughal, Ansari and Phulpoto.

Economy & Livelihood

In Sukkur district, the main source of livelihood is agriculture in the rural areas. The sources of livelihood in rural areas are less diversified as compared to urban areas. In urban areas, people are engaged in various other economic activities like trade, services, personal business, and government and private jobs.

According to 2014 PESA report, agriculture is the main source of employment for the rural population of District Sukkur. In the urban areas however, people are engaged in various other economic activities like trade, services, personal business, and government and private jobs. The Agriculture Census 2000 classifies rural households under three broad categories: households that own and cultivate land or tenants; livestock owners; and non-agricultural households. In district Sukkur, the share of non-agricultural households is 47.7%, while agricultural households constitute 25.5% and livestock owners constitute 26.8% of all rural households in the district.

District Sukkur has two industrial estates. Sindh Industrial Trading Estate (SITE) was established in 1963 over an area of about 1060 Acres. The Estate comprises of industrial units which include ghee, oil, biscuits, soap, beverages, flour, straw paper board, poultry farm, dates, Sulphuric acid, ice and cold storage. The Small Industries Estate (SIE) Sukkur was set up over an area of 110 acres. The Estate comprises of industrial units like cotton seed crushing units, RCC pipes, paints and varnishes, biscuits, flour, rice husking, printing press, ceramic wares and light engineering.

Education

District Sukkur has the lowest number of government schools compared to the districts. The district also has the lowest total enrolment ratio and the lowest number of teachers. The total enrollment of students in government schools of District Sukkur is 160,693 out of which 97,344 are males and 63,349 are females. Out of a total of 5,504 teachers, 3,969 are male and 1,535 are female teachers. This illustrates that one teacher is teaching an average of 29 students.

Table 4.7: District Summary: Government Schools, Enrolment, Teachers and School Status

Districts	No. of Schools				Enrolments			Teachers		
	Boys	Girls	Mixed	Total	Boys	Girls	Total	Male	Female	Total
Sukkur	172	199	856	1,227	97,344	63,349	160,693	3,969	1,535	5,504

Source: SEMIS Census 2015- 2016 -Sindh Education Management Information System (SEMIS)

Health

District Sukkur has the highest number of hospitals (23) with a total capacity of 1210 beds. Apart from that the district has 77 Dispensaries with a total of 12 beds, 5 Rural Health Centers (RHC) with 54 beds, and 26 Basic Health Units (BHU) with 52 beds, 6 T.B. Clinics and 6 Mother & Child Healthcare Centers with 32 beds.

Table 4.8: Details of Health facilities in District

Districts	Hospitals		Dispensaries		R.H.Cs.		B.H.Cs.		T.B. Clinics		M.C.H. Centres	
	No.	Beds	No.	Beds	No.	Beds	No.	Beds	No.	Beds	No.	Beds
Sukkur	23	1210	77	12	5	54	26	52	6	0	6	32

Source: Health Profile of Sindh-2016 (Sindh Bureau of Statistics)

Table 4.9: Health Personnel in Project District

Districts	Sector	Physicians	Gynecologist	Pediatricians	Doctors/ GMO	LHV	Midwives
	Govt.	3	5	3`	180	76	92
	Semi Govt.	-	-	-	34	9	6
	L. Bodies	-	1	-	17	-	4
	Private/ Missionary	8	6	7	150	12	41
Sukkur	**Total**	**11**	**12**	**10**	**381**	**97**	**143**

Source: Health Profile of Sindh-2016 (Sindh Bureau of Statistics)

Agriculture

Sukkur contributes significantly in agriculture sector of Sindh because its climate is suitable for production of various crops including the kharif crops of cotton, rice, jowar and sugarcane and the Rabi crops of wheat, gram and oil seeds. Date orchards are abundant in this district. Due to its soil and topography, Sukkur is an ideal place for date cultivation. Sukkur has the largest dry dates market of Sindh. Important date varieties include Aseel, Fasli, Bhedir, Karbalian, Kupro and Mithri.

Gender Roles

The literacy rate among women in the surveyed villages of district Sukkur is almost non-existent however women from Syed families are educated. Women from poor families are involved in farming alongside men while some women are able to generate income by sewing clothes. There are no separate schools for females in the rural areas. Due to tribal system in Sukkur, the females are not allowed to attend schools. Women are involved in livestock rearing and household chores.

4.6.2 Micro Environment

Land Use

The proposed site is located in the main Sukkur City of District Sukkur, Sindh, in the S.I.T.E industrial area (Sukkur) and its immediate neighbourhood WAPDA pumping station and Prime Traders Warehouse is located adjacent to the project site and Miandad Khoso village is located opposite to the proposed project's location.

Education

There are few educational facilities near the proposed project site as many of the educational institutes are located outside the premises of Sukkur S.I.T.E Industrial Area. The nearby education facilities include Govt. Girls Primary School Miandad Khoso, Govt. Boys Primary School Miandad Khoso, Workers Model School are located within 1Km. Other education facilities include Becan School Sukkur, Lareb Model School, Foundation Grammer School and School of Excellence Sukkur is located at the distance of 7km from the project. The universities include IBA Sukkur and Virtual University Sukkur Campus is located at the distance of 6km.

Health

The people of area don't have access to good health facilities but due to non-availability of trained doctors, lady health doctors and technical facilities, people prefer to go to PPHI Govt. Hospital and Sindh Rangers Hospital is approximately (4.5km). Other Healthcare facilities include Mughal Hospital (3.4km) and River City Hospital (6.8km) away from the project site. The closest healthcare facility to the project location is Sindh Employees' Social Security Institution (SESSI) – OPD Hospital (2 km).

Utilities

In S.I.T.E industrial area the basic utilities are available for the industries while the residents of the villages are no able to avail these facilities. They don't have access to basic services such as gas connections and electricity (if available they face long load-shedding of 12 to 15 hours daily). They use solar panels if they can afford. Sukkur Electric Power Company (SEPCO) is the distribution company responsible for supplying electricity to Sukkur district. There are no gas connections in any of the villages. There is no proper sewerage system in the area. Most of the villagers reported open defecation due to unavailability of latrines in their houses. There is no solid waste management system in villages. The majority of people throw their waste in the open area while industries have access to municipal waste collection.

Traffic Conditions

The project is directly facing an unnamed road that connects with Sukkur – Jacobabad Highway/ Shikarpur Road at the distance of approximately 3 kms. The traffic condition in the nearby roads is somewhat satisfactory as the project is located inside the S.I.T.E Industrial Area of Sukkur which is surrounded by numerous industries. The industrial traffic includes the flow of trucks containing raw material and finished goods.

Chapter 5 PUBLIC CONSULTATION

The participation of project stakeholders in project planning, design and implementation is now universally recognized as an integral part of environmental & social impacts assessment. Local communities, their representatives, government departments, national and international NGOs and the civil society at large may all be able to contribute to and benefits from, the dialogue directed at identified and resolving key project-related issues. Stakeholder consultation has become an important requirement of the EIA study after the enactment of the guidelines for public consultation under the Pakistan Environmental Protection Act (PEPA) 1997. After the 18th Amendment to the constitution, the Government of Sindh passed the Sindh Environmental Protection Act 2014, which also stresses the importance of engaging with the concerned primary and secondary stakeholders during the EIA Study.

While in the short-term, the impacts might be felt only in the microenvironment level of the project, in the long-term, the impacts may also spread to other nearby neighborhoods and activities including traffic management, the swift passageway for fire tenders and ambulance and stress on existing utilities. Instead of these perceived impacts, meaningful engagement with the project stakeholders has been carried out to identify the potential positive and negative impacts, assess the magnitude of these impacts from a social perspective and prescribe solutions that identify for the construction and operations phase of the proposed project.

5.1 Stakeholder Mapping

To better understand the different stakeholder groups for this project, a stakeholder mapping exercise has been carried out whereby the different stakeholder groups and their interests in the project are discussed in this section:

Local People/Neighborhood: Individuals or groups in the vicinity of the project site are informed regarding the project background and context. Due to their proximity to the project site, they are often the most vulnerable stakeholders and therefore, consultation with these stakeholders is carried out throughout the project life. The consultation exercise provides an opportunity to appraise the stakeholders regarding the consultation process, identify likely project impacts, and record concerns of local communities. Moreover, intensive stakeholder engagement during the planning stage of the project provides a basis for reducing the trust deficit and encourages confidence-building.

Proponents: The main aim of the project proponent "S.I.T.E Sukkur Association - Government of Sindh (GoS)" is to accomplish the objectives of the project through cost-effective and sustainable project activities. To this end, the project proponent has to recognize that strong associations and responsive relations with stakeholders would go a long way to achieve the project objectives. Therefore, the proponent has to strive to engage stakeholders at all levels from the outset; inform them regarding project goals, design and alternatives. Moreover, they have to keep trying to create public understanding and acceptance of the proposal through a commitment to implement the promised objectives. They have to accomplish the project through general acceptance of the design and keep improving through the use of public inputs on alternatives and mitigation measures.

Government Agencies: The government agencies involved in the EIA process is mandated to have their policy and regulatory responsibilities addressed in impact analysis and mitigation

consideration. For the competent authority, an effective public involvement program will ensure a project proposal that effectively incorporates environmental and social concerns. During the EIA review, the most important concern for SEPA is a transparent public consultation process and a strong stakeholder engagement plan that can address the concerns and suggestions of all stakeholders.

NGOs/Interest groups: Comments from NGOs and specific interest groups often provide a useful policy perspective on the project's methodology and implementation mechanisms. For example, due to the vast exposure of certain NGOs and interests groups, alternative measures for reaching the project goals may be advised that is more environmentally friendly and socially acceptable..

5.2 Primary and Secondary Stakeholders

Primary stakeholders are those who have a direct interest in the project which includes residents, commercial entities and institutions falling in the immediate environs of the project area. Secondary stakeholders include the relevant government agencies and public interest groups which may indirectly influence or be influenced by the project. The concerns and input from both primary and secondary stakeholders are important to identify the issues arising from the construction and/or operation phase of the project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

Within the project vicinity, the primary stakeholders are the residential, commercial and institutional entities in the immediate vicinity, that include Miandad Khoso Village, Slatify Warehouse, RK Rice and Flour Mill, Topsun Group, ,S.I.T.E Limited Sukkur and Sindh Education & Vocational Training Authority (STEVTA). The secondary stakeholders for this project include the utility companies that operate in the area including SEPCO, SSGC, as well as the regulatory authorities, mandated to ensure environmental protection in the city, which falls under the remit of Sindh Environmental Protection Agency (SEPA) . The primary and secondary stakeholders for the "Waste Incineration Plant" have been identified in the table below:

Table 5.1: Primary Stakeholders for Medical & Hazardous Waste Incinerator Facility

Neighborhood	*Residential Interests* • *Miandad Khoso Village* *Commercial Interests* • *Slantify Warehouse (Price and Flour Mill* • *Topsun Group* • *SEPCO Gird Station* *Institutional/Governmental Interests* • *Sindh Technical Education and Vocational Training Authority (STEVTA)* • *S.I.T.E Limited Sukkur*

Government Agencies & Other Service Providers	• Sindh Environmental Protection Agency (SEPA) • Sukkur Water & Sewerage Board (SWSB) • SEPCO • Sindh Building & Control Authority (SBCA)
NGOs/Interest groups	• Sujag Shaikh Welfare Association (SSWA) • Sindh Rural Support Organization (SRSO) • Sahil Development Organization • HANDS Sukkur

5.3 Consultation Approach & Methodology

5.3.1 Consultation with Primary Stakeholders

A Neighborhood Survey was conducted to identify the residential and commercial interests in the area that may face direct impacts from the proposed development. The survey was conducted in two stages. In the first stage, several site visits were carried out to identify all stakeholders that either reside or work in the project vicinity and conduct an initial identification of potential positive and negative impacts. Relevant public service institutions directly involved in service provision in the areas were also identified.

During the second stage, a social survey field team used a pre-designed semi-structured template to engage the area residents, commercial interests and public service institutions. Those stakeholders, who were not available at the first attempt, were re-visited on the same day or followed-up for their comments during the next few days. During each meeting, the project team introduced the project to the stakeholders, recorded their concerns, suggestions and provided contact details to enable stakeholders to share further comments over email or in writing. A 'Project Brief' providing the salient features of the project were also handed over to the available stakeholders as part of the information disclosure process.

Moreover, the team inquired about the current situation of the area such as the status of utilities, security and law and order situation in the project area from the residents near the project site. Several open-ended questions were also included in the questionnaire to ensure that the respondents could openly share their opinions and suggestions relevant to the study. The following table shows the stakeholders that were approached during the Neighborhood Survey.

Table 5.2: Consultations with Primary Stakeholders

S. No	Respondents	Stakeholders	Stakeholder Type	Date
1	Mr. Muhammad Hashim (Resident)	Miandad Khoso Village	Residential	27-6-2024
2	Mr. M. Jameel (Resident)	Miandad Khoso Village	Residential	
3	Mr. Ammar Saleem (Deputy Executive)	Topsun Group	Commercial	
4	Mr. Nazar Ahmed (Supplier Supervisor)	Slantify Warehouse	Commercial	
5	Mr. Muhammad Waseem (Shift Incharge)	SEPCO Gird Station	Commercial	
6	Mr. Chandar Kumar (Accountant)	RK Rice and Flour Mill	Commercial	
7	Mr. Ameer Hussain (Principle)	Sindh Technical Education and Vocational Training Authority	Government Institute	

5.4 Consultation Feedback

The social team from EMC carried out consultations in the project area on 4th week of June, 2024 after an initial site visit. Consultations were conducted with the residential and commercial stakeholders in the vicinity of project site. The following major issues and concerns were raised by the primary stakeholders:

Concern & Suggestions

- Residents of Miandad Khan Khoso Village expressed their interest in the proposed project and said that the new project would bring job opportunities to the locals.
- Residents expressed their concerns about the non-availability of health facility in the area and mentioned that they have to travel to Sukkur city to get medical help.
- The villagers expressed their concerns about the growing industrialization in the area. The conversion of agriculture land into industries, government should make efforts to preserve old-school agricultural practices for poor farmers who depends on this sector for their daily needs.
- The Shift In-charge of SEPCO told the consultation team that storage and transportation of waste in the incineration plant should be covered and handled with care otherwise it can pollute the environment.

- The Supplies Supervisor of Slantify Warehouse reported that there is an ice factory and feed processing factory that contribute to air pollution in the area, ice factory generates gas emissions and poultry feed produce unpleasant odor in the atmosphere.
- The Department Executive of Topsun Group complained about the sewerage and drainage system in SITE Industrial Area Sukkur is very old, we are still using pit-hole latrine system and also complained about the load shedding of electricity in the area.
- Mr. Anees Hussain, Principal of Sindh Techical Education and Vocational Training Authority (STEVTA) said that there is no check and balance on the discharge of toxic waste water in SITE area.
- The accountant of RK Rice and Flour Mill inquired about the amount of sludge produced after incinerating a single batch and also about its method of disposal.

Table: Primary Stakeholders Consultation Pictures

Consultation with Principle, Sindh Technical Education and Vocational Training Authority

Consultation with RK Rice and Flour Mill

Consultation with Consultation with Supplier Supervisor, Slantify Warehouse

Consultation with Residents, Miandad Khoso Village

Consultation with Deputy Executive, Topsun Group

Chapter 6 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & THEIR MITIGATION MEASURES

This section of the report screens the potential impacts imposed upon the physical, biological and socio-economic environment due to the waste generated by the project. The screening process has through review of literature, primary as well as secondary baseline data, and expert judgment made assessment of the potential impacts of said activities on the physical, biological, and socioeconomic environment of the Project.

Guidelines have been reviewed for classification of polluted and unpolluted sites with respect to their airshed, watershed and land use; sensitivity of ecosystem including flora, fauna, wildlife, aquatic life, historical and archeological sites and their values, and the sensitivity of the site.

The review / screening provides the assessment of impacts of different activities before the start of construction, during construction as well as installation of machinery and the resulting emission of gases, solid waste and wastewater discharges during operation of "Incinerator Plant". The impacts considered are those, which may occur at regional and local level or the macroenvironment and at the site or the microenvironment.

The earlier description in Section-4 of this report has already provided a classification of macroenvironment and microenvironment of the site, based on assessment of impacts using both primary and secondary data on emissions of pollutants, solid waste and wastewater discharges and other impacts from operation of "Incinerator Plant" on its microenvironment. The hazards encountered during the implementation of the proposed project will prove to be guidance for proposing appropriate mitigation measures. Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended. Enforcement of the recommended mitigation measures would minimize and eradicate the negative impacts, in all such cases where the levels of emission and discharges exceed the Sindh Environmental Quality Standards (SEQS), while enhancing in the positive outcome i.e. sustainable development.

The sources of pollution are first identified and then their impacts are noticed at each stages of the proposed project i.e. pre-constructed, construction and operational phase. Impacts of the project can be of short or long-term, temporary or permanent, acute or chronic, positive or negative in nature.

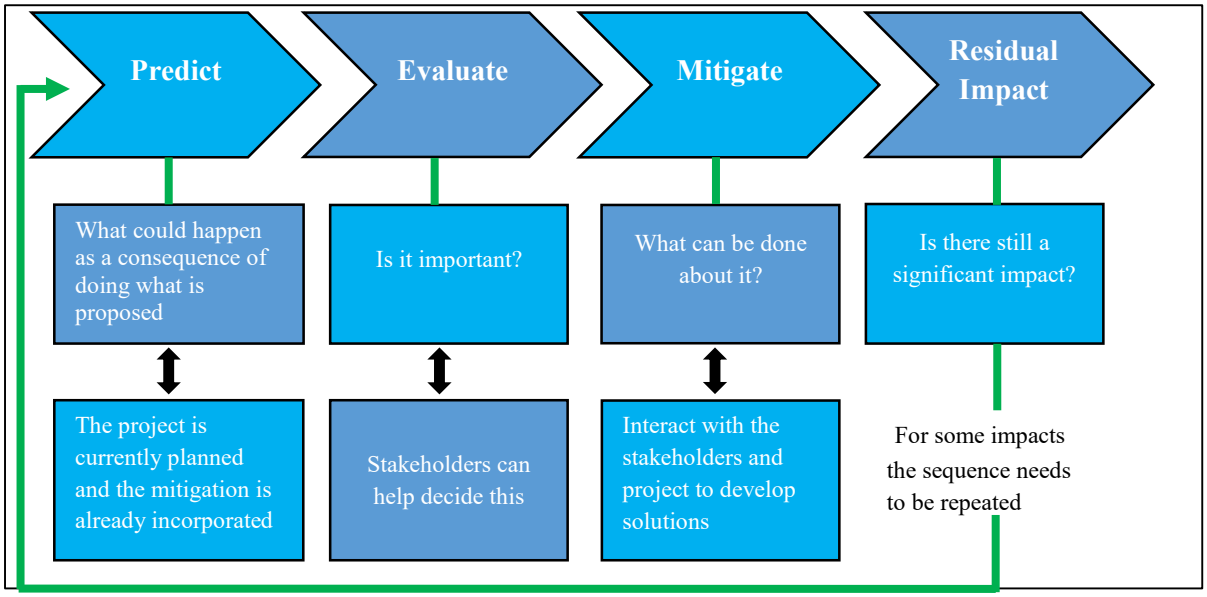


Fig 6.1: Impact Assessment Methodology

6.1 Impact Assessment Methodology

Potential environmental impacts of the proposed Project on different features of micro and macroenvironment pertain to construction and operation phase.

The screening process proceeds by identifying the potential environmental aspects of siting the project, identifying the potential environmental impacts at pre-construction, construction and operational stages of the project and identifying the residual impacts after adoption of mitigation measures that may be needed at the outset of activities. The impacts on environmental resources from the proposed project will be short-term and temporary in nature.

A systematic strategy was developed to provide an assessment of the likely impacts on the micro and macroenvironment of the Project site. The strategy included:

- Review of General Guidelines;
- Identification of potential environmental impacts by conducting survey, public consultation;
- Assessment of the intensity and significance of potential impacts by obtaining expert opinion and carrying out environment analysis;
- Defining mitigation measures to reduce impacts to as low as practicable;

Guidelines and checklists were used for the verification of permissible levels of environmental parameters during project operation and classification of the site with respect to its pollution status, soil, and ecology.

The environmental aspects of the project were identified by situation analysis related to present land use, damage to vegetation, noise and other forms of nuisance during construction at site, air pollution due to fugitive dust emission and operation of equipment during construction, air pollution due to burning of wastes.

Site Visits have been carried out prior to proceeding with impact assessment to get a better understanding of the area.

Assessment of impact of different activities, and of the resulting emission gases, and wastewater discharges during construction and subsequent operation of the proposed project are addressed in this section. The entire screening procedure was designed in such a way so as to provide a complete assessment of the impacts on the macro-environment and of the project. The project site has no protected area such as game reserve, wild life, national parks, archaeological sites or cultural heritage in its neighborhoods. Impacts may arise during different stages of project phases which are described below.

6.2 Screening of Potential Impact during Pre-Construction Phase

6.2.1 Facility Siting and Layout

- The proposed location is located in an Industrial area, hence the proposed development is in line with the existing land use.
- The site is away from the densely populated areas of the city..
- Electricity and other supplies are available in the proposed project area to meet the energy requirements of the Proposed plant.
- The land for the proposed project has already been rented by Proponent.

6.2.2 Safe Design

National standards for equipment design and operation where they exist should be implemented and be the subject of inspection by the Management. Wherever possible, the design of equipment within facility should be to industry good accepted practice and incorporate learning from relevant incidents.

The design of proposed incinerator will ensure compliance with environmental exhaust emission standards (i.e., SEQS).

6.3 Screening of Potential Impact during Construction/Installation Phase

The activities that take place during the construction phase of the project are leveling of site, construction and erection of building, truss, shades etc. and associated equipment. The potential primary and secondary impacts on the environment due to these activities and their mitigation measures are discussed as under:

6.3.1 Creation of Employment Opportunities

Employment opportunities are expected to be created for construction workers during the construction phase of the project.

Mitigation Measures

- Unskilled labor should be preferred from the neighborhood to avoid community issues.
- Project management should be careful about hiring the construction staff and shall consider workers' behavioral aspects as well.

6.3.2 Provision of Market for Supply of Construction Materials

The project will require supply of considerable quantities of construction material, most of which will be sourced locally. This provides market for material suppliers such as brick works, hardware shops and individuals with such materials. It is also a positive aspect of the project in terms of local economic activity.

6.3.3 Soil Erosion

Excavation works for construction/installation of proposed project will expose soils in the affected areas, leaving them vulnerable to erosion by surface run-off during moderate to heavy rainfall. It is important to conserve the "topsoil" wherever possible for later restoration. However, excavations are not expected to be deep for project activities and potential of soil erosion is expected to be low.

Mitigation Measures

To minimize the impacts that could arise during the construction phase following measures will be adopted

- Minimize the area of exposed soil at any given time and to wet, compact and resurface the disturbed areas during the construction phase.
- Removal of topsoil with vegetation in it (rather than cutting off the vegetation) so that the vegetation helps to hold and enrich the soil.
- Exposed surface will be regularly wetted to effectively keep airborne dust levels to minimum
- Stockpiles of fine material will be wetted or covered with tarpaulin especially during windy conditions until concreting and landscaping is complete.

6.3.4 Soil Contamination

During the construction stage, the contamination of soil may occur due to unchecked chemicals or fuel spillage during handling, transportation and storage.

The sources of spills are:

- During refueling, the transfer of fuel from one container to the other
- Maintenance of vehicle and machinery
- Filling of fuel to Generators sets
- Leakage from the container
- Vehicular Accident

Mitigation Measures

Actions necessary to manage the risk from soil contamination will depend on factors such as the level and location of contamination, the type and risks of the contaminated media, and the intended land use. However, a basic management strategy will include:

- Washing of vehicles and equipment should be carried out in the designated area.

- Vehicles and equipment maintenance will take place at specified area.
- Construction vehicles and equipment will have periodic maintenance.
- Removal of oil and contaminated soil around the fuel and oil storage areas will be made possible by the availability of appropriate implements i.e. shovels, plastic bags and absorbent materials.
- Contaminated medium will be managed with the objective of protecting the safety and health of laborer at the site, the surrounding entities, and the environment.
- Plans and procedures will be prepared, to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment.

6.3.5 Construction Waste

Certain amount of construction waste will be generated during construction phase which includes concrete, metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, empty paints and solvent containers, broken glass, steel, wooden scaffolding, cement bags, excavated soil, wood remains etc. this waste will predominantly be non-hazardous. Improper disposal of waste may cause clogging of drains and may affect aesthetics of surrounding environment and will cause nausance.

Mitigation Measures

The mitigation measures laid down as under will help to mitigate the impacts posed due to the constructional phase of the proposed project:

- A comprehensive waste disposal plan will be developed to effectively manage these wastes.
- The construction waste which will be sent for recycling like damaged pipes, left over steel, wooden and plastic pieces. While, the rest of the left-over non-hazardous waste will then be taken away to the approved dumping site(s) for disposal.
- Various waste containers for different types of waste will be deployed, in order to segregate the waste at source.
- The waste bins will be properly marked for each type of waste produced during the construction activities.
- Use of materials that have minimal packaging to avoid the generation of excessive packaging waste.
- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of waste generated over time.
- Hazardous waste will be disposed through EPA certified waste contractor.

6.3.6 Impact on Water Quality, Consumption & Conservation

Water requirement for construction phase will be met by water tankers to fulfill the required quantity.

Potential sources of impacts on the hydrology and ground water quality during the construction phase are as follows:

- Soil runoff from the site leading to off-site contamination (particularly during rainy season).

- Improper disposal of construction debris leading to off-site contamination of water sources.
- Spillage of oil and grease from the vehicles and wastewater stream generated from onsite activities such as vehicles washing, workshop etc.

Mitigation Measures

To mitigate these impacts precautions and preventive measure shall be taken at the site during construction to avoid any ground and surface water contamination. Following mitigation measures shall be adopted as conservation.

- Provision of adequate storm water diversion channels to divert storm runoff from flowing over the construction areas.
- Regular monitoring of water consumption
- Use of leak proof storage tanks.

6.3.7 Dust Emissions

The principle source of dust may arise from construction activity is fugitive type. Temporary dust nuisance, measurable as total suspended particulates and respirable suspended particles, may generate as a result of construction activities during the construction phase.

Among all construction activities, excavation and foundation laying has the highest potential of causing dust nuisance.

Mitigation Measure

In order to cater above impacts, following mitigation measures have potential to reduce the dust formation:

- water sprinkling at construction sites at regular intervals or when and where required. It can reduce or suppress the dust formation by approx. 50% if sprinkling is conducted upto 3 times in a day.
- Allocate specific timings during normal daytime working hours for movement of earth moving equipment.
- Develop schedule for movement of dump trucks that may be used for hauling or excavation soil.
- Use of proper roads for transportation means during construction work.
- Stockpiles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions.
- Site workers and drivers should wear dust mask and safety goggles especially during dry and windy weather conditions to avoid injuries and health risk due to dust.
- Good housekeeping practices will also reduce dust emission.

6.3.8 Exhaust Emissions

Major sources of exhaust emissions are vehicles and exhaust from construction machinery/earth moving equipment. Exhaust emissions predominantly may comprise of CO, CO2, SOx, NOx and particulates.

These emissions are injurious to human health if in high concentration and may also cause vegetation damage by clogging the photosynthesis process in plants. Emissions of greenhouse gases from combustion of fossil fuels are associated with the global warming, triggering climate change.

Mitigation Measures

Controlling the exhaust emissions by adopting preventive measures is the best possible way to reduce these emissions in the ambient air. The measures given below may assist management and construction contractor in the reduction of exhaust emission during construction work:

- Where possible use of newer generators with lower emissions.
- Generators shall be kept away from walking areas and at safe place where worker access is limited.
- Equipment, vehicles and generators should be properly tuned, serviced and monitored on regular basis.
- Ensure that the vent of the generator exhaust is at adequate height.
- Fuel of low emission content will be utilized for generators.

6.3.9 Wastewater Generation

During the construction phase, the wastewater is generated from the project site is mainly due to the municipal activities, run-off from the project site during the precipitation, washing of construction vehicles etc. The undeterred and untreated wastewater release may deteriorate the groundwater resources near the project site as it may contain oil and grease.

Mitigation Measures

The following are the recommendations to reduce and control the wastewater generated during the constructional activities:

- Wastewater will not be disposed of directly into the environment, but first be treated through septic tank and then will be discharged in allocated drain.
- Wastewater generation will be minimized by controlling the pollutant at the source.
- Monitoring of the wastewater generation will be taken into consideration.
- Adequate portable or permanent sanitation facilities serving all workers will be provided.

6.3.10 Noise

As part of the construction, noise is also one of the aspects which may cause hearing impacts on workers associated with construction activities if the noise levels are persistently high. It is anticipated as like the construction will be of short period therefore; the impacts associated with the noise are temporary and low. Following are major activities which may generate noise:

- Construction and installation works such as earth moving equipment, piling works, welding, cuttings, drilling, grinding etc.
- Diesel generators used for power supply during construction works.
- Material loading/unloading vehicles and other transport used by employees.

- Use of pressure horns.

Noise level during construction phase may pose health issues to the workers if not wearing proper PPE. Regular exposure to high noise may result in hearing impairment or hypertension.

Mitigation Measures

The following measures are adopted in order to keep the noise within the limits as prescribed in SEQS:

- Noise control devices can be used such as temporary noise barriers and deflectors for impact activities.
- Construction equipment will be kept in good condition to reduce noise generation.
- Generators and equipment can be installed and placed in enclosures to minimize ambient noise levels.
- Generator and other noisy equipment will be regularly monitored.
- Develop schedule for movement of trucks that will be initially used for hauling of excavated soil.
- Minimize night time activities as practically possible.
- Carry out noise monitoring on regular basis especially during heavy machinery operation.
- Site labor working in high noise area such as where noise level exceeds 90 dB (A), should wear earmuffs.

6.3.11 Biodiversity

The survey of the project area, it was revealed that there is no significant flora and fauna of biological importance present within the project area as the project site is located in a designated industrial area at SITE, Sukkur. Therefore, there are no major threats imposed upon the flora and fauna of the proposed project area.

6.3.12 Traffic Flow

The site is located in an Industrial area. The likelihood of increase in traffic during construction is very limited as the proposed construction activity is very limited and will not cause any major traffic increase during construction phase.

Mitigation Measures

- The proponent will put in place measures to address such concerns by ensuring that construction vehicles preferably deliver materials during off-peak hours when traffic volume is low.
- Impacts from the traffic flow will be minimized through proper planning of the transportation of materials to ensure that vehicle fills are increased, in order, to reduce the number of trips done or the number of vehicles on the road.
- Truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas and to switch off or keep vehicle engines at construction site.

6.3.13 Occupational Health & Safety Issues

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, overexertion, and manual handling, are among the most common causes of injuries in construction site. Overexertion is a major cause of the inflammation of joints and ligaments that results from excessive physical effort.

Mitigation Measures

Recommendations for their prevention and control include:

- Workers will be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two person lifts are necessary.
- Work site layout will be planned to minimize the need for manual transfer of heavy loads.
- Tools will be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations.
- Administrative controls, such as job rotations and rest or stretch breaks will be implemented into the work processes.

6.3.13.1 Slip and fall

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction site.

Mitigation Measures

Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Good house-keeping practices, such as the sorting and placing loose construction materials in established areas away from foot paths, would be implemented.
- Excessive waste debris and liquid spills will be cleaned up regularly.
- Electrical cords and ropes will be located in common and marked areas.
- Slip retardant footwear will be used.

6.3.13.2 Work at Height

Falls from elevation associated with working with ladders and scaffolding are among the most common cause of fatal or permanent disabling injury at construction site. If fall hazards exist, a fall protection plan will be in place which includes one or more of the following aspects, depending on the nature of the fall hazard. Many work activities during construction phase involve working at height. Working from ladders, scaffolds and platforms are common examples.

Mitigation Measures

Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface.

- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards as well as fall rescue procedures to deal with workers whose fall has been successfully arrested.
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones.

6.3.13.3 Struck by Objects

Construction activities of the project may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.

Mitigation Measures

Techniques for the prevention and control of these hazards include:

- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap. Temporary fall protection measures in scaffolds and out edges of elevated work surfaces would be used, such as hand rails and toe boards to prevent materials from being dislodged.
- Appropriate PPE such as safety glasses with side shields, face shields, hard hats, and safety shoes, would be wore.

6.3.13.4 Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise.

Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.

Mitigation Measures

Techniques for the prevention and control of these impacts include:

- The location of vehicle movement, equipment operation, walking areas, and controlling vehicle movement will be planned.
- The visibility of personnel will be ensured through the use of high visibility vests when working in or walking through heavy equipment operating areas as well as training of workers to verify eye contact with equipment operators before approaching the operating vehicle.
- Inspected and well-maintained lifting devices will be used that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

6.4 Impact Associated with the Operational Phase of Incinerator Plant

The operation of the project is expected to produce the following impacts, which should be taken into consideration:

- Air Quality
- Noise level
- Soil Contamination
- Waste Water
- Transporting, Storage and Handling of Incinerable Hazardous Waste
- Odor Management
- Impact due to Waste Disposal
- Fire Hazard
- Occupational Health and Safety
- Natural Disaster
- Occupational Health and Safety
- Social Impact

6.4.1 Air Emissions

The major source of air pollution from the proposed project during operations, are emissions from incineration of medical and hazardous waste. To smaller extent, emissions from standby-generators and vehicles may also be the potential sources of air pollution. Pollutants potentially emitted from waste incinerators include;

- Various organic compounds (e.g. dioxins and furans, chlorobenzenes, chloroethylene and polycyclic aromatic hydrocarbons [PAHs]), can be generated during combustion and post-combustion processes;
- Hydrogen chloride (HCl) and fluorides, and potentially other halogens-hydrides (e.g. bromine and iodine);
- Heavy metals; Mercury, Lead, Cadmium
- Typical combustion products such as sulfur oxides (SOX), nitrogen oxides (NOX), volatile organic compounds (including non-methane VOCs), particulate matter and methane (CH4) and carbon monoxide (CO).

The technologies used in proposed project includes; compete burning of waste in primary chamber, destruction of hazardous chemicals in exhaust gases by providing higher temperature and suitable retention time, air dilution and dilution and cooling of exhaust gases, Chimney Height approx. 35’ and end of pipe treatment i.e., wet scrubber. Wet scrubber is proposed to be integrated part of the project. Hence it is envisaged that impacts on the air quality of the project will be low when the incinerator will be operated as per design specification. However, certain measures are proposed in this section to ensure environmentally safe operations.

The pollutants released into the atmosphere will disperse in the down wind direction. The concentration at ground level will depend upon the strength of the emission source and micrometeorology of the area.

Mitigation measures

- Waste segregation and/or presorting to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic);
- Removal of the following items from waste destined for incineration: halogenated plastics (e.g. PVC), pressurized gas containers, large amounts of active chemical waste, silver salts and photographic / radiographic waste, waste with high heavy metal content (e.g. broken thermometers, batteries), and sealed ampoules or ampoules containing heavy metals;
- Follow applicable national requirements and internationally recognized standards for incinerator design and operating conditions
- Introduce wastes into the incinerator only after the optimum temperature is reached in the final combustion chamber.
- Minimize the uncontrolled ingress of air into the combustion chamber via waste loading or other routes;
- Optimize furnace geometry, combustion air injection, and, if used, NOx control devices using flow modeling;
- The pollution control equipments should be regularly checked and maintained to ensure their efficiency.
- Use flue gas treatment system for control of acid gases, particulate matter, and other air pollutants;
- Minimize formation of dioxins and furans by ensuring that particulate control systems do not operate in the 200 to 400 degrees Celsius temperature range; identifying and controlling incoming waste composition; using primary (combustion-related) controls; using designs and operation conditions that limit the formation of dioxins, furans, and their precursors; and using flue gas controls;
- The flue gases from the primary chamber would be combusted completely in the secondary chamber which is further heated up to more than 1100 ˚C by firing additional auxiliary fuel or high calorific value liquid incinerable waste. The secondary chamber and the ducting would be designed in such way as to have minimum of 2 seconds residence time in order to ensure complete combustion. The refractory in secondary chamber will be capable of withstanding around 1400 ˚C.
- Stack height must be kept high enough to disperse the gas effectively.
- Utilize advanced scrubber systems to capture and neutralize harmful emissions before they are released into the atmosphere

Other mitigations for Air Emission Control

- Regular maintenance and tuning of the incinerator and generators will be carried out.
- For control of VOCs, Dioxins and Furans flue gas should be passed through secondary combustion chamber where these pollutants are burned and destroyed at temperatures between 700º C to 1,300ºC.

- Staff operating the refractory lined dual chamber type incinerator would be required to wear proper PPE. Staff operating the incinerator should be trained to operate the facility in accordance with the SOPs and EIA study requirements.
- In the incinerator; materials to be burnt would be limited to those proposed in incineration manual;
- Incinerator operations guide (including bypass operations) should be developed and maintained.
- All the records of waste processing should be kept and maintained on daily basis.
- The wind mostly blows from the south for 7.4 months (March 25 to November 6), with a peak percentage of 83% on July 4 and from the north for 2.7 weeks, from March 6 to March 25 and for 2.1 weeks, from November 20 to December 5, with a peak percentage of 34% on November 29[5], where the SITE industrial area and residential settlements are located. To minimize the impact:
  - Increase incineration activities during the 7.4 months when the wind is predominantly from the south. This reduces the likelihood of emissions affecting residential areas.
  - Reduce or limit incineration activities during the periods when the wind is predominantly from the north, especially during the peak period from November 20 to December 5. This helps minimize the impact on nearby residential and industrial areas.
  - Plant trees and vegetation around the incineration plant, particularly on the south side, to act as natural barriers and absorb pollutants.

6.4.2 Noise Level

During the incinerator operations, noise will mainly be coming from moving parts such as blowers, pumps, etc. and will mainly be confined in the incinerator room.

Mitigation Measures

Followings steps will be taken during operational phase to reduce the noise level impact.

- All equipment including standby generators will be managed and maintained regularly.
- Truck drivers to be advised for turning off the engines when vehicle is in idle state.
- Truck drivers to be restricted to procedures for proper maintenance of vehicles.
- Steps will be taken to reduce the noise at the source level.
- Provision of insulating caps and aids at the exit of noise source on the machinery.
- Provision of earmuffs to the workers and enforcement to its use by the workers will be ensured.

6.4.3 Soil Contamination

During operational phase accidental spillage of hazardous waste at the facility can contaminated the soil. To mitigate that risk, it will be ensured that hazardous materials will be placed in proper and designated areas which are lined to minimize the possibility of spillage.

The other activities during the operation phase are storage of solid wastes fuel and material spills which may have following potential impacts:

[5] https://weatherspark.com/y/106589/Average-Weather-in-Sukkur-Pakistan-Year-Round#google_vignette

- During transfer from one container to another or during lifting of waste through forklifts and front-end loaders, etc.;
- During maintenance of facility and vehicles;
- Improper handling of waste including its handling and transfer (due to lack of good housekeeping).

Mitigation Measures

- All spills will be cleaned and removed from the site and will be restored back to its original conditions;
- Oils, lubricants, chemicals, and other listed hazardous materials should be placed safely at designated spots and away from any potential source of fire;
- Ash from incineration operations will be disposed in approved disposal site(s). Temporary storage at site should be in lined pits.
- Periodic testing of ash contents is recommended.
- Proponent also plans for an MOU with SSWMB for ash disposal at Gond Pass disposal site.

6.4.4 Wastewater

Wastewater will be generated from the incinerator flue gas scrubbing process and from domestic sources. The domestic wastewater will be disposed of through sewage pits. Scrubber wastewater will be collected and recycled in the process to the extent feasible, and the remaining wastewater will be incinerated. The treated water from the recycling process may be utilized for wet scrubbing or facility aesthetics purposes. However the remaining wastewater is proposed to be treated in a packaged-type Effluent Treatment Plant (ETP).

Mitigation Measures

- Waste water discharged to industrial drain must comply with SEQS limits.
- Regular monitoring of waste water to ensure compliance of SEQS.

6.4.5 Transporting, Storage and Handling of Incinerable Hazardous Wastes

Handling and transportation of the hazardous waste can cause soil and water contamination, bad aesthetics, odor, health and safety impacts and mixing of hazardous and non-hazardous waste if not carried out properly.

Mitigation Measures

- It will be ensured that wastes are packaged in a manner suitable for safe handling, storage and transportation.
- Labeling on packaging should readily be visible and material used for packaging shall withstand physical and climatic conditions. Generator shall ensure that information regarding characteristics of wastes particularly in terms of being corrosive, reactive, ignitable or toxic is provided on the label.
- Upon collection from waste generation site or on receiving of the waste at facility the labeling and packing of waste shall be inspected and inventory of waste received and incinerated must be maintained.

- All hazardous and medical waste shall be handled, transported and stored as per Hazardous Substance Rules, 2014 and Sindh Hospital Waste Management Rules, 2014.
- The transport vehicles shall be designed suitably to handle and transport the hazardous wastes of various characteristics.
- Transporting the wastes in closed containers at all times delivering the wastes at designated points.
- Informing regulatory authorities immediately in case of spillage, leakage or other accidents during transportation.
- Solid waste storage facilities will be properly lined with impervious material.
- Third party contractor will be hired for the disposal of solid waste.

6.4.6 Odour Management

The most common odor causing compounds from incinerators are volatile organic acids and methyl mercaptan. These compounds are detectable at low concentrations. The waste combustion process itself is not generally prone to frequent odor problems. Other sources for odor are waste storage area and waste transportation vehicles.

Mitigation Measures

- Waste combustion facility will be designed to draw air from the waste receiving and storage areas to be used to provide oxygen to the combustion process. This should create a negative air pressure in these waste handling areas and prevent the escape of odor causing pollutants to outside surrounding areas. If odors are being emitted, the air pressure should be able to be controlled by closing unused openings to the outside.
- Any leakages should be checked and fixed.
- Proper treatment of flue gas through scrubber shall be ensured.
- Suitable masks should be provided to the workers.
- Good housekeeping shall be ensured.

6.4.7 Impacts due to Waste Disposal

The waste generated during the project operation phase will include bottom ash from incinerator and sludge from the scrubber operations and subsequent treatment of wastewater. The bottom ash will be collected and will either be utilized in cement and road making or will be disposed in approved disposal sites. A temporary storage of bottom ash may be required at site. Sludge would be disposed through EPA approved contractor. Onsite incineration is also an option.

Incinerator ash, which may be contaminated with heavy metals like lead and cadmium (if they have not removed substantially from the charged waste) as well as toxic compounds like dioxins, are usually disposed in nearby landfill sites. These pollutants can leach out posing a more immediate threat to ground water and rivers if the landfill sites are not properly designed and managed. Ash residues from the gas cleaning filters of incinerators are classified as hazardous waste and should be disposed of in special landfills.

Mitigation Measures

- Site specific waste management plan should be developed.
- Implement stringent waste selection procedures so that only wastes that can be effectively managed are accepted;
- All wastes should be stored separately.
- Incinerator Ash and sludge from the scrubber will be collected and stored at covered designated area and will be sent for environmentally friendly disposal at regular intervals after testing for its contituents.

6.4.8 Fire Hazard

Fire is a major hazard due to its potential to severely harm the people in the vicinity and affect the environment. Fires can cause loss of life and property. Risk of fire during operation of the proposed incinerator is low however following measures shall be adopted to prevent and control the any emergency.

Mitigation Measures

- There should be clear and visible labeling on ignitable wastes (if any).
- MSDS of chemicals, if used, should be sought form the waste generator and shall be posted at respective waste area.
- Water hydrant system shall be provided to cover the whole facility and hydrant points shall be provided in all potential fire risk areas.
- Fire Extinguishers shall be provided at different locations and on all vehicles.
- Firefighting equipment such as fire extinguishers and hydrant systems will be maintained at strategic locations within the premises.
- Regular inspection and servicing of the extinguishers will be undertaken by a reputable service provider and record of such inspections should be maintained.
- Firefighting training and drills should be conducted on regular basis.
- The facility will possess an emergency response plan that will be regularly drilled to make sure that the responsible staff remains trained at all times.
- Proper grounding to avoid static electricity build up and lightning hazards (including formal procedures for the use and maintenance of grounding connections)

6.4.9 Natural Disaster (Earthquake)

The Geological Survey of Pakistan has defined the Sukkur region to fall in a Seismic Zone 2A region. This suggests the possibility of moderate to major seismic hazards i.e. probability of earthquakes of intensity VI to VIII MM scale and 5.6 to 6.6 on Richter scale. From the charts published, the peak ground level acceleration (PGA) for this zone is 28%. The seismic risk factor of 0.2 is advisable and will need to be incorporated in the design for constructions and installations in the coastal zone, for operational basis earthquakes (OBE) pertaining to damage due to moderate level earthquakes (MM-VI to VIII).

Mitigation Measure

In order to avoid the disastrous situation due to earthquake, it is anticipated that management of proposed project will consider the zoning requirement for building and machinery erection. It is desired that all project structures should be constructed keeping in view the structural and material requirements of Zone 2A projects.

6.4.10 Occupational Health and Safety

The workers and incinerator operator can be exposed to hazardous wastes, heat, noise levels and emissions from the project operations. The most significant occupational health and safety impacts typically associated with workers at industrial waste management facilities occur during the operational phase and include:

- Accidents and injuries
- Exposure to hazardous and medical waste

Mitigation Measures

- Health and safety Management Plan should be implemented and workers training related to health and safety and waste management should be provided on regular basis.
- Hazardous materials management plan should be incorporated into and be consistent with facility operations.
- Written standard operating procedures should be made available
- Health and safety risks associated with onsite processes would be addressed in procedures developed to guide the safe handling of materials and waste.
- Provide workers with appropriate protective clothing, gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers to avoid puncture wounds to the feet. For workers near loud equipment, include noise protection. For workers near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of hard hats;
- Control and characterize incoming waste.
- Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work;
- Annual health screening of workers shall also be ensured.

6.4.11 Social Impacts

No direct negative impact are envisaged to income generation of local populace. Positively affecting the local socio-economic conditions of the area by;

- Enhanced employment opportunities for the local community,
- Provide opportunity for waste management of the surrounding area and improving ambiance of the area by minimizing the open dumping or pit burning of waste in the area.

Table 6.1: Characteristics of Environmental Impacts from Construction Activities					
S #	Environmental Impacts	Impact Characteristics			
		Nature	Duration	Reversibility	Significance
1.	Employment Opportunity	Beneficial	Short Term	N/A	N/A
2.	Provision of market for Supply of construction material	Beneficial	Short Term	N/A	N/A
3.	Soil Erosion	Adverse	Short Term	Irreversible	Low Significance (if, provided measures are effectively implemented)
4.	Soil Contamination	Adverse	Long term	Irreversible	Low Significance (if, provided measures are effectively implemented)
5.	Construction Waste	Adverse	Short Term	Reversible	Low Significance (if, Provided measures are effectively implemented)
6.	Water Quality	Adverse	Short Term	Irreversible	Low Significance (if, Provided measures are effectively implemented)
7.	Dust	Adverse	Short term	Reversible	Low Significance (if, Provided measures are effectively implemented)
8.	Exhaust Emission	Adverse	Short term	Reversible	Low Significance (if, provided measures are effectively implemented)
9.	Waste Water Generation	Adverse	Short Term	Reversible	Low Significance (if, Provided measures are effectively implemented)
10.	Noise Quality	Adverse	Short term	Reversible	Low Significance (if, Provided measures are effectively implemented)

Table 6.1: Characteristics of Environmental Impacts from Construction Activities					
S #	Environmental Impacts	Impact Characteristics			
		Nature	Duration	Reversibility	Significance
11.	Biodiversity	Adverse	Long term	Irreversible	Low Significance (if, provided measures are effectively implemented)
12.	Traffic Flow	Adverse	Short Term	Reversible	Low Significance (if, provided measures are effectively implemented)
13.	Occupational Health & Safety	Adverse	Long term	Reversible / Irreversible	Low Significance (if, provided measures are effectively implemented)

Table 6.2: Characteristics of Environmental Impacts from Operational Phase					
S #	Environmental Impacts	Impact Characteristics			
		Nature	Duration	Reversibility	Significance
1. 1	Air Quality	Adverse	Long Term	Irreversible/Reversible	Low Significance (if, provided measures are effectively implemented)
2.	Noise	Adverse	Long Term	Reversible	Low Significance (if, provided measures are effectively implemented)
3.	Soil Contamination	Adverse	Long Term	Irreversible	Low Significance (if, provided measures are effectively implemented)
4.	Impacts on Water Quality	Adverse	Long Term	Irreversible	Low Significance (if, provided measures are effectively implemented)
5.	Hazardous waste Handling and storage	Adverse	Short Term	Reversible	Low Significance (if, provided measures are effectively implemented)
6.	Odour	Adverse	Short Term	Reversible	Low Significance (if, provided measures are effectively implemented)
7.	Waste Disposal	Adverse	Long Term	Irreversible	Low Significance (if, provided measures are effectively implemented)

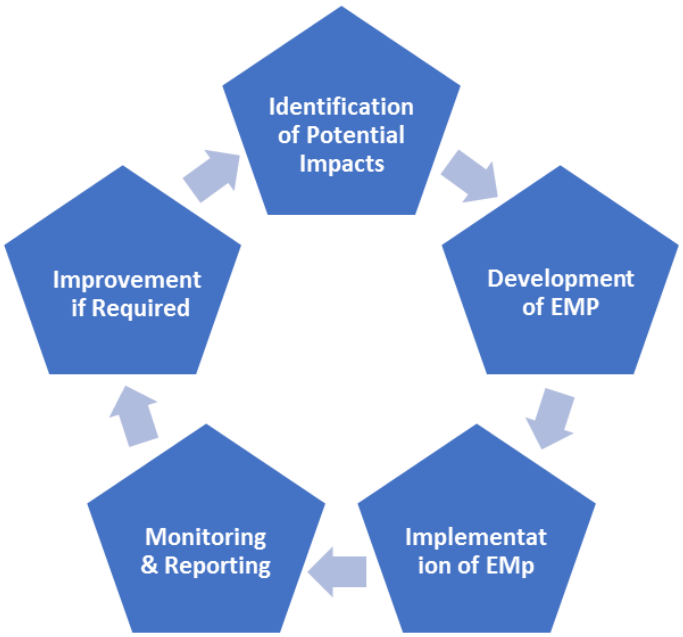
Table 6.2: Characteristics of Environmental Impacts from Operational Phase					
S #	Environmental Impacts	Impact Characteristics			
		Nature	Duration	Reversibility	Significance
8.	Fire Hazard	Adverse	Short Term	Irreversible	Low Significance (if, provided measures are effectively implemented)
9.	Natural Disaster	Adverse	Long Term	irreversible	Low Significance (if, provided measures provided in chapter 8 are effectively implemented)
10.	Occupational Health & Safety	Adverse	Long Term	Reversible / Irreversible	Low Significance (if, provided measures are effectively implemented)
11.	Socio Economic Impacts	Beneficial	Long Term	N/A	N/A

Chapter 7 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN

7.1 Introduction

This section of the EIA study details the Environmental Management Plan (EMP) for the work concerning the Project Siting, Construction/Installation and the Operational stages of the proposed incinerator project.

Environmental Management plays a vital role in development of any project to ensure that all the phases of the proposed project are being carried out in environmentally sustainable way. The Environmental Impact Assessment for the proposed project has identified potential impacts that are likely to arise during different phases (siting, construction/installation and operation phases) of the project and mitigation measures, management and monitoring practices, physical controls are recommended to control and minimized the adverse impacts in acceptable limits.



To ensure environmentally sound development an Environmental Managements Plan (EMP) has been prepared and presented in this section. The management measures and site monitoring required to ensure that potential impacts are identified and minimized are presented in EMP. This plan is specific to the pre-construction, construction/installation and operation of the proposed Project.

The factors which require management and monitoring are discussed in the following sections.

7.2 Need for EMP

The EMP is meant to provide an overall approach for managing and monitoring environment-related issues and to describe the institutional framework for implementing the EMP.

The previous sections identified the environmental impacts of different activities during the designing, pre-construction, construction and operation stages of the proposed Project and mitigation measures to reduce the severity of the impacts. For successful environmental practices, an essential requirement of the SEPA 2014 is to develop an environmental management plan (EMP) to guide through the procedures to the management and employees

of the organization for continual improvement. This EMP will be implemented by proponent of the project. It is essential for Top management to implement this EMP in letter and spirit and to make changes where required, with information to the Responsible Authority. EMP aims to achieve the following objectives:

- Outlining measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels.
- The actions needed to implement these measures such as defining roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other stakeholders.
- Defining the requirements for communication, documentation, training & management and implementation of the mitigation measures.
- Actions required assessing the effectiveness of the mitigation measures employed such as guide through the monitoring mechanism and identifying related parameters that will be required for confirming the effective implementation of the mitigation measures.

7.3 EMP Process

The EMP comprises of the following areas & defining the methods and procedures of implementation.

- Organizational structure and roles and responsibilities of project personnel.
- Specific requirements for the implementation of the EMP.
- Mitigation or impact management matrix.
- Monitoring plan with the emphasis on specific parameters to monitor.
- The preparation of this plan has involved an extensive and detailed program of investigation to the processes involve and with consultation the issues concerned. Therefore, this network will provide a structure to assist in the implementation of the management plan accordingly.
- The proponent establishes environment, health & safety (EHS) department which handles the entire environment related concerns and issues. The EHS manager is the Incharge of EHS department and liable to report Managing Director. EHS department will appoint EHS officer who will coordinate with the contractor during construction process and also monitor during the operations of incinerator.

7.4 Management Approach

Management will undertake overall responsibility for compliance with the EMP. It will ensure that all the activities that the management executes comply with positive environmental sensitivities as well as it will cooperate with the concerned regulatory agencies such as Sindh Environmental Protection Agency (SEPA). The dynamic approaches that are followed towards successful implementation of the environmental management plan listed below:

- Compliance with the relevant legislative and regulatory requirements of the project.
- Developing appropriate monitoring indicators in order to assess the performance as well as magnitude of impact on the environment.
- Regular review of the project activities and assessing their impacts on the environment.

- Setting project's key environmental concerns and addressing issues through public support, awareness and publicly reporting its progress.
- Communicating broadly with internal & external stakeholder on issue of environmental concerns.

7.5 Maintenance of the EMP

EMP needs to be revised on periodic basis to maintain up-to-date environmental management requirements with the changing physical and regulatory constraints. Therefore, outlining and defining the responsibilities of personnel and activities under the project's operation execution, implementation, mining, operation & monitoring and decommissioning phase are integral part of maintenance of the EMP. Dissemination of reviewed and revised EMP need to be notified to all stakeholders particularly, relevant government and municipal agencies so that their modified role is also redefined and re-established in the overall environmental management process.

7.6 Health, Safety and Environment Management System

Health, Safety and Environment Management System is essential and integral component of the environmental management system for the safe and secure working environment assuring sustained development, dependent on health associated performance of human resources. EHS issues and aspects are outlined in EMP with mitigation measures based on principles of best management practices. EHS management system undertakes carrying out a complete assessment, evaluating, monitoring, identifying and control measures (mitigation) of all potential hazards and risks arising during the construction, and operation phases of the proposed project. It needs to ensure that the Health and Safety Plan (HSP) along with the Health and Safety Rules is established, documented and enforced. The plan also outlines roles, responsibilities and expected outcomes of proper implementation with respect to the environment, health and safety management of various phases of the project. These measures should be implemented to ensure that no significant adverse, health and safety impacts occur due to proposed activities associated with the project.

7.7 Risk Assessment

7.7.1 Identification of Environmental and Social Aspects of Project

Potential environmental and social aspects from the development and operation of the proposed project include the following key activities:

- Siting the proposed project
- Construction and installation the project
- Water consumption and wastewater generation
- Construction waste generation and disposal
- Incinerator operations
- Air Emissions from incinerator
- Handling and management of waste during operations

- Emergency situations

Risk assessment of the abovementioned project activities identifies the following environmental liabilities which would require mitigation/control measures to be implemented to reduce the environmental impacts to an acceptable level.

- Air and noise emissions
- Possible contamination of water, soil and land from discharge of effluents including oily waste and seepage to land and water
- Solid waste including excavated material, hazardous and non-hazardous wastes
- Traffic issues during construction and operation phase
- Resource consumption
- Emergency case scenarios
  - Fire hazard
  - Occupational safety hazards
  - Natural disasters
- Socioeconomic impacts

Workers are prone to safety hazards during construction work such as accidents during work at height, poor ergonomic conditions etc. and exposure to hazards and toxic and explosive materials.

Hazards associated with the operational activities of the proposed project can be of the following categories:

1. **Electrical:** Electrocution from live conductors and misuse of power tools, overhead power lines, downward electrical wires, buried cables.
2. **Structural:** Potential for falling or strain when working conditions include slippery surfaces, steep grades, narrow stairs, open holes, trip hazards and unstable flooring; potential puncture from objects and potential burial from trench cave-ins or from unstable slopes on material stock-piles.
3. **Mechanical:** Collision accidents with moving equipment, especially when operating in reverse, failed pulleys, snapped cables, and clothes catching in gears or drills.
4. **Temperature:** Heat stress in hot environments or when working in clothing which limits the dissipation of body heat and moisture.
5. **Noise:** Stress and physical damage to the ear when subjected to noise levels exceeding recommended guidelines (e.g. an 8-hour, time-weighted average sound level of 90 dB(A), as per US guidelines, SEQS recommend 85dB (A) as the limiting value for motor vehicle noise- there is no SEQS limitation imposed on noise generated from industrial process).
6. **Exposure to Hazardous Material:** During handling of hazardous waste worker can be exposed to hazardous and infectious materials.

In addition, it is possible that if the work areas are not designed properly, they can cause workers discomfort and mental stress, which can result in loss of efficiency, and thus lessen the worker's

ability to respond promptly to any hazard. Also, creation of such conditions can cause monotony and fatigue, thereby increasing the potential for hazards and accidents to occur.

7.8 Legislations & Guidelines

The EIA for the proposed Project has discussed in detail the national and international legislation and guidelines that are relevant to the project in Chapter 3 of the EIA report.

The proponent of the project will ensure that the project is conducted in conformance with national legislation and relevant international conventions and that guidance is sought form national and international guidelines. It will also be ensured that key project management of the company and all its assigned contractors are aware of these legislation and guidelines prior to start of the project activities.

7.9 Roles & Responsibilities

Environmental management should become an integral part of policy of the proposed project. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is synonymous with running well-managed efficient proposed project operations. During the construction phase, main responsibility of environmental performance will be followed by the EHS officer on the daily basis.

In case of normal operational phase, main responsibility for environmental performance will be supervised by site manager while the daily management will be performed under the site officer who in turn charges of environmental matters. Under their surveillance, environmental management during operations will be performed as per the mitigation and monitoring plans outlined in this EIA. A brief structure of role and responsibilities is given below:

7.9.1 Top Management of Incinerator Plant

Environmental management plan (EMP) will be regulated by the Top Management of proposed Incinerator Plant; therefore, will play an important role. Some of the key role & responsibilities are given below:

- To cooperate and consult with relevant environmental agency in order to perform in better way.
- To evaluate the progress of development and implementation of this management plan.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

7.9.2 Project Manager

The role of Project Manager is very important. The success of an EMP will mainly depend upon effective management of the EMP by Project Manager. Following are some of the roles & responsibilities given to the Project Manager:

- Ensure that the contractor is aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment.
- Ensure that all stipulations within the EMP are communicated and adhered to by contractor(s).
- Monitor the implementation of the EMP throughout the project by means of site inspections and meetings. This will be documented as part of the minutes of the site meeting documents.
- Be fully conversant with the Environmental Impact Assessment of the project, the conditions of the approval of EIA and all relevant environmental legislations.
- To ensure that the points of views of staff are considered and placed in the EMP accordingly.
- To identify issues and where possible propose solutions for inclusion in the management plan review process.
- To improve coordination and exchange of information between top management, employees, contractors, etc.
- To contribute towards the actions to deliver the management plan and ensure its continued development.
- To monitor the progress of development and implementation of this management plan.
- Have overall responsibility for the implementation of EMP.

7.9.3 Contractor(s) for Construction and Operation

On behalf of contractor, the main responsibilities for all matters pertaining to environment will be that of the chief of the assigned contractor. The role and responsibilities of the contractor will consist of the following basic points:

- To carry out construction/operation activities in environmentally sound manner.
- Shall propose measures to minimize environmental impacts during construction process, and submit them to the Environmental Officer.
- In case of having impacts on the environment, the contractor will inform them to the Project Manager in time to get instructions and then take next step.
- Comply with the environmental management specifications;
- Submitting and obligatory Method Statements for approval by the Project Manager before any work is undertaken;
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting.
- Maintaining a public complaint register.
- Arrange that all his employees and those of his subcontractors receive training before the commencement of construction.

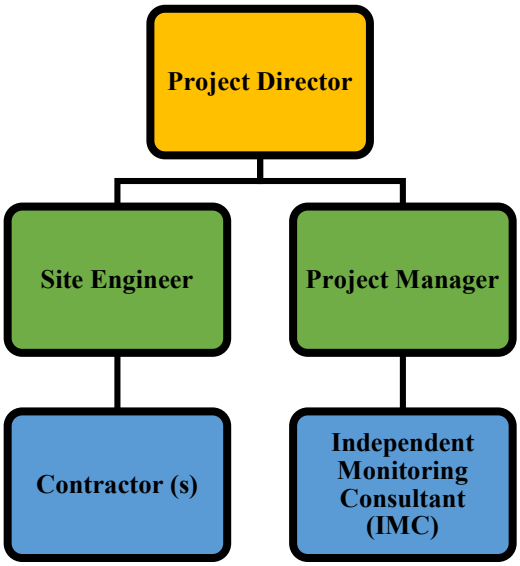


Figure 6.1: Suggested Organogram for Environmental Management for proposed Incinerator Plant

7.9.4 Independent Monitoring Consultant

The proponent shall appoint an Independent Monitoring Consultant (IMC) who will monitor to ensure that the construction is in accordance with the EIA approval conditions. The results of the periodic monitoring will be compiled in monitoring reports which will be submitted to the project management for review and necessary action. The consultant will maintain monitoring records and any deviations from or changes to the contract plans.

7.9.5 Environmental Management Program

Current plans for environmental management during development/design, construction, and operation phase of the proposed project are mentioned in sections below.

7.9.6 Design of Facility

It includes the location of proposed project site, extension area, facilities to be installed in given space of project area as well as machines and other related operations. If design parameters need to be change due to any reason after getting environmental approval, proponent will assess the environmental impacts that may arise from such changes. If the impacts are found to be different and in excess of those mentioned in the report, mitigation measures must be developed to minimize these impacts with respect to the changes.

7.9.7 Approvals

Obtaining NOC from SEPA does not relieve the proponent for other obligations and hence proponent and the contractor will obtain all relevant clearances and necessary approvals required by the Government of Sindh prior to initiate the proposed operations.

7.9.8 Environmental Trainings

Necessary training on environmental and other safety issues will be provided to the technical and supporting staff before start of activities to ensure that all the staff is well acquainted with the nature of job, inherent risks, hazards, requirements of job safety and EMP. The Project Manager will determine the training requirements.

During the training, the following areas of knowledge and experience are considered essential:

- Understanding the properties (e.g. flammability, corrosiveness, toxicity, reactivity, infectious) of hazardous waste, as well as the levels at which they pose a significant danger requiring protective measures.
- Waste management plan
- Health and safety risks associated with the plant operation
- Awareness of early-warning indicators, hazards/risk identification, and ability to recognize potentially hazardous situations.
- Familiarity with engineering controls to avoid occurrence of hazardous situations.
- Knowledge of the use and maintenance of emergency response equipment, as well as routine equipment for health and safety monitoring and protection.
- Knowledge of methods and procedures for decontaminating equipment, and facility, following potential chemical contamination.

Records of all trainings should be maintained. It is recommended that in case of any undesirable event or emergency situation, a follow-up session should be arranged to review the weaknesses ad gaps in the existing system and possible reasons which caused the event. This would enable the management in keeping such events from recurring by placing additional and more efficient controls.

7.9.9 Communications

For effective management and monitoring of the environmental performance during the construction and operation phase, communication will be maintained by the Site Supervisor and Project Manager who will coordinate with the project management and regulatory agency on necessary matters.

- **Construction Phase:** Site supervisor will be responsible for coordinating the project progress to the Project Manager during construction phase. He will supervise the construction work to ensure that provisions of EMP/EIA are not violated at any stage. If any undesirable event such as work-related injury, death, or any other emergency situation arises during construction, the Site Supervisor shall report this to the Project manager. Any issues that require attention of higher management will be communicated to them for action by the EHS manager. The site supervisor should report to the Project Manager on weekly basis during the construction phase.
- **Kick-off Meeting** to define the environmental responsibilities, awareness of EMP to the managing staff and to streamline the work plan according to the EMP. This meeting is to be arranged prior to commencement of activities.

- **Quarterly Meetings** to review the progress of activities performed and effectiveness of measures in place for pollution control. Deadlines are re-evaluated in it and if necessary, the project program is revised in these meetings. In the end of quarterly meetings, minutes will be issued to include the outcome of the meeting, issues discussed, and decisions. The minutes of meeting will also be provided to the project manager and the contractor for their own record.
- **Peer Review** for professional opinion and evaluation of the project performance, recommendations for innovation such as new available pollution controls, waste minimization strategies etc.

7.9.10 Fire Protection System

The following fire-fighting facilities should be provided depending upon the nature and risk of the installation:

- Fire water system (mixed installation)
- Foam generation system
- Fixed fire-fighting equipment
- Mobile fire-fighting equipment
- Fire detection and alarm system
- Communications

Design of the fire-protection system facilities is provided as per the following criteria, and recommendations of the NFPA 30 have generally been followed:

a) Fire-protection facilities are based on the single largest emergency contingency.
b) All the potential fire risk areas are fully covered by hydrant and monitoring systems.
c) Water spray systems will be considered in hazardous locations and equipment in process unit areas.

7.9.11 Construction Phase

1. Construction Work Management

All construction related work including campsite establishment, operation, and management of waste streams, equipment and material mobilization etc. shall be in compliance with the (1) agreed procedures (if) provided by the proponent to the contractor and (2) provisions of NOC. The contractors will abide by the relevant contractual provisions relating to the environment.

Performance of contractor and subcontractor will be monitored by IMC periodically and site supervisor constantly. All the construction crew particularly the technical staff will be provided with necessary PPEs and other safety equipment as required by their job. Site supervisor and contractor will ensure that each job is being performed in safe and sound manner and in accordance with the safe work procedures.

Solid waste during construction will be removed on daily basis either through a local waste contractor or by the construction contractor himself who will engage some workers for removal of construction waste from site and disposal to a waste collection facility.

Proper drainage will be provided to construction camp and construction site, especially near excavations. The wastewater will be initially treated by sedimentation technique to remove suspended solids and reused if it meets the desired quality. If the effluent cannot be reused, it will be discharged to local sewers after ensuring that it does not contain any solid debris which can choke the sewer lines. Where possible, wastewater will be used for watering the vegetation nearby.

Type of construction material for the Project shall meet the seismic design requirements for buildings located in seismic zone 2A. The design consultant also needs to consider other safety aspects for events like cyclones, Tsunami etc.

The Site Supervisor also needs to ensure that construction and operation of the project does not influence the business going on in the vicinity. This is possible during construction phase from obstruction of routes; campsite location, noise emissions, and resource consumption e.g. water. Similarly, during operation phase, logistics will be managed by traffic management plan. Any complaints from nearby industrial units will be addressed effectively.

2. Site Restoration

The Site Supervisor will ensure that the restoration of the site after the end of construction activities is carried out according to the requirements of the EIA and EMP.

3. Construction Monitoring

An Independent monitoring consultant will be hired to monitor the construction work and EMP compliance which would also include monitoring of waste management.

7.9.12 Operation Phase

1. Co-ordination with Stakeholders

The proponent will ensure that co-ordination required with the project stakeholders on environmental and social matters as required by the EMP is maintained throughout the operation of the project.

2. Control of Air Pollution from incinerator

Air pollution due to the incinerator operations would primarily result from waste burning and waste transportation and handling. movement of trucks carrying the waste and emissions from generator.

Air Emissions from incinerator plant will comply with the Sindh Environmental Quality Standards (SEQS). At no time will the emission levels be allowed to go beyond the stipulated standards. To ensure this, following measures will be undertaken:

- Regular monitoring of stack emissions
- Monitoring that the plant is being operated as per manufacturer specifications.
- Monitoring of pollution control technology is effectively working
- Regular maintenance of all machinery and equipments

3. Monitoring

The proponent will ensure that the mitigation measures mentioned in the EIA are adhered to and organizational EHS Management Systems are implemented during the proposed project.

Ambient air quality will be monitored by IMC in the Incinerator plant facility.

4. Emergency Procedures

The EHS department will prepare contingency plans to deal with any emergency situation that may arise during the operation e.g. fire, major oil, chemical spills, medical evacuation and communicate these to the regulatory agencies if required by these agencies.

The EHS department will also implement necessary measures to prevent fire hazards, contain oil spills, and perform soil remediation as needed.

a) Fire Contingency Plan

Possibility of presence of flammable materials at this site, fire is an ever-present hazard. All personnel and subcontractors are not trained professional fire-fighters. Therefore, if there is any doubt that a fire cannot be quickly contained and extinguished, a designated officer will notify by radio and vacate the area. The designated officer will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- “No Smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.

The following procedures will be implemented in the event of a fire:

- Anyone who sees a fire will notify their designated fire officer who will then contact the work crew and ring the siren.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count. When a small fire has been extinguished by a worker, all workers will be notified.

5. Emergency Response Plan (ERP)

Emergency may be defined as a sudden event causing and has the potential to cause serious human injury and/or environmental degradation of large magnitude. The best "cure" for an emergency is, of course, "prevention".

The probable emergency situation can be:

- Serious fire and explosion;
- Natural calamity such as heavy rain, flooding, dust storm, earthquake etc.;
- Bomb threat or any sabotage/terrorist activity;
- Any other incident involving all or large part of the premises and its workers.

A Project-specific ERP will be developed by proponent which primarily relates to the different construction activities of the project. It supports the EMP and addresses actions and requires responses of proposed project employees and contractors.

Emergency response management will be provided with small teams of senior managers (the control committee) who in turn will direct all response activities through the Emergency response unit, industry security, communications, public relations, environment and safety affairs and material procurement departments. Each of these departments has specific responsibilities to perform in the event of an emergency.

6. Communication and Documentation

For effective monitoring, management and documentation of the environmental performance during the operation, environmental matters will be discussed during regular meetings. Any environmental issue identified at the meeting will be considered and addressed by the EHS department. Issues that require attention of senior management will be communicated to them for action.

7. Occupational health and safety risk management

During routine operations, workers may develop occupational diseases of the lungs, skin, and other organs, depending on the amount and length of time of exposures. Workers exposed to hazardous noise levels may develop noise-induced hearing loss. Other dangers include confined spaces, in which untrained workers may get seriously injured or killed.

In view of the existence of the occupational health and safety risks in the proposed facility, the EHS department needs to develop an Occupational Health and Safety Risk Management Plan for exposure control in situations when workers may be overexposed to chemical hazards. This plan should provide a detailed approach for protecting workers against chemical exposures, including health hazard information, engineering controls, safe work procedures, worker training, and record keeping.

It is recommended that the Occupational Health and Safety Risk Management Plan should necessarily include the following elements:

1. Statement of purpose
2. Responsibilities of employers, supervisors, and workers
3. Risk identification and assessment
4. Risk controls
5. Worker education and training
6. Written safe work procedures
7. Hygiene facilities and decontamination procedures
8. Documentation
9. Health monitoring (may also be required, depending on the nature of the chemicals being used)

8. Waste Streams

To provide guidelines and simplify the process of categorizing, quantifying, managing, and disposing of wastes. Waste management is a critical component of operating policies. Waste management includes proper handling, accumulation, storage, transportation, and disposal of the waste generated and collected.

A Project-specific Waste management procedure will be developed by proponent which primarily relates to the different activities of the project. It supports the EMP and addresses actions and requires responses of proposed project employees and contractors.

9. Training

All employees will receive general firefighting training (i.e. fire extinguisher use). Employees who are members of the fire brigade shall receive at a minimum the following training:

- Use and limitations of the firefighting equipment.
- Firefighting strategies and methods.
- Use of respiratory equipment and its limitations.
- Care and maintenance of firefighting equipment and hoses.
- First aid.

10. Equipment maintenance

Equipment maintenance schedule is proposed to be as follows for efficient and safe operations;

Suggested maintenance schedule			
S. No.	**Incinerator Plant**	**Maintenance Area**	**Maintenance Frequency**
1	Iinside Of Furnace	Removing Of Ash	After Operatlon
2	Inside Of Furnace	Cleaning Of Deposit	After Operatlon
3	Thermo-Couple	Cleaning Of Protect Cover	After Operatlon

Suggested maintenance schedule			
S. No.	**Incinerator Plant**	**Maintenance Area**	**Maintenance Frequency**
4	Flame Eye	Cleaning Of Cover Glass	After Operatlon
5	Main Burner	Cleaning Of Atomizing Cup And Primary Air Nozzle	After Operatlon
6	Ignition Burner	Cleaning Of Nozzle And Electrodes	After Operatlon
7	Ignition Burner	Relocation Of Electrodes	Before Operation
8	Sludge Strainer	Cleaning Of Screen	After Operatlon
9	Diesel Oil Strainer	Cleaning Of Screen	Weekly
10	Main Burner	Filling Up Of Lubricant	Weekly
11	Main Burner And Exhaust Fan	Adjustment Of Tension Of Driving Belt	Monthly
12	Main Burner And Exhaust Fan	Replacement Of Lubricant	Quarterly
13	Inside Of Furnace	Mending Of Refractory	Quarterly
14	Every Parts	Ensure And Tighten Screws And Threads	Quarterly
15	Air Cylinder	Cleaning Of Spindle	Biannually
16	Panels And Sensors	Cleaning Of Contactors Of Switch-Gear	Biannually
17	Main Burner And Sludge Pump	Overhaul	Biannually
18	Solenoid Valves	Overhaul	Biannually
19	Ignition Burner And D. O. Pump	Overhaul	Biannually
20	Exhaust Fan	Overhaul	Biannually
21	Duct And Pipings	Cleaning Of Inside	Annually

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
Construction Phase			
1.	Employment Opportunities and workforce	• Unskilled labor should be preferred from the neighborhood to avoid community issues. • Project management should be careful about hiring the construction staff and must consider workers' behavioral aspects.	Contractor
2.	Soil Erosion	• The contractor must minimize the area of exposed soil at any given time and to wet, compact and resurface the disturbed areas during the construction phase. • Removal topsoil with vegetation in it (rather than cutting off the vegetation) so that the vegetation helps to hold and enrich the soil. • Exposed surface will be regularly wetted to effectively keep airborne dust levels to minimum • Stockpiles of fine material will be wetted or covered with tarpaulin especially during windy conditions until concreting and landscaping is complete.	Contractor
3.	Soil Contamination	• Washing of vehicles will be carried out in the designated areas. • Vehicles and equipment maintenance will be taken place at specified site. • Construction vehicles and machinery will be examined on a regular basis for leakage prevention. • Removal of oil and contaminated soil around the fuel and oil storage areas will be made possible by the availability of appropriate implements i.e. shovels, plastic bags and absorbent materials. • Contaminated medium will be managed with the objective of protecting the safety and health of laborer at the site, the surrounding residents, and the environment. • Plans and procedures will be prepared, to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment.	Contractor
4.	Construction Waste	• A comprehensive waste disposal plan to be developed to effectively manage these wastes in signigificant quantities. • The construction waste which will be sent for recycling like damage pipes left over steel, wooden and plastic pieces. While, the rest of the left-over waste will then be taken away to the approved dumping sites for disposal.	Contractor

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• The construction material will be kept in a covered place, especially during the precipitation season. • The excavated soil will be re-used by adopting different methods, which will be used as a filling material for the construction. • Various waste containers for different types of waste will be deployed, in order to dispose/recycle the waste in accordance with its nature. • The waste bins will be properly marked for each type of waste produced during the constructional activities. • Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste. • Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated.	
5.	Impact on Water Quality, Consumption	• Construction of storm water diversion channels to divert storm runoff from flowing over the construction areas. • Regular monitoring of water consumption. • Use of leak proof storage tanks.	Contractor
6.	Dust/ Particulate Matter	• Sprinkling of water to suppress dust at predetermined frequency. It can considerably reduce dust emissions. • Allocate specific timings during normal daytime working hours for movement of heavy earth moving equipment. • Develop schedule for movement of dump trucks that will be initially used for hauling or excavation soil. • Use of proper roads for transportation means during construction work. • Stockpiles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions.	Contractor

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• Site workers and drivers should wear dust mask and safety goggles especially during dry and windy weather conditions to avoid injuries and health risk due to dust. • Good housekeeping practices will also reduce dust emission.	
7.	Exhaust Emission	• Where possible, use of new diesel generators may reduce the emissions. • Generators shall be kept away from walking areas and at safe place where the probability of human intervention are very limited. • Generators should be properly tuned, serviced and monitored on regular basis. • Ensure that the vent of the generator exhaust is at adequate height. • Low Sulphur Fuel should be utilized for generators.	Contractor
8.	Wastewater Generation	• Washing of vehicles and construction machinery will be restricted to a designated area. • Wastewater will not be disposed of directly into the water bodies, but first be treated through Septic Tank and then the will be disposed of in a proper manner. • The oily waste, if any, will be contained before disposing the wastewater into the sewer. • Monitoring of the wastewater generation will be taken into consideration. • Adequate portable or permanent sanitation facilities serving all workers will be provided at all construction sites.	Contractor
9.	Noise	• The activities associated with greatest potential to generate noise will preferably be planned during the day period. • Noise control devices will be used such as temporary noise barriers and deflectors for impact activities. • Truck drivers will be sensitized to switch off vehicle engines while offloading material, when practicable. • Construction machinery will be kept in good condition to reduce noise generation. • Generators and heavy-duty equipment should be installed and placed in enclosures to minimize ambient noise levels. • Generator and other noisy equipment will be regularly monitored.	Contractor

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• Minimize night time activities as practically possible. • Site labor working in high noise area such as where noise level exceeds 90 dB (A), should wear earplugs/earmuffs.	
10.	Flora	• Cutting of trees will be avoided. • The vegetation which if gets chopped down during the construction of the project will be replanted.	Contractor
11.	Traffic Flow	• The proponent will put in place measures to address such concerns by ensuring that construction vehicles preferably deliver materials during off-peak hours when traffic volume is low. • There will also be provision for caution signs on the access road to alert users on construction activities in progress in order to prevent occurrence of accidents. • Impacts from the traffic flow will be minimized through proper planning of the transportation of materials to ensure that vehicle fills are increased, in order, to reduce the number of trips done or the number of vehicles on the road. • Truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas and to switch off or keep vehicle engines at construction site.	Contractor
12.	Occupational Health & Safety Issues	• Workers will be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two person lifts are necessary. • Work site layout will be planned to minimize the need for manual transfer of heavy loads. • Tools will be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations. • Administrative controls, such as job rotations and rest or stretch breaks will be implemented into the work processes.	Contractor

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
Operational Phase			
1.	Air Emissions and Ambient Air Quality	• Waste segregation and/or presorting to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic); • Removal of the following items from waste destined for incineration: halogenated plastics (e.g. PVC), pressurized gas containers, large amounts of active chemical waste, silver salts and photographic / radiographic waste, waste with high heavy metal content (e.g. broken thermometers, batteries), and sealed ampoules or ampoules containing heavy metals; • Follow applicable national requirements and internationally recognized standards for incinerator design and operating conditions. • Introduce wastes into the incinerator only after the optimum temperature is reached in the final combustion chamber. • Minimize the uncontrolled ingress of air into the combustion chamber via waste loading or other routes; • Optimize furnace geometry, combustion air injection, and, if used, NOx control devices using flow modeling; • The pollution control equipments should be regularly checked and maintained to ensure their efficiency. • Use flue gas treatment system for control of acid gases, particulate matter, and other air pollutants; • Minimize formation of dioxins and furans by ensuring that particulate control systems do not operate in the 200 to 400 degrees Celsius temperature range; identifying and controlling incoming waste composition; using primary (combustion-related) controls; using designs and operation conditions that limit the formation of dioxins, furans, and their precursors; and using flue gas controls;	Proponent

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• The flue gases from the primary chamber would be combusted completely in the secondary chamber which is further heated up to more than 1100 ˚C by firing additional auxiliary fuel or high calorific value liquid incinerable waste. The secondary chamber and the ducting would be designed in such way as to have minimum of 2 seconds residence time in order to ensure complete combustion. The refractory in secondary chamber will be capable of withstanding around 1400 ˚C. • Stack height must be kept high enough to disperse the gas effectively. • Regular maintenance and tuning of the incinerator and generators will be carried out. • For control of VOCs, Dioxins and Furans flue gas should be passed through secondary combustion chamber where these pollutants are burned and destroyed at temperatures between 700º C to 1,300ºC. • Staff operating the refractory lined dual chamber type incinerator would be required to wear proper PPE. • Staff operating the incinerator should be trained to operate the facility in accordance with the SOPs and EIA study requirements. • In the incinerator; materials to be burnt would be limited to those proposed in incineration manual; • Incinerator operations guide (including bypass operations) should be developed and maintained. • All the records of waste processing should be kept and maintained on daily basis.	
2.	Noise	• Equipment including standby generators will be managed and maintained regularly. • Truck drivers to be advised for turning off the engines when vehicle is in idle state. • Truck drivers to be restricted to procedures for proper maintenance of vehicles. • Steps will be taken to reduce the noise at the source level. • Provision of earmuffs to the workers and enforcement to its use by the workers will be ensured.	Proponent
3.	Soil Contamination	• Spills will be cleaned and removed from the site and will be restored back to its original conditions;	Proponent

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• Oils, lubricants, chemicals, and others hazardous materials should be placed safely at designated spots and away from any potential source of fire; • Ash from incineration operations will be disposed in approved dump sites;	
4.	Waste Water	• Wastewater discharged to industrial drain must comply with SEQS limits. • Regular monitoring of wastewater to ensure compliance of SEQS.	Proponent
5.	Transporting, Storage and Handling of Incinerable Hazardous Wastes	• Labeling on packaging is readily visible and material used for packaging shall withstand physical and climatic conditions. • Upon collection from waste generation site or on receiving of the waste at facility the labeling and packing of waste shall be inspected and inventory of waste received and incinerated must be maintained. • All hazardous waste shall be handled, transported and stored as per Hazardous Substance Rules, 2014 and Sindh Hospital Waste Management Rules, 2014. • The transport vehicles shall be designed suitably to handle and transport the hazardous wastes of various characteristics. • Transporting the wastes in closed containers at all times delivering the wastes at designated points. • Informing regulatory authorities immediately in case of spillage, leakage or other accidents during transportation. • Solid waste storage facilities will be properly lined with impervious material.	Proponent
6.	Odor Management	• Waste combustion facility will be designed to draw air from the waste receiving and storage areas to be used to provide oxygen to the combustion process. This should create a negative air pressure in these waste handling areas and prevent the escape of odor causing pollutants to outside surrounding areas. If odors are being emitted, the air pressure should be able to be controlled by closing unused openings to the outside. • Ventilated areas to be provided for onsite temporary storage of waste. • Any leakages should be checked and fixed.	Proponent

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• Suitable masks should be provided to the workers. Good housekeeping shall be ensured.	
7.	Impacts due to Waste Disposal	• Site specific waste management plan should be developed. • Incinerator Ash and sludge from the scrubber will be collected and stored at covered designated area and will be sent for recycling and/or adequate disposal at regular intervals.	Proponent
8.	Fire Hazard	• There should be clear and visible labeling on ignitable wastes (if any). • Firefighting equipment such as fire extinguishers and hydrant systems will be maintained at strategic locations within the premises. • Regular inspection and servicing of the extinguishers will be undertaken by a reputable service provider and record of such inspections should be maintained. • Firefighting training and drills should be conducted on regular basis. • The facility will possess a detailed emergency and evacuation plan that will be regularly drilled to make sure that the responsible staff remains trained at all times. • Proper grounding to avoid static electricity build up and lightning hazards (including formal procedures for the use and maintenance of grounding connections)	Proponent
9.	Natural Disaster (Earthquake)	• In order to avoid the disastrous situation due to earthquake, it is anticipated that management of proposed project will consider the zoning requirement for building and machinery erection. It is desired that all project structures should be constructed keeping in view the structural and material requirements of Zone 2A projects.	Proponent
10.	Occupational Health and Safety	• Health and safety Management Plan should be implemented and workers training related to health and safety and waste management should be provided on regular basis. • Hazardous materials management plan should be incorporated into and be consistent with facility operations. Written standard operating procedures should be made available. • Health and safety risks associated with onsite processes would be addressed in procedures developed to guide the safe handling of materials and waste.	Proponent

Table 7.1: Mitigation Matrix for Proposed Incinerator Project			
S. No.	**Affected Areas**	**Mitigation Measures**	**Responsibility**
		• Provide workers with appropriate protective clothing, gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers to avoid puncture wounds to the feet. For workers near loud equipment, include noise protection. For workers near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of hard hats; • Control and characterize incoming waste. • Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work;	

7.10 Environmental Monitoring Plan

Monitoring of activities during the construction and operation phase will be necessary to assess the impacts of these activities on the environment. For this purpose, the proponent will engage an Independent Monitoring Consultant (IMC) for implementing a monitoring program to:

- Monitor the:
  - Air Emissions
  - Wastewater
  - Solid waste management
  - Occupational health and safety
- Follow the monitoring frequency of selected parameters as per the monitoring plan given in the Tables below
- Record all non-conformities observed and report them along with actions to Project Management for further action.
- Report any impact anticipated along with recommendations for further action.

The Contractor shall take note of the recommendations relating to issues identified in the construction monitoring report. Similarly, the proponent will consider the issues identified by IMC for the operation phase monitoring. Table 7.2 & 7.3 presents a proposed monitoring plan to monitor different environmental Aspects during the Construction and Operations Phases of the Project. This monitoring plan can also be improved by the proponent if found necessary to improve the usefulness of the Plan.

Table 7.2: Environmental Monitoring Plan (Construction Phase)				
Environmental Concern	**Parameters to be Monitored**	**Monitoring Location**	**Frequency**	**Responsibility**
Ambient air quality	Ambient air quality parameters as per SEQS	Construction site	Quarterly	- Contractor - IMC
Exhaust emissions from generators and other construction equipment	Gaseous emission includes COx, NOx, SOx and PM from generators and other equipment	selected equipment at construction site	Quarterly	- Contractor - IMC
Vehicular emissions	Vehicular emissions include Smoke, CO and Noise from vehicle exhaust vent.	selected vehicles at construction site	Quarterly	- Contractor - IMC
Noise level	Noise level Leq dB(A) monitoring	Construction site as well as the generators, equipment and vehicles.	Quarterly	- Contractor - IMC
Soil Erosion	Visual inspections and photographic evidences	Construction site and its immediate surroundings	periodically	- Contractor - IMC
Solid Waste Management	Record and logging of daily generated waste. Hazardous and non-hazardous waste quantity	Construction site	periodically	- Contractor - IMC
Occupational Health and Safety	EHS compliance	Construction site	periodically	- Contractor - IMC

Table 7.3: Environmental Monitoring Plan (Operational Phase)				
Environmental Concern	**Parameters to be Monitored**	**Monitoring Location**	**Frequency**	**Responsibility**
Operational Phase				
Ambient Air Quality	Ambient air quality parameters as per SEQS	Approx.5 m away from the incinerator stack	Monthly	- Proponent
Exhaust emissions	For backup Generators: CO, NOx, SOx, PM, For incinerator stack: CO, NOx, SOx, PM	Exhaust at operational site Generators Equipment etc.	Monthly	- Proponent
Wastewater	Priority paremeters for wastewater as per SEQS	Waste discharge point	Monthly	- Proponent
Noise level	Noise level Leq dB(A) monitoring	Incinerator room and waste areas	Monthly	- Proponent
Waste Management	- Records of waste received and waste incinerated - Ash storage and Disposal - Sludge disposal	waste areas inside the facility	Monthly	- Proponent

Table 7.4: EMP Implementation Cost		
Activity	**Cost (Rupees PKR)**	**Remarks**
Training Program	500, 000	refer section 7.9.8
Environmental Monitoring		
Ambient Air (Construction)	(40,000*1*4) = 160,000	Cost for monitoring at 01 location @Rs.40, 000/per location.
Ambient Air (Operation)	(40,000 * 1*12) = 480,000	Cost for 1-year monitoring at 1 location @Rs.40,000/per location
Wastewater (Operation)	(50,000 * 12) = 600,000	Cost for 1-year monitoring at 1 location @Rs.50,000/location
Noise Levels (Construction)	(1,000 * 4 * 4) = 16,000	Cost for 1-year monitoring at 04 locations @Rs.1,000/location
Noise Levels (Operation)	(1,000 * 4 * 4) = 16,000	Cost for 1-year monitoring at 04 location @Rs.1,000/location
Solid Waste (Construction/Operation)	(10,000*12) = 120,000	Estimated cost for 1 year@Rs.10,000/month
Gaseous Emissions (Construction)	(1,500 * 2 * 6 * 4) = 72,000	Cost for 1-year monitoring at 1 location for 06 parameters @Rs.1,500/parameter
Gaseous Emissions (Operation)	(1,500 * 2 * 6 * 12) = 216,000	Cost for 1-year monitoring at 2 locations for 06 parameters @Rs.1,500/parameter
Mitigation Measures (Construction)	500,000	Initial estimates
Mitigation Measures (Operation)	500,000	Initial estimates
Reporting	1,000,000	Initial estimates
Sub-total	4,180,000	-
Contingencies (5% of EMP cost)	209,000	-
Grand Total	**4,389,000**	-

Chapter 8 CONCLUSION

The EIA study for proposed Incinerator Plant has identified potential impacts that are likely to arise during construction and operational phases of the project. Potential environmental impacts are associated with air quality, solid waste, Wastewater, water quality, soil quality, terrestrial ecology, health and safety, as well as socio-economic impacts. The project is expected to bring a positive change in the socioeconomic setup of the area through short to medium term employment creation and providing a suitable waste disposal option for the city.

Potential Project impacts have been identified related to the project construction and operation phases. Impact predictions are based on the consultants' previous experiences on similar projects; professional judgment; data collected in the field; discussions with local communities, relevant government officials and relevant technical specialists. Many of the mitigation measures are related to good design practices, others with good construction and housekeeping practices.

A series of mitigation and monitoring measures have been included to address the concerns for these measures. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the adverse environmental and social impacts of the proposed Project are envisaged to be within the acceptable limits.

The implementation of the mitigation measures detailed in Environmental Impact Assessment report and listed in the Environmental Management Plan (EMP) of the EIA Report, including monitoring, will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the development are enhanced and mitigated to a level which is deemed adequate for the development to proceed.

In summary, based on the findings of this assessment there is no reason why the facility proposed for the site should not be authorized, contingent on the mitigations and monitoring for potential environmental and socio-economic impacts as outlined in the EIA and EMP being implemented.

ANNEXURES

Annexure – I: Land Use NOC

Sindh Industrial Trading Estates (Guarantee) Limited

Manghopir Road, Karachi-75700

Managing Director	: 021-99333153-3
Deputy Managing Director	: 021-99333154-99333153
Secretary	: 021-99333164
Director Administration	: 021-99333170
Director Finance	: 021-99333161
P.A.B.X. No.	: 021-99333317-9

Chief Engineer	: 021-99333168
Estate Engineer, SITE (Phase-I&II)	: 021-36487830
Estate Engineer, Nooriabad	: 0254-470262
Estate Engineer, Kotri	: 0223-670068
Estate Engineer, Hyderabad	: 022-9250135
Estate Engineer, Tando Adam	:
Estate Engineer, (Nawabshah)	:
Shaheed Benazirabad	:
Estate Engineer, Sukkur	: 071-5807965
Estate Engineer, Larkana	:

Ref : 113

Date : 13/06/24

To Whom It May Concern

This is to certify that **M/S. GUL ENTERPRISES**, Plot No. C-20 is our allottee, and we have no objections from SITE Limited Sukkur to Plot No. C-20, utilizing the incinerator plant located at SITE Area Sukkur.

13/06/24

ESTATE ENGINEER
SITE LTD SUKKUR

Annexure – II: Environmental Monitoring Report

Annexure – III: Layout Plan

Annexure – IV: Sindh Environmental Protection Act, 2014

Annexure – V: Sindh EPA Environmental Assessment Regulations, 2021