

ENVIONMENTAL IMPACT ASSESSMENT
FOR
ENVIRO WASTE BUSTERS
PRIVATE LIMITED

Final Report
July, 2023

Submitted To:
Sindh Environmental Protection Agency

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

WASTE MANAGEMENT FACILITY

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Final Report

July, 2023

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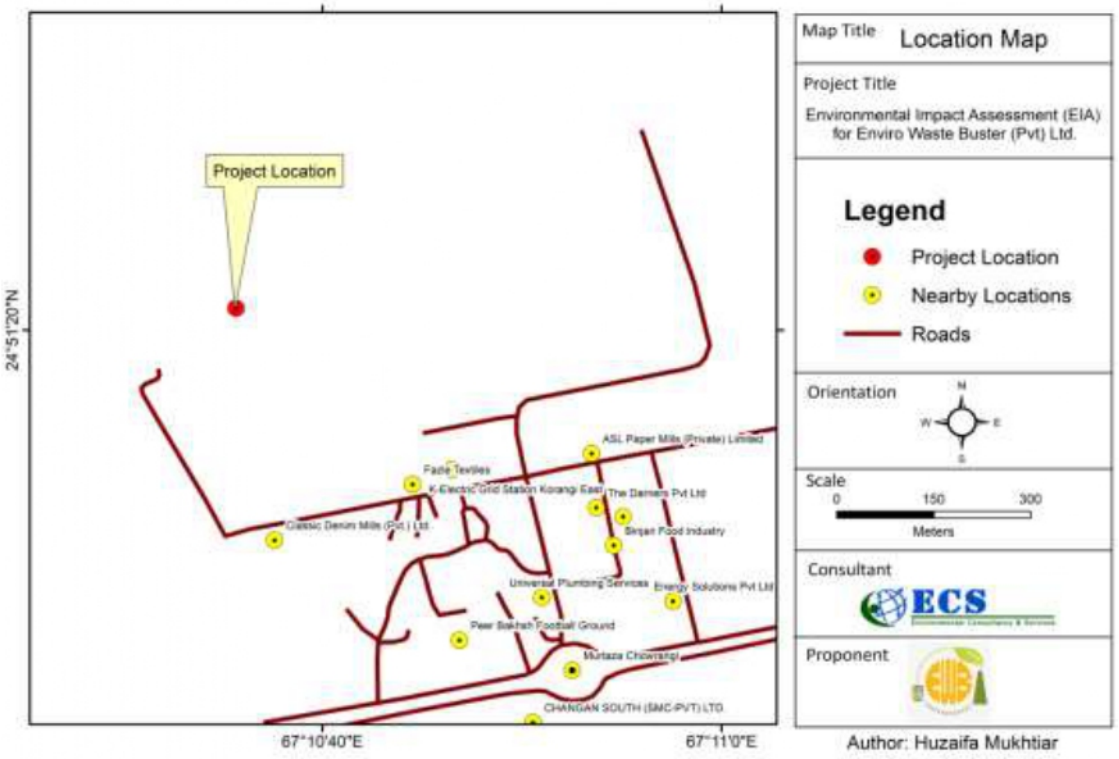
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EXECUTIVE SUMMARY

The proposed project Waste Management Facility (WMF) of Enviro Waste Busters Private Limited (EWBPL) will be located in Korangi, Karachi. In compliance with Sindh Environmental Protection Act, 2014, the EWBPL has engaged Environmental Consultancy Services (ECS) for a detailed Environmental Impact Assessment (EIA) study for their proposed Waste Management Facility.

The proposed project will be located at Survey No. 118, Sharafi Road, Near Murtaza Chowrangi-Sector 20, Korangi, Karachi. Project location is shown in the map below.



The proposed WMF will include two (02) incinerators, office area, green belt, storage yard, access road (driveway), generator room, fuel storage tank, treatment tank, septic tank and soakage pit and shredding section. The total covered area of the project would be approximately 4000 Sq.yds. The proposed WMF will have 02 hazardous waste incinerator units with cumulative treatment capacity of around 1000 kg/hr.

The proposed project will expand the city's hazardous waste treatment capacity which will cater and treat hazardous waste generated from hospitals and industrial units. High tech incinerators with built-in air pollution control devices will significantly reduce the chances of ambient air pollution within the project surrounding.

To develop a comprehensive environmental and social baseline of the project area comprehensive review of literature was done by team of experts. The literature

reviewed for developing a comprehensive environmental and social baseline was validated by frequent site visits and field investigations for ground trothing. Baseline investigations further revealed that the proposed project lies in the Korangi, which does not shelter any significant or endangered fauna species in the surrounding area of the proposed project.

However, a detailed Environmental Management & Monitoring Plan (EMMP) is prepared for the proposed project construction phase and operation phase to mitigate the impacts identified during this EIA study.

Under this EIA study following aspects has been covered:

- Review of relevant legislative requirements applicable to the proposed project.
- Review documentation and analysis of the existing baseline conditions in project surrounding areas.
- Identification of documentation and analysis of environmental and social impacts associated with the proposed project construction and operation phases.
- Identification and documentation of mitigation safeguards to minimize the adverse environmental impacts of the proposed project construction and operation phases.

Therefore, this EIA study concludes the following:

The proposed Waste Management Facility (WMF) of EWBPL will not have any long term significant and adverse environmental impact as the main components of the proposed project would include two (02) incineration units, office area, green belt, storage yard, access road (driveway), generator room, firefighting tank, fuel storage tank, treatment tank, septic tank, and soakage pit. Furthermore, the concentration of stack emissions expected from proposed project operations at the receptors and nearby settlement in proximity of the proposed project site, as revealed through Air Dispersion Modeling (ADM), will not exceed the limits specified under Sindh Environmental Quality Standard (SEQS).

Additionally, a detailed EMMP identifies all the possible impacts associated with construction and operational phases of the proposed project and mitigation safeguards are integral part of plan to minimize adverse impacts associated with the proposed project. Based on the point discussed above it is concluded that the proposed project will not have any significant long term adverse impacts onto the existing environment, if the EWBPL ensures strict implementation of the Environmental Management and Monitoring (EMMP) during project construction and operation phases. The impacts identified were mostly short term, site specific and would be easily managed by implementation of the EMMP in this EIA document.

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ACRONYMS

CSR	CORPORATE SOCIAL RESPONSIBILITY
EA	ENVIRONMENTAL ASSESSMENT
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
ECC&CDD	ENVIRONMENTAL CLIMATE CHANGE & COASTAL DEVELOPMENT DEPARTMENT
EWBPL	ENVIRO WASTE BUSTERS PRIVATE LIMITED
GEP	GOOD ENGINEERING PRACTICES
GPD	GALLONS PER DAY
IEE	INITIAL ENVIRONMENTAL EXAMINATION
K.E	K-ELECTRIC
KW	KILO WATTS
KWSB	KARACHI WATER AND SEWERAGE BOARD
NCS	NATIONAL CONSERVATION STRATEGY
NEP	NATIONAL ENVIRONMENT POLICY
PBS	PAKISTAN BUREAU OF STATISTICS
SEPA	SINDH ENVIRONMENTAL PROTECTION AGENCY
S-EPA	SINDH ENVIRONMENTAL PROTECTION ACT
SEQS	SINDH ENVIRONMENTAL QUALITY STANDARDS
WMF	WASTE MANAGEMENT FACILITY

Chapter 1: Introduction

1.1 Background Information

Project Title:	Environmental Impact Assessment for Waste Management Facility (WMF)
Project Location:	Survey No. 118, Sharafi Road, Near Murtaza Chowrangi-Sector 20, Korangi, Karachi
Study Type:	Environmental Impact Assessment
Proponent:	Enviro Waste Busters Private Limited
Environmental Consultants:	Environmental Consultancy & Services

Industrialization and urbanization have intensified environmental health risks and pollution, especially in developing countries like Pakistan. The total amount of waste that is generated by the industries, commercial and health-care facilities is about 80 to 85% general, non-hazardous and the remaining 15% to 20 % is considered as hazardous in its nature and type that may be infectious, toxic, or radioactive. The amount of solid waste is expected to substantially increase with rapid growth of population and economic activities within the city (Karachi). The quality of civic life is closely related and affected by sanitary conditions in the residential neighborhoods and other areas, where efficient collection of garbage is the key to clean and healthy environment.[1]

The city conspicuously lacks garbage transfer stations which need to be developed for better handling of the garbage and transfer to sanitary landfills. Poor planning, inappropriate technology and poor management are obviously the main areas of concern needing serious efforts on the part of the local government and other agencies towards efficient management and modern technological development of this sector. Figure 1 shows the existing (waste dumping sites) located within the city.

[1] https://www.trade.gov/country-commercial-guides/pakistan-waste-management

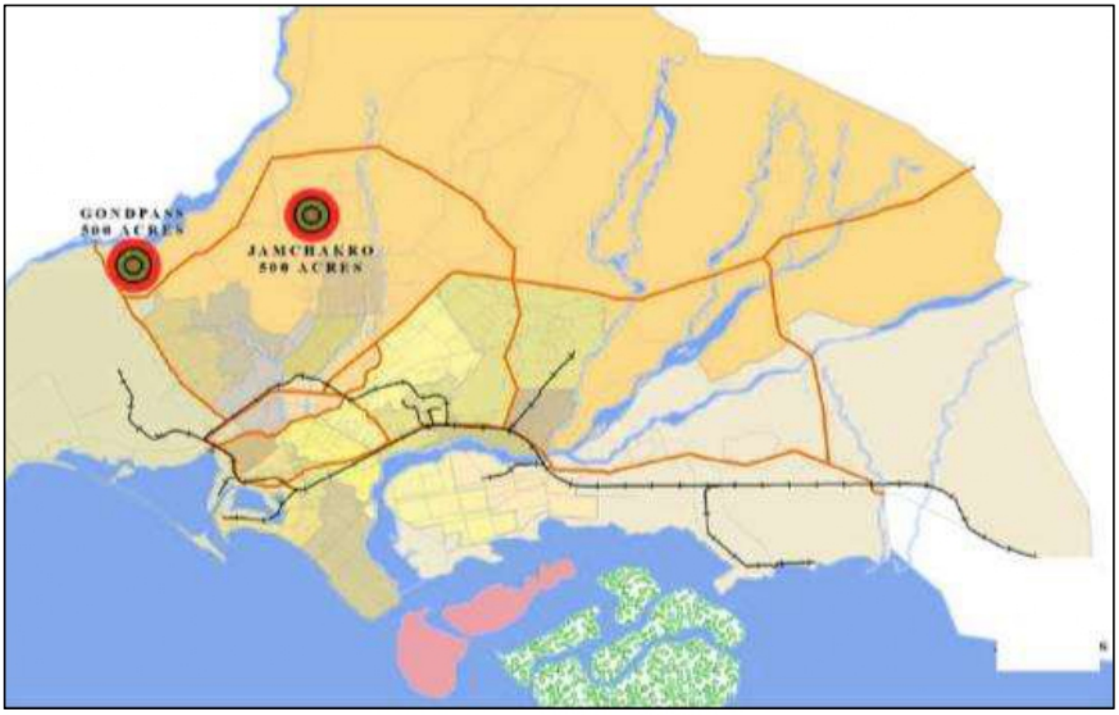


Figure 1: Land Fill Sites in Karachi

Solid waste management combines all activities performed in order to keep the city clean on a regular basis and handle waste collection and disposal, sewerage, water treatment, recycling, health and hygiene issues. With the ratio of solid waste, increasing amount of solid waste per day in the urban center, there is an immediate need to implement major steps to improve the current situation. A more consolidated strategy for solid waste management needs to be designed and implemented, which streamlines the processes of waste collection, disposal and treatment.

The above-mentioned information demonstrates that there is a dire need to increase the number of well managed waste management, handling, transportation, and treatment facilities within the city, therefore in this regard Enviro Waste Busters Private Limited (EWBPL) is looking forward to establishing a robust waste management facility by installation of two incineration plants which will be equipped with air pollution control systems. The proposed incineration units would be installed for the treatment of medical as well as industrial waste.

The proposed Waste Management Facility (WMF) of EWBPL will be located at Survey No.118, Sharafi Road, Near Murtaza Chowrangi-Sector 20, Korangi, Karachi. The location map of the proposed facility is given below in Figure 2.

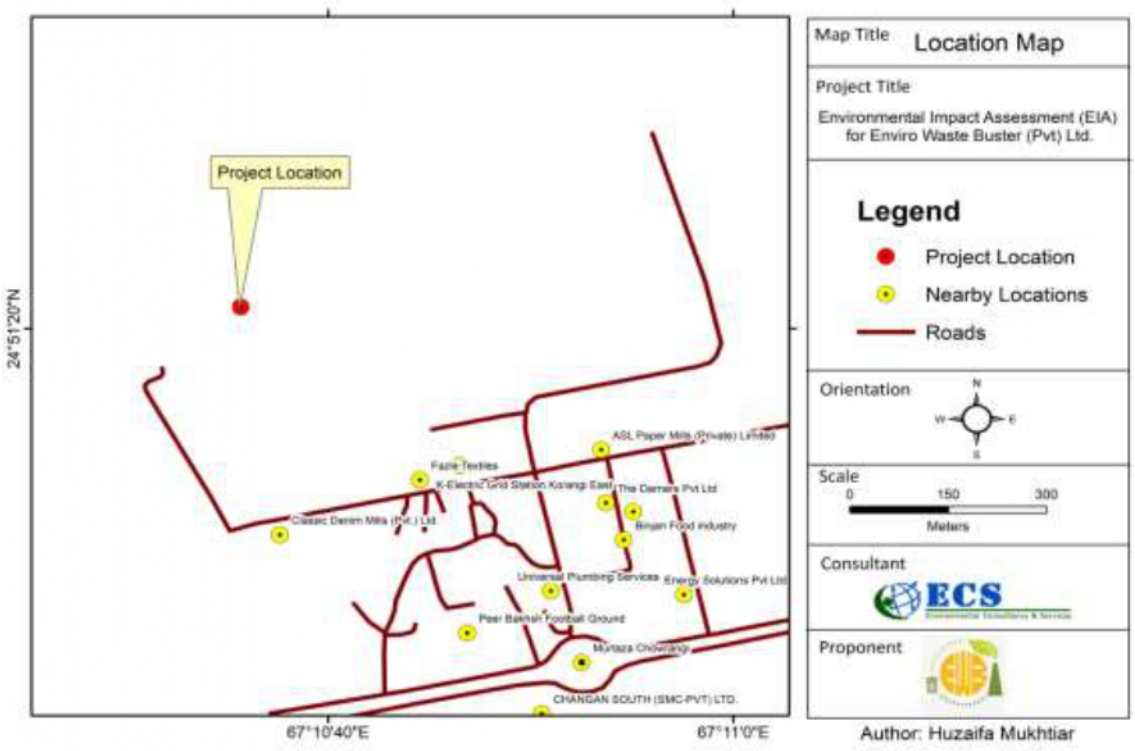


Figure 2: Location Map of Proposed WMF

The proposed facility will also include offices, storage area, loading/unloading, treatment tank, septic tank and soakage pit and shredders. However, a detailed description of the proposed project has been discussed in Chapter-03 of this report. The EIA report has been prepared in compliance with the requirement of Sindh Environmental Protection Act, 2014 and the Sindh EPA Environmental Assessment Regulations, 2021, for submission to the Sindh Environmental Protection Agency for decision on environmental viability of the project.

1.2 Project Proponent

The management of EWBPL has vast experience in handling and disposal of hazardous and non-hazardous waste. The objective of EWBPL is to operate on the principle of 3R i.e., to reduce, reuse and recycle for environmental sustainability. Business integrity, safety of their employees and surroundings, legal compliance, customer's satisfaction is prime focus of EWBPL. EWBPL has a team of experienced professionals with proven track record of delivering a number of waste management services across the country. EWBPL being responsible custodian of environment, health and safety of their workers and community have also developed a dedicated HSE Policy and an Emergency Preparedness and Response Plan which is implemented and applicable at all tiers of the organization.

1.3 Purpose of Environmental Impact Assessment (EIA)

This Environmental Impact Assessment (EIA) Report has been prepared in compliance with the Sindh Environmental Protection Act (SEPA), 2014 and Sindh EPA (Environmental Assessment) Regulations, 2021 for decision on environmental approval of the proposed facility. As per SEPA (Environmental Assessment) Regulations, 2021, the proposed facility falls in the **Category H (1) of Schedule-III "Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration units, etc.)"** which means the proposed facility requires full-fledged EIA to be conducted at planning stage for complying with SEPA Act, 2014.

1.4 Specific Objectives of EIA

The specific objectives of this EIA are:

- Assess the existing environmental and socio-economic conditions at and around the project site, particularly identify any environmental and social sensitivity areas.
- Identify the likely impacts of the proposed facility on the natural and socio-economic environment, predict and evaluate these quantitatively wherever possible and determine their significance in the light of technical and regulatory concerns, and as well as those related to public perceptions.
- Propose appropriate mitigation and monitoring measures that can be incorporated into the design of the proposed activities to minimize any damaging effects or lasting negative consequences identified by the assessment.
- Prepare an EIA report for submission to the Sindh Environmental Protection Agency (SEPA).

1.5 EIA Methodology

The environmental assessment has been conducted with the following basic targets:

- Identification of the regulatory requirements that apply to the facility activities in the proposed area, in the context of environmental protection, health and safety.
- Assessment of the proposed facility activities in terms of their likely impacts on the environment during the construction and operation phases of the project in order to identify issues of environmental concerns.
- Recommendation of appropriate mitigation measures that can be incorporated into the design of the project to minimize the environmental impacts of those identified.

For achieving these targets amicably M/S. Enviro Waste Busters Private Limited (EWBPL) commissioned the services of environmental consultant namely, Environmental Consultancy & Services (ECS) for conducting this EIA study for the proposed facility.

To further perform the tasks related to this EIA study, ECS engaged the following experts as shown in table 1.

Table 1: Detail of EIA Team

Sr. #	Name	Position in EIA Assessment Team
1.	Mr. Shahid Ali Lutfi	Team Leader / Sr. Environment Engineer
2.	Mr. Nouman Sheikh	Deputy team leader/ Environmental Engineer
3.	Mr. Mian Rashid Mehboob	Sr. EHS Expert
4.	Mr. Saeed Akhtar	Sr. Environmental Expert
5.	Dr. M Mansha	Air Quality and Dispersion Modeling Expert
6.	Mr. Ateeb Khan	Sr. Environmental Engineer
7.	Mr. Faisal Madni	Wastewater Treatment Expert
8.	Ms. Rani Habib	Environment Engineer
9.	Ms. Mariam Intesama	Environmentalist

1.6 EIA Study Stages

Stage-I **Project Data Acquisition**	• Initial meeting between environmental consultant and proposed project proponent (EWBPL) for basic project acquisition.
Stage-II **Desk Study/Literature Review**	• Review of regulatory requirements based on preliminary assessment of project activities and the project area. • Review of secondary literature review to collect environmental data about the project area.
Stage-III **Scoping and Stakeholder Consultation Meetings**	• Disclose basic non-technical summary of the proposed facility to the primary and secondary stakeholder through formal and informal discussions during scoping and consultation meetings to identify environmental and social parameters those are likely to undergo significant change due to the proposed facility and document suggestions, concerns and

	recommendations of stakeholders consulted.
Stage-IV **Baseline Investigations and Surveys**	• Site visits for the baseline investigations including physical, ecological, and social environmental conditions of the project area.
Stage-V **Environmental and Social Impact Analysis and Mitigation**	• Evaluation of the environmental parameters those are likely to undergo significant changes due to the proposed facility activities. • Development of Environmental Management and Monitoring Plan to mitigate adverse impacts of the proposed facility.
Stage-VI **Documentation of EIA report**	• Documentation and submission of EIA report to SEPA for preliminary scrutiny.

1.7 EIA Report Structure

This EIA report has been organized in the following chapters.

Chapter 1: Introduction

Highlights background information, basic overview of the proposed facility, need and significance of the proposed facility and purpose of this EIA study.

Chapter 2: Legislative and Policy Framework

It gives an overview of policies, legislation, and guidelines relevant to the proposed facility.

Chapter 3: Project Description

It highlights a detailed description of the proposed facility such as construction, operation, utility requirements/sources etc.

Chapter 4: Environmental and Social Baseline

It describes the existing environment in the proposed facility area, which includes the physical, ecological, and social conditions of the area.

Chapter 5: Stakeholder Consultations

It describes the details about stakeholders and overall consultation process and their concerns and recommendations about the project.

Chapter 6: Analysis of Alternatives

This section of the EIA document presents an outline for project alternatives to select the best option among all the possible project options which includes project sitting and technologies.

Chapter 7: Environmental Impacts Analysis and Mitigations

It describes the anticipated environmental and social impacts of the proposed project and their consequent screening in accordance with the general guidelines. The screening further identifies the residual impacts resulting as a consequence of the adoption of mitigation measures.

Chapter 8: Environmental Management and Monitoring Plan

Details the environmental management and monitoring plan to be implemented by the proponent for effective mitigation of adverse impacts and improved environmental performance.

Conclusion:

Summarizes the report and presents conclusion.

Chapter 2: Legislative and Policy Framework

2.1 Background Information

The first cover to the environmental safeguards within the country was under the Pakistan Environmental Protection Ordinance (EPO), 1983. It was the first commitment at the state level to ensure environmental conservation and safeguards in developmental pursuits. EPO focused primarily on industrial operations and unspecified other environmental aspects. The perceived technical lacunas were resolved when Pakistan Environmental Protection Act (PEPA), 1997 was enacted which was ambitious to incorporate preventive and curative measure for the promotion of sustainable development in the country (GoP, 1997).

Before the 18th Amendment in the constitution of Pakistan, Environmental Protection Act empowered Pakistan Environmental Protection Agency to implement all the relevant environmental legislation across all the provinces of Pakistan. However, after the 18th amendment the environmental portfolio devolved to provincial governments. Consequently, the Sindh Environmental Protection Agency was empowered to formulate environmental legislation, rules, regulations, and standards and their enforcement/implement in the whole Sindh provinces as a formulating, regulatory and monitoring agency. However, it is important to note that, the enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively an ongoing and continuous phenomenon in a developing country like Pakistan.

2.2 Overview of National and Provincial Environmental Policies and Guidelines

A basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is in place. Environmental Policies and Guidelines relevant to the proposed facility were also reviewed for this EIA study brief history of the national policies and guidelines is given below.

2.2.1. National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary Policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends

immediate attention to these core areas in order to preserve the country's environment. A midterm review of the achievements of the NCS in 2000 concluded that achievements under the NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that the NCS was not designed and is not adequately focused as a national sustainable development strategy. The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.

The NEAP was approved by the Pakistan Environmental Protection Council under the chairmanship of the President/Chief Executive of Pakistan in February 2001. NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan. A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005. This policy has already been endorsed by the Pakistan Environmental Protection Council during 2004. The new policy has total 171 guidelines on sector and cross-sector issues. The objectives of new policy include assurance of sustainable development and safeguard of the natural wealth of country. The following are the approved Sector 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.

2.2.2. National Environmental Policy, 2005

The national environmental policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development[2]. The objectives of the policy are:

- Conservation, restoration and efficient management of environmental resources.
- Integration of environmental considerations in policy making and planning process.
- Capacity building of government agencies and other stockholders at all level for better environmental management.
- Meeting international obligations effectively in line with the national aspirations.
- Creation of a demand for environment through mass awareness and community mobilization.

2.2.3. National Climate Change Policy, 2011

To ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development[3]. 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 inter-related 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 the challenges posed by climate change.
- To minimize the risks arising from the expected increase in frequency and intensity of extreme weather events such as floods, droughts and tropical storms.
- To strengthen inter-ministerial decision making and coordination mechanisms 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.

[2] National Environmental Policy, 2005.
[3] National Climate Change Policy, 2011.

- To enhance the awareness, skill and institutional capacity of relevant stakeholders.
- To promote conservation of natural resources and long-term sustainability.

2.2.4. Sindh Drinking Water Policy, 2017

The Public Health Engineer and Rural Health Development Department, Government of Sindh with the approval of Chief Minister Sindh issued Drinking Water Policy in 2017. The main principles of Sindh Drinking Water Policy have been adopted from National Water Policy, 2009. The goal of Sindh Drinking Water Policy, 2017 is to improve the quality of life of people of Sindh by reducing morbidity and mortality caused by water borne diseases through provision of safely managed and potable drinking water to the entire population that is located in premises available when needed and free from contamination, affordable and sufficient quantity and in a way that is equitable and sustainable.

2.3 Main Environmental Framework Applicable on Proposed Facility

"Institutional Framework" refers to a law or other formal provision that assign primary responsibility as well as the authority to an agency for dealing with regulatory affairs related to the subject. In this case it is important to note that post 18th Amendment to the Constitution of Pakistan, the provincial Environmental Protection Agencies are fully empowered to initiate, modify and enforce environmental legislation in their respective provinces. In the province of Sindh, the Sindh Environmental Protection Agency (SEPA) is the prime regulatory and monitoring agency. SEPA is headed by a Director General (DG) and is responsible for enforcement of environmental legislation within the province of Sindh. DG, SEPA is also responsible for the guidance of other provincial departments/institutes on environmental matters and related issues.

EPA Sindh is attached with Environment, Climate Change & Coastal Development Department (ECC&CDD), Government of Sindh. The ECC&CDD, headed by a Secretary, is the administrative body and responsible for coordination with other line departments and agencies of the province. It also performs coordination and communication with other provinces and federal government agencies. As discussed earlier in this EIA document, this EIA has been conducted and prepared in compliance with the Sindh Environmental Protection Act, 2014 details of the Act along with the applicable environmental rules, regulations and standards under Sindh Environmental Protection Act, 2014 are given in the section below:

2.3.1. Sindh Environmental Protection Act, 2014

The Sindh Environmental Protection Act was notified by the Provincial Assembly of Sindh via notification #PAS/Legis-B-06/2014 dated March 20, 2014. The Act extends to whole of the province of Sindh and is to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development. The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the SEPA and adherence with Sindh Environmental Quality Standards (SEQS). The Act, under Section 17, empowers the EPA Sindh to require from the proponent an environmental impact assessment or initial environmental examination document from the proponent of any project prior to commencement of any construction or operations activity. Refer to **Annexure-1** to review SEPA Act, 2014.

2.4. Provincial Rules, Regulation and Standards

2.4.1. Sindh EPA (Environmental Assessment) Regulations, 2021

In exercise of the powers conferred by Section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government of Sindh has notified the 'Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021' vide notification No. NO.EPA/TECH/739/2021.

This regulation describes the procedure for conducting environmental assessments and their approvals process. Categories for projects requiring IEE, EIA or Environmental Checklists is mentioned in the regulation. The environmental assessment includes preparation of an Environmental Management Plan (EMP).

SEPA (Environmental Assessment) Regulations 2021 is attached as **Annexure-2** for ready reference and further guidance.

2.4.2. Sindh Hazardous Substance Rules, 2014

The Sindh Hazardous Substances Rules, 2014 are a set of rules derived from the Sindh Environmental Act, 2014 and are first of the very specific hazardous substances regulations brought into force in 2014 after the initial draft set of rules devised in 2003. They represent specific regulations with aspect of handling, storage and disposal of hazardous substances and issuing an approving license to the user or facility. The

Schedule-I of the Rules enlists the hazardous substances that are under the scrutiny of the Sindh-EPA[4].The Hazardous Substance Rules, 2014 is attached as **Annexure-3.**

Under its licensing terms, the Rules highlight components as follows:

- Employment of Qualified technical personnel
- Packing and labeling
- Conditions of Premises
- Safety precautions
- Trainings
- A comprehensive safety plan
- Waste management Plan
- Transporting of hazardous substances.

2.4.3. Sindh Hospital Waste Management Rules, 2014

Sindh Hospital Waste Management Rules, 2014 promulgated under SEPA 2014 were enforced in December, 2014. Under these Rules, 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.

The section 2 of Sindh Hospital Waste Management Rules, 2014 states that 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".

According to Section 8, "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".

The Hospital Waste Management Plan shall include:

- Waste management points for every ward and department, indicating each point, location on the basis of risk assessment.
- The categories of waste being generated in accordance with Schedule-I.
- Quantity of each waste category.
- Details of the types, numbers of containers, waste bags and trolley required annually.
- Schedule and frequency of waste collection from each ward and department.

[4] Hazardous Substances Rules, 2014;

- Effective arrangements for onsite and off-site transportation of waste as provided in Schedule-I and II.
- Contingency plans for storage or disposal of risk waste in the event of breakdowns of hospital waste facility, or of maintenance or collection arrangements.
- Training courses and programs on waste management.

The Waste Management Plan shall be regularly monitored, reviewed, revised, updated and submitted to the Agency on annual basis. Hospital Waste Management Rules, 2014 is attached as **Annexure-4.**

2.4.4. Other Provincial Regulations/Rules

In exercise of the powers conferred by Section 36 read with Section 26 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Government of Sindh, has notified following Rules and Regulations in December 2014:

- **Sindh Environmental Protection Tribunal Rules, 2014:** It provides a complete process for functioning of the Environmental Tribunals, which are responsible for prosecution of environmental related matters and legal cases initiated by the EPA Sindh.

- **Sindh Environmental Protection (Composition of Offenses and Payment of Administrative Penalty) Rules 2014**: Describes the process for compounding offenses or complaints under Section 22(6) of the Act. The Rules describe the format that should be used for filling an Application to the DG SEPA by the accused; format for the Affidavit by the accused; and format for administrative penalty notices.

- **Sindh Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2014:** This describes the process to be adopted by every industry for compliance with the Environmental Quality Standards. It includes the categorizing of industrial unit for identification of the reporting parameters and frequency of reports submission to SEPA.

2.5. Sindh Environmental Quality Standards (SEQS)

SEQS is an important and prime legislation in the Sindh, targeted for the control of pollution. The Government of Sindh in exercise of the powers conferred under clause (g) of sub-section (1) of section of 6 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Sindh Environmental Protection Council, has established following standards, copy of SEQS act is attached as **Annexure-5 (A, B & C).**

- SEQS which were notified by the Sindh Environment Protection Council in 2015 with the prior approval of Government of Sindh. These SEQS for Municipal and Industrial Effluent, are effective and attached as **Annexure 5-A**.
- SEQS which were approved by the Sindh Environment Protection Council in 2015 with the prior approval of Government of Sindh. These SEQS for Industrial Gaseous Emissions, Motor Vehicle Exhaust, Noise and Ambient Air Quality are effective and attached as **Annexure 5-B**.
- SEQS which were approved by the Sindh Environment Protection Council in 2015 with the prior approval of Government of Sindh. These SEQS for Ambient Noise Level are effective and attached **as Annexure 5-C**.

2.6. Other Provincial Regulations

2.6.1. Wildlife Protection (Amendment) Act 2008

The Sindh Wildlife Ordinance 1972 empowers the government to declare certain areas reserved for the protection of wildlife and to control activities within these areas. It also provides protection to endangered species of wildlife[5].

2.6.2. Sindh Forest Act (2012)

The act empowers the provincial forest department to declare any forest area as reserved or protected. The Act also empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests[6].

[5] Retrieved from faolex.fao.org, 2009
[6] *Retrieved fromSindhforests.gov.pk*

2.6.3. Sindh Local Government Ordinance

Under clause (h) of sub section 54 of chapter V, the law endorses the management, operation, maintenance and improvement of the sanitation disposal and solid waste collection of solid, liquid, industrial and hospital waste.

2.6.4. Sindh Healthcare Commission Guidelines

These guidelines enforce the implementation of hospital waste management under the Pakistan Environmental Protection Act 1997.

2.6.5. Factories Act 1934

According to this act, "factory" means any premises, including the precincts thereof, whereon ten or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on or is ordinarily carried on with or without the aid of power, but does not include a mine, subject to the operation of the Mines Act, 1923 (IV of 1923) :Under this act, effective arrangements shall be made in every industry to accommodate and dispose the effluent and waste generated due to the effect of manufacturing processes carried out on them.

2.6.6. The Sindh Solid Waste Management Board Act, 2014

This act empowers the collection and disposal of solid and other waste in the province of Sindh. It also empowers supporting, promoting, administering, executing, and implementing a waste management plan or scheme which may benefit the management of waste.

- Employ a third party to take over management of solid waste on behalf of the Board which shall have the authority as vested in the Managing Director, to employ such parties as may expedite the waste management and benefit the people.
- The Board may support, promote, administer, execute, and implement schemes for undertaking any commercial or business enterprise which may benefit the management of waste.
- Construct, improve, and maintain the buildings, sites and machinery relating to the operation of solid waste management.
- Regulate control or inspect the source points of generation, accumulation, transfer, recycling, trading of solid waste.

Chapter 3: Project Description

3.1 Background Information

This section of the EIA report presents a detailed project description which is mainly related to the construction, commissioning, and operational phases of the proposed project. A detailed insight regarding the project description was established by reconnaissance survey, site visits, and discussions between technical team of project proponent and the consultant. The proposed WMF for EWBPL will include two incineration units with an average disposal capacity of approximately 500 Kgs/hr. for each unit. The cumulative capacity of the units will be approximately 1,000 Kgs/hr. for treatment of medical as well as industrial waste in an environmentally sound manner with proper and effective air pollution control systems. The project will spread on an area of approximately 4000 Sq.Yds. which will include following components; Office area, green belt, storage yard, two (02) incineration units, shredders, access road (driveway), generator room, fuel storage tank, treatment tank, septic tank and soakage pit. The incineration units will essentially include built in air pollution control system (wet scrubber) combustion chamber, control panel, feeding system, hydraulic ramp, ash removal system, induced auxiliary fan and temperature control system etc. The layout plan of the proposed facility is given in the Figure-3.

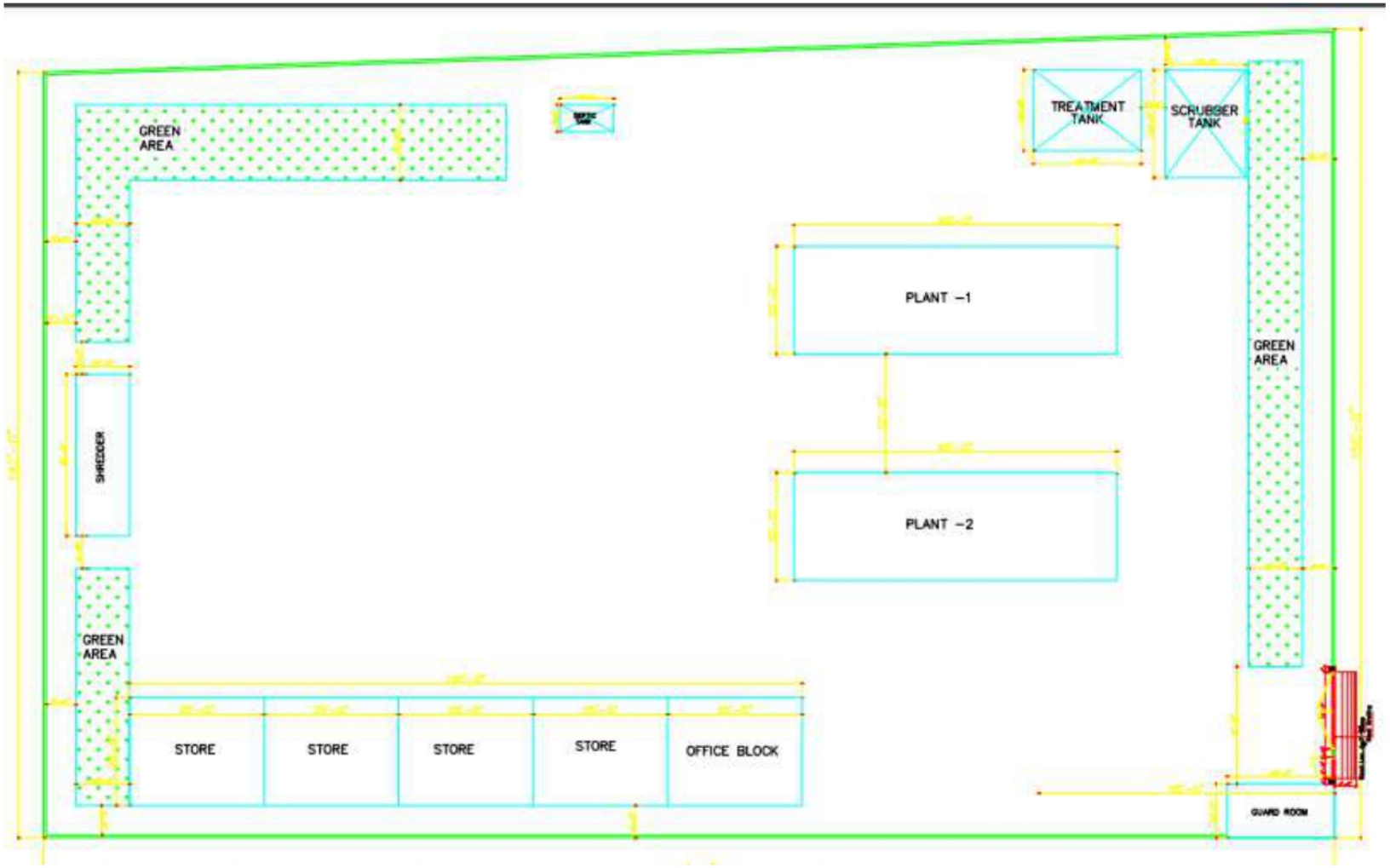


Figure 3: Layout Plan of Proposed Project

3.2 Project Location

The Waste Management Facility (WMF) will be located at Survey No. 118, Sharafi Road, Near Murtaza Chowrangi-Sector 20, Korangi, Karachi. The proposed project site is located within 08 acres boundary wall land. Location map of project area is given in Figure-4.

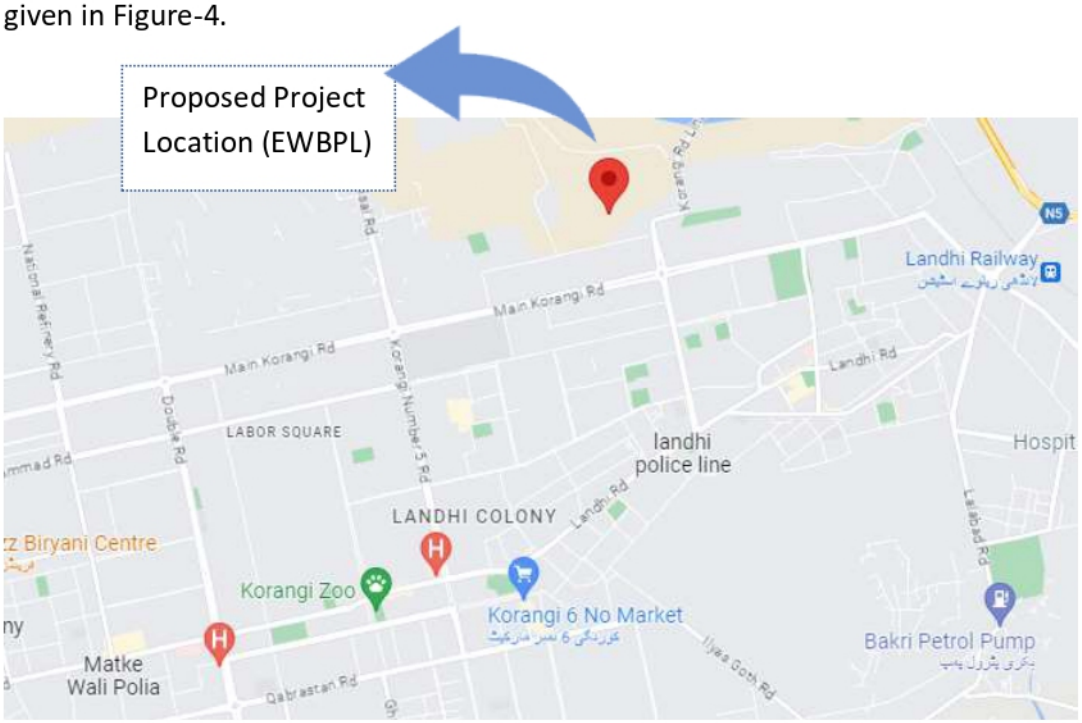


Figure 4: Location map of project area

3.3 Project Significance

According to International Trade Administration (ITA), 16500 tons of waste per day is reportedly produced in Karachi. Considering the unavailability and poor conditions of landfill sites plus the collection facilities, not all the waste produced is collected. Hazardous as well as medical waste demands proper treatment which includes its segregation, handling, storage, transportation, and disposal. Exposure to hazardous waste can result in severe health implications with children being the most susceptible. If in contact with the human body in any form, hazardous and biomedical waste can lead to certain infectious diseases and at times may result in serious chronic illnesses as well.

The proposed project will provide a facility to dispose both hazardous and non-hazardous waste of industries as well as the facility will also facilitate effective treatment of medical waste. Additionally, it is important to note that Industrialization and urbanization have intensified environmental health risks and pollution, especially in developing countries like Pakistan. It has been observed that

Environmental sanitation is the subject of least priority in developing countries where appreciable amount of hazardous waste is produced, and disposed at open dumping sites without any treatment which often results in air pollution, bad sanitation and unhygienic conditions. The city is expanding day by day and with the increase in population environmental stress is inflated within the city. Among all the relevant environmental issues solid waste management is one of the prominent ones. In addition, field investigations and surveys during this EIA study revealed that there were no engineered landfill sites (both hazardous and non-hazardous) in the city; however, the available site referred to as "Landfill Sites" are merely open dumping sites. Looking at the increasing amount of solid waste generation in 2014 Sindh Assembly passed Sindh Solid Waste Management Act, 2014 under the umbrella of which, Sindh Solid Waste Management Board (SSWMB) proposed scientific improvement of the landfill sites at Gond Pass and Jam Chakro which at present are the main dumping sites in Karachi[7]. However, at present due to limited capacity of the management authorities, a bulk of residential, industrial, and medical waste at time is left unattended contributing to harmful diseases and infections. In addition, to study the need of incinerators installation at proposed site the present situation of medical and industrial waste management/treatment were thoroughly reviewed and studied. It has been observed that the hazardous as well as medical waste management system is under capacity, therefore there are significant leakages in the waste treatment system of the city. It has been observed that due to mishandling of hazardous waste somehow or other; many consumables like used syringes, urinary bags, blood bags, glass slides, vials, I.V drips bags, and etc. are often reused in the markets.

As per World Health Organization (WHO) Key Fact Sheet, which was last updated on February 2018; following facts and figures were taken into consideration while reviewing the significance of the proposed project:

- The total amount of waste generated by health-care activities can be categorized as follows; about 80 to 85% is general and non-hazardous waste and the remaining 15% to 20 % is considered as hazardous one that may be infectious, toxic or radioactive.[8]
- The disposal of untreated health care wastes in landfills can lead to the contamination of drinking, surface, and ground waters if those landfills are not properly constructed.

[7] *https://www.pakistantoday.com.pk/2018/02/06/pc-i-to-redesign-landfills-in-karachi-approved-on-scientific-grounds-report/*
[8] *https://www.who.int/news-room/fact-sheets/detail/health-care-waste*

- Worldwide, an estimated 16 billion injections are administered every year. Not all needles and syringes are disposed of safely, creating a risk of injury and infection and opportunities for reuse.
- Additional hazards occur from scavenging at waste disposal sites and during the handling and manual sorting of hazardous waste from health-care facilities.
- These practices are common in many regions of the world, especially in low- and middle-income countries.
- The waste handlers are at immediate risk of needle-stick injuries and exposure to toxic or infectious materials.
- Health-care waste contains potentially harmful microorganisms, viruses, bacteria which can infect hospital patients, health workers and public in general if left unattended and disposed at open dumping sites directly without any treatment.

Guidelines regarding hazardous waste management:

International Finance Corporation (IFC) has issued general/hazardous waste guidelines under the General EHS guidelines. These guidelines must be applicable to all the projects that, in any phase, generate, store, transport and handle the waste.

Hazardous waste must always be handled separately from the non-hazardous waste. The key response is to prevent the generation. However, after it is generated, it demands management for the safety of the environment and human health.

- Hazardous waste must be stored in a way that its contact with other wastes is minimal to zero, with proper ventilation and cool environment.
- Any leaks or spills to be monitored and inspected.
- Facilities that are to generate hazardous waste must have permit and approvals of applicable government authorities.
- Ensure regular visual inspection and proper labeling and categorization of the waste.
- Ensure regular audits of waste segregation and collection.
- Ensure regular monitoring of groundwater quality in cases of hazardous waste on site storage and pretreatment/disposal.
- Maintain monitoring records for hazardous waste collected, stored or shipped should include identification number/name, physical state, quantity, date of storing and packing, repacking and treatment, shipment tracking, dispatching date, receiving date.

Lack of awareness about handling the waste and hazards related to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources and the low priority given to the topic are the most common problems connected with health-care waste in

Karachi. The proposed WMF is likely to reduce risk of public health and environmental degradation associated with health care waste likely to generate commercially in the future. High tech incinerators will significantly reduce the chances of ambient air pollution within the project surrounding and therefore this state-of-the-art technology shall serve as a model for other upcoming stakeholders to effectively manage and treat hazardous waste likely to generate from proposed development within the city in coming days.

Key Benefits of Proposed Facility

- Volume and Mass Reduction of hazardous, medical, and non-hazardous waste.
- Proper disposal of waste with reduced environmental impacts.
- Reduction in air pollution is currently caused due to uncontrolled burning of waste.
- Improved health and sanitation conditions for the city of Karachi and surrounding areas.
- State-of-art facility with occupational health and safety considerations
- Capacity to handle a variety of waste.
- Capacity development of hospitals and industries for proper handling of waste.

3.4 Technical Description

The proposed project will include office area, green belt, storage yard, two (02) incineration units, shredders, access road (driveway), generator room, fuel storage tank, treatment tank, septic tank and soakage pit. The incineration units will essentially include built in air pollution control system (wet scrubber) combustion chamber, control panel, feeding system, auto hydraulic ramp, ash removal system, induced auxiliary fan and temperature control system etc.

3.4.1 Construction Phase Activities

- Site Clearance
- Base Construction
- Engineering works
- Office Construction
- Development of Green Areas
- Septic Tanks Construction
- Utilities/Labor requirement during construction

3.4.2 Site Clearance

It is important to note that the proposed project site is a vacant plot located in Korangi, Karachi. During the site survey, a team of environmental experts and consultant observed that no mature trees exist at the proposed project location.

Installation and commission activities will be executed as per the standards by adopting Good Engineering Practices (GEP) to complete the assigned work in specified time schedule. A prefabricated structure of different sections and offices will be assembled for WMF.

3.4.3 Project Timelines

The construction of the incineration units and associated facilities is expected to be completed in six months after obtaining all necessary permits.

3.4.4 Engineering and Miscellaneous Works

The electrical and other auxiliary works will essentially consist of the following:

- Electrical services including power, lighting, gas supply, etc.
- Plumbing and drainage services.
- Coloring and painting.
- Carpentry work.

3.4.5 Machinery Required

The major machinery that will be used is listed below:

- Hand Trolleys
- Dumpers / Trucks
- Water Pumps
- Steel Cutting Equipment
- Steel Shuttering
- Scaffolding Pipes
- Power Generators
- Tractor and Trucks

3.5 Incinerator Design and Technical Details

The objective of the proposed project is to construct a waste management facility consisting of two incineration units of industrial/hospital waste with a view to supporting the waste management issue faced by the city of Karachi. The technical specifications of the incinerator are mentioned in Table 2. A general schematic of the proposed incineration units is given in Figure 5.

Table 2: Specification of Each Incineration Unit

S. No.	Features	Descriptions
1.	Capacity	500 Kg/hr.
2.	Temperature Control	Digital Temperature Controller
3.	Type of Waste	Solid/Fluid
4.	Combustion Air Motor	3 x 3 HP
5.	Combustion Burner	2 x 500 KW
6.	Thermocouples	3
7.	Wet Scrubber	1 x 15 gallons per hr. (Recyclable)
8.	Electrical Pump for Scrubber	1 x 1 HP
9.	Refractories withstand temp.	1800 centigrade
10.	Air Damper	Manual
11.	Post Combustion Chamber Burner	1 x 500 KW
12.	Induced Draft Fan	1 x 20 HP
13.	Stack Height	15 meters
14.	Chambers	Two
15.	Primary Chamber Temperature	600˚C— 800˚C
16.	Secondary Chamber Temperature	1200˚C
17.	Combustion Flow Control	Air and Gas Mixture Flow Control
18.	Waste Feeding	2 Doors
19.	Ash Removal	3 Doors
20.	Control Panel	Pre-wired PLC Controlled
21.	Paint	Heat Resistant
22.	Fuel	Natural Gas, LPG, and Diesel Oil

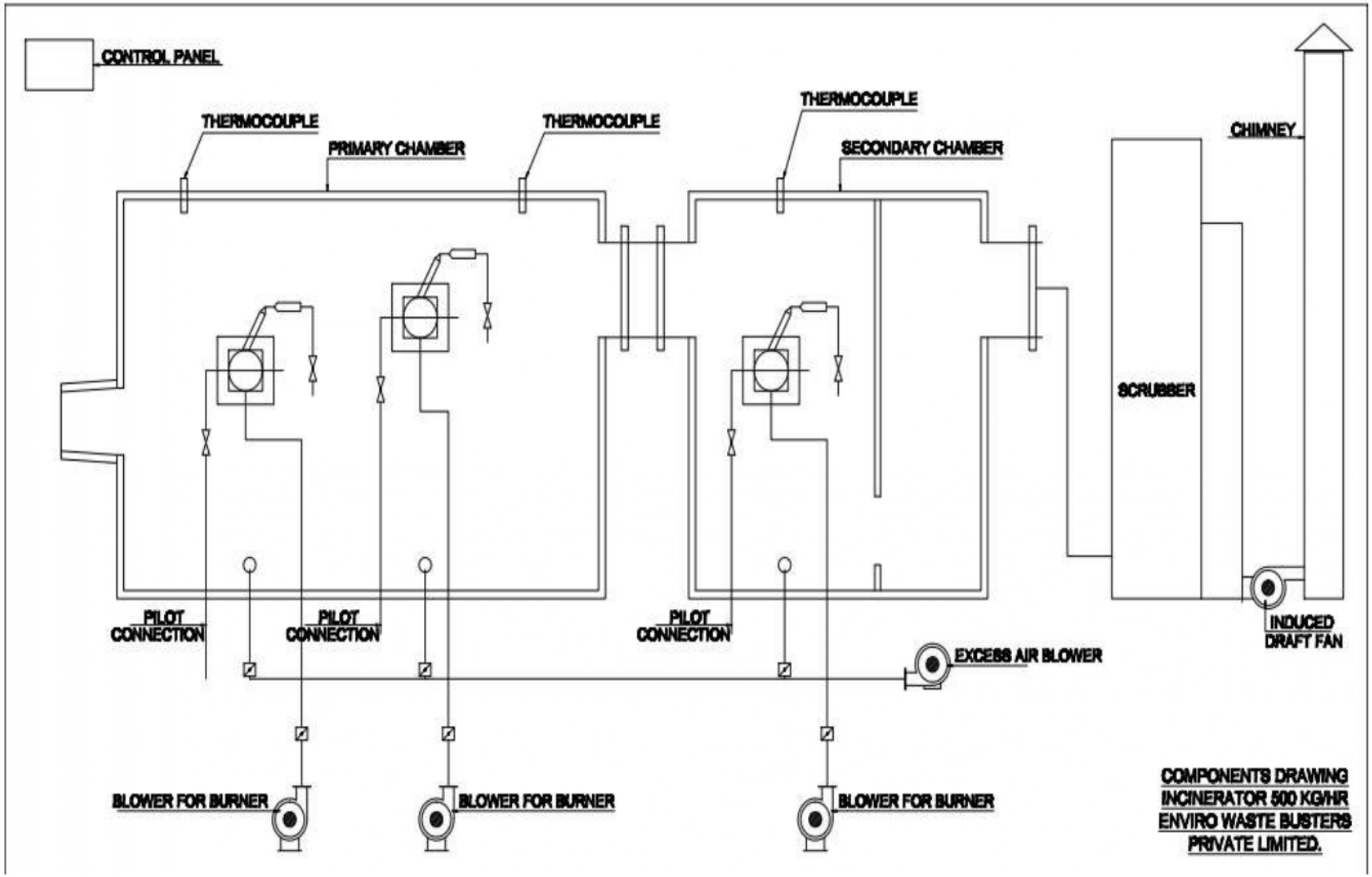


Figure 5: General Schematic for Proposed Project

3.5.1 Waste Feeding System

The waste feeding in the proposed incineration units will be done through hydraulic lift ram to transport the waste into the feeding chamber. The feeding chamber will first drop the waste into the holding area which after receiving the waste will air locked from the top, following which it will be transferred to the combustion chamber where it will be incinerated. The project will also have a shredder which will be utilized to reduce large size waste material prior to feeding/disposal process as per requirement.

3.5.2 Primary Chamber

The waste is loaded in the incinerator when the primary chamber is first heated to attain a temperature of minimum 600°C. In most cases the waste generated heat itself and the temperature rises to almost 800°C. However, in case of waste with low calorific values, external heating is required to maintain the temperature between 600°C to 800°C. The primary chamber will be equipped with 2 burners of 500 KW each.

3.5.3 Secondary Chamber

The secondary chamber is meant for combustion of gases produced by the incineration of waste in the primary chamber. The secondary chamber of the incineration plant will consist of a burner of 500 KWH. The temperature in the secondary chamber reaches up to 1200°C, the incinerator permits the gases to be exposed to this temperature. This process in the secondary chamber helps get rid of obnoxious matter and pollutants.

3.5.4 Scrubbing System

A wet scrubbing system has been proposed for each incineration unit. The scrubbing system will remove the remaining particulate matter and acid gases from waste gas streams and will reduce the temperature of the gases coming out of the secondary chamber. The pollutants are removed primarily through the impaction, diffusion, interception and/or absorption of the pollutant onto droplets of liquid. The liquid containing the pollutant is then collected in recycling tanks and the consumed water will be recycled a number of times in the scrubbers. The scrubber will be constructed from stainless steel and will consist of multiple water spraying nozzles. The water consumption in each will be 15 gallons per hour which will be recycled. The two-stage scrubbing process ensures cleaning of gases to meet the standards for emissions. Finally, the clean gases will be discharged from the stack which will be 15 m high.

A treatment tank will be constructed for water recirculation to reduce water consumption and to settle the particles collected in the used scrubbing water. The sludge formed in the tanks will be collected and incinerated in the incineration plant, whereas clean water will be filtered and re-cycled in the scrubbing system.

3.5.5 De-Ashing System

The de-ashing process will take place through de-ashing doors of each incinerator. These doors will open in the ash tank where the ash is collected, and the tanks are removed using chain system. The ash will be sent to the off-site government designated site for final disposal. The ash removal will be a batch process and has been designed to remove the ash in the minimum time and safest manner. The doors will be steel fabricated with firebrick lining from inner side.

3.6 Utilities Requirement

3.6.1 Land Ownership

The Project land is rented out to by Directors of EWBPL for the period of five years. Copy of ownership document is attached as Annexure-6.

3.6.2 Gas Supply

The EWBPL management will apply for a new gas connection during construction phase, it is estimated that 6-8 MMBTU/day will be required during normal operation of the proposed project.

3.6.3 Diesel Oil

The EWBPL management will establish backup storage for Diesel Oil which may be required to be used in the absence of natural gas. The diesel oil tank will have a storage capacity of 400 liters.

3.6.4 Electricity Supply

The primary source of electricity for the proposed project would be K-Electric. The requirement for the proposed project will be 70 KW during operational phase. The EWBPL management will apply for a new connection to K-Electric during construction phase. In addition to this, a dedicated diesel-based generator will be installed capable

of generating around 120 KVA of power as secondary power source at proposed project. The generator will be placed at a designated area with impermeable floor, roofs, and boundaries to avoid any unforeseen environmental hazard. The project will apply to K-E for electric supply connection during the construction connection as per K-E Policy.

3.6.5 Water Supply

The primary water supply source to the project would be the water supply of project line of project area. The project's requirement during the construction phase would be around 1500 gallons per day (GPD). During the operation phase, the estimated requirement will be 700-1000 GPD. This requirement will be mainly for scrubbing system and domestic usage.

3.6.6 Manpower Requirement

The total manpower requirement during the operation phase of the project will be as follows:

- Manager - 1
- Site Supervisor - 1 supervisor in each shift
- Workers - 6-8 workers in each shift
- Security Staff - 2 private security guards in each shift

3.7 Operational Phase

The facilities and equipment's installed and commissioned during the construction phase would be utilized during the operational phase at the proposed facility. Utilization purpose and description of each component of incineration unit is given in the below section.

3.7.1 Stores

The proposed project will have dedicated four stores. The three stores will be utilized as a dedicated storage area for interim storage of waste as and when required. In addition, one dedicated store will be also utilized for storage of different mechanical and maintenance equipment's, cleaning detergents and any other chemicals etc. In addition, two dedicated stores will also be utilized.

3.7.2 Diesel Storage Facility

A dedicated diesel storage area will be utilized at proposed project site, which should follow all the relevant safety standards and engineering controls such as geotextile lining to prevent ground water and soil contamination.

3.8 Environmental, Health and Safety Control and Arrangements

Proposed WMF of EWBPL will essentially include the following environmental, health and safety components as an integral part of the proposed project. Details of each component are given in the below sections.

3.8.1 Air Pollution Control Systems

It is important to note that the proposed incinerators will be installed with built in air pollution control system (the wet scrubber) details are already elaborated under section 3.5.4.

3.8.2 Wastewater Management

During the normal operation, only domestic wastewater will be generated from washrooms, ablution, etc. The wastewater generation will be around 100-150 GPD which will be diverted into the wastewater treatment system. This system will be based on dual staged mechanism. The initial stage will have a septic tank. The wastewater from the proposed project will be routed to the septic tank from where it will flow from the top portion of the septic tank into the second stage. The second stage will contain a soak pit. The soak pit will contain loose gravel which allows wastewater to gradually soak into the ground, while wastewater from wet scrubbers will be recycled.

3.8.3 Solid Waste Management

The purpose of solid waste management is to outline the requirements to handle the solid waste generated from the project during construction and operation phases. EWBPL has a solid waste management policy which shall be implemented at all project stages.

3.8.4 Safety and Security

The safety considerations of the project will include the following:

- Firefighting systems
- Safety Alarm systems
- Complete PPEs for staff working at site
- Periodic safety audits
- Safety signs and markings
- Emergency showers and eye wash for employees
- Fire drills / safety drills

Two security guards will be hired for security purposes of the project site; in addition, CCTV cameras with recording backup will be installed during operation phase.

3.8.5 Corporate Social Responsibility Activities

As a part of this project EWBPL will conduct training for hospitals and industries to guide them on waste handling and storage techniques.

EWBPL's objective is to develop awareness in society on the importance of handling and disposal of waste in a proper and appropriate manner.

It is very important for the hospitals and industries to know how the different types of waste should be handled and stored on their site.

EWBPL will use the services of experts in the field to create awareness. Training programs will be a regular activity which plan to carry out when project starts.

Chapter 4: Environmental & Social Baseline

4.1 Background Information

As discussed earlier in Chapter 1 and 3 that the proposed project will be located in Korangi, Karachi, Pakistan. Therefore, this section of the report mainly focuses onto the Physical, Ecological and Social Baseline of the project area. To develop a comprehensive environmental and social baseline of the project area, a comprehensive review of literature was done by team of experts. Furthermore, the literature reviewed for developing a comprehensive environmental and social baseline was validated by frequent site visits and field investigations for ground trothing to describe the existing environmental settings in the study area and is based upon the secondary information collected from the published sources, reconnaissance survey, primary socio-economic survey and environmental monitoring of ambient air and ambient noise, in the study area. The major purpose of describing the environmental settings of the study area is:

- To assess the existing environmental quality, as well as study the environmental impacts due to the proposed project.
- To identify environmentally significant factors or geographical areas that could preclude any future development.

Additional purposes of the baseline studies are to provide sufficient information so that decision makers unfamiliar with the general location can develop an understanding of

- The project needs.
- Environmental characteristics of the study area

Following activities were performed at project site for baseline development:

- Visual observations by experts were carried out within and around the project site.
- Ambient Air and noise monitoring were carried out through EPA approved laboratory.
- Ocular observations by experts were carried out for validating the ecological and social conditions of the project area.

This section of the report is further divided into following sub section:

- Physical Environment
- Ecological Environment
- Social Environment

4.2 Methodology of Conducting Baseline Study

In order to develop the comprehensive baseline for the proposed project area, a thorough review of the available and published literature was carried out by consultant's team. The literature review was further supplemented by the site visits and field surveys for the data validation and on ground verification in context to the physical, ecological and the social baseline of the project area.

4.3 Physical Environment

The existing physical environmental conditions of the project area are described in this section. Data on topography and land use, geological conditions, climatic conditions, wind speed and directions, water resources and drainage, natural disaster and seismology was acquired from published literature and previously conducted studies. Air quality and noise level were analyzed during extensive field surveys conducted specially for this EIA.

4.3.1 Topography and Land use

The city of Karachi has a land area of 3,640 km² and is located on the Arabian Sea Coast in the extreme south of Pakistan; the city is located at 24° 56' 46'' north and 66^{0}37" to 67° 0' 20" east. It is bounded by Jamshoro District in the northeast, Thatta District in the southeast, the Arabian Sea to the south and the Lasbela District of Balochistan Province to the west. Karachi can be broadly divided into two parts; the hilly areas in the north and west and the coastal area in the southeast. The hilly areas of Karachi are known to be the offshoots of the Kirthar Range. The highest point of these hills in Karachi is about 528 m in the extreme north. These hilly areas have sparse and scattered vegetation and have wide plains, dry riverbeds, and water channels. Karachi has a long coastline in the south.

The topographical map of the project site is shown in Figure 6; land elevation of proposed project site is 18m.

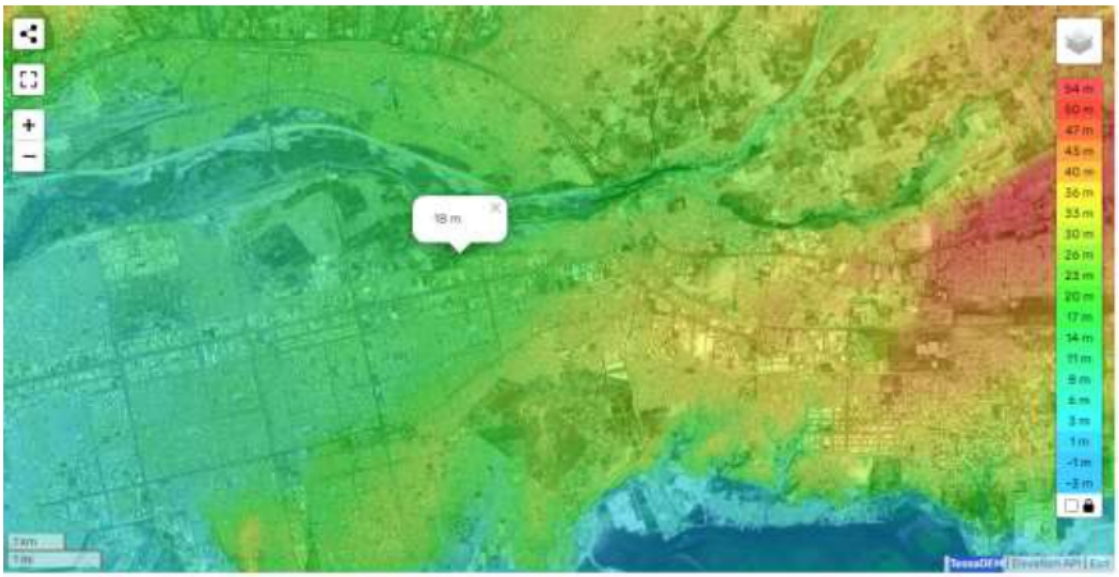


Figure 6: Topographical Elevation of Project Site

4.3.2 Geological Conditions

Geology of the local area is underlain lower Indus basin described as Indus River alluvial of early Eocene. Early deposition of sediments includes silt, sand, stone, and conglomerate, limestone with low compact and cementing materials. Surface feature is described as syncline delta, and valley region and anticline ridges are exposed. As stratigraphic description there are two formations Gazij and Manchar formation that dip gently northeast to southeast in offshore. The coastal region is found to be of tertiary and post-tertiary origin. The region has been formed by the upheaval of land from the Tethys Sea, which once extended up to the northern border of Pakistan but, gradually withdrew with the rising of the Himalayas. The underlying rocks are mostly of marine origin, highly folded, faulted and fissured everywhere.

The exposed geological material in the city is generally silty sand, sandy gravel and silty clay which is either product of in-situ weathering or deposited by the action of gravity and water. Below this over burden of silty sandy gravel soil, alternating layer of sedimentary rock comprising of sandstone, shell mudstone, siltstone and limestone are present. The rock formation of this area is from Nari Formation of Oligocene age and partially from Gaj Formation of Miocene age. The Nari Formation consists mainly of sandstone, siltstone and shale with subordinate limestone while the Gaj Formation consists of shale with subordinate limestone. However, the study area of the (proposed project site) under focus is Alluvial. Refer to Figure-7 for Geological map of the project site.

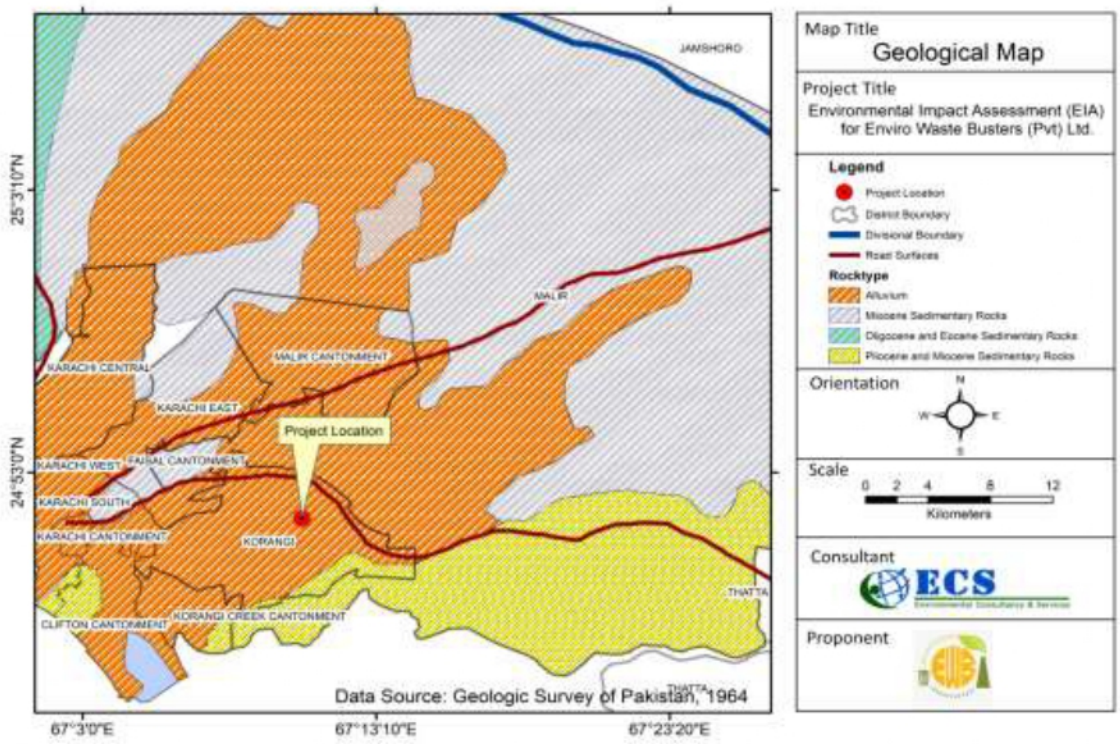


Figure 7: Geological Map of Project Site

4.3.3 Metrology and Climate

The seasons in Pakistan can be best classified as:

- Winter (from December to February)
- Summer (from April to July)
- Monsoon (from July to September)
- Post-monsoon (from September to December)

The Pakistan Meteorological Department (PMD) has a weather forecast station situated at Jinnah Internal Airport. For the preparation of climate profile, the climate data of the weather observing stations of Pakistan Meteorological Department (PMD) situated at Karachi Airport is used.

A. Climate

The proposed project is located at Survey No. 118, Sharafi Road, Near Murtaza Chowrangi-Sector 20, Korangi, Karachi. The climate of the project area is characterized as hot and dry during summer, and mild during winter with heavy, sporadic, rainfall during the monsoon. The monsoon prevails from April to October in the Proposed

Project area. The monsoon is characterized by a reversal in wind direction during the remaining months and heavy rainfall occurs over most part of the Indian Subcontinent.

B. Temperature

At Karachi Airport, Pakistan Meteorological Department (PMD) has a monitoring station, which records climatic data representing all parts of Karachi city. The ambient air temperature of this city varies from summer to winter and this change in temperature has a direct influence on the environment of the city. The hot weather during summer deteriorates the air quality and increases the ambient particulate matters due to drying of road pavements and open soil.

The maximum temperature reaches to approximately 94°F during summer and minimum temperature reaches to 55°F during winter.[9]

The hot season lasts from April 01 to July 13 with an average daily high temperature above 91°F. The hottest month of the year in Karachi is June with an average high temperature of 94°F and low temperature of 84°F.

The cold season lasts from December 17 to February 12 with an average daily high temperature below 81°F. The coldest month of the year is January with an average low temperature of 56°F and high temperature of 78°F.

Average high and low temperature of Karachi is shown in below in Figure-8.

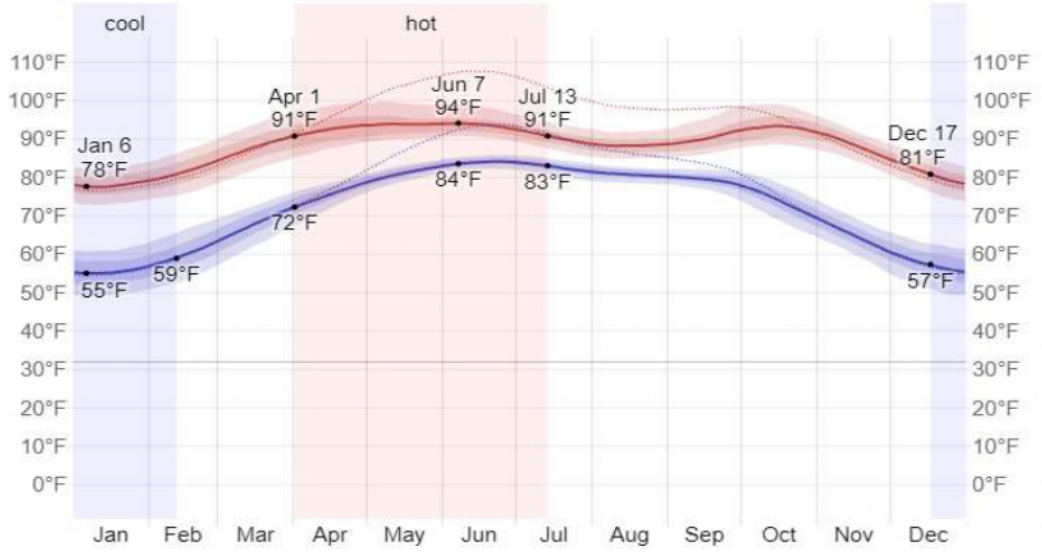


Figure 8: Average high and low temperature of Karachi

[9] https://weatherspark.com/y/106467/Average-Weather-in-Karachi-Pakistan-Year-Round%23Figures-WindSpeed

4.3.4 Rainfall Conditions

The rainy period of the year lasts for 2.7 months, from June 25 to September 15, with a sliding 31-day rainfall.

The rainless period of the year lasts for 9.3 months, from September 15 to June 25. The month with the least rain in Karachi is May, with an average rainfall of 0.0 inches. The mean monthly precipitation records for Karachi can be seen in Figure-9.



Figure 9: Precipitation Trend in Karachi

4.3.5 Relative Humidity

Karachi experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 7.8 months, from March 14 to November 8, during which time the comfort level is muggy, oppressive, or miserable at least 27% of the time. The muggiest day of the year is July 25, with muggy conditions 100% of the time. The least muggy day of the year is January 18, with muggy conditions 2% of the time.

The relative humidity typically ranges from 25% (dry) to 91% (very humid) over the course of the year, rarely dropping below 10% (very dry) and reaching as high as 100% (very humid). The air is driest around February 9, at which time the relative humidity drops below 33% (comfortable) three days out of four; it is most humid around August 2, exceeding 83% (humid) three days out of four. The mean monthly relative humidity for Karachi is shown graphically in Figure-10.

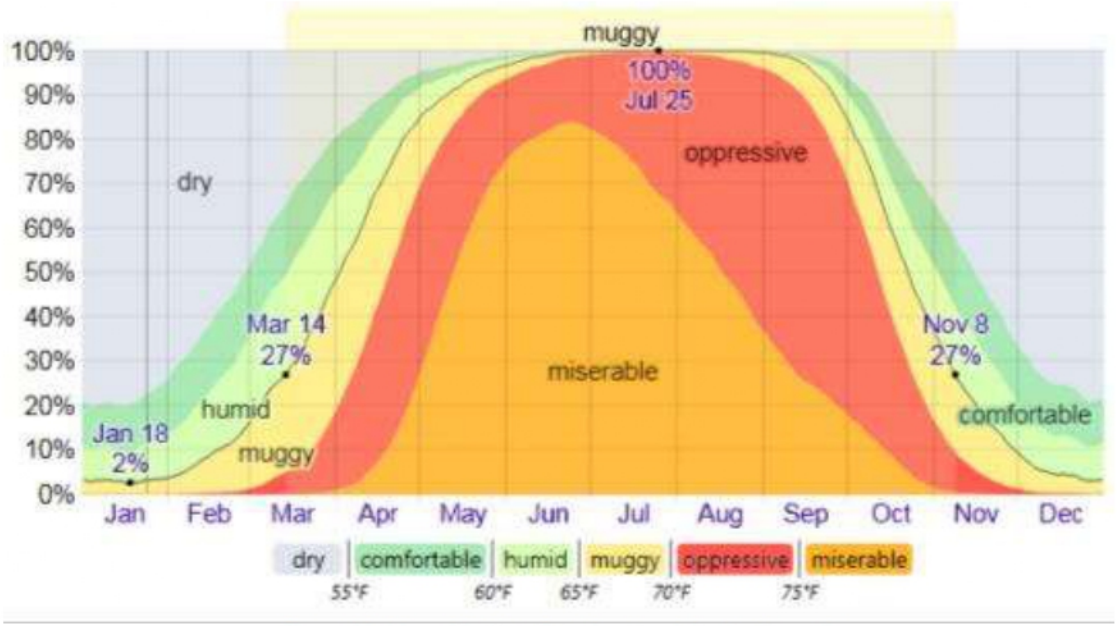


Figure 10: Mean Monthly Relative Humidity for Karachi

4.3.6 Wind Speed

Karachi weather is characterized as pleasant weather due to sea breeze movement, which blows all the year except during local disturbances which are experienced sometimes in winter and summer months. This wind has the highest velocities during the summer months, when the direction is south-west to west. Over the course of the year, typical wind speeds vary from 9.4 mph to 14.7 mph (fresh breeze).

The average hourly wind speed in Karachi experiences significant seasonal variation over the course of the year.

The windier part of the year lasts for 5.1 months, from April 14 to September 18, with average wind speeds of more than 10.8 miles per hour. The windiest month of the year in Karachi is June, with an average hourly wind speed of 14.5 miles per hour.

The calmer time of year lasts for 6.9 months, from September 18 to April 14. The calmest month of the year in Karachi is November, with an average hourly wind speed of 6.9 miles per hour.

The data on wind speed experienced in Karachi region is given in Figure 11[10]. Detail of wind speed is given in Table-3.

[10] https://weatherspark.com/y/106467/Average-Weather-in-Karachi-Pakistan-Year-Round#Figures-WindSpeed

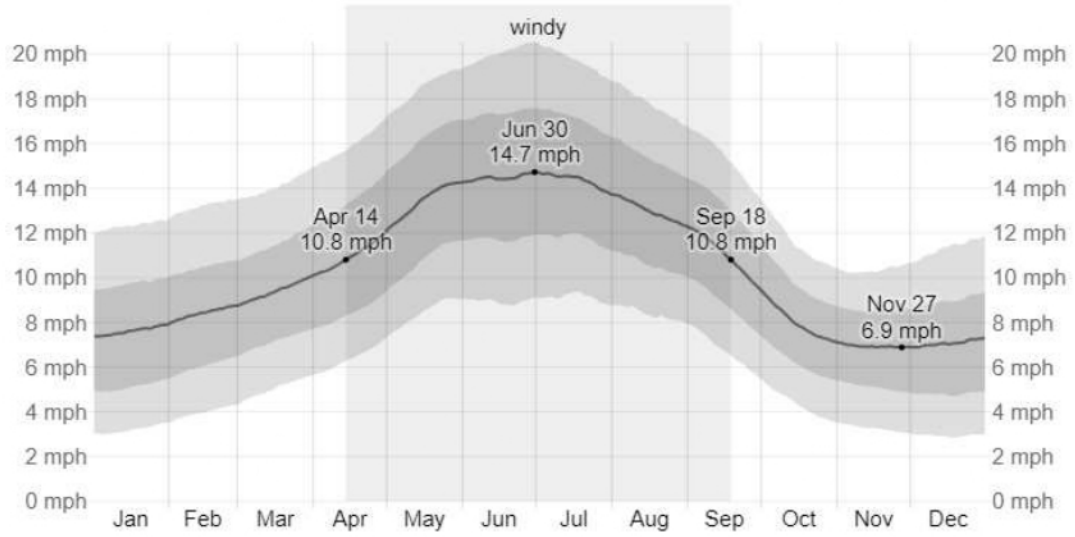


Figure 11: Average Wind Speed of Karachi Region

Table 3: Details of wind Speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed mph	7.6	8.4	9.4	10.8	13.5	14.7	14.3	13	10.8	7.9	6.9	7.1

4.3.7 Ambient Air Quality

The ambient air monitoring of the project area was conducted in the month of July, 2023 through third party SEPA approved Laboratory (i.e., M/s Imperial Environmental Research Laboratory, IERL) within the proposed project area. The ambient air quality (mean value) concentrations of parameters including SO_2, NO, NO_2, CO, O_3, $PM_{2.5}$, PM_{10}, SPM and Lead are within the prescribed limits of SEQS. Table-4 shows the results of ambient air quality; copies of lab reports are attached as **Annexure-7.**

Table 4: Ambient Air Monitoring Results

Parameters	Unit	SEQS Limit	Sharafi Road	Proposed Project Location (Result)	North of Project Location
SO_2	µg/m^3	120	8.25	8.865	10.35
NO	µg/m^3	40	12.75	15.095	16.05
NO_2	µg/m^3	80	19.22	25.25	22.6
CO	mg/m^3	10	3.61	2.085	4.05
O_3	µg/m^3	130	6.6	7.815	9.30
$PM_{2.5}$	µg/m^3	75	27.25	31.48	58.5
PM_{10}	µg/m^3	150	109.95	123.41	134
SPM	µg/m^3	500	149.9	185	198.4
Lead	µg/m^3	1.5	ND	ND	ND

4.3.8 Ambient Noise Levels

The ambient noise monitoring of the project area was conducted in the month of July, 2023 through third party SEPA approved laboratory (IERL). This shows that ambient noise levels range between 56.5-64 dB (A). The report shows that the average results fall within the permissible limits of SEQS. Table-5 shows the results of ambient noise monitoring of the project area, copy of ambient noise monitoring report is attached as **Annexure-8.**

Table 5: Ambient Noise Monitoring Results

Sr. #	Description (Proposed Location)	Method	SEQS Limit	Unit	Results
1.	West	ASTM E1503	65.0	dB (A)	59
2.	East	ASTM E1503	65.0	dB (A)	64
3.	South	ASTM E1503	65.0	dB (A)	63
4.	North	ASTM E1503	65.0	dB (A)	56.5

4.3.9 Water Resources

The city of Karachi lies in the Hub River Basin and the Malir River Basin. The MalirRiver Basin is drained by the Malir River and the Lyari River. The aquifer of Karachi is, therefore, mainly recharged by seepage from Hub River, Hub Dam as well as the Malir and the Lyari Rivers. The Hub River lies on the western frontier of Sindh and for some distance the boundary between Sindh andthe Baluchistan provinces. It located about 30 km to the west of Karachi, along the Karachi- Lasbela boundary. It falls into the Arabian Sea near Cape Monze, with a total drainage course length of 336 km.During the past several years, a number of pumping wells have been installed to meet requirements for the irrigation-water supply (to raise vegetables, fruits, dairy and poultry) and drinking-water supply forKarachi. Excessive pumping of groundwater and continuous lowering of water-table is likely to result in intrusion of seawater into the Malir Basin under natural seepage conditions and under artificially induced conditions of recharge of saline seawater in the coastal aquifer(s) of Karachi.

Recharge Sources: Five possible water-sources are contributing to the groundwater recharge in Karachi. The first possible source is rainfall. As the city of Karachi suffers from deficit of precipitation (only rainfall), the contribution to shallow groundwater storage from rain is very little. However, rainfall in the hinterlands and other areas surrounding Karachi may significantly contribute to the groundwater flow-system. The two freshwater sources are the Hub Lake/Hub Dam and the IndusRiver. Water from Hub Dam and the Indus River is piped to various residential zones in Karachi. The spring water discharges into Malir River and Lyari River and themunicipal/industrial waste effluents added to these rivers are also contributing to groundwater storage as a fourth recharge source. Seawater intrusion along Karachi coast is the fifth possible source.

4.3.10 Water Supply and Sewage system

The water supply and sewerage system are managed by Karachi Water Supply & Sewerage Board (KW&SB). The present water supply requirement of Karachi is 1100 MGD but only half of the requirement is being met by two water sources, the Indus River and Hub Dam. The details of the water supply to Karachi are given in Table-6. [11]

Table 6: Description of Water Supply Schemes for Karachi Bulk Water Supply

Sr. #	Water Supply Schemes	Rated Supply (MGD)	Actual Supply (MGD)
1.	Haleji Scheme	30	-
2.	Greater Karachi (GK) Bulk Water Supply (BWS) Scheme Stages 1-4	280	280
3.	K-2 Scheme	100	100
4.	Additional Water Supply from GK BWS	40	40
5.	K-3 Scheme	100	100
6.	Hub Dam	100	70[12]
Total		**650**	**590**

Sewage system: Sewage is gathered through RCC pipes and uncovered channels, and gathered sewerage is arranged to neighboring water bodies through rivers and Nallah's. Karachi's untreated wastewater including domestic sewage and industrial wastewater is discharged into the Lyari and Malir rivers, and finally disposed to the nearest coastal belt. According to KWSB, 417MGD untreated sewage is drained into the sea through the 232KM network of main nallah's & 1000Km network of town drains. These Nallah's mainly discharge into the two main rivers namely Malir River & Layari River, refer to Table 7 to observe the main sewerage containing bodies.[13]

[11] https://www.thenews.com.pk/print/969300-a-look-at-what-s-being-done-for-water-starved-karachi
[12] https://tribune.com.pk/story/2056804/1-perpetual-issue-leaks-system-create-water-crisis/
[13] Hyder. A presentation on the reforms in Karachi Water & Sewerage Board (KW&SB). Retrieved from http://arifhasan.org/karachi/reforms-in-kwsb-an-overview-for-civil-society

Table 7: Details of Sewerage Lines in Karachi

Major Nallah's	Major Rivers	Final Drain
Soldier Bazar Nallah	Malir River	Sea
Gujjar Nallah	Layari River	
Orangi Nallah		
Railway Station Nallah		
Nehr e Khayam		
Ferer Nallah		
Manzoor Colony Nallah		

4.3.11 Storm Water Management

Karachi has two main-perennial rivers the Malir and Lyari Rivers, crossing the thickly populated city areas before falling into Arabian sea. The natural drainage system of Karachi consists of Lyari and Malir Rivers and their tributaries of nallahs. Figure-12 shows the storm water network of Karachi.

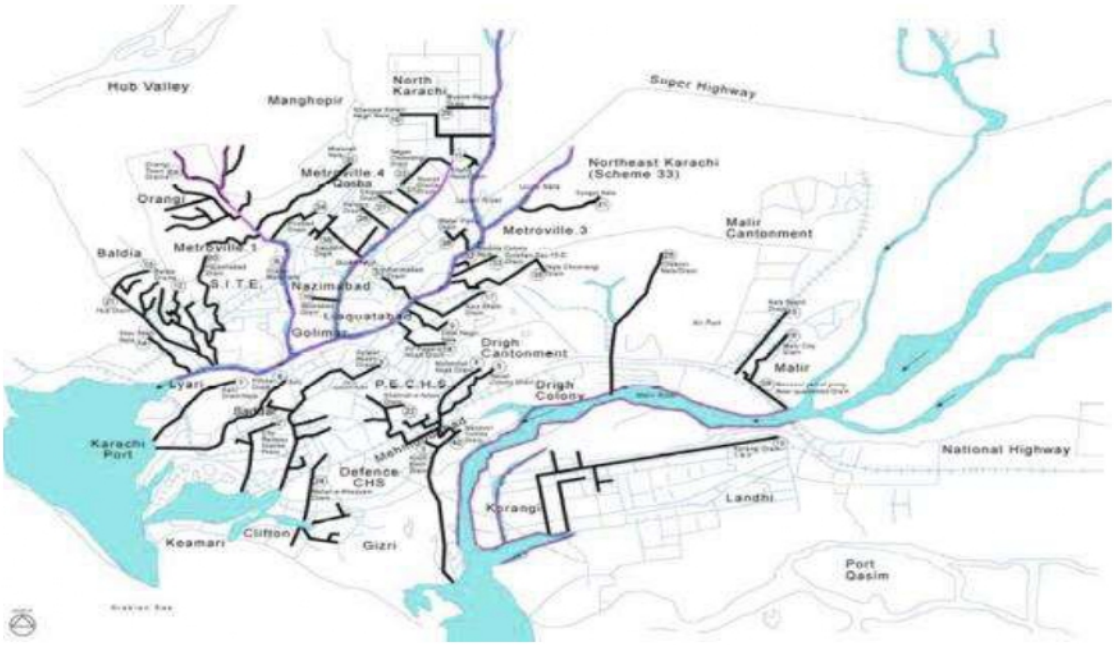


Figure 12: Storm Water Network of Karachi

4.3.12 Solid Waste Management

Approximately 16500 tons of solid waste is generated each day alone in Karachi (2022) households, trade and industrial establishment, construction activity and a variety of intuitions contribute to waste generation. The amount of solid waste is expected to substantially increase with rapid growth of population and economic activity. The quality of civic life is closely related and affected by sanitary conditions in the residential neighborhoods and other areas, where efficient collection of garbage is the key to a clean and healthy environment[14].

It is important to effectively organize primary collection of garbage i.e., from the households (within the union council) and location of origin/generations such as markets, industrial areas, hospitals, and recreational places. The city conspicuously lacks garbage transfer stations which need to be developed for better handling of the garbage and transfer to sanitary landfills.

Poor planning, inappropriate technology and poor management are obviously the main areas of concern needing serious efforts on the part of the local government and other agencies towards efficient management and modern technological development of this sector. The existing landfill sites are shown in Figure-1.

4.3.13 Disaster Risks

Pakistan straddles the boundaries between the Indo-Pakistan, Arabian and Eurasian plates, and its structure is predominantly affected by their past and present interrelationships. Two composite plates, comprising both continental and oceanic crust (Indo-Pakistan & Arabia) are separated by an intra-oceanic transform boundary, which within the Pakistan offshore area is expressed as the Murray Ridge. The Eurasian Plate is a collage of three microplates which amalgamated in Iran-Afghanistan and western Pakistan area during Cretaceous to Paleogene times (Quad Report, 1994). The most easterly of these microplates, the Afghan Block, forms a considerable part of Pakistan's northwestern edge, and is bounded by the two major transform fault systems of Herat and Chamman. The boundaries between microplates can be traced by belts of ophiolite assemblages. The Indo-Australian plate upon which Pakistan, India and Nepal lie, is continuously moving northward, colliding with and sub-ducting under the Eurasian

[14] https://www.trade.gov/country-commercial-guides/pakistan-waste-management

plate, thus forming the Himalayan mountains, and triggering earthquakes in the process. Figure-13 shows Tectonic plates configuration of Pakistan.

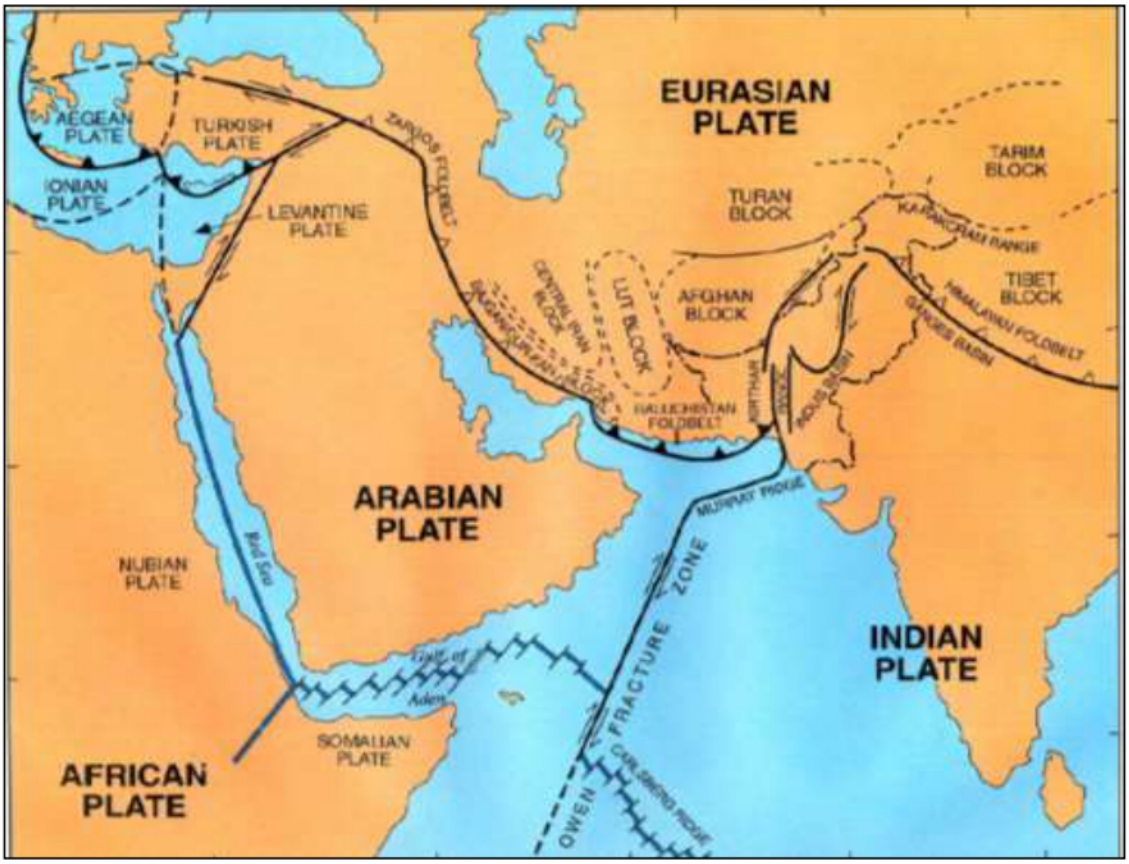


Figure 13: Tectonics Plate Configuration of Pakistan

The history reveals that: The areas comprising Pakistan have suffered four major earthquakes in the 20th century including the Quetta earthquake of 1935, the 1945 earthquake off the coast of Makran, the 1976 earthquake in the Northern areas, and the October 2005 Kashmir earthquake. In between these major events, the Northern areas and Kashmir have experienced many small quakes with localized impact. No appreciable earthquakes have been recorded in Karachi during the recent past. The proposed project lies in zone 2B which is a medium risk zone, where level of seismic activity is believed to exist, but large magnitude earthquakes are rare. The boundaries of Seismic Zones are defined below in Table 8.

Table 8: Details of Boundaries of Seismic Zone

Seismic Zone	Peak Horizontal Ground Acceleration
Zone 1	0.05 to 0.08g
Zone 2A	0.08 to 0.16g
Zone 2B	0.16 to 0.24g
Zone 3	0.24 to 0.32g
Zone 4	> 0.32g

Note: Where "g" is the acceleration due to gravity

4.4 Ecological Resources

A. Methodology Adopted

In order to compile the biodiversity in the vicinity of the proposed project location, the data and information were obtained from two sources; Primary data based on the various field surveys conducted within proposed project surrounding in the month of June and July 2023 and Secondary data from published literature.

B. Field Survey

The survey of the proposed project area was conducted by the team of consultant representatives.

C. Ecological Status

The proposed project lies in the Korangi, Karachi, which does not shelter any significant or endangered fauna species in the vicinity of proposed location and there has no evidence of flora found at the project's location too.

4.4.1 Fauna

During the survey, following common fauna species were recorded:

Species Type			
Animal	Mammals	Bird	Reptiles
Street Dog	Indian Gerbil	Grey Quail	Lizard
Cat	Five Striped Palm Squirrel	Blue Rock Pigeon	
Cow		Indian Myna	

		Rose Ringed Parakeet
		Crow
		Common Babbler

4.4.2 Flora

Since, the proposed project is in Korangi, Karachi. During survey, common flora species were recorded within the vicinity of project which include Conocarpus, Ficrus Religiosa (pepul), Palm tree, Azadirachta Indica (Neem) and other indigenous species.

4.5 Social Environment

4.5.1 Demographics and Surroundings

Korangi District is one of the seven administrative districts of Karachi. The population of Karachi is increasing exponentially which is coupled by the effect of rural population migration to urban center for more livelihood opportunities. The city credits its growth to the mixed populations of economic and political migrants and refugees from different national, provincial, linguistic and religious origins largely come to settle here permanently. Figure-14 shows the Korangi map.



Figure 14: Korangi Karachi Map

The proposed Project site is in Korangi, Karachi. The immediate vicinity of the proposed project site includes the warehouse in the west and south and open land and plantation in north and east. The nearby areas are Classic Denim, Fazle Textile, Mills, Sharafi Goth, Main Korangi Industrial Area Road, K-Electric East Grid Station, Murtaza Chowrangi, Korangi Link Road.

4.5.2 Livelihood and Human Settlements

The livelihood of the people in the project area is mostly dependent on small scale business activities, private and government jobs, however lower-class people earn

their living by working as a laborer at local's shops and factories. Landhi and Korangi Industrial area both are considered as opportunity ground for employment as a various of industrial units are located and are operational in those areas. The middle-class population mostly prefers jobs and are already employed on officer level positions within the already existing industrial units of the area, while on the other hand the lower-class people are mostly unskilled with limited education therefore they prefer to be engaged as laborer within the existing industrial units of the project area surrounding. The proposed project area sustains several medium and large sized industrial units. Unfortunately, due to inefficiency of local governments with passage of time a number of Katchi Abadi were developed within the proposed project surrounding which is located near the industrial area.

Chapter 5: Stakeholder Consultation

5.1 Background Information

The main objective of consultation is to disseminate information about the project and its anticipated impact on the primary and secondary stakeholders. Stakeholder consultation with local community and government departments is a mean of involving all primary and secondary stakeholders in the Project's decision-making process in order to address their concerns, improve project design and give project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of project sustainability.

The public consultation and participation serve, as an effective tool for social interaction. This tool helps to develop significant confidence between the stakeholders and the proponent of the proposed project M/s Enviro Waste Busters Private Limited to minimize the anticipated environmental and social impacts of the project.

Primary stakeholders are usually referred to those, who may be directly affected by the proposed project's activities; while on the other hand secondary stakeholders refers to those who are usually affected indirectly, or they have power to make decisions at governmental or institutional level. Detailed, limited stakeholder consultation meetings are carried out with different stakeholders.

The most important objective of these consultations is to determine the extent of the impact of proposed project activities and suggest appropriate mitigation measures accordingly. This section of EIA clearly describes the issues raised by the stakeholders during different consultation meetings conducted specifically for this assignment, informal and focused group discussions with the primary and secondary stakeholders are carried out which was primarily focused on determining the perceptions of the following key stakeholders:

- Local Communities
- Key Stakeholders of Surrounding Areas
- Governmental Departments

The overall objectives of the process are identified as follows:

- To inform and acquire feedback from primary and secondary stakeholders on proposed project activities.
- To identify potential issues and mitigation measures.

- To incorporate stakeholders concerns in the project documents.
- To identify the negative impacts due to the project execution.

Following stakeholders approached for consultation meetings during this EIA study.

Primary Stakeholders.

- Hi-Tech Engineering
- M&E Engineering Works
- Nearby Community
- Farmers in the nearby Area
- Imam-e-Masjid

Secondary Stakeholders.

- Sindh Environmental Protection Agency (SEPA)
- Sindh Health Care Commission
- Sindh Solid Waste Management Board
- Karachi Municipal Corporation (KMC)

5.2 Stakeholder Consultation Outcomes/Findings

Consultation outcomes have been discussed in the following sub sections.

5.2.1 Feedback by Primary Stakeholders

The comments, concerns and recommendations received from stakeholders during the primary stakeholder consultation have been included in this section. The comments gathered from stakeholder consultation were helpful in the screening of potential environmental and social aspects of the project. The stakeholder consultation was done in the month of June and July, 2023. Figure-15 shows the primary stakeholders' consultations.

- The primary stakeholders expressed their positive views regarding the proposed project and told that new developments like these will attract more industrialists in the area and will create jobs.
- The neighboring industries supported the project and expressed that it will resolve hazardous waste management issues of the surrounding industries.
- Air pollution control must be taken into consideration.

- It was discussed that the project executer should ensure proper waste management system is in place to effectively manage the waste that is to/will be treated in the proposed incinerator.
- State of the art HSE and Fire protection system must be adopted to cope with some unexpected situations and emergencies.
- Nearby communities have people from different communities including Baloch, Pathan, and Sindhi. However, Baloch's are found to be in the majority.
- Project executers were requested to prefer the local people for labor jobs.











Figure 15: Pictorial View of Consultation with Primary Stakeholders

5.2.2 Views, Opinions and Recommendations of Secondary Stakeholders / Government Departments

The recommendations received from secondary stakeholder consultation have been provided in this section, the stakeholder consultation was done in the month of July, 2023.

- It was discussed that the project executers must provide transparent information about the type of waste that will be treated in the proposed incinerator.
- The air pollution control system must be taken into consideration.
- Installation of boundary wall of appropriate height was suggested for better security and to protect the nearby area from the foul odor of waste.
- They suggested disposing of incinerated ash and residue to approved landfill sites through proper transportation.
- It was suggested that medical waste should be disposed off to incinerator plant immediately to avoid interim storage and bacterial growth.
- Hospital waste should be stored properly in temperature-controlled storage areas.
- The disposal of ash from the proposed incineration units should be assessed by the developer before its disposal to the landfill sites.
- The incineration plants are useful because of the overgrowing generation of waste from hospitals, clinics, and industries.

During the process of stakeholder consultation, recommendations of the following stakeholders were obtained and documented. Figures 16-19 show the stakeholder consultations with Government Departments.



Figure 16: Stakeholder Consultation with Sindh EPA



Figure 17: Stakeholder Consultation with SSWMB



Figure 18: Stakeholder Consultation with Sindh HealthCare Commission



Figure 19: Stakeholder Consultation with DMC Korangi

Chapter 6: Project Alternatives

6.1 Background Information

Analysis of alternatives as it is an integral part of the EIA process to select the best option among the entire possible project options related to project site, technology, and design. After careful examination and experts' judgment rationale for project site and technology selection was developed and discussed in the below section.

6.1.1 Rationale for Site Selection

The basic purpose of the proposed WMF is to provide support to waste management system in the city. Karachi city produces the most waste in the country, yet the city lacks proper incineration facilities at government level, therefore the installation of incineration units to treat the medical and industrial waste is a necessity. During the operational phase, some amount of fugitive emissions is always expected, thus the incineration unit is expected to be built in an area which is thinly populated, meanwhile, consisting of efficient technology to prevent the release of emissions during its operational phase.

Additionally, site for proposed incineration units is better than the other available option as the modeling study of air dispersion predicted that the ambient air levels of the selected criteria pollutants (CO, SO_2, NOx, and PM_{10}) would be in compliance with the SEQS limits when plant would be in operational phase subject the present emission rates, stack design, metrological and topographic condition in/around the project site within the modeling domain.

6.1.2 Rationale for technology selection

Due to strict environmental regulation for medical and industrial waste management mainly because of adverse health and environmental impacts associated with medical and industrial waste a number of technologies are adopted globally to treat medical/hazardous waste prior to its final disposal with minimum effects on public health and environment. In this case among all possible options incineration is the best possible option for treatment of hospital waste in the project surrounding refers to Table-9 to observe advantages VS disadvantages of available hospital/hazardous waste treatment options.

Table 9: Advantages VS Disadvantages of Available Hospital/Hazardous Waste Treatment Options

S No.	Treatment Option	Advantages	Disadvantages
1.	Pyro lytic incineration /two-stage incineration with efficient gas cleaning.	Very high disinfection efficiency. Adequate for all infectious waste and most pharmaceutical and chemical waste.	Incineration temperature above 800°C, expected outcomes after and during incineration process. - Air emissions. - Fly ashes. - Bottom ashes.
2.	Single chamber incineration with dust reduction	- Good disinfection efficiency and waste volume reduction - Residues will be disposed off in a land fill; no need for highly qualified operators; relatively low investment and operation costs.	- Significant concentration of air pollutants/emissions into the environment. - Periodic accumulation of slag and soot particles. - Inefficient in destruction of thermally resistant chemicals and drugs such as cytotoxic.
3.	Drum or brick incinerator	- Waste volume reduction. - Residues may be disposed off in a landfill; no need for highly qualified operators; very low investment and operating costs.	- Significant air emissions of black smoke, fly ash and toxic flue gas - Exception only for disposal of infectious waste under certain circumstances outside urban areas

4.	Chemical disinfection	- Efficient disinfection under good operating conditions with special waste.	- Costly if the chemical disinfectants are expensive. - Requirement of highly qualified technicians for operation of the process; use of hazardous substances which require comprehensive safety measures. - Inadequate for pharmaceutical, chemical and most types of infectious waste (mixed solid waste).
5.	Microwave irradiation	- Good disinfection efficiency under appropriate operational conditions; environmentally sound.	- High investment and operation costs; potential operation and maintenance problems. - Only for wet infectious waste or for infectious waste with a high water content.
7.	Shredding and Disinfect/ Autoclave wet-thermal treatment,	- Environmentally sound; relatively low investment and operation costs. - Good for infectious and microbiological wastes. - Immediate treating of hospital waste without any transportation to faraway of hospital site for treating.	- Shredders may be subjected to breakdowns and may require qualified technicians; - Inadequate for chemical waste or waste which is not easily penetrable by steam (post shredding type)

- Low volume of residues
  up to 90%

Based on thorough literature review, review of available technologies, options for medical and industrial waste disposal and environmental experts' judgment the finest possible option for treatment of medical and industrial waste is incineration covering following key advantages in terms of environmental sustainability.

- Insignificant impact and disturbance onto the existing land use patterns.
- Very high disinfection efficiency.
- Adequate for all infectious waste and most pharmaceutical and chemical waste.
- Conversion of hazardous waste into inert and non-pathogenic waste.

Chapter 7: Potential Environmental Impacts and Mitigation Measures

7.1 Background Information

This section discusses the potential environmental and social impacts of the proposed project activities associated with construction and operational phase, additionally, this section of the report predicts the magnitude of the impact, assess its significance, recommends mitigation measures to minimize adverse impacts, and identifies the residual impacts of the proposed project.

The possible construction phase impacts on the environment from various activities at the proposed project can be categorized as follows:

- Topography and Land use pattern
- Site Aesthetics
- Air Emissions
- Noise Levels
- Water Quality
- Soil Quality
- Ecology
- Health and Safety
- Solid waste disposal

The possible operational phase impacts on the environment from various activities at the proposed project can be categorized as follows:

- Topography and Land use pattern
- Site Aesthetics
- Air Emissions
- Noise Levels
- Water Quality
- Ecology
- Health and Safety
- Road Safety & Traffic
- Livelihood and Economy
- Solid Waste Disposal

Potential construction phase and operational phase impacts from the various activities at proposed project were identified by thorough review of the project activities, study of surrounding environment, review of literature, review of previous similar studies and experts' judgment.

The identification and assessment of environmental impacts is based on the local and international guidelines as discussed previously in the section of legislative requirements of this EIA document, which was supplemented by review of project activities, experts' judgment study of surrounding environment, review of literature and review of previous similar studies. The assessment procedure includes following steps:

A. Prediction of the Potential Environmental and Social Impacts

This step refers to the description, quantitatively (where possible) or qualitatively impacts of the proposed project. This may be achieved through comparison with other similar activities.

i Definition of the Criteria for Determining Significance

The consequence of the proposed activity is evaluated by comparing it against a recognized Significance Criteria. The criteria are of the following types:

- Institutional recognition laws, standards, government policies, or plans
- Technical recognition guidelines, scientific or technical knowledge, or judgment of recognized resource persons
- Public recognition social or cultural values or opinion of a segment of the public, especially the community directly affected by the proposed project
- Professional interpretation of the evaluator

ii Identification of the mitigation measures

If it is determined that the predicted impacts are significant then the suitable mitigation measures are identified. There is a range of mitigation measures that can be applied to reduce impacts. Broadly, these measures can be classified into four categories:

- Avoiding the impacts altogether by not taking certain proposed activities or parts of an activity, for example, using chlorofluorocarbons (CFC) -free equipment to avoid impact on ozone layer
- Minimizing impacts by limiting the degree or magnitude of the activities, for example, minimizing dust emission by reducing vehicle speed
- Rectifying the impacts by repairing, rehabilitating, or restoring the affected environment
- Compensating for the impacts by replacing or providing substitute resources or environments

iii Evaluation of the Residual Impacts

Incorporation of the suggested mitigation measures reduces the adverse impacts of the proposed project and brings it within the acceptable limits. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied.

A. Identification of the monitoring requirements

The last step in the assessment process is the identification of the minimum monitoring requirements. The scope and frequency of the monitoring depends on the residual impacts, and its details are later addressed in Chapter 8; Environmental Management and Monitoring Plan (EMMP) of this EIA document. The purpose of monitoring is to confirm that the impacts are within the predicted limits and to provide timely information if unacceptable impacts are taking place.

7.2 Construction Phase Impacts

7.2.1 Topography and Land use

Potential Impacts

The activities associated with construction phase, may result in changes in topography no major impacts onto the existing land use pattern is envisaged at proposed project location. However small-scale excavations, leveling and grading may result in micro topographical changes at project site. Further, in case of residual construction material such as cement and or ready mix if not handled properly and left unattended it may result information of uneven structures referred to as heaps. The impact on the topography is expected to be insignificant.

Criteria for Determining the Significance

An adverse impact will be interpreted if surface topography is modified and an adverse impact onto the surface topography of project site will be interpreted if the fact is established that the topographic elevation of project site is modified, and prominent heaps are observed.

Mitigation measures

- Proper site leveling should be ensured, in order to minimize the probability of topographic changes at and project site.
- The cutting and leveling activities within the site will be controlled as required for the proposed project.

- Ensure that construction material such as cement and or ready mix is handled properly, and no residual material is left unattended so as to avoid the probability of formation of heaps and uneven structures.

Residual Impacts

If the suggested mitigation measures are implemented, disturbance to the surface topography will be minimized.

Monitoring Requirements

Surface topography will be monitored during construction phase by an Independent Environmental Monitoring Consultant (IEMC).

7.2.2 Site Aesthetics

Potential Impact

If construction residuals are not well managed and or shifted and not disposed off at a designated area, it may affect the site aesthetics. Furthermore, the construction activities will generate solid waste, if the waste is scattered and not handled properly and left unattended it will result in adverse visual aesthetics at the proposed project site.

Criteria for Determining the Significance

Adverse, unpleasant, and unaesthetic conditions may be developed if construction residuals and waste left unattended.

Mitigation measures

- A designated area will be allocated for storage of the construction residual and associated waste material, prior to its final disposal.
- Ensure that construction material such as cement and or ready mix is handled properly, and no residual material is left unattended so as to avoid the probability of formation of heaps and uneven structures.
- It is recommended that green belts will be developed in and around the proposed project site, while considering plantation of native species.
- Proper site-specific housekeeping is to be ensured during construction activities.

Residual Impacts

Implementation of the mitigation measures will not leave long-term residual impacts.

Monitoring Requirements

Periodic visual inspections will be carried out as part of the Environmental Management Plan (EMP) to ensure good site aesthetics.

- Proper housekeeping
- Visual Assessment
- Waste Storage Practices

7.2.3 Ambient Air Quality

Potential Impact

The proposed project will include small scale construction activities which may affect the ambient air quality on temporary basis. Ambient air quality may be altered typically by use of construction machinery, equipments and vehicles if the items discussed are not tuned properly also untrained drivers of heavy vehicles as well as improper storage of stockpiles and raw material to be used may contribute in dust dispersion within the project vicinity which may cause impairment of human health which includes chronic respiratory diseases.

Criteria for Determining the Significance

An adverse impact will be interpreted if the ambient air quality at the proposed project location exceeds the prescribed SEQS limits.

Mitigation measures

- Use of standard construction equipments and vehicles
- Scheduled maintenance of equipments and vehicles including engine tuning, filter cleaning, etc.
- Water spraying will be done to reduce dust emissions.
- The vehicles speed on graded roads will be limited in order to minimize dust emissions.

Residual Impacts

Ambient air quality is likely to be altered during the construction phase.

Monitoring Requirements

Ambient air quality monitoring includes critical pollutants such as SOx, NOx, PM_{10} and CO to be conducted by engaging Independent Environmental Monitoring Consultant (IEMC). The monitoring reports to be submitted quarterly to EPA-Sindh, providing compliance status with applicable regulations.

7.2.4 Noise

Potential Impact

Noise related nuisance is a characteristic feature of construction stage. Machinery that will be used during construction phase is likely to generate elevated levels of noise which may cause negative health effects on the workers and to those who are exposed to it such as stress, hypertension, headaches and even hearing loss. However, it is important to note that the major construction activities are expected to be carried out during the daytime.

Criteria for Determining the Significance

An adverse impact will be interpreted, if the noise level within the close proximity of the proposed project construction sites exceeds the SEQS limits.

Mitigation Measures

- All construction vehicles, machineries and equipments to be installed with suitable silencers.
- Project construction zone will be barricaded, and proper sign boards will be displayed.
- Unauthorized personnel will not be allowed to access construction zone.
- Onsite workers associated with construction activities will be provided with adequate 'personal protective equipments' (PPEs) to reduce their probability of high noise exposure.
- The construction activities will be scheduled / planned in such a way as to prevent high noise activities during night times and simultaneous operation of multiple high noise equipments will be avoided to the extent feasible.

Residual Impact

Strict implementation of the mitigation measures will not leave any long-term residual impact; however, the minimal level of noise is still expected from proposed project activities.

Monitoring Requirements

During construction phase periodic noise level monitoring will be carried out as prescribed in SEQS, by an IEMC. The ambient noise levels and noise emission from equipments and machineries will also be monitored.

7.2.5 Water Quality

Potential Impact

Use of water during construction phase will be minimal. Wastewater will be generated in form of domestic during the construction activities. This water will be in limited amounts and will be routed into the soak pit. Supervision of construction site will be done in a way that no stagnant water pools or puddles remain for longer period as they will serve as breeding grounds for mosquitoes.

Criteria for Determining the Significance

A significant impact on the water quality will be interpreted if improper discharge of construction material onsite causes nuisance and may result in stagnant water and ground water quality degrades and deviates from the existing baseline.

Mitigation measures

- Avoid excessive use of water for water conservation.
- Avoid mixing of water with waste generated during construction.
- Avoid dumping of construction waste in any water channel or nallah around proposed facility.
- Regular check and maintenance of vehicles and machineries to avoid spills.

Residual Impacts

Residual impacts are foreseen to be negligible/low in this case if adhered to the recommended mitigation measures.

Monitoring Requirements

Visual inspection and proper implementation of mitigation measures will be ensured.

7.2.6 Soil Quality

Potential Impact

Since the proposed project will be developed on a vacant plot, hence very minimum excavation will be required, which may result in soil erosion, not only this but leakage and spillage of construction material and or leakages from construction machineries may also result in soil contamination.

Criteria for Determining the Significance

The adverse impact onto the site soil will be interpreted in case if it is contaminated by spillage of construction material.

Mitigation Measures

- Careful use of heavy machineries and equipments should be ensured in order to prevent leakages which may result in release of contaminants directly onto the soil.
- Ensure that malfunctioning machineries should be kept away from exposed soil area and should be repaired on immediate basis at designated workshops having impermeable floors.
- A spill prevention response team will be available throughout the construction phase.

Residual Impacts

Residual impacts will be negligible/low if adhered to recommended mitigation measures.

Monitoring Requirement

Visual inspections will be carried out by site supervisor to ensure that the soil within the project surrounding is not being contaminated during the project activities.

7.2.7 Ecology

Potential Impact

Since most flora and fauna recorded or reported within study area are disturbance tolerant and are dwellers of typical urban setting, hence no significant impact is envisaged.

7.2.8 Health and Safety

Potential Impact

Construction phase activities may result in severe health and safety hazards and health conditions. It is important to note that the untrained workers may cause harm to themselves as well as others due to lack of awareness and skills.

Criteria for Determining the Significance

A significant impact will be interpreted if a large number of frequent accidents, incidents, injuries and hazards occur at proposed project site.

Mitigation Measures

The contractor will ensure that activities at the site will not cause damage to lives and properties by implementing the following measures to ensure the health and safety of workers and the public.

- Only skilled workers will be allowed to work at the construction sites.
- Provision of first aid facilities for workers at site to meet the emergency needs of workers.
- Emergency response training should be given to employees and evacuation drills should be scheduled and conducted.
- Ensure that hazards associated with manual lifting are controlled with proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.
- Unauthorized personnel will not be allowed to access the proposed project site without permission and safety permits.
- Arrangement of proper first aid unit and emergency vehicle will be done to take affected personnel to the nearest medical facility.
- Workers should be facilitated by providing appropriate work specific PPE's.
- Construction area will be fenced to avoid accidents and will be properly drained to avoid stagnant water that could harbor mosquitoes and other disease vectors.
- Accidents record will be maintained.
- Use of signage must be implemented.
- The EWBPL management must ensure implementation of proper Safety policy at project location so as to reduce the chances of occurrence of frequent hazards.

Residual Impacts

Residual impacts are seen to be negligible/low in this case if recommended mitigation measures are implemented.

Monitoring Requirements

Risk assessment to be carried out on Bi-monthly basis by engaging Independent Environmental Monitoring Consultant.

7.2.9 Solid Waste Disposal

Potential Impact

Main solid waste generation during construction phase will be construction debris like rubble, excess construction materials, steel scrap, wooden scrap, sand, gravel, lubricating oils and chemicals etc. If the waste disposed off improperly can pose a health hazard; pollute soil, surface and ground water. The majority of the construction material will be used, and the waste generated as a result of construction activity will be inherently less reactive and chemically inert under normal conditions. However, its handling and storage may pose adverse impacts of minor nature which could easily be controlled by implementing the recommended mitigation measures.

Criteria for Determining the Significance

A significant impact will be interpreted if the construction waste is scattered and dispersed at the project site and its surroundings.

Mitigations Measures

A waste management plan will be developed by the contractor after approval of EWBPL's management before the start of the construction activities. Key elements for the waste management system will be the following:

- Separate bins will be placed for different types of wastes - plastic, paper, metal, glass, wood, and cotton.
- Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling.
- No waste will be dumped at any location outside the proposed site boundary.
- All hazardous waste will be separated from other wastes. Hazardous waste will be stored in designated areas with restricted access and proper marking. Hazardous waste will be disposed off through SEPA approved contractor.
- Surplus construction material including partially filled chemical and paint containers will be returned to suppliers. Inert construction waste will be sold as scrap to contractors.
- Record of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- Training will be provided to workers for identification, segregation, and management of waste.

Residual Impacts

Proper implementation of the mitigation measures will ensure that the residual impact from waste is minimal.

Monitoring Requirements

An IEMC will carry out monthly visual inspections to ensure good solid waste management practices at the proposed project site.

7.3 Operational Phase Impacts

7.3.1 Topography and Land use

Potential impact

Since all the activities for development of proposed WMF are limited to construction phase only, hence no impact on to the topography and land use pattern is envisaged during the operational phase of the proposed project.

7.3.2 Site Aesthetics

Potential Impact

If proper housekeeping practices are not adopted during the operational phase and the items to be utilized are scattered at all places within and around the proposed WMF, it may create adverse effects onto the existing site aesthetics.

Criteria for Determining the Impacts

Incase if the items to be utilized during operational phase are scattered within and around the proposed WMF, may pose adverse impacts.

Mitigation Measures

- It is strongly recommended to keep all the items to be utilized during operational phase at a designated area, those areas should be properly marked and for its effective utilization and purpose for example, hazardous/medical and industrial waste shall only be stored in controlled temperature, chemical drums and maintenance material etc. shall only be placed in warehouse and so on.

- Strong administrative controls and a management system should be in place and implemented during the entire life cycle of the proposed project to avoid the chances of adverse aesthetic impact at the project site.

Residual Impact

Strict implementation of the suggested mitigation measures will significantly reduce the chances of any residual impact; however, weak administrative control may exhibit and enhance the quantum of the impact discussed above.

Monitoring Requirements

Periodic visual inspections and housekeeping audit should be carried out by engaging a third party Independent Environmental Monitoring Consultant (IEMC) to monitor housekeeping practices at the proposed project site.

7.3.3 Air Quality

Potential impacts

During operational phase, following would be the potential air pollution sources; incineration units, backup generators, waste transportation vehicles, fugitive emissions from diesel storage area and incineration ash, following ambient air pollutants are likely to disperse in ambient environment; Oxides of Nitrogen, Oxides of Sulphur (SOx), Carbon Monoxide (CO), Particulate Matter PM_{10} incase if proper pollution abatement technologies and methods are not adopted. Furthermore, it is important to note that incineration units are installed with an air pollution control system which will significantly reduce air emissions levels in the project area. Additionally, the detailed Air Dispersion Modeling (ADM) is conducted to identify and predict stack emissions concentration within the project surrounding areas. The model revealed that the stack emissions during project operations will remain within the permissible limits as defined in SEQS. The ADM findings are attached as **Annexure-9**.

Criteria for Determining the Significance

Adverse impacts will be interpreted if the proposed facility exceeds the maximum permissible SEQS limits for gaseous emissions and air emissions. Also, if the fact is established on scientific grounds that the ambient air quality is degraded or affected by proposed project operations then the significant impact on ambient air quality will be interpreted.

Mitigation Measures

- All the possible ambient air pollution sources shall be installed with appropriate air pollution abatement technologies.
- Pollution abatement equipment to be utilized for proposed incineration units. A combination of APC devices (with capacity to remove 95% to 99% pollutants) would be utilized as part of the mitigation measures to safeguard against non-compliant chlorinated dioxin concentrations. This combination would be a specially designed wet scrubbing system.
- A specially designed wet scrubbing system with fitted incineration units should be frequently checked and replaced once it expires and completes the life span to avoid chances of ambient air pollution in the project surrounding.
- The air to fuel ratio of incinerators and generators should be maintained at all times.
- Diesel storage facilities should be inspected for any leakages and if a leakage is identified it should be immediately repaired to avoid fugitive emissions from the source.
- Discourage the idling of vehicles i.e., vehicles and equipment will be turned off when not in direct use to reduce exhaust emissions.
- Discarded or broken medical equipment such as mercury thermometers, sphygmomanometers, blood pressure devices, dilation and feeding tubes will not be incinerated at any time to avoid chances of dioxins and furans emissions.
- Stack will have sampling points consisting of sampling port-hole, platform and access ladder, to monitor the emission levels.

Residual Impacts

Strict implementation of the mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

Periodic ambient air quality monitoring as prescribed in SEQS shall be carried out during the entire life cycle of the proposed project by engaging Independent Environmental Monitoring Consultant (IEMC).

7.3.4 Noise

Potential Impacts

The proposed project will include a number of noise sources, which will have potential adverse impacts on the workplace and ambient noise levels. The noise normally occurring inside rooms is often referred to as "background noise." The continuous exposure to the elevated levels of noise may result in, headaches, hearing problems and even loss in severe conditions, anxiety, and accumulation of stress hormones and hypertension. All these health conditions may affect the overall health of the exposed workers and laborers associated with the proposed project.

Criteria for Determining the Significance

An adverse impact will be interpreted if the noise level exceeds the prescribed SEQS limits.

Mitigations Measures

- Ensure proper maintenance of all the equipment which will be utilized during operational phase throughout the entire life cycle of the proposed project to reduce the chances of elevated noise levels.
- Provide barriers by using appropriate noise reduction material such as; UPVC walls around site boundaries to provide some buffer against noise propagation.
- Proper signboards indicating noise area shall be installed at all areas within the proposed WMF.
- Workers to be provided with ear plugs and earmuffs at high noise areas and unauthorized personnel shall not be allowed to enter high noise area at all times.
- Authorized personnel should seek and obtain work permits before entering the noisy area.

Residual Impacts

Strict implementation of mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

During the operational phase of WMF, periodic noise level monitoring will be carried out as prescribed in SEQS, through SEPA approved laboratory. The ambient noise levels and noise emission from equipment and machinery will also be monitored.

7.3.5 Water Quality

Potential Impact

As discussed earlier in the environmental baseline section there are no prominent surface water resources at project site, however the main sources of water supply to the project area includes water supply line and water tanker. Primarily domestic wastewater will be generated during operational phase. The wastewater may be a potential source of pollution to groundwater.

Criteria for Determining the Significance

A significant impact will be interpreted if the discharge effluent water does not meet the prescribed SEQS limits or exceeds the limits.

Mitigations Measures

- Ensure that sewage water shall be treated properly at the site by wastewater treatment system and ensure that there will be proper soakage pits with porous walled chamber that allow water to slowly soak after the effluent is pre-settled in septic tanks.
- Effluent sewers shall be periodically cleaned and inspected for integrity in order to ensure effective transport of effluents and prevent overflows and leakages and infiltration.
- Wastewater from all sections of the facility shall be routed to a wastewater treatment system, also ensure that the project site have provision of adequate soakage pits; those shall be designed and engineered properly.
- Utilization of sand and fine gravel shall be made mandatory in pits which should be spread across the bottom of pit to help disperse the flow. Depth should not be less than 1.5 meters above the ground water table, the pits shall be designed in a way which allows percolation through soil from the soak pits, and small particles shall be filtered out by soil matrix allow organic material to be digested/degraded by microorganisms.

Residual Impacts

Strict implementation of the mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

Treated water from the Sewage Treatment System shall be periodically monitored for relevant parameters to assess compliance with SEQS. Periodic monitoring shall be conducted through SEPA approved laboratory, monitoring reports will be submitted to SEPA as required and to assess implementation of the control measures and results of monitoring to be reviewed and corrective actions to be taken for any deviations.

7.3.6 Ecology

Potential Impact

As described in ecological baseline the proposed WMF will be located in Korangi, Karachi, which does not shelter any significant or endangered fauna species and there has no evidence of flora found at the project's location too.

Additionally, it is important to note that once the medical and industrial waste is incinerated the process will produce ash as a final product which if stored improperly before disposal in an open environment may disperse in the ambient environment and ultimately ash particles may settle onto the plant's life which may affect the process of transpiration, and which ultimately may affect existing project area's life. During the process of ash transportation if the ash is transported in an uncovered vehicle there are significant chances of its dispersion. Accidental spills may also affect the existing plant species in the project area.

Criteria for Determining the Significance

An adverse impact will be interpreted if any physical damage is observed to the existing species in the project area and if the fact is established on scientific grounds that the damage has been caused by project operations.

Mitigations Measures

- Incineration ash will be controlled at source and stored in bags for a short time in covered area to avoid its dispersion in ambient environment.
- The anticipated impacts on to the existing species nearby the project area are invisible in the short run, while the accumulation of incineration ash particles onto the existing species may exhibit the devastating impacts onto the survival rate in the long run, therefore it is strongly recommended to observe the survival rate of the existing species on quarterly basis and in case if it is declining the species should be replanted by ratio of 1:5 by the help of local communities.

Residual Impacts

Strict implementation of mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

During operational phase periodic ecological monitoring will be carried out.

7.3.7 Health and safety

Potential Impact

During the operational phase a number of equipment and systems would be working which include incineration units, generators, etc. in parallel to that a number of technical and non-technical personnel would also work at the proposed WMF which may include routine office working, repairs and maintenance and incinerator operations, safety and security provision, loading and unloading of medical and industrial waste and incineration ash etc. Therefore, a number of health and safety hazards are envisaged incase if proper Standard Operating Procedures (SOPs) for machinery and equipment operations, Material Safety Data Sheets (MSDS) for chemical handling and storage, protocols for operations monitoring and inspections and adequate health, safety and environmental risk assessment systems, tools and personnel are not in place. Incase if the HSE systems are not in place project operations may not only harm the workers but the local communities may also be affected by project operations.

Criteria for Determining the Significance

Significant impacts will be interpreted if a large number of fires, explosions, frequent accidents, incidents, injuries and hazards are reported at proposed project site and if the fact is established on scientific grounds that the nearby settlements are affected by project operations in terms of health and safety.

Mitigation Measures

- It is strongly recommended that a proper HSE management system and team should be available at project site at all times on rotational basis during the entire life cycle at the proposed WMF.
- Ensure that all areas of the proposed WMF shall be properly marked and labeled by adequate safety sign boards; these boards shall display hazard type, nature and quick remediation in case of its occurrence. All the sign boards shall be displayed in English, Urdu, and Sindhi language.

- HSE staff shall make sure that all the hazards that are likely to occur at project site should be clearly identified and a proper risk assessment matrix along with its mitigation and controls are in place and communicated to all the workers via toolbox talk.
- Toolbox talk shall be made mandatory on a regular basis and all the workers should be trained for all the possible hazards at project site.
- Ensure that adequate firefighting systems are in place and frequent mock drills shall be carried out to enhance the emergency preparedness and response skill of the workers.
- Ensure proper maintenance of firefighting system during the entire life cycle at the proposed WMF.
- All the workers involved in, operational activities will be provided with proper PPEs according to their job description including, Masks, aprons, head covering, and shoe covers, gloves, eye-shields and coverall etc.
- Ensure all compressed gas containers and cylinders are stored outdoors in a designated cage and must be appropriately label and shielded from exposure to extreme temperatures and away from any combustible materials.
- Eye-wash stations or emergency showers should be provided close to all workstations where immediate flushing with water is the recommended first-aid response.
- Material Safety Data Sheet (MSDS) for chemicals, if any, will accompany the consignment.
- The facility must ensure implementation of proper Safety policy at all project locations so as to reduce the chances of occurrence of frequent hazards.
- Proper systems for contractor's safety shall be in place which shall be implemented when the contractor's access at project site for any of the activity associated with operational phase. The contractor shall only be allowed to access at the project site if they qualify HSE criteria and policies after getting a proper work permit and the permit shall clearly identify nature, type, quantum and time of work which shall remain valid for a specific period of time till such time the contractor completes their job at site.
- All the vehicles accessing the project area shall also be inspected for fitness especially gas cylinders shall be inspected thoroughly to avoid any leakages or unforeseen hazard associated with damaged gas cylinders.

Residual Impacts

Strict implementation of mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

Detailed Health and Safety Inspections shall be carried out by engaging a third-party consultant on a monthly basis.

7.3.8 Road Safety & Traffic

Potential Impact

During the operational phase it is envisaged that a number of administration officials will travel to the project site. Although, the access to the proposed project site is easy as the area is in developed zone, and all the stakeholders are fully active and operational, severe traffic issues may develop with the passage of time and population concentration in project area. At this stage particularly waste carrier (specialized vehicles) may move from different parts of the city to the project site and from project site to the waste dumping/disposal site. During this routine waste transportation via specialized vehicles in case if the drivers does not obey traffic rules and speed limit a number of serious accidents may occur at different road networks also if the vehicles are not parked within the existing boundaries of the proposed WMF, the nearest stakeholders may experience nuisances and their daily operations may be delayed due to traffic congestion.

Criteria for Determining the Significance

A significant impact will be interpreted if any driver or employ associated with the proposed WMF have a severe accident at nearby road networks, if any employ associated with EWBPL does not have driving license and drives the vehicle to and from project site on regular basis and if a fine is posed by traffic constable on any of the driver and or worker associated with the proposed WMF.

Mitigation Measures

- The project proponent will develop a comprehensive traffic management plan in consultation with local Traffic Police of the project area, and this plan shall be implemented during the entire life cycle of the proposed project.
- The proponent should ensure that the transportation of the waste is done in off peak hours when there is less chance of traffic congestion.

- All project vehicles shall be fitted with internal and external cameras which shall be strictly monitored by administration unit for vehicular speed maintenance at all times.
- Drivers and employees accessing project sites via project vehicles should have valid licenses and HSE staff must impart proper training to the drivers and workers regarding road accidents and mitigations.

7.3.9 Livelihood and Economy

Potential Impacts

The proposed project operations will require a significant number of unskilled and skilled professionals. Therefore, a positive impact on the local livelihood during the project operations is expected by creating new job opportunities. In addition, local hotels, (Dhaba) in the project vicinity will also benefit in terms of increased routine sales. Therefore, a positive impact is expected by proposed project operations.

7.3.10 Solid Waste Disposal

Potential Impacts

Biomedical waste is any waste which is generated during the diagnosis, and treatment of human beings or in research activities pertaining to the production or testing of biological material or substance. The World Health Organization (WHO) and SEPA concur that the following wastes should be classified as infectious waste:

- Sharps (needles, scalpels, etc.)
- laboratory cultures and stocks
- blood and blood products
- Pathological wastes: including tissues, organs and other body parts and fluids that are removed during surgery or autopsy, or their medical procedures, and specimens of body fluids and their containers.
- Waste is generated from patients in isolation because they are known to have an infectious disease.
- Chemicals and other hazardous materials are used in patient diagnosis and treatment.

However, the proposed project includes 02 high tech incineration units with built in air pollution control system "Wet Scrubbers", but the principal waste expected during project operations may include incineration ash approximately (5-7%) of total waste, waste oil and chemical drums and domestic office waste such as papers and tube lights etc. Even small quantities of incineration ash or other domestic/routine office waste may result in adverse impact on human health of the workers and local communities as well as other environmental receptors.

Criteria for Determining the Significance

A significant impact will be interpreted if the incineration ash is not handled properly and in accordance with globally best practices.

Mitigation Measures

- Proper inventories of all waste generated at project site during operations shall be maintained and recorded daily.
- Additionally, it is important to note that a number of research work is available which shows that hospital waste incineration ash may be stabilized and solidified, and the main objective of this treatment is to reduce the leachability or to increase the mechanical characteristics of the bottom ash. Therefore, the solidified matrix can immobilize the heavy metals found in fly and bottom ash[15].
- Based on the research discussed in the mitigation above final fate of incineration ash to be decided after its composition testing; if ash composition is suitable enough to be reused then the process of industrial ecology shall be adopted which means; waste of one industry/sector becomes raw material for other industry.
- However, if the composition is not suitable for reuse then ash shall be stored separately in a designated area with impermeable roof, walls and floor till and shall be disposed by engaging EPA, certified contractor at the nearest available dumping site.

Residual Impacts

Strict implementation of the proposed mitigation measures is unlikely to leave any long-term residual impact.

Monitoring Requirements

A detailed inspection into waste management practices shall be carried out.

[15] *https://www.sciencedirect.com/science/article/pii/S0304389411006650*

Chapter 8: Environmental Management Plan

8.1 Background Information

The potential environmental impacts during the construction and operational phase of the proposed project on various environmental components such as social, biological, and physical environment were predicted in the course of this EIA study. This EIA document has also identified mitigation measures to minimize the environmental impacts of the proposed project, keeping these effects within acceptable limits.

The Environmental Management & Monitoring Plan (EMMP) has been designed to address how the proposed measures will be implemented. It defines the responsibilities of EWBPL Management and contractor, it develops a system of checks and balances, proposes actions that will be taken by each role player; and lays down the required documentation, communication, and monitoring procedures.

8.2 Objectives and Purpose of EMMP

The purpose of this EMMP is not only to address the expected environmental impacts of the proposed project, but also to enhance project benefits and to introduce standards of good practice to be adopted for the proposed project.

The primary objectives of the EMMP are:

- Facilitate the implementation of the mitigation measures that are identified in the EIA.
- Define the responsibilities of the project proponent and contractor and to provide a means for effective communication of environmental issues between them.
- Identify monitoring parameters in order to ensure the effectiveness of the mitigation measures guidelines.

Detailed Environmental Management Plan for construction phase is given in Table 10 and monitoring plan is given in Table 11. Meanwhile on the other hand a detailed Environmental Management Plan for operational phase is given in Table 12 and its monitoring plan is given in Table 13 accordingly.

The summarized environmental monitoring and sampling plan for construction and operation phase is given in Table-14.

Table 10: Environmental Management Plan (EMP) for Construction Phase

S.No.	Aspect	Probable Impact	Safeguards and Mitigations	Implementation Responsibility
1.1.	Land Use and Topography	Since the proposed WMF will be limited to land acquired by EWBPL on rental basis, therefore no impact on land use is expected. However minor topographical changes in case of improper site leveling.	• All construction activities to be properly planned by qualified engineers.	EWBPL's and Contractor's
1.2.	Site Aesthetics	Construction material and residue if left unattended may result in unaesthetic visual impact.	• All construction material and debris to place at a designated area, which shall be properly marked and labeled with impermeable flooring.	EWBPL's and Contractor's
1.3.	Ambient Air Quality	The proposed project will include small scale construction activities which may affect the ambient air quality on a temporary basis, if construction machinery, equipment, and vehicles are not maintained properly and untrained drivers of heavy vehicles as well as improper storage of stockpiles and raw material to be used may contribute to dust	• Use of standard construction equipment and vehicles • Scheduled maintenance of equipment and vehicles including engine tuning, filter cleaning, etc. • Water spraying will be done to reduce dust emissions.	EWBPL's and Contractor's

		dispersion within the project vicinity which may cause impairment of human health which includes chronic respiratory diseases.	• The vehicles speed on graded roads will be limited to minimize dust emissions	
1.4.	**Noise**	Noise related nuisance is a characteristic feature of construction stage. Machinery that will be used during construction phase is likely to generate elevated levels of noise which may cause negative health effects on the workers and to those who are exposed to it such as stress, hypertension, headaches and even hearing loss. However, it is important to note that the major construction activities are expected to be carried out during the daytime	• All construction vehicles, machinery, and equipment to be installed with suitable silencers. • Project construction zone will be barricaded, and proper sign boards displayed. • Unauthorized personnel will not be allowed to access the construction zone. • Onsite workers associated with construction activities will be provided with adequate 'personal protective equipment' (PPEs) to reduce their probability of high noise exposure. • The construction activities will be scheduled / planned in such a way as to prevent high noise	EWBPL's and Contractor's

			activities during night times and simultaneous operation of multiple high noise equipment will be avoided to the extent feasible.	
1.5.	**Water Quality**	Use of water during construction phase will be minimal. Wastewater will be generated in form of domestic during construction activities. This water will be in limited amounts and will be routed into the soakage pit. Supervision of construction site will be done in a way that no stagnant water pools or puddles remain for longer period as they will serve as breeding grounds for mosquitoes.	• Avoid excessive use of water for water conservation. • Avoid mixing water with waste generated during construction. • Avoid dumping of construction waste in any water channel or nallah around proposed facility. • Regular check and maintenance of vehicles and machineries to avoid spills.	EWBPL's and Contractor's
1.6.	**Soil Quality**	Since the proposed project will be developed on a vacant plot, hence very minimum excavation will be required, which may result in soil erosion, not only this but leakage and spillage of construction material and or leakages	• Careful use of heavy machinery and equipment should be ensured to prevent leakages which may result in the release of contaminants directly onto the soil.	EWBPL's and Contractor's

		from construction machineries may also result in soil contamination.	• Ensure that malfunctioning machinery should be kept away from exposed soil area and should be repaired on immediate basis at designated workshops having impermeable floors. • A spill prevention response team will be available throughout the construction phase.	
1.7.	**Ecology**	Since most terrestrial flora and fauna recorded or reported within study area are disturbance tolerant and are dwellers of typical urban setting, hence no significant impact is envisaged.	• Not required.	
1.8.	**Health and Safety**	Construction phase activities may result in severe health and safety hazards and health conditions. It is important to note that the untrained workers may cause harm to themselves as well as others due to lack of awareness and skills.	• Only skilled workers will be allowed to work at the construction sites. • Provision of first aid facilities for workers at site to meet the emergency needs of workers.	EWBPL's and Contractor's

		• Emergency response training should be given to employees and evacuation drills should be scheduled and conducted. • Ensure that hazards associated with manual lifting are controlled with proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities. • Unauthorized personnel will not be allowed to access the proposed project site without permission and safety permits. • Arrangement of proper first aid unit and emergency vehicle will be done to take affected personnel to the nearest medical facility.	

				• Workers should be facilitated by providing appropriate work specific PPE's. • Construction area will be fenced to avoid accidents and will be properly drained to avoid stagnant water that could harbor mosquitoes and other disease vectors. • Accidents record will be maintained. • Use of signage must be implemented. • The EWBPL management must ensure implementation of proper Safety policy at project location so as to reduce the chances of occurrence of frequent hazards	
1.9.	**Solid Waste Disposal**		Main solid waste generation during construction phase will be construction debris like rubble, excess construction	• Separate bins will be placed for different type of wastes -	EWBPL's and Contractor's

	materials, steel scrap, wooden scrap, sand, gravel, lubricating oils and chemicals etc. If the waste is disposed off improperly can pose a health hazard; pollute soil, surface, and ground water. The majority of the construction material will be used, and the waste generated as a result of construction activity will be inherently less reactive and chemically inert under normal conditions. However, its handling and storage may pose adverse impacts of minor nature which could easily be controlled by implementing the recommended mitigation measures.	plastic, paper, metal, glass, wood, and cotton. • Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling. • No waste will be dumped at any location outside the proposed site boundary. • All hazardous waste will be separated from other wastes. Hazardous waste will be stored in designated areas with restricted access and proper marking. Hazardous waste will be disposed off through SEPA approved contractor. • Surplus construction material including partially filled chemical and paint containers will be returned to suppliers.	

			Inert construction waste will be sold as scrap to contractor. • Record of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register. • Training will be provided workers for identification, segregation, and management of waste.	

Table 11: Environmental Monitoring Plan (Construction Phase)

Aspect	Monitoring Parameters	Monitoring Frequency	Monitoring Responsibility
Land Use and Topography	Visual inspection for site leveling and surface topography	Weekly	EWBPL's HSE Staff through IEMC
Site Aesthetics	Housekeeping and construction debris management.	Weekly	EWBPL's HSE Staff through IEMC
	Waste Storage Practices.	Weekly	EWBPL's HSE Staff through IEMC
	Waste Disposal Mechanism	Quarterly basis	EWBPL's HSE Staff through IEMC
Ambient Air Quality	Vehicle, equipment and machinery fitness, emissions, and noise.	Monthly basis.	EWBPL's HSE Staff through IEMC
Ambient Noise Levels	Water sprinkling	Monthly basis	EWBPL's HSE Staff through IEMC
Water Quality	Spillage control and prevention plan.	Before commencement of construction activities and implementation monitoring on weekly basis during construction phase.	EWBPL's HSE Staff through IEMC

	Water utilization inventories.	Weekly basis during construction phase,	EWBPL's HSE Staff through IEMC
	Water recycling inventories.	Weekly basis during construction phase,	EWBPL's HSE Staff through IEMC
Soil Quality	Native soil conservation.	Weekly basis during construction phase.	EWBPL's HSE Staff through IEMC
	Chemicals, lubricants, oil leakages from construction equipment, machinery and vehicles.	Weekly basis during construction phase.	EWBPL's HSE Staff through IEMC
Human Health and Safety	HSE inspection.	Weekly basis during construction.	EWBPL's HSE Staff through IEMC
	Staff and contractor' Qualification.	Before procurement.	EWBPL's HSE Staff through IEMC
	HSE toolbox talk and training records.	Monthly basis.	EWBPL's HSE Staff through IEMC
	Speed limit.	Daily basis during construction phase.	EWBPL's HSE Staff through IEMC

Table 12: Environmental Management Plan (EMP) Operational Phase

S.No.	Aspect	Probable Impact	Safeguards and Mitigations	Responsibility
	Site Aesthetics	If proper housekeeping practices are not adopted during the operational phase and the items to be utilized are scattered at all places within and around the proposed WMF, it may create adverse effects onto the existing site aesthetics.	• It is strongly recommended to keep all the items to be utilized during operational phase at a designated area, those areas should be properly marked and for its effective utilization and purpose for example, medical waste shall only be stored in controlled temperature, chemical drums and maintenance material etc. shall only be placed in warehouse and so on. • Strong administrative controls and management system should be in place and implemented during the entire life cycle of the proposed project to avoid the chances of adverse aesthetic impacts at the project site.	EWBPL's Administration and HSE Staff

2.1.	**Ambient Air Quality**	During operational phase, following would be the potential ambient air pollution sources; incineration units, backup generators, waste transportation vehicles, fugitive emissions from diesel storage area and incineration ash, following ambient air pollutants are likely to disperse in ambient environment; Oxides of Sulphur (SOx), Nitrogen Oxide (NO), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulate Matter (PM_{10} and $_{2.5}$) VOCs, Dioxins, Furans, and incineration ashes, incase if proper pollution abatement technologies and methods are not adopted	• All the possible ambient air pollution sources shall be installed with appropriate air pollution abatement technologies. • Pollution abatement equipment to be utilized for proposed incineration units. A combination of APC devices (with capacity to remove 95% to 99% pollutants) would be utilized as part of the mitigation measures to safeguard against non-compliant chlorinated dioxin concentrations. This combination would be a specially designed wet scrubbing system. • A specially designed wet scrubbing system with fitted incineration units should be frequently checked and	EWBPL's Administration and HSE Staff

replaced once it expires and completes the life span to avoid chances of ambient air pollution in the project surrounding.

- The air to fuel ratio of incinerators and generators should be maintained at all times.
- Diesel storage should be inspected for any leakages and if a leakage is identified it should be immediately repaired to avoid fugitive emissions from the source.
- Discourage idling of vehicles i.e., vehicles and equipment will be turned off when not in direct use to reduce exhaust emissions.
- Discarded or broken medical equipment such as mercury thermometers, sphygmomanometers, blood

			pressure devices, dilation and feeding tubes will not be incinerated at any time to avoid chances of dioxins and furans emissions. • The height of stacks will be as per good engineering practices. Stack will have sampling points consisting of sampling port-hole, platform and access ladder, to monitor the emission levels.	
2.2.	**Noise Levels**	The proposed project will include several noise sources, which will have potential adverse impacts on the workplace and ambient noise levels. The noise normally occurring inside rooms is often referred to as "background noise." The continuous exposure to the elevated levels of noise may result in, headaches, hearing problems and even loss in severe conditions, anxiety, and accumulation of stress hormones and hypertension. All these health conditions may affect the overall health of the exposed	• Ensure proper maintenance of all the equipment which will be utilized during operational phase throughout the entire life cycle at the proposed project to reduce the chances of elevated noise levels. • Provide barriers by using appropriate noise reduction material such as; UPVC walls around site boundaries to	EWBPL's Administration and HSE Staff

		workers and laborers associated with the proposed project.	provide some buffer against noise propagation. • Proper signboards indicating noise area should be installed at all areas within the proposed WMF. • Workers to be provided with ear plugs and earmuffs at high noise areas and unauthorized personnel shall not be allowed to enter high noise area at all times. • Authorized personnel should seek and obtain work permit before entering the noisy area.	
2.3.	**Water Quality**	As discussed earlier in the environmental baseline section there are no prominent surface water resources at the project site, however the main sources of water supply to the project area include water supply line and water tanker. Primarily domestic wastewater will be generated during operational phase. The wastewater may be a potential source of pollution.	• Ensure that sewage water shall be treated properly at the site by wastewater treatment system and ensure that there will be proper soakage pits with porous walled chamber that allow water to slowly soak after the effluent is pre-settled in septic tanks.	EWBPL's Administration and HSE Staff

- Effluent sewers shall be periodically cleaned and inspected for integrity to ensure effective transport of effluents and prevent overflows and leakages and infiltration.
- Wastewater from all sections of the facility shall be routed to a wastewater treatment system, also ensure that the project site has provision of adequate soakage pits; those shall be designed and engineered properly.
- Utilization of sand and fine gravel shall be made mandatory in pits which should be spread across the bottom of pit to help disperse the flow. Depth should not be less than 1.5 meters above the ground water table, the pits shall be designed in a way which allows

			percolation through soil from the soak pits, and small particles shall be filtered out by soil matrix allow organic material to be digested/degraded by microorganisms.	
2.4.	**Ecology**	As described in ecological baseline the proposed WMF will be in Korangi, Karachi, which does not shelter any significant or endangered fauna species and there has no evidence of flora found in the project's boundary too. Additionally, it is important to note that once the medical and industrial waste is incinerated the process will produce ash as a final product which if stored improperly before disposal in an open environment may disperse in the ambient environment and ultimately ash particles may settle onto the plant's life which may affect the process of transpiration, and which ultimately may affect existing project area's life. During the process of ash transportation if the ash is	• Incineration ash will be controlled at source and stored in a designated area with an impermeable roof, floor and boundaries to avoid its dispersion in ambient environment. • The anticipated impacts on to the existing species nearby the project area are invisible in the short run, while the accumulation of incineration ash particles onto the existing species may exhibit the devastating impacts onto the survival rate in the long run, therefore it is strongly	EWBPL's Administration and HSE Staff

		transported in an uncovered vehicle there are significant chances of its dispersion. Accidental spills may also affect the existing plant species in the project area.	recommended to observe the survival rate of the existing species on quarterly basis and in case if it is declining the species should be replanted by ratio of 1:5 by the help of local communities	
2.5.	**Health and Safety**	During the operational phase a number of equipment and systems would be working which include incineration units etc. in parallel to that a number of technical and non-technical personnel would also work at the proposed WMF which may include routine office working, repairs and maintenance and incinerator operations, safety and security provision, loading and unloading of medical and industrial waste and incineration ash etc. Therefore, a number of health and safety hazards are envisaged incase if proper Standard Operating Procedures (SOPs) for machinery and equipment operations, Material Safety Data Sheets (MSDS) for chemical handling and storage, protocols for operations monitoring	• It is strongly recommended that a proper HSE management system and team should be available at project site at all times on rotational basis during the entire life cycle at the proposed WMF. • Ensure that all areas of the proposed WMF shall be properly marked and labeled by adequate safety sign boards, these boards shall display hazard type, nature and quick remediation in case of its occurrence. All the sign boards shall be displayed in English, Urdu and Sindhi language.	EWBPL's Administration and HSE Staff

and inspections and adequate health, safety and environmental risk assessment systems, tools and personnel are not in place. Incase if the HSE systems are not in place project operations may not only harm the workers but the local communities may also be affected by project operations.

- HSE staff shall make sure that all the hazards that are likely to occur at project site should be clearly identified and a proper risk assessment matrix along with its mitigation and controls are in place and communicated to all the workers via toolbox talk.
- Toolbox talk shall be made mandatory on a regular basis and all the workers should be trained for all the possible hazards at project site.
- Ensure that adequate firefighting systems are in place and frequent mock drills shall be carried out to enhance the emergency preparedness and response skill of the workers.
- Ensure proper maintenance of firefighting system during the

entire life cycle at the proposed WMF.

- All the workers involved in, operational activities will be provided with proper PPEs according to their job description including Masks, aprons, head covering, and shoe covers, gloves, eye-shields, and coverall etc.
- Ensure all compressed gas containers and cylinders are stored outdoor in a designated cage and must be appropriately label and shielded from exposure to extreme temperatures and away from any combustible materials.
- Eyewash stations or emergency showers should be provided close to all workstations where immediate flushing with water is the

recommended first-aid response.

- Material Safety Data Sheet (MSDS) for chemicals, if any, will accompany the consignment.
- The facility must ensure implementation of proper Safety policy at all project locations so as to reduce the chances of occurrence of frequent hazards.
- Proper systems for contractor's safety shall be in place which shall be implemented when the contractor's access at project site for any of the activity associated with operational phase. The contractor shall only be allowed to access at the project site if they qualify HSE criteria and policies after getting a proper work permit

			and the permit shall clearly identify nature, type, quantum and time of work which shall remain valid for a specific period of time till such time the contractor completes their job at site. • All the vehicles accessing project area shall also be inspected for fitness especially gas cylinders shall be inspected thoroughly to avoid any leakages or unforeseen hazard associated with damaged gas cylinders.	
2.6.	**Road Safety & Traffic**	During the operational phase it is envisaged that a number of administration officials will travel to the project site. Although, the access to proposed project site is easy as the area is developed, and all the stakeholders are fully active and operational, severe traffic issues may develop with the passage of time and population concentration in the project area. At this stage particularly waste carrier	• The project proponent develop a comprehensive traffic management plan in consultation with local Traffic Police of the project area, and this plane shall be implemented during the entire life cycle of the proposed project.	EWBPL's Administration and HSE Staff

		(specialized vehicles) may move from different parts of the city to the project site and from project site to the waste dumping/disposal site. During this routine waste transportation via specialized vehicles in case if the drivers does not obey traffic rules and speed limit a number of serious accidents may occur at different road networks also if the vehicles are not parked within the existing boundaries of the proposed WMF, the nearest stakeholders may experience nuisances and their daily operations may be delayed due to traffic congestion.	• The proponent should ensure that the transportation of the waste is done in off peak hours when there is less chance of traffic congestion. • All project vehicles shall be fitted with internal and external cameras which shall be strictly monitored by administration unit for vehicular speed maintenance at all times. • Drivers and employees accessing project site via project vehicles should have valid licenses and HSE staff must impart proper training to the drivers and workers regarding road accidents and mitigations.	
2.7.	**Livelihood and Economy**	The proposed project operations will require a significant number of unskilled and skilled professionals. Therefore, a positive impact on the local livelihood during the project		EWBPL's Administration and HSE Staff

		operations is expected by creating new job opportunities. In addition, local hotels, (Dhabas) in the project vicinity will also benefit in terms of increased routine sales. Therefore, a positive impact is expected by proposed project operations.		
2.8.	**Solid Waste Disposal**	Proposed WMF itself is a mitigation for treatment of medical and industrial waste as the proposed project includes high tech incineration units with built in air pollution control system but the principle waste expected during project operations may include; incineration ash, waste oil and chemical drums and domestic office waste such as; papers and tube lights etc. even small quantities of incineration ash or other domestic/routine office waste may result in adverse impact onto human health of the workers and local communities as well as other environmental receptors.	Incineration ash to be disposed of in an environmentally sound manner or reused after composition testing by adopting the concept of industrial ecology i.e., waste of one industry becomes raw material of other.	EWBPL's Administration and HSE Staff

Table 13: Environmental Monitoring Plan (Operational Phase)

Aspect	Monitoring Parameters	Monitoring Frequency	Responsibility
Site Aesthetics	Housekeeping practices and visual inspection, standard procedures and practices for effective housekeeping.	Weekly basis	EWBPL's Administration and HSE Staff.
Ambient Air and Noise Quality	Provision of ambient air and noise pollution systems in operational phase equipment, machineries and vehicles	Before procurement and on monthly basis.	EWBPL's Administration and HSE Staff.
	Provision of centrifugal ceramic filters in incineration units, ambient air and noise monitoring as prescribed in SEQS.	Before procurement and on monthly basis.	EWBPL's Administration and HSE Staff.
	Incinerator maintenance record and gaseous emissions monitoring as per SEQS, 2014.	Monthly basis	EWBPL's Administration and HSE Staff.
	Visual inspection for leakages and VOCs testing	Quarterly basis	EWBPL's Administration and HSE Staff.
Water Quality	Wastewater monitoring and wastewater treatment system maintenance record.	Quarterly	EWBPL's Administration and HSE Staff.

Terrestrial Ecology	Survival rate of the existing species, in case if it is declining the species should be replanted by ratio of 1:5 by the help of local communities.	Quarterly	EWBPL's Administration and HSE Staff.
Health and Safety	• Availability of HSE team • Display of HSE signs and symbols • Provision of PPEs	Daily basis	EWBPL's Administration and HSE Staff.
	• Tool box talk and training records • Firefighting systems, and fire extinguisher maintenance records	Monthly basis	EWBPL's Administration and HSE Staff.
Road Safety and Traffic	Driving license and roadside accident prevention and mitigation training record.	Monthly basis	EWBPL's Administration and HSE Staff.
	Waste transportation schedule and time.	Daily basis	EWBPL's Administration and HSE Staff.
Solid Waste Disposal	Composition testing of ash.	Each incineration batches.	EWBPL's Administration and HSE Staff.

Table 14: Summarized Environmental Monitoring and Sampling Plan

CONSTRUCTION PHASE				
1. Gaseous Air Emission Plan				
Parameters	**Source**	**Frequency**	Standards	
CO, Smoke, Noise	Construction Machinery	Quarterly	SEQS	
CO, NOx, SOx and Particulates	Power Generator	Quarterly	SEQS	
2. Ambient Air Quality Plan				
Parameters	**Locations**	**Frequency**	Duration	
$PM_{2.5}$, PM_{10}, SPM, NO, NO_2, CO, SO_X,	7 meters from the Project Boundaries	Quarterly	8-hours	
3. Drinking Water Quality Sampling Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards
E-Coli, fecal coliform, Total Coliform pH, TDS.	Drinking Water Source	Quarterly	-	SEQS/WHO
4. Noise Level Sampling Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards
Decibels [dB(A)Scale]	At the interface of project 7 meters from the equipment at construction site	Quarterly	Continuous for 8 hours in a full working day	SEQS Noise Guidelines
5. Solid Waste Sampling & Characterization Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards

• Waste generation rate, • Waste composition, • Recyclables and non-recyclables, • hazardous waste	At main solid waste collection point from where the waste is transported from site	Quarterly	-	SEPA
OPERATION PHASE				
1. Gaseous Air Emission Plan				
Parameters	**Source**	**Frequency**		Standards
CO, NOx, SOx, Pb, HCI, Cd, Hg, PM, Smoke, HF, Zn, Ar, H_2S	Incinerators	Monthly		SEQS
CO, SOx, NOx and PM	Power Generator (Stand by)	Quarterly		SEQS
2. Ambient Air Quality Plan				
Parameters	**Locations**	**Frequency**		Duration
$PM_{2.5}$, PM_{10}, SPM, NO, NO_2, CO, SO_X	EWBPL Project	Quarterly		24-hours
3. Wastewater Quality Sampling Plan				
Parameters	**Locations**	**Frequency**	**Duration**	**Standards**
pH, BOD_5, COD, TSS, O&G	EWBPL Project	Bi-annually	-	SEQS
4. Drinking Water Quality Sampling Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards
E-Coli, fecal coliform, Total Coliform pH, TDS.	Drinking Water Source	Quarterly	-	SEQS/WHO
5. Noise Level Sampling Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards

Decibels [dB(A)Scale]	EWBPL-Boundaries	Quarterly	8 hours	SEQS Noise Guidelines
6. Solid Waste Sampling & Characterization Plan				
Parameters	**Locations**	**Frequency**	**Duration**	Standards
• Waste generation rate, • Waste composition, • Recyclables and non-recyclables, • Hazardous waste	At main solid waste collection point from where the ash and waste (if any) is transported from site	Quarterly	-	SEPA

ANNEXURE

ANNEXURE 1: Sindh Environmental Protection Act, 2014

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PART-IV

PROVICIAL ASSEMBLY OF SINDH
NOTIFICATION
KARACHI, THE 20th MARCH, 2014.

NO.PAS/Legis-B-06/2014-The Sindh Environmental Protection Bill, 2014 having been passed by the provincial Assembly of Sindh on 24th Feburary, 2014 and assested by the Governer of Sindh on 19th March, 2014 is hereby published as an Act of the legislature of Sindh

THE SINDH ENVIRONMENTAL PROTECTION ACT, 2014

SINDH ACT NO.VIII OF 2014

AN
ACT

to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

Preamble

WHEREAS it is expedient to provide for the protection, conservation, rehabilitation and improvement of the, environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto;

PART-I

It is hereby enacted as follows:-

Short title and commencement

1. (1) This Act may be called the Sindh Environmental Protection Act, 2014.

(2) It extends to the whole of the Province of Sindh.
(3) It shall come into force at once

2. In this Act, unless there is anything repugnant in the subject or context- **Definitions**

(i) "adverse environmental effect" means impairment of, or damage to, the environment and includes—

(a) impairment of, or damage to, human health and safety to biodiversity or property;
(b) pollution; and

(c) any adverse environmental effect as may be specified in the rules or regulations made under this Act;

(ii)"Agency" means the Sindh Environmental Protection Agency established under section 5 of this Act;

(iii) "agricultural waste" means waste from farm and agricultural activities including poultry, cattle farming, animal husbandry residues from the use of fertilizers, pesticides and other farm chemicals and agricultural runoff;

(iv) " "air pollutant" means any substance that causespollution of air and includes soot, smoke, dust particles, odor, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioactive substances;

(v) "biodiversity" or "biological diversity" means the variability among living organisms from all sources, including inter-alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems;

(vi) "biosafety" means the mechanism developing through policy and procedure to ensure human health and the environmentally safe application of biotechnology;

(vii) "Council" means the Sindh Environmental Protection Council established under section 3 of this Act;

(viii) "discharge" means spilling, leaking, pumping, depositing, seeping, releasing, flowing-out, pouring, emitting, emptying or dumping into the land, water or atmosphere;

(ix) "ecosystem" means a dynamic complex of plant, animalnd micro-organism communities and their non-living environment interacting as a functional unit;

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(x) "effluent" means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapour;

(xi) "emission standards" means the permissible standards established by the Agency for emission of air pollutants and noise and for discharge of effluent and waste;

(xii) "environment" means-
(a) air, water, land and natural resources;
(b) all layers of the atmosphere;
(c) all organic and inorganic matters and living organisms;
(d) ecosystems and ecological relationships;
(e) buildings, structures, roads, facilities and works;
(f) all social and economic conditions affecting community life; and

(g) the inter-relationship between any of the factors in sub-clause (a) to (f) made under this Act;

(xiii) "environmental aspect" means an organization's activities or services that can interact with the environment;

(xiv) "environment audit" means a systemic scrutiny of environmental performance of an organization, factory, company or manufacturing and production unit regarding to its operations;

(xv) "environmental impact assessment" means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;

(xvi) "Environmental Management Plan" means a site specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with the environmental legislation;

(xvii) "Environmental Protection Order" means an order passed under Section 21 made under this Act.

(xviii) "Environmental Protection Tribunal" means the Environmental Protection Tribunal constituted under section 25 of this Act ;

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(xvix) "Environmental Review" means a quantitative and qualitative assessment of documents submitted by proponent, comments from public and Government agencies or organizations;

(xx) "factory" means any premises in which industrial activity is being undertaken;

(xxi) "genetically modified organism" means any organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology and which does not occur naturally through mating and or recombination and includes both living and non-living modified organisms;

(xxii) "Government" means the Government of Sindh;

(xxiii) "Government Agency" includes:-

(a) A department, attached department or any other office of Government; and

(b) A development authority, local authority, company body corporate established or control by Government;

(xxiv) "Court" means the Court of the Judicial Magistrate First Class;

(xxv) "hazardous substance" means-

(a) a substance or mixture of substances, other than a pesticide as defined in the Agricultural Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical activity or toxic, explosive, flammable, corrosive, radioactive or other characteristics, causes, or is likely to cause, directly or in combination with other matters an adverse environmental effect; and

(b) any substance which may be prescribed as a hazardous substance;

(xxvi) "hazardous waste" means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, hospital waste, nuclear waste, obsolete pesticides and persistent organic pollutants;

(xxvii)"hospital waste" means waste medical supplies and materials of all kinds, and waste blood, tissue, organs and other parts of the human and animal bodies, from hospitals, clinics, laboratories and veterinary facilities;

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(xxviii) "industrial activity" means any operation or process for manufacturing, making, formulating, synthesising, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purposes;

(xxix) "industrial waste" means waste resulting from an industrial activity;

(xxx) "initial environmental examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment;

(xxxi) "local authority" means any agency set up or designated by Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;

(xxxii) "local council" means a local council constituted or established under a law relating to local government;

(xxxiii) "motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer, but does not include a vehicle running upon fixed rails;

(xxxiv) "municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(xxxv) "noise" means the intensity, duration and character of sounds from all sources, and includes vibration;

(xxvi) "non degradable plastic products" means a plastic product which are made from the non-biodegradable substances;

(xxxvii) "nuclear waste" means waste from any nuclear reactor or nuclear plant or other nuclear energy system, whether or not such waste is radioactive;

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(xxxviii) "Oxo-biodegradable Plastic Products" means a plastic product made of a polymer by adding a pro-degrading additive containing a transition metal salt, except cobalt, which cause the plastic to degrade and bio-grade from oxidative and cell mediated phenomena either simultaneously or successfully;

(xxxix) "person" means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

(xxxl) "pollution" means the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiational, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity;

(xli) "prescribed" means prescribed by rules made under this Act;

(xlii) "project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes-

(a) construction or use of buildings or other works;

(b) construction or use of roads or other transport systems;

(c) construction or operation of factories or other installations;

(d) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like;

(e) any change of land use or water use; and

(f) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations;

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(xliii) " proponent" means the person who proposes or intends to undertake a project;

(xliv) "regulations" means regulations made under this Act;

(xlv) "rules" means rules made under this Act;

(xlvi) "sewage" means liquid or semi-solid wastes and sludge from sanitary conveniences, kitchens, laundries, washing and similar activities and from any sewerage system or sewage disposal works;

(xlvii) "Schedule Plastic Products" means all types of flexible plastic packaging and disposable plastic products made of Polythene, Polypropylene, Polystyrene and Poly-ethylene Terephthalate (PET), used for food and non-food items, like shopping bags, garbage bags, snacks packs, water and milk packaging, shrink wraps, bubble pellet wraps, films, liners, woven or non-woven bags, mulch films;

(xlviii) "Sindh Environmental Quality Standards" means standards established by the Agency under clause (e) of sub-section(1) of section 6 and approved by the Council under clause (c) of sub-section(1) of section 4 made under this Act;

(xlix) "standards" means qualitative and quantitative standards for discharge of effluent and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Sindh Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations;

(l) "strategic environmental assessment" mean an analysis of a proposed policy, legislation, plan or programme to determine whether the principles of sustainable development have been integrated therein and to identify its likely environmental effects and such components as require an initial environmental examination or environmental impact assessment;

(li) "sustainable development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;

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(lii) "trans-boundary environmental impacts" means environmental impact arising from beyond the boundaries or limits of Sindh province and causing any adverse environmental impact or pollution in the air, land, water and coaster water of Sindh province;

(liii) "waste" means any substance or object which has been, is being or is intended to be, discarded or disposed-of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

(liv) "waters (coastal waters, internal waters, territorial waters and historical waters)" means such limits of the waters adjacent to the land territory as may be specified in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976).

PART-II
THE SINDH ENVIRONMENTAL PROTECTION COUNCIL.

Establishment of the Sindh Environmental Protection Council.

3. (1) The Government of Sindh shall, by notification in the official Gazette, establish a Council to be known as the Sindh Environmental Protection Council consisting of-

(i)	Chief Minister or such other person as the Chief Minister may nominate in this behalf.	**Chairperson**
(ii)	Minister-in-charge of the Environment Protection Department.	**Vice Chairperson**
(iii)	Additional Chief Secretary, Planning and Development Department, Government of Sindh.	**Ex-officio member**
(iv)	Secretaries of the Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Live Stock and Fisheries, Forest and Wildlife, Energy, Education, Departments of Government of Sindh and the divisional commissioners of Sindh.	**Ex-officio members**

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(v)	Such other persons not exceeding twenty- five as Government may appoint from representatives of the Chambers of Commerce and Industry and industrial associations, representatives of the Chambers of Agriculture, the medical and legal professions, trade unions, non-governmental organizations concerned with the environment and sustainable development, and scientists, technical experts and educationists.	**Non-official members**
vi)	Director General, Sindh Environment Protection Agency	**Member / Secretary**
vii)	Two Members of the Provincial Assembly of Sindh amongst the eleven Members of the Standing Committee on Environment nominated by the Speaker	**Mambers**

2) The Members of the Council, other than ex-officio members, shall be appointed in accordance with the prescribed procedure.

(3) A non-official member, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-appointment but shall not hold office for more than two terms.

(4)The Council shall frame its own rules of procedure.

(5) The Council shall hold meetings, as and when necessary, but not less than two meetings, shall be held in a year.

(6) The Council may constitute committees of its members and entrust them with such functions as it may deem fit, and the recommendations of the committees shall be submitted to the Council for approval.

(7) The Council, or any of its committees, may invite any technical expert or representative of any Government Agency or non-governmental organization or other person possessing specialized knowledge of any subject for assistance in performance of its functions.

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4. (1) The Council shall-

(a) co-ordinate and supervise the enforcement of the provisions of this Act and other laws relating to the environment in the province;

(b) approve comprehensive provincial environmental and sustainable development policies and ensure their implementation within the framework of a conservation strategy and sustainable development plan as may be approved by Government from time to time;

(c) approve the Sindh Environmental Quality Standards;

(d) provide guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources.

(e) coordinate integration of the principles and concerns of sustainable development into socio-economic and development policies, plans and programmes at the provincial, district and local levels;

(f) consider the annual Sindh Environment report and give appropriate directions thereon and cause it to be laid before the Provincial Assembly;

(g) deal with inter-provincial and federal-provincial issues, and liaise and coordinate with other Provinces through appropriate inter-provincial forums regarding formulation and implementation of standards and policies relating to environmental matters with an inter-provincial impact;

(h) provide guidelines for biosafety and for the use of genetically modified organisms; and

(i) assist the Federal Government or Federal Agency in implementation and or administration of various provision of United Nation Convention on Laws on Seas, 1980 (UNCLOS) in coastal waters of the province;

(2) The Council may, either itself or on the request of any person or organization, direct the Agency or any Government Agency to prepare, submit, promote or implement projects for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, and the sustainable development of resources or to undertake research in any specified aspect of environment.

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PART III
THE SINDH ENVIRONMENTAL PROTECTION AGENCY

Establishment of the Sindh Environmental Protection Agency.

5. (1) Government shall, by notification in the Official Gazette, establish the Sindh Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations made thereunder.

(2) The Agency shall be headed by a Director General who shall be appointed by Government on such terms and conditions as it may determine.

(3) The Agency shall have such administrative, technical and legal staff as Government may specify, to be appointed in accordance with such procedure as may be prescribed.

(4) The powers and functions of the Agency shall be exercised and performed by the Director General.

(5) The Director General may, by general or special order, delegate any of these powers and functions to staff appointed under sub-section (3).

(6) For assisting the Agency in the discharge of its functions Government shall establish Advisory Committees for various sectors and appoint as members thereof eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

Functions of the Agency.

6. (1) The Agency shall –

(a) administer and implement the provisions of this Act and the rules and regulations;

(b) prepare, in co-ordination with the appropriate Government Agency or local council and, in consultation with the concerned Advisory Committees where established, environmental policies for the approval of the Council;

(c) take all necessary measures for the implementation of the environmental policies approved by the Council;

(d) prepare and publish an annual Sindh Environment Report on the state of the environment in the province;

(e) prepare or revise and establish the Sindh Environmental Quality Standards with approval of the Council:

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Provided that before seeking approval of the Council, the Agency shall publish the proposed Sindh Environmental Quality Standards for public opinion in accordance with the prescribed procedure;

(f) ensure enforcement of the Sindh Environmental Quality Standards;

(g)where the quality of ambient air, water, land or noise so requires, the Agency may, by notification in the Official Gazette establish different standards for discharge or emission from different sources and for different areas and conditions as may be necessary:

Provided that where these standards are less stringent than the Sindh Environmental Quality Standards; prior approval of the Council shall be obtained;

(h) 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 in various sectors;

(i) take measures to promote research and the development of science and technology which may contribute to the prevention of pollution, protection of the environment, and sustainable development;

(j) issue licences, approval for the consignment, handling, transport, treatment, disposal of, storage, handling or otherwise dealing with hazardous substances;

(k) certify laboratories as approved laboratories for conducting tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation for the purposes of this Act;

(l) identify the needs for and initiate legislation in various sectors of the environment;

(m) provide assistance to relevant Federal and Provincial Government Agencies in the management of environment accidents and natural and environmental disasters, including conduct of inquiry thereto;

(n) render advice and assistance in environmental matters including such information and data available with it as may be required for carrying out the purposes of this Act:

Provided that the disclosure of such information shall be subject to the restrictions specified in Part XI (Access to Information);

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(o) assist Government Agencies, local councils, local authorities and other persons to implement schemes for the proper disposal of wastes so as to ensure compliance with the Sindh Environmental Quality Standards;

(p) provide information and guidance to the public on environmental matters;

(q) recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions;

(r) promote public education and awareness of environmental issues through mass media and other means including seminars and workshops;

(s) establish and maintain mechanisms, including its own website, to disseminate information, subject to the provisions of this Act, regarding policies, plans and decisions of the Government, the Council and the Agency, relating to the environment;

(t) specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned persons in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans;

(u) review and approve mitigation plans and give guidance and directions, where necessary, relating to clean up operations ordered under this Act;

(v) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;

(w) take or cause to be taken all necessary measures for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution and promotion of sustainable development; and

(x) perform any function that the Council may assign to it.

(2) The Agency may -

(a) undertake inquiries or investigation into environmental issues, either of its own accord or upon complaint from any person or organization;

(b) request any person to furnish any information or data relevant to its functions;

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(c) initiate, with the approval of Government, requests for foreign assistance in support of the purposes of this Act and enter into arrangements with foreign agencies or organizations for the exchange of material or information and participate in international seminars or meetings;

(d) recommend to Government and the Council the adoption of financial and fiscal programmes, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including -

(i) taxes, duties, cesses and other levies; and

(ii) incentives, prizes, awards, rewards, subsidies, tax exemptions, rebates and depreciation allowances;

(e) establish and maintain laboratories to help in the performance of its functions under this Act and to conduct research in various aspects of the environment and provide or arrange necessary assistance for the establishment of similar laboratories in the private sector;

(f) arrange, in accordance with such procedure as may be prescribed, financial assistance for projects designed to facilitate in discharge of its functions; and

(g) acquire assistance of concerned authorities of district administration and other relevant agencies, departments and police assistance for enforcement of this Act.

Power of the Agency

7. Subject to the provisions of this Act, the Agency may-

(a) lease, purchase, acquire, own, hold, improve, use or otherwise deal in and with any property both moveable and immovable;

(b) sell, convey, mortgage, pledge, exchange or otherwise dispose of its property and assets;

(c) fix and realize fees, rates and charges for rendering any service or providing any facility, information or data under this Act or its rules and regulations;

(d) enter into contracts, execute instruments, incur liabilities and do all acts or things necessary for proper management and conduct of its business;

(e) appoint, with the approval of Government and in accordance with such procedures as may be prescribed, such advisers, experts and consultants as it considers necessary for the efficient performance of its functions on such terms and conditions as it may deem fit;

(f) summon and enforce the attendance of any person and require him to supply any information or document needed for the conduct of any enquiry or investigation into any environmental issue;

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(g) Director General may authorize any officer or official to enter and inspect or under a search warrant issued by Environmental Protection Tribunal or a Court, search at any time, any land, building, premises, vehicle or vessel or other place where or in which there are reasonable grounds to believe that an offence under this Act has been, or is being, or likely to be committed;

(h) take samples of any materials, products, articles or substances or of the effluent, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission;

(i) arrange for the testing and analysis of samples at a certified laboratory;

(j) confiscate any article used in the commission of the offence where the offender is not known or cannot be found within a reasonable time:

Provided that the powers under clauses (f), (g), (h) (i), and (j) shall be exercised in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898) or the rules and regulations and under the direction of the Environmental Protection Tribunal or a Court; and

(k) establish the Sindh Environmental Co-ordination Committee comprising the Director-General as its Chairman and such other persons as Government shall appoint as its members to exercise such powers and perform such functions as shall be delegated or assigned to it by Government for carrying out the purposes of this Act and for ensuring coordination among Government Agencies in implementation of environmental policies.

PART IV
SINDH SUSTAINABLE DEVELOPMENT FUND

8. (1) There shall be established a Sindh Sustainable Development Fund. **Establishment o the Sindh Sustainable Development Fund.**

(2) The Sindh Sustainable Development Fund shall be derived from the following sources, namely—

(a) allocations and grants made or loans advanced by the Government of Sindh or by the Federal Government;

(b) aid and assistance, grants, advances, donations and other non-obligatory funds received from foreign governments, national or international agencies, and
non-governmental organizations; and

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(c) voluntary contributions from private, corporate, multinational organizations and other persons.

(d) Any fees generated under the provision of this act including the fines imposed against contraventions including penalties.

(3)The Sindh Sustainable Development Fund shall be utilized, in accordance with such procedures as may be prescribed for -

(a) providing financial assistance to projects designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any specified aspect of the environment; and

(b) any other purposes which, in the opinion of the Board, will help achieve environment objectives and the purposes of this Act.

9. (1)The Sindh Sustainable Development Fund shall be managed by a Board known as the Provincial Sustainable Development Fund Board consisting of— **Management of the Sindh Sustainable Development Fund.**

(i)	Additional Chief Secretary, Planning and Development Department, Government of Sindh,	**Chairperson**
(ii)	Such officers of Government, not exceeding five (05), as Government may appoint including Secretaries of the Environment, Finance, Industries and Local Government Departments, Government of Sindh.	**Ex-officio Members**
(iii)	Such non-official persons, not exceeding five(05), as Government may appoint, including representatives of the Chambers of Commerce and Industry, non-governmental organizations and major donors.	**Non-official Members**
(iv)	Director General, Sindh Environmental Protection Agency.	**Secretary/ Member**

(2) The members of the Board, other than ex-officio member shall be appointed in accordance with the prescribed procedure.

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(3) A non-official member of the Board, unless he sooner resigns or is removed, shall hold office for a term of three years and shall be eligible for re-nomination, but shall not hold office for more than two terms.

(4) The Board shall frame its own rules of procedure with the approval of Government.

(5) In accordance with such procedures and such criteria as may be prescribed, the Board shall have the power to —

(a) sanction financial assistance for eligible projects;

(b) invest moneys held in the Sindh Sustainable Development Fund in such profit-bearing Government bonds, saving schemes and securities as it may deem suitable; and

(c) take such measures and exercise such powers as may be necessary for utilization of the Sindh Sustainable Development Fund for the purposes specified in sub-section (3) of section 8.

(6) The Board shall constitute committees of its members to undertake regular monitoring of projects financed from the Sindh Sustainable Development Fund and to submit progress reports to the Board which shall publish an Annual Report incorporating its annual audited accounts and performance evaluation based on the progress reports.

Accounts

10.(1) The Agency shall maintain proper accounts of the Sindh Sustainable Development Fund and other relevant records and prepare annual statement of accounts in such form as may be prescribed.

(2) The accounts of the Sindh Sustainable Development Fund shall be audited annually by the Auditor General of Pakistan.

PART V
PROHIBITIONS AND ENFORCEMENT

Prohibition of certain discharges or emissions and compliance with standards.

11. (1) Subject to the provisions of this Act and the rules and regulations, 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 to 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; or, where applicable, the standards established under Section 6(1)(g)(i); or direction issued under Section 17, 19, 20 and 21 of this Act; or any other direction issued, in general or particular, by the Agency.

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(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.

(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.

12. No person shall import hazardous waste into Sindh province or its coastal, internal, territorial or historical waters, except acquiring prior approval of the Agency. **Prohibition of import of hazardous waste.**

13. Subject to the provisions of this Act, no person shall import, generate, collect, consign, transport, treat, dispose of, store, handle or otherwise use or deal with any hazardous substance except- **Handling of hazardous substances.**

(a) under a licence issued by the Agency; or

(b) in accordance with the provisions of any other law, rule, regulation or notification for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Government is a party.

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- **Prohibition of action adversely affecting Environment.**

(a) recycling or reuse of hospital waste and infectious waste;

(b) disposal of solid and hazardous wastes at unauthorized places as prescribed;

(c) dumping of wastes or hazardous substances into coastal waters and inland water bodies;

(d) release of emissions or discharges from industrial or commercial operations as prescribed;

(e) recycling or reuse or recovery of hazardous wastes or industrial by-products in an unauthorized or non-prescribed manner or procedure; and

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(f) any activity which may cause adverse environmental affect due to trans boundary projects of Province of Sindh.

which lead to pollution or impairment of or damage to biodiversity, ecosystem, aesthetics or any damage to environment and natural resources as defined in section 2 (xxxvi) of this Act.

(2) No person shall generate, handle, transport, dispose of or handle the hospital waste and infections waste except in accordance with the Hospital Waste Management Rules and in such manner as may be prescribed.

(3) No person shall import, manufacture, stockpile, trade, supply, distribute or sell any scheduled plastic product which is non-degradable. The scheduled plastic products must be oxo-biodegradable and the pro-degradant used must be approved by the Agency or any other department or agency and in such manner as prescribed.

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. **Regulation of motor vehicles.**

(2) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as prescribed.

(3) For ensuring compliance with the standards mentioned in sub-section (1), the Agency may direct that any manufacturer of motor vehicle or class of vehicles shall use such manufacturing standard or design or pollution control devices or other equipment or undergo such testing as may be prescribed.

(4) Where a direction has been issued by the Agency under sub-section (2) and (3) in respect of any motor vehicles or class of motor vehicles, no person shall operate or manufacture any such vehicle till such direction has been complied with.

16. (1) The monitoring, testing and analysis carried out in compliance or for the enforcement of any provisions of this Act. **Certified Environmental Laboratory**

(2) The laboratory or organization having any facility for environmental monitoring, testing and analysis and intend to perform under sub-section (1) shall register with the Agency in accordance with the Environmental Laboratory Certification Rules as prescribed.

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PART VI
ENVIRONMENTAL EXAMINATIONS AND ASSESSMENTS

Initial environmental examination and environmental impact assessment.

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 impact assessment, and has obtained from the Agency approval in respect thereof.

(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 impact assessment by the proponent; or

(b) review the environmental impact assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental impact assessment as being contrary to environmental objectives.

(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.

(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 impact 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 impact 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:

(5) The provisions of sub-sections (1), (2), (3) and (4) shall apply to such categories of projects and in such manner as prescribed:

(6) The Agency shall maintain separate registers for initial environmental examination and environmental impact assessment projects, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open for inspection to the public during office hours.

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Strategic environmental assessment.

18. (1) All provincial government agencies, departments, authorities, local councils and local authorities responsible for formulating policies, legislation, plans and programmes to be implemented in Sindh province which may cause any environmental impact in the jurisdiction of the province shall, before submitting the same to the competent authority for approval, forward to the Sindh Environmental Protection Agency a strategic environment assessment containing —

(a) description of the objectives and features of the proposed policy, legislation, plan or programme that are in consonance with the principles of sustainable development;

(b) assessment of the adverse environmental effects, if any, likely to be caused during implementation of the policy, legislation, plan or programme along with proposed preventive, mitigation and compensatory measures;

(c) analysis of possible alternatives; and

(d) identification of those components of the policy, legislation, plan or programme, if any, in respect of which specific environmental impact assessment need to be carried out in due course.

(2) The Agency shall, in consultation with the concerned Government Agencies and Advisory Committees where established, review the strategic environment assessment, within sixty (60) days of its filing, and prepare a report containing its comments and recommendations in respect thereof which shall be forwarded to the initiating Government Agency, authority, local council or local authority and duly considered by it and the competent authority before approval or otherwise of the proposed policy, legislation, plan or programme.

(3) The provisions of sub-sections (1), and (2) shall apply to such categories of policies, plans and programmes and in such manner as may be prescribed.

Environmental monitoring.

19. (1) The Agency shall carry out or arrange environmental monitoring of all projects in respect of which it has approved an initial environmental examination or environmental impact assessment to determine whether the actual environmental impact exceeds the level predicted in the assessment and whether the conditions of the approval are being complied with.

(2) For purposes of sub-section (1), the Agency may require the person in charge of a project to furnish such information as it may specify pertaining to the environmental impact of the project, including quantitative and qualitative analysis of -

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(a) discharge of effluents, wastes, emissions of air pollutants, noise and any other matter or action that may be found offensive under section 14 from the project on daily, weekly, monthly or annual basis;

(b) ambient quality of the air, water, noise and soil before, during and after construction and during operation of the project.

(3) On review of the data collected by it and information provided, the Agency may issue such directions to the person in charge as it may consider necessary to ensure compliance with the conditions of the approval.

Environmental Audit and Review

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.

(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; and

(c) recommendations for further minimizing or mitigating the adverse environmental impact of the project.

(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.

PART VII
ENVIRONMENTAL PROTECTION ORDER

Environmental Protection Order.

21. (1) Where the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of any provision of this Act, the rules or regulations or of the conditions of a licence, or is likely to cause, or is causing or has caused an adverse environmental effect, the Agency may, after giving the person responsible for such

discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures as the Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include —

(a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, act or omission, or to minimize or remedy the adverse environmental effect;

(b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, act or omission;

(c) action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances;

(d) action to restore the environment to the condition existing prior to such discharge, disposal, handling, act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfaction of the Agency; and

(e) impose a penalty as prescribed.

(3) Notwithstanding the provisions of sub-section (1), in an emergency situation where, for reasons to be recorded, the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act and that circumstances of the case warrant immediate action in the public interest, it may pass an ad-interim order of the nature described in sub-sections (1) and (2) by providing reasonable opportunity of hearing.

PART VIII
OFFENCES AND PENALTIES

Penalties.

22. (1) Whoever contravenes or fails to comply with the provisions of sections 11, 17, 18 and 21 or any order issued there under shall be punishable with a fine which may extend to five million rupees, to the damage caused to environment and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if the contravention of the provisions of section 11 also constitutes a contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2).

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(2) Whoever contravenes or fails to comply with the provisions of sections 13, 14, 15 and 16 or any rule or regulation or conditions of any license, any order or direction, issued by the Agency, shall be punished with a fine, and in case of continuing contravention or failure with an additional fine which may extend to ten thousand rupees for every day during which such contravention continues.

(3) Where an accused has been convicted of an offence under sub-sections (1) and (2), the Environmental Protection Tribunal and Court shall, as the case may be, in passing sentence, take into account the extent and duration of the contravention or failure constituting the offence and the attendant circumstances.

(4) Where an accused has been convicted of an offence under sub-sections (1) or (2), the Environmental Protection Tribunal or Court, as the case may be, shall endorse a copy of the order of conviction to the concerned trade or industrial association, if any, or the concerned Provincial Chamber of Commerce and Industry or the Federation of Pakistan Chambers of Commerce and Industry.

(5) Where a person convicted under sub-sections (1) and (2) had been previously convicted for any contravention of this Act and its rules or regulations, the Environmental Protection Tribunal, as the case may be, may, in addition to the punishment awarded thereunder-

(a) sentence him to imprisonment for a term that may extend up to three years;

(b) order the closure of the factory;

(c) order confiscation of the facility, machinery and equipment, vehicle or substance, record, document or other object used or involved in contravention of the provisions of this Act;

(d) order such person to restore the environment at his own cost, to conditions existing prior to the contravention or as close to such conditions as may be reasonable in the circumstances to the satisfaction of the Agency; and

(e)order that compensation be paid to any person or persons for any loss, or damage to their health or property suffered by such contravention.

(6) The Director General or an officer generally or specially authorised by him in this behalf may, on the application of the accused, compound an offence under this Act with the permission of the Environmental Protection Tribunal or Court in accordance with such procedure as prescribed.

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(7) Where the Director General is of the opinion that a person had contravened any provision of this Act, he may, subject to the rules, by notice in writing to that person require him to pay to the Agency a penalty in the amount set out in the notice for each day the contravention continues.

Offences by body corporate.

23. Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been committed with the consent or connivance of, or is attributed to any negligence on the part of, any director, partner, manager, secretary or other officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly:

Provided that in the case of a company as defined under the Companies Ordinance, 1984 (XLVII of 1984), only the Chief Executive as defined in the said Ordinance shall be liable under this section.

Explanation.— For the purposes of this Section, "body corporate" includes a firm, association of persons and a society registered under the Societies Registration Act, 1860 (XXI of 1860), or under the Co-operative Societies Act, 1925 (VII of 1925).

Offences by Government Agencies, local authorities or local councils.

24. Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of, or is attributable to any negligence on the part of, the Head or any other officer of Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

PART IX
ENVIRONMENTAL PROTECTION TRIBUNALS AND COURTS

Environmental Protection Tribunals.

25. (1) Government may, by Notification in the Official Gazette, establish as many Environmental Protection Tribunals as it considers necessary and, where it establishes more than one Environmental Protection Tribunal, it shall specify territorial limits within which, or the class of cases in respect of which, each one of them shall exercise jurisdiction under this Act.

(2) An Environmental Protection Tribunal shall consist of a Chairperson who is, or has been, or is qualified for appointment as a Judge of the High Court to be appointed after consultation with the Chief Justice of the High Court and two members to be appointed by Government, of which at least one shall be a technical member nominated from amongst the officers of the Agency with suitable professional qualifications and experience in the environmental field.

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(3) For every sitting of the Environmental Protection Tribunal, the presence of the Chairperson and not less than one Member shall be necessary.

(4) A decision of an Environmental Protection Tribunal shall be expressed in terms of the opinion of the majority of its members, including the Chairperson, or if the case has been decided by the Chairperson and only one of the members and there is a difference of opinion between them, the decision of the Environmental Protection Tribunal shall be expressed in terms of the opinion of the Chairperson.

(5) An Environmental Protection Tribunal shall not, merely by reason of a change in its composition, or the absence of any member from any sitting, be bound to recall and rehear any witness who has given evidence, and may act on the evidence already recorded by, or produced, before it.

(6) An Environmental Protection Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.

(7) No act or proceeding of an Environmental Protection Tribunal shall be invalid by reason only of the existence of a vacancy in, or defect in the constitution, of, the Environmental Protection Tribunal.

(8) The terms and conditions of service of the Chairperson and members of the Environmental Protection Tribunal shall be such as may be prescribed.

Jurisdiction and powers of Environmental Protection Tribunals.

26. (1) An Environmental Protection Tribunal shall exercise such powers and perform such functions as are, or may be, conferred upon or assigned to it by or under this Act or the rules and regulations.

(2) All contraventions punishable under sub-section (1) of section 22 shall exclusively be triable by an Environmental Protection Tribunal.

(3) An Environmental Protection Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by—

(a) the Agency or any Government Agency or local council; and

(b) any aggrieved person, who has given notice of not less than thirty days to the Agency, of the alleged contravention and of his intention to make a complaint to the Environment Protection Tribunal.

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(4) In exercise of its criminal jurisdiction, the Environmental Protection Tribunal shall have the same powers as are vested under the Code of Criminal Procedure, 1898 (Act V of 1898).

(5) In exercise of the appellate jurisdiction under section 27 the Environmental Protection Tribunal shall have the same powers and shall follow the same procedure as an appellate court in the Code of Civil Procedure, 1908 (Act V of 1908).

(6) In all matters with respect to which no procedure has been provided for in this Act, the Environmental Protection Tribunal shall follow the procedure laid down in the Code of Civil Procedure, 1908 (Act V of 1908).

(7) An Environmental Protection Tribunal may, on application filed by any officer duly authorised in this behalf by the Director General, issue bailable warrant for the arrest of any person against whom reasonable suspicion exists, of his having been involved in contravention punishable under sub-section (1) of section 22:

Provided that such warrant shall be applied for, issued and executed in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898):

Provided further that if the person arrested executes a bond with sufficient sureties in accordance with the endorsement on the warrant he shall be released from custody, failing which he shall be taken or sent without delay to the officer in-charge of the nearest jurisdiction police station.

(8) All proceedings before the Environmental Protection Tribunal shall be deemed to be judicial proceedings within the meaning of sections 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Environmental Protection Tribunal shall be deemed to be a court for the purpose of sections 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than an Environmental Protection Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of an Environmental Protection Tribunal extends under this Act and the rules and regulations.

(10) Where the Environmental Protection Tribunal is satisfied that a complaint made to it under sub-section (3) is false and vexatious to the knowledge of the complainant, it may, by an order, direct the complainant to pay to the person complained against such compensatory costs which may extend to one hundred thousand rupees.

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Appeals to the Environmental Protection Tribunal.

27. (1) Any person aggrieved by any order or direction of the Agency under any provision of this Act or the rules or regulations may prefer an appeal with the Environmental Protection Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

(2) An appeal to the Environmental Protection Tribunal shall be in such form, contain such particulars and be accompanied by such fees as prescribed.

Appeals from orders of the Environmental Protection Tribunal.

28. (1) Any person aggrieved by any final order or by any sentence of the Environmental Protection Tribunal passed under this Act may, within thirty days of communication of such order or sentence, prefer an appeal to the High Court.

(2) An appeal under sub-section (1) shall lie before the High Court of Sindh.

Jurisdiction of Judicial Magistrate.

29. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1898 (Act V of 1898), or any other law for the time being in force, but subject to the provisions of this Act, all contraventions punishable under sub-section (2) of section 22 shall exclusively be triable by the Court of Judicial Magistrate of First Class having of First Class having jurisdiction.

(2) A Judicial Magistrate shall be competent to impose any punishment specified in sub-sections (2) and (4) of section 22.

(3) A Judicial Magistrate shall not take cognizance of an offence triable under sub-section (1) except on a complaint in writing by—

(a) the Agency; and

(b) any aggrieved person.

Appeals from orders of the Judicial Magistrate.

30. Any person aggrieved by any final order or sentence passed by a Judicial Magistrate under section 28 may, within thirty days from the date of the communication of such order or sentence, appeal to the Court of the District and Sessions Judge defined as Green Court under this Act, whose decision thereon shall be final.

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PART X
PUBLIC PARTICIPATION

Public participation.

31.(1)The Agency shall cause relevant details of any proposed project regarding which an Environmental Impact 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 impact assessment or strategic impact assessment, and decision or action taken thereon shall be communicated to the persons who have furnished the said comments.

PART XI
GENERAL

Power to make and amend schedule.

32. The Agency may, by notification in the official Gazette, make and amend the schedule.

Indemnity

33. No suit, prosecution or other legal proceedings shall lie against Government, the Council, the Agency, the Director General of the Agency, members, officers, employees, experts, advisors, committees or consultants of the Agency or Environmental Protection Tribunal or Court or any other person for anything which is done or intended to be done in good faith under this Act or rules or regulations.

Dues recoverable as arrears of land revenue.

34. Any dues recoverable by the Agency under this Act and rules or regulations shall be recoverable as arrears of land revenue.

Act to override other laws.

35. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

Power to make rules.

36. The Sindh Environment Protection Agency may, by notification in the Official Gazette, make rules for carrying out the purposes not in consistence of this Act with the approval of Government.

Power to make regulations.

37. (1) For carrying out the purposes of this Act, the Agency may, by Notification in the Official Gazette and with the approval of Government, make regulations not inconsistent with the provisions of this Act or the rules.

(2) In particular and without prejudice to the generality of the foregoing power, such regulations may provide for —

(a) submission of periodical reports, data or information by any Government Agency, local authority or local council in respect of environmental matters;

(b) preparation of emergency contingency plans for coping with environmental hazards and pollution caused by accidents, natural disasters and calamities;

(c) appointment of officers, advisors, experts, consultants and employees;

(d) levy of fees, rates and charges in respect of services rendered, actions taken and schemes implemented;

(e) monitoring and measurement of discharges and emissions;

(f) categorization of projects to which, and the manner in which sections 17, 18 and 20 applies;

(g) laying down of guidelines for preparation of initial environmental examination, environmental impact assessment and strategic environmental assessment, and development of procedures of their filing, reviews and approval.

(h) laying down standard operating procedures for environmental sampling, examination of water, waste water, gaseous emissions, solid waste and noise;

(i) providing procedures for handling hazardous substances; and

(j) installation of devices in, use of fuels by, and maintenance and testing of motor vehicles for control of air and noise pollution.

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ANNEXURE 2: SEPA (Environmental Assessment) Regulations, 2021

GOVERNMENT OF SINDH
SINDH ENVIRONMENTAL PROTECTION AGENCY

Karachi dated the 03rd September, 2021

NOTIFICATION

NO.EPA/TECH/739/2021:- In exercise of the powers conferred by section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government, is pleased to make the following regulations, namely:-

1. Short title and commencement

(1) These regulations may be called the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021.

(2) They shall come into force at once.

2. Definitions. -

(1) In these regulations, unless there is anything repugnant in the subject or context

(a) "Act" means the Sindh Environmental Protection Act, 2014 (VIII of 2014);

(b) "Agency" means the Sindh Environmental Protection Agency as defined under section 2(ii);

(c) "Director General" means the Director General of the Agency;

(d) Environmental Checklist means rapid environmental assessment or environmental screening through a prescribed checklist in respect of projects having least/minimal impacts on the environment.

(e) "Firm" means the Environmental Consulting Firm registered by the Agency.

(f) "Environmentally sensitive area" means a location, large or small, that has significant environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical or cultural heritage value, or are important in providing amenity, harmony or sense of community, ecosystem as declared by Agency.

(g) "Protected area" means any area which safeguards the earths precious bio-diversity, protected areas of natural beauty and conservation of cultural significance as declared by relevant authority;

(h) "Schedule" means the Schedules provided in these regulations;

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(i) "Urban area" means an area within the limits of a town, municipality or city as determined by the Agency on the basis of population and environmental issues

(2) All other words and expressions used but not defined in these regulations shall have the same meaning as are assigned to them in the Act.

3. Projects requiring Environmental Checklist (EC)

A proponent of a project falling in any category listed in Schedule-I shall file environmental checklist with the Agency and the provisions of section 17 shall apply to such projects.

4. Projects requiring an Initial Environmental Examination (IEE)

A proponent of a project falling in any category listed in Schedule-II shall file an IEE with the Agency, and the provisions of section 17 shall apply to such projects.

5. Projects requiring an Environmental Impact Assessment (EIA)

A proponent of a project falling in any category listed in Schedule-III shall file an EIA with the Agency, and the provisions of section 17 shall apply to such projects.

6. Projects not requiring an Environmental Assessment

(1) A project not falling in any category listed in Schedules-I, II and III shall not be required to file an EC, IEE or EIA

(2) Notwithstanding anything contained in sub-regulation (1), the Agency may direct the proponent of a project, whether or not listed in Schedule I or II or III, to file an EC or IEE or EIA, for reasons to be recorded in such direction:

Provided that no such direction shall be issued without the recommendations in writing of the Advisory Committee constituted under regulations 21.

7. Preparation of environmental assessment report

(1) The Agency may issue guidelines for preparation of an EC or IEE or EIA reports including guidelines of general applicability, and sectoral guidelines indicating specific assessment requirements for planning, construction and operation of projects relating to particular sector.

(2) The Agency may issue guidelines for preparation scope of an Environmental Management Plan(EMP) or Environmental Audit(EA).

(3) Where guidelines have been issued under sub-regulation (1) & (2), an EC, IEE or EIA or EMP or EA shall be prepared, to the extent practicable, in accordance therewith and the proponent shall justify any departure therefrom.

8. Review Fees

The proponent shall pay, at the time of submission of an EC, IEE or EIA or EMP or BTS tower a non-refundable review fee to the Agency as prescribe in Schedule-IV.

9. Filing of report

(1) Two hard copies and two electronic copies for an EC or IEE or EIA report shall be filed with the Agency by the proponent. The Agency may require the proponent to submit additional copies, as and when required during the review process.

(2) Every EC, IEE and EIA shall be accompanied by -

(a) an application, in the form prescribed in Schedule-V;

(b) Copy of receipt showing payment of review fee as prescribed in Schedule-IV

10. Preliminary Scrutiny

(1) Any report filed by the proponent or applicant shall be returned, if found incomplete in terms of Regulation 9.

(2) Notwithstanding anything contained in sub-regulation (1) of regulation 12, the Agency may require the proponent to submit an additional information at any stage during the review process.

11. Public participation

(1) In the case in an EIA, the Agency shall issue a public notice to be published in widely circulated English or Urdu or Sindhi national newspaper and in a local newspaper of general circulation in the area affected by the project, mentioning the type of project, its exact location, the name and address of the proponent and the date, time and place of public hearing for inviting comments from primary stakeholders.

(2) The date fixed under sub-regulation (1) shall not be earlier than ten days from the date of publication of the notice.

(3) The Agency shall also ensure the circulation of the EIA, where necessary, to the concerned Government Agencies and solicit their comments thereon.

(4) All comments received by the Agency from the public or any Government Agency shall be duly considered before issuance of decision.

(5) The Agency may issue guidelines indicating the basic techniques and measures to be adopted to ensure effective public consultation, involvement and participation in EIA assessment.

12. Review process

(1) Notwithstanding anything contained in sub section (4) of Section 17, the Agency shall make every effort to conclude its review process of the EA, EMP or environmental checklist within fifteen days, of the IEE within thirty days, and of the EIA within sixty days after receiving of complete case.

(2) In reviewing an EIA, the Agency shall consult such Committee of Experts be constituted for the purpose by the Director General, and may also solicit views of concerned Advisory Committee, if any, constituted by the Agency.

(3) The Director General may, where considers it necessary, constitute a committee to inspect the site of the project and submit its report on such matters as may be specified.

(4) In reviewing the IEE, the Director General may constitute a committee of the officers from within the Agency, on case to case basis, in view of the jurisdiction and location of the project for the purpose to extend final recommendation about the approval or rejection of the IEE.

(5) The review of the IEE or EIA by the Agency shall be based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government Agencies received under regulation 12, and views of the committees mentioned in sub-regulations (2) and (3) above.

(6) EMP, EA, EC shall be reviewed as per guidelines issued by SEPA

13. Decision

(1) The documentary evidence in the form of videos (soft copies) of public hearing shall be submitted by the proponent within three days after conclusion of public hearing to the Agency.

(2) On completion of the review process, the decision of the Agency shall be communicated to the proponent in the form prescribed in Schedule-VI or in case of an IEE or EMP or environmental checklist or environmental audit in the form prescribed in Schedule-VII in case of an EIA.

14. Conditions of approval

(1) Every approval of an EC or IEE or EIA or EMP or EA shall, in addition to such conditions as may be imposed by the Agency, be subject to the condition that the project shall be designed, constructed or operated and mitigatory and other measures adopted, strictly in accordance with the EC or IEE or EIA or EMP or EA, unless any variations thereto have been specified in the approval by the Agency.

(2) Where the Agency accords its approval subject to certain conditions, the proponent shall submit an undertaking to the Agency, before commencing operation of the project, in the form prescribed in Schedule-VIII that the conditions of approval, and the requirements in the IEE or EIA relating to design and construction, adoption of mitigation and other measures have been duly complied with.

15. Validity period of Approval

(1) The approval accorded by the Agency under section 17 read with sub-regulation (2) of regulation 15 shall be valid, for commencement of construction, for a period of three years from the date of issue.

(2) If construction is commenced during the initial three years validity period, the

validity of the approval shall stand extended for a further period of three year.

(3) The proponent may apply to the Agency for extension in the validity periods mentioned in sub-regulations (1), (2), which may be granted by the Agency in its discretion for such period not exceeding three years at a time, if the conditions of the approval do not require significant change:

Provided that the Agency may require the proponent to submit a fresh IEE or EIA, if in its opinion changes in location, design, construction and operation of the project so warrant.

16. Entry and inspection

(1) For the purpose of verification of any matter relating to the review or to the conditions of approval of an EC or IEE or EIA or EMP or EA list prior to, before or during and after commencement of construction or operation of a project, duly authorized staff of the Agency shall be entitled to enter and inspect the project site, factory building and plant and equipment installed therein.

(2) The proponent shall ensure full cooperation of the project staff at site to facilitate the inspection, and shall provide such information as may be required by the Agency for this purpose and pursuant thereto.

17. Cancellation of approval

(1) Notwithstanding anything contained in these regulations, if, at any time, on the basis of information or report received or inspection carried out, the Agency is of the opinion that the conditions of an approval have not been complied with, or that the information supplied by a proponent in the approved EC or IEE or EIA or EMP or EA list is incorrect, it shall issue notice to the proponent for show cause within two weeks of receipt thereof as to why the approval should not be cancelled.

(2) In case no reply is received or if the reply is considered unsatisfactory, the Agency may, after giving the proponent an opportunity of being heard -

(i) require the proponent to take such measures and to comply with such conditions within such period as it may specify, failing which the approval shall stand cancelled; or

(ii) cancel the approval.

(3) On cancellation of the approval, the proponent shall cease construction or operation of the project forthwith.

(4) Any action taken under this regulation shall be without prejudice to any other action that may be taken against the proponent under the Act or rules or regulations or any other law for the time being in force.

18. Registers of EC or IEE and EIA projects

Separate Registers to be maintained by the Agency for EC or IEE and EIA projects shall be in the form prescribed in Schedule-IX.

19. Environmentally sensitive areas

(1) The Agency may designate an area to be an environmentally sensitive area,

(2) Notwithstanding anything contained in regulations 3 and 5, the proponent of a project situated in an environmentally sensitive area shall be required to file an EIA with the Agency.

20. Environmental assessment guidelines

(1) The Agency may from time to time issue guidelines to assist proponents and other persons involved in the preparation of environmental assessment.

(2) Where guidelines have been issued under sub-regulation (1), the projects shall be planned and prepared, to the extent practicable, in accordance therewith and any departure therefrom justified in the IEE/EIA pertaining to the project.

21. Environmental Assessment Advisory Committee. -

The agency may constitute one or more Committees for the purpose of rendering advice on implementation and enforcement of Section 17, which may include experts of relevant field, civil society, academia, environmental experts, representative of Administrative Department, legal expert and experts from natural resources.

22. Repeal and Savings.

(1) The Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations 2014, shall, on commencement of these regulations, stand repealed.

(2) All orders made, notification issued, actions taken under the repealed Regulations shall remain in force until amended, altered or repealed by the provisions of these regulations.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION AGENCY

SCHEDULE-I

(See Regulation 3)

List of projects requiring Environmental Screening (through check list)

a. Subject to the compliance with concerned zoning laws:
   i. Construction of residential and commercial buildings having total covered area from 60,000 sq.feet to 100,000 sq.feet
   ii. Housing Schemes covering an area from 05 acres to 15 acres.
   iii. Ware Houses for Non-Hazardous substances having total area from 1000 sq.yards to 5,000 sq.yards
   iv. Warehouse for Fertilizers
   v. Marriage Halls/Banquet/Restaurants/Baking facilities having total area more than 500 sq.yards
   vi. Motor vehicle workshops/Service Stations having total area of more than 500 sq.yards.
b. Construction/Reconstruction/Rehabilitation of roads in urban area from 500 meters to 01 kilometres and in rural area from 500 meters to 05 kilometres.
c. Construction of Flyover, underpasses and bridges of length from 100 meters to 500 meters
d. On-farm dams and fish farms
e. Pulses mills
f. Flour Mills
g. Lining of existing minor canals and /or water courses.
h. Canal cleaning
i. Forest harvesting operations
j. Rain harvesting projects
k. Health care units of less than 50 beds
l. BTS Tower
m. Lime Kilns
n. Ice factories and cold storage.
o. Cotton oil mill
p. Construction of LPG, CNG, LNG filling station and petrol pumps
q. Carpet manufacturing units
r. Rain harvesting projects
s. Industrial Effluent Treatment Plant
t. Sanitary Landfill site up to 500 tons/day

Schedule-II

(See Regulation 4)

List of projects requiring an Initial Environmental Examination

A. Agriculture, Livestock and Fisheries

1. Poultry, livestock and fish farms
2. Warehousing for pesticides and pharmaceuticals
3. Projects involving packaging, formulation, cold storage and warehouse of agricultural, livestock and fish products.
4. Construction & Operation of Slaughter houses

B. Energy

1. Hydroelectric power generation up to 25 MW
2. Thermal power generation up to 100 MW
3. Coal fired power plants with capacity up to 50 MW
4. Transmission lines up to 132 KV, and grid stations
5. Waste-to-energy generation projects including bio-mass up to 25 MW
6. Construction of Coal Handling and storage facilities
7. Handling, Transportation & Storage of Biofuel Facility
8. Handling and storage of edible grains and seeds
9. All Renewable energy Projects (excluding Protected/Sensitive area under any law)

C. Oil and Gas projects:

1. Oil and gas 2D/3D Seismic survey and drilling activities (on and off shore)
2. Oil and gas extraction projects including exploration and production located outside the environmentally sensitive/protected areas
3. Oil & Gas transmission gathering, storage, separation & transportation system
4. Construction of CNG, LPG Petroleum and LNG bulk storage facility
5. Oil blending and recycling units

D. Manufacturing and processing

1. Ceramics and glass units
2. Food processing units
3. Pharmaceutical units.
4. Rice mills, ghee/oil mills, Cotton ginning
5. Man-made fibers and resin projects

6. Tanning and leather finishing projects
7. Manufacturing of apparel, textile garments units, including weaving, spinning, dyeing, bleaching and printing
8. Woodwork units manufacturing products
9. Steel re-rolling mills
10. Waste recycling plants
11. Battery manufacturing plant
12. Brick Kilns
13. Marble processing units
14. Stone Crushing units

E. Mining and mineral processing

1. Commercial extraction of sand, gravel, limestone, clay, Sulphur and other minerals not included in Schedule I.
2. Crushing, grinding and separation processes
3. Metal Smelting plant production capacity up to 20 tons/day

F. Transport

1. Construction of flyovers, underpasses and bridges having length more than 500 meters to 1000 meters in urban areas and more than 5km in rural areas
2. Bus terminals/ railway station/ metro stops and construction & operation of transport related terminals
3. Rehabilitation or rebuilding or reconstruction of existing roads more than one kilometers in urban areas and more than 5 km from rural areas

G. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of less than 25 million cubic meters of surface area less than 4 square kilometers
2. Irrigation systems and drainage system with the area of less than 15,000 hactors
3. Flood protection bunds

H. Water supply and filtration

Water supply schemes and filtration plants

I. Waste disposal and wastewater treatment

1. Solid and Non-hazardous waste with annual capacity up to 10,000 tonnes (excluding municipal landfill sites and commercial facilities) including Garbage Transfer station/composting plant

2. Wastewater treatment for sewerage treatment facility less than 100 mgd
3. Hospital waste disposal facilities including incineration units owned by Hospitals for own use excluding commercial facility.

J. Urban development

1. Housing schemes more than 15 acres to 50 acres
2. Residential, Commercial multistory High rise construction projects having covered area more than 100,000 sq.feet to 500,000 sq.feet.
3. Laboratories
4. Hospitals, health care unit of more than 50 beds
5. Construction of Educational and Academic institutions.

K. Other projects

Any other project for which filing of an IEE is required by the Agency under sub-regulation (2) of Regulation 6.

SCHEDULE III

(See Regulation 5)

List of projects requiring an EIA

A. Energy

1. Hydroelectric power generation more than 50 MW
2. Thermal power generation more than 100 MW
3. Coal power projects more than 50 MW
4. Transmission lines above 132 KVA and distribution projects.
5. Nuclear power plants
6. Wind, Solar or renewable energy projects if falls under any environmental sensitive and protected area.

B. Oil and Gas projects

1. Oil Petroleum refineries.
2. LPG and LNG Terminals Projects
3. Coal Handling Terminals Projects

C. Manufacturing and processing

1. Cement plants
2. Chemical manufacturing industries
3. Fertilizer plants
4. Steel Mills
5. Sugar Mills and Distilleries
6. Establishment of Industrial estates & Export processing zones
7. Petrochemicals complex
8. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, printing and publishing, paints and dyes.

D. Mining and mineral processing

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Metal Smelting plant production capacity more than 20 tons/day

E. Transport

1. Airports
2. Construction of highway, motor ways, major roads (Intercity roads) more than one km and above

3. Ports and harbor development
4. Mass transit projects
5. Railway works
6. Construction of Flyover, underpass and bridges having total length more than one km.

F. Water management, dams, irrigation and flood protection

1. Dams and reservoirs with storage volume of 25 million cubic meters and above having surface area of 4 square kilometers and above
2. Irrigation and drainage projects serving more than 15,000 hectares and above

G. Water supply and filtration

Public water supply schemes and **filtration** plants.

H. Waste Disposal and treatment

1. Facilities for handling, storage or disposal of hazardous or toxic wastes or radioactive waste (including landfill sites, incineration units, etc.)
2. Solid waste municipal landfill sites.
3. Combine Effluent Treatment Plant
4. Domestic wastewater treatment plant more than 100mgd

I. Urban development and tourism

1. Housing schemes above 50 acres
2. Residential, Commercial High rise buildings subject to compliance of building bylaws of relevant organizations more than 500,000 sq.feet
3. All Projects located in High Density Zones notified by Government and relevant land controlling organization, irrespective of their size.
4. Commercialization of major corridors/roads in urban centers
5. Large Scale public facilities
6. Large-scale tourism development projects

J. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas being identified by the Agency.

K. Other projects

1. Any other project for which filing of an EIA is required by the Agency under sub-regulation (2) of Regulation 5.
2. Any other project likely to cause an adverse environmental effect.

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Schedule-IV

(See Regulation 8)

Project Cost (in million)	Review Fee
Up to 20	Rs.50,000
Above 20 up to 100	Rs. 100,000
Above 100 up to 200	Rs. 200,000
Above 200 up to 500	Rs. 400,000
Above 500	Rs. 600,000
Review fee for Environmental Checklist or EMP shall be Rs. 40,000/=	
Review fee for BTS Tower shall be 20,000/=	

*

Note:

The fee shall be payable into the "Sindh Sustainable Development Fund" account Details are as under:

A/C Title: Sindh Sustainable Development Fund

Account Number: 03084572626100

Bank: Sindh Bank

Branch Code: 0308-Korangi Industrial Area

13

SCHEDULE V

[See Regulation 9(2)(a)]

Application Form

1.	Name and address of Proponent		Phone: Email:	
2.	CNIC No. of proponent			
3.	Brief description of project			
4.	Location of project			
5.	Cost of the Project			
6.	Objectives of project			
7.	IEE/EIA attached?	IEE/EIA: Yes/No		
8.	Have alternative sites/options been considered/ reported in IEE/EIA?		Yes/No	
9.	Title document of the project			
10.	Existing land use		Land requirement	
11.	Is basic site data available, or has it been measured?	(only tick yes if the data is reported in the IEE/EIA)	Available	Measured
		Meterology (including rainfall)	Yes/No	Yes/No
		Ambient air quality	Yes/No	Yes/No
			Yes/No	Yes/No
			Yes/No	Yes/No
12.	Have estimates of the following been reported, especially Quantitative Analysis?	Water balance	Estimated	Reported
		Solid waste disposal	Yes/No	Yes/No
		Liquid waste	Yes/No	Yes/No
			Yes/No	Yes/No
13.	Source of power		Power requirement	
14.	Labour force (number)	Construction: Operation:		
15.	Environmental Consulting Firm			

Verification. I do solemnly affirm and declare that the information given above and contained in the attached EC/IEE/EIA is true and correct to the best of my knowledge and belief.

Date

Signature, name _____
of proponent (with official stamp/seal)

14

SCHEDULE VI
[See Regulation 13(2)]

Decision on IEE/Environmental Check List

1. Name and address of proponent _____

_____

2. Description of project

3. Location of project

4. Date of filing of IEE

5. After careful review of the IEE, the Agency has decided –

(a) to accord its approval, subject to the following conditions:

_____

_____

or (b) that the proponent should submit an EIA of the project, for the following reasons –

_____

Dated _____

Tracking no.___

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)

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SCHEDULE VII

[See Regulation 13(2)]

Decision on EIA

1. Name and address of proponent _____

2. Description of project _____

3. Location of project _____

4. Date of filing of EIA _____

5. After careful review of the EIA, and all comments thereon, the Federation Agency has decided –

(a) to accord its approval, subject to the following conditions:

_____

_____

or (b) that the proponent should submit an EIA with the following modifications-

_____

or (c) to reject the project, being contrary to environmental objectives, for the following reasons:

_____

Dated _____

Tracking no.___

Director-General
Sindh Environmental Protection Agency
(with official stamp/seal)

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SCHEDULE VIII
[See Regulation 14(2)]

Undertaking

I, (full name and address) as proponent for (name, description and location of project) do hereby solemnly affirm and declare that the conditions of approval and the requirements in the IEE or EIA relating to design and construction, adoption of mitigation and other measures and other relevant matters have been duly complied with in the design and construction of the project.

Signature, name and designation of proponent
(with official stamp/seal)

Witnesses(full names and addresses)

_____

_____

17

SCHEDULE IX

(See Regulation 18)

Form of Registers for EC, IEE and EIA projects

S. No.	Description	Relevant Provisions
1	2	3
1.	Tracking number	
2.	Category type (as per Schedules I or II)	
3.	Name of proponent	
4.	Name and designation of contact person	
5.	Name of consultant	
6.	Description of project	
7.	Location of project	
8.	Date of submission of IEE/EIA	
9.	Date of public hearing / technical presentation	
10.	Date of committee of experts for schedule-II projects	
11.	Approval granted (Yes/No)	
12.	Date of approval granted or refused	

ANNEXURE 3: Hazardous Substance Rules, 2014

GOVERNMENT OF SINDH
SINDH ENVIRONMENT PROTECTION AGENCY

Karachi dated the 16th, December, 2014.

NOTIFICATION

NO.EPA/TECH/739/2014:- In exercise of the powers conferred by section 36 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Government is pleased to make the following rules, namely:-

1. **Short title and commencement.** (1) These rules may be called the Hazardous Substances Rules, 2014.

(2) They shall come into force at once.

2. **Definition.** (1) In these rules, unless there is anything repugnant in the subject or context -

(i) "Act" means the Sindh Environmental Protection Act, 2014;

(ii) "Director-General" means the Director-General of the Agency;

(iii) "environmental impact assessment" means an environmental impact assessment as defined in clause (xv) of section 2;

(iv) "major accident" means an occurrence resulting from uncontrolled developments during industrial activity or from natural events which is likely to cause an adverse environmental effect, involving substantial loss of life and property;

(v) "section" means a section of the Act;

(vi) "Schedule" means Schedule to these rules; and

(vii) "worker" shall have the same meaning as defined in clause (h) of section 2 of the Factories Act, 1934 (XXV of 1934).

(2) All other words and expressions used in these rules but not defined shall have the same meanings as are assigned to them in the Act.

3. **Substances prescribed as hazardous substances.** As provided in sub-clause (b) of clause (xxv) of section 2, substances listed in Schedule-I are hereby prescribed as hazardous substances.

4. **Application for licence.** An application for grant of licence under section 13 shall be filed with the Agency in Form-A of Schedule-II:

Provided that an applicant for grant of licence to import or transport a hazardous substance shall, in addition to information in Form-A, also provide details mentioned in sub-rule (1) of rules 20 and 21 respectively.

5. **EIA of project or industrial activity.** (1) An application for grant of licence filed under rule 4 shall be accompanied by an environmental impact assessment of the project or industrial activity involving generation, collection, consignment, transport, treatment, disposal, storage, handling or import of a hazardous substance in respect of which the licence is sought.

(2) The environmental impact assessment submitted by the applicant shall include –

(a) a safety plan, containing information specified in sub-rule (1) of rule 17;

(b) a waste management plan, if hazardous waste shall be generated by the project or industrial activity, containing information specified in sub-rule (1) of rule 19.

6. **Applicability of Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations 2014.** The environmental impact assessment accompanying an application for grant of licence shall be prepared, scrutinized, reviewed and decided in accordance with the provisions of the Sindh Environmental Protection Agency (Review Initial Environmental Examination and Environmental Impact Assessment) Regulations 2014.

7. **Issue of Licence.** (1) Where the Director General approves an application for grant of licence, the applicant shall be informed accordingly and directed to deposit with the Agency, a licence fee at the rate specified in Schedule-III.

(2) On receipt of the licence fee, the Agency shall issue a licence in Form-B of Schedule-II.

(3) If a licence is defaced, damaged or lost, duplicate thereof shall be issued on payment of such fee as specified in Schedule-III.

8. **Conditions of licence.** (1) A licence granted under section 13 shall be subject to the conditions of approval of the environmental impact assessment accompanying the application for licence.

(2) Without prejudice to the provisions of sub-rule(1), a licence granted under section 13 shall also be subject to the following conditions:-

(a) the licensee shall employ qualified technical personnel having necessary knowledge and experience regarding the use, storage and handling of the hazardous substance, and safety precautions relating thereto;

(b) the hazardous substance shall be packed and labeled in

accordance with rule 9;

(c) the premises of the licensee shall comply with the conditions laid down in rule 10;

(d) the licensee shall ensure compliance with the provisions of rules 11 and 12 regarding safety precautions;

(e) the licensee shall provide necessary information, and where required training, to the persons to whom the hazardous substances are sold or delivered, regarding the use, storage and handling of the hazardous substances, and safety precautions relating thereto;

(f) the licensee shall maintain a detailed record of the quantity, type, quality and origin of the hazardous substance and the names and addresses of the persons to whom the hazardous substances are sold or delivered; and

(g) the licensee shall not extend his operation beyond the scope of the project or industrial activity in respect of which the environmental impact assessment has been submitted and approval granted.

(2) The Agency may, in the light of its review of the environmental impact assessment, require that the licensee maintain adequate insurance cover for any aspect of his operation.

(3) The licensee shall provide copy of approval from importing country under the international convention and protocol.

9. **Packing and labeling.-** (1) A container of a hazardous substance shall be of such size, material and design as to ensure that –

(a) it can be stored, transported and used without leakage and safely;

(b) the hazardous substance therein does not deteriorate in a manner as to render it more likely to cause, directly or in combination with other substances, an adverse environmental effect.

(2) The following information shall be printed conspicuously, legibly and indelibly on every container of a hazardous substance:-

(a) name of the hazardous substance;
(b) name, address and licence number of the licensee;
(c) net contents (volume or weight);
(d) date of manufacture and date of expiry, if any;
(e) a warning statement comprising –

(i) the word "DANGER!" in red on a contrasting background;
(ii) a picture of a skull and cross-bones;
(iii) pertinent instructions for use, storage and handling and safety precautions relating thereto.

(f) instructions regarding return or disposal of the empty container:

Provided that if the hazardous substance has an inner container as well as an outer container, the information shall be printed on both containers:

Provided further that if it is impracticable to print the aforesaid information on the container itself due to its size, material or design, the same shall be printed on a label or tag which shall be conspicuously affixed or attached to the container in such manner as to render it difficult to remove. The empty chemical containers or drums may not be used for other purposes:

(g) basic instructions mentioning immediate steps to be taken in case of any accident or emergency, preferably in local language.

10. Conditions for premises. (1) The premises in which a hazardous substance is generated, collected, consigned, treated, disposed of, stored or handled shall -

(a) comply with the conditions specified in Schedule-IV;

(b) be fitted with a notice on the outer door or gate bearing the following information:-

(i) the words "DANGER ! HAZARDOUS SUBSTANCE!" in red, on a contrasting background; and

(ii) a prominent picture of a skull and cross-bones.

(2) In case of import of hazardous substances, proponent shall provide approval from Climate Change Division (International Convention Wing) Government of Pakistan.

11. General safety precautions. (1) A licensee shall ensure that the following safety precautions are conveyed to persons to whom the hazardous substances are sold or delivered:-

(a) carefully read and follow the instructions and safety precautions printed on the container; (Urdu or local language translation of the same may be preferably given to the local buyers);
(b) when opening the container, wear protective clothing and equipment including helmet or cloth cap, safety spectacles or goggles, respirator or mask, rubber or plastic gloves, and work boots, as may be required;
(c) avoid contact of the hazardous substance with exposed skin or eyes, and if such contact occurs, wash the exposed area immediately and consult a doctor;
(d) avoid contaminating clothing, gloves and footwear with the hazardous substance, and if such contamination occurs, remove the

clothing, gloves and footwear immediately and wash the same thoroughly before reuse;

(e) do not eat, drink or smoke in the vicinity of hazardous substances.

(2) The general safety precautions mentioned in sub-rule (1) shall be in addition to such other specific precautions or measures that may be required to be conveyed by the licensee for a particular hazardous substance. The licensee will be bound to inform the Agency, the details of his subsequent consignments as the licence will be issued for a period of one year under section 13.

12. **Safety precautions for workers.** A licensee shall ensure that the following safety precautions are taken in respect of workers employed by him for handling hazardous substances:-

(a) No worker aged below eighteen years or over sixty years shall be employed for any job involving physical handling of hazardous substances.

(b) All workers shall be thoroughly trained in safety precautions for handling hazardous substances and shall be supervised by qualified supervisors.

(c) Protective clothing and equipment comprising helmet or cloth cap, safety spectacles or goggles, respirators or masks, rubber or plastic gloves and work-boots shall be available for all workers who may be exposed to any hazardous substance, and no worker shall be permitted on job unless and until he is wearing such protective clothing and equipment.

(d) Adequate supply of water shall be made available to the workers for personal washing as well as for washing their protective clothing and equipment.

(e) Protective clothing and equipment of the workers shall be washed and cleaned as often as may be required to ensure their efficacy.

(f) No worker shall be permitted to eat, drink or smoke till he has removed his protective clothing and equipment, washed his hands and face, and left the place of work.

(g) All fire-fighting, emergency and safety equipment shall be frequently checked and properly maintained.

(h) First-aid medical facility equipped with required antidotes shall be available in the premises, supervised by trained staff.

(i) Medical check-up of all workers shall be carried out at the time of employment and at least once a year thereafter.

(j) A record of every worker shall be maintained containing, amongst other details, his name and address, his medical check-up history, and the hazardous substances handled by him.

13. **Validity of licence.** A licence issued under rule 7 shall be valid for a period of one year from the date of issue:

Provided that if an application for renewal is made under rule 14, the licence shall continue to remain valid till the application for renewal is decided.

14. **Renewal of licence.** An application for renewal of licence shall also be made to the Federal Agency in Form-A of Schedule II, at least 30 days before the date of its expiry.

(i) An application for renewal shall be accompanied by a brief update of the original environmental impact assessment, unless changes in circumstances require submission of a fresh environmental impact assessment.

(ii) the fee for renewal of licence shall be as provided in Schedule-III, and the licence issued on receipt thereof shall also be in Form-B of Schedule II.

(iii) the fee for duplicate copy of licence shall be as provided in Schedule-III and the licence issue on the receipt thereof shall also be in Form-B of Schedule-II.

15. Cancellation of the licence. (1) Notwithstanding anything contained in these rules, if at any time on the basis of information or report received or inspection carried out, the Agency is of the opinion that the conditions of the licence have not been complied with, or that the information supplied by the licensee in his application or approved environmental impact assessment is incorrect, it shall issue notice to the licensee to show cause, within two weeks of receipt thereof, why the licence should not be cancelled.

(2) If no reply is received or if the reply is considered unsatisfactory, the Agency may, after giving the licensee an opportunity of being heard -

(i) require the licensee to take such measures and to comply with such conditions within such period as it may specify, failing which the licence shall stand cancelled; or

(ii) cancel the licence.

(3) On cancellation of the licence under sub-rule (2), the licensee shall cease his operations forthwith.

(4) The action taken under this rule shall be without prejudice to any other action that may be taken against the licensee under the Act or rules or regulations or any other law for the time being in force.

16. **Entry, inspection and monitoring.** (1) For the purposes of verification of any matter relating to the conditions of the licence, duly authorized staff of the Agency shall be entitled to enter and inspect the premises in which the hazardous

substance is being generated, collected, consigned, treated, disposed of, stored or handled:

Provided that the Agency shall inspect the premises at least once a year.

(2) The licensee shall ensure cooperation of his staff at the premises to facilitate the inspection mentioned in sub-rule (1).

(3) The licensee shall provide such information as may be required by the Agency for effective monitoring of compliance by the licensee with the conditions of the licence.

17. **Safety plan.** (1) The safety plan to be submitted by an applicant under clause (a) of sub-rule (2) of Rule 5 shall include –

(a) an analysis of major accident hazards relating to the hazardous substance involved;

(b) an assessment of the nature and scope of the adverse environmental effects likely to be caused by major accidents;

(c) a description of the safety equipment and systems installed and safety precautions taken; and

(d) a description of the emergency measures proposed to be taken on and off the premises of the applicant to control a major accident, and to mitigate its adverse environmental effect.

(2) Before issue of the licence, the Agency shall, in consultation with other relevant Government Agencies and Departments including the licensee, review the safety plan to ensure that it covers all anticipated contingencies and all emergencies likely to result from a major accident involving the hazardous substance involved, and that the concerned Government Agencies, Departments and the licensee are aware of their specific responsibilities thereunder.

(3) After issue of the licence, the licensee shall ensure that all persons liable to be affected by the approved safety plan are informed of the relevant provisions thereof.

18. **Notification of major accident.** (1) Where a major accident occurs on the premises of a licensee, the licensee shall immediately notify the Agency concerned and shall submit within twenty four hours and weekly thereafter, a report in Schedule-V.

(2) On receipt of the report under sub-rule (1), the Agency shall require the licensee to carry out a detailed environmental audit of the major accident and initiate necessary action, in accordance with the approved safety plan or otherwise, to control the major accident, mitigate its adverse environmental effect and prevent it from recurring.

19. **Waste management plan.** (1) The waste management plan, if required to be submitted by an applicant under clause (b) of sub-rule (2) of rule 5, shall -

(a) provide for the generation, collection, transport and disposal of the hazardous waste in a manner which shall protect against an adverse environmental effect;

(b) ensure that the hazardous waste is not mixed with non-hazardous waste, unless the applicant can prove that such mixing will better protect against an adverse environmental effect.

(2) The waste management plan shall be reviewed every year by the licensee to take into consideration the development of new technologies and management practices which can better protect against an adverse environmental effect, and if required revised waste management plan and fresh environmental impact assessment shall be submitted with the application for renewal of licence.

(3) If the waste management plan provides for export of the hazardous waste, such export shall only be allowed if it is in accordance with a bilateral, multilateral or regional agreement or arrangement that conforms to the requirements of Article 11 of the Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, Basel, 1989.

(4) The licensee shall inform the Agency on a yearly basis about -

(a) the quantity and characteristics of hazardous waste generated in the previous year; and

(b) progress regarding implementation of the waste management plan.

20. **Import of hazardous substances.** (1) The applicant shall, for grant of licence to import a hazardous substance in addition to the information contained in Form-A of Schedule II, also provide the following details:-

(i) port of entry into Province of Sindh;

(ii) particulars of transport from exporting country to Pakistan;

(iii) quantity of hazardous substance being imported;

(iv) complete information pertaining to safety precautions to be adopted; and

(v) the purpose for which the hazardous substance is to be utilized, alongwith environmental impact assessment in respect thereof, if required under rule 5.

(vi) Licensee shall provide copy of approval from Climate Change Division (International Convention Wing) Government of Pakistan under the provisions of International Convention and Protocol.

(2) If the licence applied for is granted, the concerned Federal Agency or Ministry and the Agency and port authority concerned, shall ensure that proper steps are taken for safe off-loading, handling and storage of the hazardous substance on arrival at the port.

21. **Transport of hazardous substances.** (1) The applicant shall, for grant of licence for transport of a hazardous substance in addition to the information contained in Form-A of Schedule II, also provide the following details :-

(i) name and address of the person from whom the hazardous substance is to be collected;

(ii) name and address of the person to whom the hazardous substance is to be delivered;

(iii) quantity of hazardous substance to be transported;

(iv) mode of transport, including full particulars and specifications of the motor vehicles or other conveyance;

(v) route to be adopted between the origin and destination;

(vi) date and time of proposed transportation;

(vii) nature of waste which may be liquid or solid and its toxicity along with Material and Safety Data Sheet (MSDS); and

(viii) contingency or emergency response plan.

(2) If the licence applied for is granted, the Agency shall ensure that the Government Departments or Agencies concerned are informed of the relevant particulars of the transportation, for taking necessary safety precautions and other measures.

22. **Other approvals.** The issuance of a licence under section 13 read with rule 7 shall not absolve the licensee to obtain any other approval or consent that may be required under any law for the time being in force.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION AGENCY

SCHEDULE-I
(see Rule 3)

List of Prescribed Hazardous Substances or Any Other Synthetically Chemical

S. NO.	NAME OF CHEMICALS	CAS. NO
1.	Acetaldehyde	75-07-0
2.	Acetic acid	64-19-7
3.	Acetic anhydride	108-24-7
4.	Acetone	67-64-1
5.	Acetone cyanohydrins	75-86-5

S. NO.	NAME OF CHEMICALS	CAS. NO
6.	Acetone Thiosemicarbazide	
7.	Acetylene	74-86-2
8.	Acetyl chloride	75-36-5
9.	Acrolein	107-02-8
10.	Acrylamide	79-06-1
11.	Acrylonitrile	107-13-1
12.	Adiponitrile	111-69-3
13.	Aldicarb	116-06-3
14.	Aldrin	309-00-2
15.	Allyl alcohol	107-18-6
16.	Allyl amine	107-11-9
17.	Allyl chloride	107-05-1
18.	Amino biphenyl	92-67-1
19.	3-Amino-1, 2,4 triazole	61-82-5
20.	Aminopterin	
21.	Amiton	78-83-5
22.	Amiton dialate	
23.	Ammonia	7664-41-7
24.	Ammonium chloride	12125-02-9
25.	Ammonium sulphamate	7773-06-0
26.	Aniline	62-53-3
27.	Aniline 2,4,6-Trimethyl	
28.	Anthraquinone	84-65-1
29.	Antimony & Compounds	7440-36-0
30.	Arsenic & Compounds	7440-38-2
31.	Arsine	7784-42-1
32.	Asbestos	1332-21-4
33.	Azinpho-ethyl	
34.	Azinphos methyl	86-50-0
35.	Bacitracin	
36.	Barium and Compounds	513-77-9
37.	Benzal chloride	98-87-3
38.	Benzenamine 3-Trifluoromethyl	
39.	Benzene	71-43-2
40.	Benzene sulfonyl chloride	98-09-9
41.	Benzene 1- (chloromethyl) –4 Nitro	
42.	Benzene arsenic acid	
43.	Benzidine and Salt	92-87-5
44.	Benzimidazole, 4,5-dichloro-2 (Trifluoromethyl)	
45.	Benzyl chloride	100-44-7
46.	Beryllium and Compounds	7440-41-7
47.	Bis (2-chloroehyl) Sulphide	?

S. NO.	NAME OF CHEMICALS	CAS. NO
48.	Bis (chloroethyl) ketone	?
49.	Bis (Tert-butyl peroxy) cyclohexane	?
50.	Bis (Tert-butyl peroxy) butane	?
51.	Bis (2,4,6-Trinitrophenylamine)	?
52.	Bromo chloro methane	74-97-5
53.	Bromoform	75-25-2
54.	Butyl amine tert	75-64-9
55.	Butvl-n-mercaptan	109-79-5
56.	Cadmium and Compounds	7440-43-9
57.	Calcium arsenate	7778-44-1
58.	Calcium Cyanamide	156-62-7
59.	Camphechlor Toxaphene)	8001-35-2
60.	Cantharidin	?
61.	Captan	133-06-2
62.	Carbachol chloride	?
63.	Carbaryl	63-25-2
64.	Carbofuran	1563-66-2
65.	Carbon tetrachloride	56-23-5
66.	Carbon disulphide	75-15-0
67.	Carbon monoxide	630-08-0
68.	Cellulose nitrate	9004-70-0 ?
69.	Chlordane	12789-03-6
70.	Chlorinated benzene	108-90-7
71.	Chlorine	7782-50-5
72.	Chlorine oxide	10049-04-4
73.	Chlorine trifluoride	7790-9102
74.	Chloroacetaldehyde	107-20-0
75.	Chlorobenzene	108-90-7
76.	Chloroform	67-66-3
77.	Chloromethyl methylether	107-30-2
78.	Chloronitrobenzene	88-73-3
79.	Chloroethyle Vinyl ether	110-75-8
80.	Chromium and Compounds	7440-47-3
81.	Cobalt and Compounds	7440-48-4
82.	Copper and compounds	7440-50-8
83.	Crotonaldehyde	123-73-9
84.	Cumene	98-82-8
85.	Cyanides and Compounds	151-50-8
86.	Cyclohexane	110-82-7
87.	DDT	50-29-3
88.	Demeton	298-03-3
89.	Dichlorobenzene	95-50-1

S. NO.	NAME OF CHEMICALS	CAS. NO
90.	Dichloroethyl ether	111-44-4
91.	Dichlorophenol-2.6	87-65-0
92.	Dichlorophenol-2.4	120-83-2
93.	Dichloropropene-1,3	142-28-9
94.	Dichloroproponic acid	127-20-8
95.	Dichlorvos	62-73-7
96.	Dieldrin	60-57-1
97.	Dimethyl hydrazine	57-14-7
98.	Dimethyl phenol 2,4	105-67-9
99.	Dimethylamine	109-89-7
100.	Dimethylaniline	121-69-7
101.	Dinitrophenol 2-4	51-28-5
102.	Dinitrotoluenes	121-14-2
103.	Dinoseb	88-85-7
104.	Dinitrobenzene	528-29-0
105.	Dioxane-p	123-91-1
106.	Dioxathion	78-34-2
107.	Diquat	85-00-7
108.	Endosulfan	115-29-7
109.	Endrin	72-20-8
110.	Epichlorohydrine	106-89-8
111.	Ethion	563-12-2
112.	Ethyl acetate	141-78-6
113.	Ethyl benzene	100-41-4
114.	Ethyl amine	75-04-7
115.	Ethyl ether	60-29-7
116.	Ethyl methacrylate	97-63-2
117.	Ethylene dichloride	107-06-2
118.	Ethylene dibromide	106-93-4
119.	Ethylene diamine	107-15-3
120.	Ethylene oxide	75-21-8
121.	Ethylenimine	151-56-4
122.	Fluorine	7782-41-4
123.	Formaldehyde	50-00-0
124.	Formic acid	64-18-6
125.	Furfural	98-01-1
126.	Heptachlor	76-44-8
127.	Hexachlorobenzene	118-74-1
128.	Hexachlorocyclohexan (Lindane)	608-73-1
129.	Hexachlorocyclopentadiene	77-47-4
130.	Hydrochloric acid	7647-01-0
131.	Hydrogen sulphide	7783-06-4

S. NO.	NAME OF CHEMICALS	CAS. NO
132.	Hydrogen cyanide	74-90-8
133.	Hydrogen fluoride	7664-39-3
134.	Iridium tetrachloride	?
135.	Isobutyl alcohol	?
136.	Lead (Inorganic)	7439-92-1
137.	Lead arsenate	7784-40-9
138.	Lindane	58-89-9
139.	Magnesium powder or ribbon	7439-95-4 ?
140.	Malathion	121-75-5
141.	Maleic anhydride	108-31-6
142.	Malononitrile	109-77-3
143.	Mercury and Compounds	502-39-6
144.	Methoxy chloride	
145.	Methyl alcohol	67-56-1
146.	Methyl amine	74-89-5
147.	Methyl bromide (Bromomethane)	74-83-9
148.	Methyl chloride	74-87-3
149.	M ethyl chloroform (1,1,1-Trichloroethane)	137-5-3
150.	Methyl ethyl ketone peroxide	1338-23-4
151.	Methyl isocyanate	624-83-9
152.	Methyl methacrylate monomer	80-62-6
153.	Methyl Parathion	298-00-0
154.	Mevinphos	7786-34-7
155.	Molybdenum and Compounds	7439-98-7
156.	Monocrotophos	6973-22-4
157.	Butyl acetate	123-86-4
158.	Butyl alcohol	71-36-3
159.	Naled	300-76-5
160.	Naphthalene	91-20-3
161.	Naphthyl amine	91-51-8
162.	Nickel salts	7440-02-0
163.	Nicotine	54-11-5
164.	Nitric acid	7697-37-2
165.	Nitric oxide	10102-43-9
166.	Nitro benzene	98-95-3
167.	Nitrocholorobenzene	100-00-5
168.	Nitrocyclohexane	
169.	Nitrogen dioxide	10102-44-0
170.	Nitrogen trifluride	7783-54-2
171.	Nitrophenols	88-75-5
172.	Nitropropane-2	79-46-9
173.	Nitroso dimethyl amine	62-75-9

S. NO.	NAME OF CHEMICALS	CAS. NO
174.	Cresol	1319-77-3
175.	Nitroaniline	100-01-6
176.	Osmium tetroxide	20816-12-0
177.	Oxygen (Liquid)	7727-37-9
178.	Oxygen difluoride	7783-41-7
179.	Ozone	10028-15-6
180.	Paraoxon (diethyl-4 nitrophenyphosphate)	
181.	Parathion	56-38-2
182.	Pentaborane	19624-22-7
183.	Pentachlorobenzene	608-93-5
184.	Pentachlorophenol	87-86-5
185.	Pentabromophenol	
186.	Phenol	108-95-2
187.	Phenol,2,2-thiobis (4,6-dichloro)	
188.	Phenol,2,2-thiobis (4 chioro 6 methyl phenol)	
189.	Phenol, 3- (1- methyl-ethyl)- methylcarbamate	
190.	Phorate	298-02-2
191.	Phosgene	75-44-5
192.	Phosphoric acid	7664-38-2
193.	Phosphorus	7723-14-0
194.	Phosphorus oxychloride	10025-87-3
195.	Phosphorus pentasulphide	1314-80-3
196.	Phosphorus trichloride	7719-12-2
197.	Phthalic anhydride	85-44-9
198.	Picric acid (2,4,6-trnitrophenol)	88-89-1
199.	Polychlorinated biphenyls (PCBs)	1336-36-3
200.	Propionic acid	79-09-4
201.	Propargyl alcohol	107-19-7
202.	Propylene oxide	75-56-9
203.	Pyrethrins	8003-34-71
204.	Pyridine	110-86-1
205.	Quinone	106-51-4
206.	Sodium azide	26628-22-8
207.	Sodium fluoro-acetate	62-74-8
208.	Sodium hydroxide	1310-73-2
209.	Strychnine	57-24-9
210.	Styrene	100-42-5
211.	Sulfuric acid	7664-93-9
212.	Tert- Butyl peroxyacetate	
213.	Tetra ethyl pyrophosphate	107-49-3
214.	Tetra nitromethane (Rocket Industry)	509-14-8
215.	Tetra-chlorodibenzo-p-dioxin, 1,2,3,7,8 (TCDD)	1746-01-6

S. NO.	NAME OF CHEMICALS	CAS. NO
216.	Tetraethyl lead	78-00-2
217.	Thallic oxide	
218.	Titanium powder	7440-32-6
219.	Toluene	108-88-3
220.	Toluene 2,4-diisocyanate	584-84-9
221.	Toxaphene	8001-35-2
222.	Trans-1,4-dichloro-butene	
223.	Trichloroethylene	79-01-6
224.	Trichlorophenols	95-95-4
225.	Trichlorophenoxy acetic acid 2,4,5 triethylamine	93-76-5
226.	Trichlorophenol 2,3,6	933-75-5
227.	Trichlorophenol 2,4,5	95-95-4
228.	Triethylamine	121-44-8
229.	Triethylene melamine	
230.	Trinitrobenzene	99-35-4
231.	Trinitrotoluene (TNT)	118-96-7
232.	Turpentine	8006-64-2
233.	Uranium and compounds	7440-61-1
234.	Vanadium and compounds	7440-62-2
235.	Vinyl acetate	108-05-4
236.	Vinyl chloride	75-01-4
237.	Vinyledene chloride	75-35-4
238.	Warfarin	81-81-2
239.	Xylene	1330-20-7
240.	Xylidine	1300-73-8
241.	Zinc chloride	7646-85-7
242.	Zirconium and compounds	7440-67-7
243.	Any other substance declared hazardous by Sindh EPA	

SCHEDULE-II
FORM A
(see Rule 4)

Application for grant/renewal of licence for hazardous substance

I/we [*name(s)* _____] of [*address* _____] hereby apply for grant/ renewal of licence to generate/collect/consign/transport/treat/dispose of/ store/ handle/ import (delete words inapplicable) the following hazardous substance

_____

at my/our premises situated at [*address* _____].

I/we have read, and hereby undertake to comply with, all applicable provisions of the Sindh Environmental Protection Act, 2014 and rules and regulations made thereunder, including and in particular the Hazardous Substances Rules, 2014.

I/we submit herewith the following documents:-

(i) Environmental Impact Assessment (EIA) of the project/industrial activity involving the above-mentioned hazardous substance, including safety plan. Waste management plan is/is not included. [*delete word(s) inapplicable*].

(ii) Approved building plan of the premises mentioned above.

(iii) List of machinery and equipment installed/proposed to be installed.

(iv) List of qualified personnel and number of workers employed/proposed to be employed.

Date: _____ _____
Applicant

SCHEDULE-II
FORM B
(See Rule 7)

Licence for hazardous substance

M/s [*name* _____] of [*address* _____] is hereby granted licence to generate / collect / consign / transport / treat / dispose of/ store /handle /import (*delete words inapplicable*) the following hazardous substance –

_____

at its premises situated at [*address* _____] subject to the conditions specified below –

1) the following conditions of approval of the EIA accompanying the application for licence –

2) the conditions specified in Rule 8 of the Hazardous Substances Rules, 2014.

3) The following additional conditions –

This licence shall be valid for a period of one year from the date given below.

Date: _____ _____

Director-General
Sindh Environmental
Protection Agency

SCHEDULE III
(see Rule 7)
Licence fees

Description	Fee
Licence Fee	Rs.50,000
Renewal Fee	Rs.25,000
Duplicate Fee	Rs. 10,000

SCHEDULE IV
(see rule 10)

Conditions for premises

1. **Location**

The premises shall not be located -

(a) in a congested, residential, commercial or office area;

(b) in small lanes or bye-lanes;

(c) close to drinking water sources; or

(d) in an area liable to flooding.

2. **Building**

The building shall -

(a) be soundly constructed with good ventilation and protection against direct sunlight;

(b) have well-maintained electrical installations;

(c) have walls protected by non-flammable or slow-burning material;

(d) have fire-resistant doors fitted with self-closing system;

(e) have smooth, crack-fee floors impermeable to liquids;

(f) have drains, if absolutely necessary, which do not connect directly with the sewerage system;

(g) have signs indicating location of emergency exits, escape routes, and fire-fighting equipment, prohibition of smoking, and safety precautions; and

(h) have proper washing facilities with adequate supply of water.

SCHEDULE V

(see rule 18)

Notification of major accident

Report no._____

1. Name and address of licensee _____
2. Licence no. and date _____
   Nature of industrial activity mentioning Hazardous substance involved.
   _____
3. Description of major accident -
   (a) Date and time
   _____

(b) Exact location

_____

(c) Process/operation during which accident took place

_____

(d) Type and circumstances of accident and estimated quantity of hazardous substance involved.

_____

4. Known causes of the major accident.

_____

5. Nature and extent of damage –

(a) In the premises; _____

(b) Outside the premises. _____

6. Description of emergency measures already taken.

_____

7. Description of further measures proposed to be taken to –

(a) mitigate adverse effects _____

(b) prevent recurrence _____

8. Any other relevant information. _____

_____

Date: _____

Time: _____

Licensee

ANNEXURE 4: Hospital Waste Management Rules, 2014

The Sindh Hospital Waste Management Rules, 2014

CONTENTS

Rules.

1. Short title and Commencement.
2. Definitions.
3. Responsibility for waste management.
4. Hospital Waste Management Plan.
5. Waste Segregation.
6. Waste collection.
7. Waste Storage.
8. Waste treatment.
9. Waste Disposal.
10. Accidents and spillages.
11. Maintenance of Record.
12. Immunizations.
13. Inspection.
14. Applicability of section13 and 14.
15. Schedule-I (Categories of hospital Waste)
16. Schedule-II (Label for Bi-Medical waste containers/Bags).

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GOVERNMENT OF SINDH
SINDH ENVIRONMENT PROTECTION AGENCY

Karachi dated the 16th December,2014.

NOTIFICATION

NO.EPA/TECH/739/2014:- In exercise of the powers conferred by section 36 of the Sindh Environmental Protection Act, 2014 (VIII of 2014), the Environmental Protection Agency with the approval of the Government of Sindh, is pleased to make the following rules, namely: -

Short title and commencement.- (1) These rules may be called the Sindh Hospital Waste Management Rules, 2014.

(2) They shall come into force at once.

2. **Definitions.**- (1) In these rules, unless there is anything repugnant in the subject or context,-

(a) "Act" means the Sindh Environmental Protection Act, 2014 (VIII of 2014);

(b) "Authorised Officer" means any Officer designated by the Director General of the Agency for the purpose of these rules;

(c) "chemical waste" includes chemicals from diagnostic and experimental work, cleaning processes, housekeeping and disinfecting procedures, mercury waste such as from broken clinical equipment and spillage, and cadmium waste such as from discarded batteries;

(d) "genotoxic waste" includes cytotoxic drugs and outdated materials, vomitus, faeces or urine from patients treated with cytotoxic drugs or chemicals, and materials such as syringes and vials contaminated from the preparation and administration of such drugs;

(e) "Hospital" includes a clinic, laboratory, dispensary, pharmacy, nursing home, health unit, maternity center, blood bank, autopsy centre, mortuary, research institute and veterinary institutions, hospital waste facility, including any other facility involved in health care and biomedical activities;

(f) "Hospital waste" includes any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities or in the cleaning of medical equipments, supplies and accessories pertaining thereto or in the production or testing of biological, and including categories mentioned in Schedule I;

(g) "Hospital Waste Facility" means a suitable thermal, chemical, irradiation, incineration, filtration, autoclaving, destruction, shredding, microwaving, encapsulation or other treatment method, or by a combination of such methods involving proper validation and monitoring procedures;

(h) "Infectious waste" means waste contaminated by any type of pathogens such as bacteria, viruses, parasite or fungi and includes cultures from laboratory work, waste from surgeries and autopsies, waste from infected patients, discarded or disposable materials and equipment which have been in contact with such patients and infected animals from laboratories;

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(i) "Liquid waste" means liquid chemical waste, liquid infectious waste, liquid radioactive waste generated from laboratory, which is likely to cause adverse impact on human health and natural resources;

(j) "Non-risk waste" includes paper and cardboard, packaging, food waste and the like;

(k) "Occupier" means a person who controls and administers the Hospital and its premises;

(l) "Operator" means a person who owns or controls or operates a facility for the collection, transportation, treatment, disposal or any other form of handling of hospital waste;

(m) "Pathological waste" includes tissues, organs, body parts, fetuses, blood and body fluids;

(n) "Pharmaceutical waste" includes expired or unused pharmaceutical products, spilled contaminated pharmaceutical products, surplus drugs, vaccines or sera, and discarded items used in handling pharmaceutical such as bottles, boxes, gloves, masks, tubes, or vails;

(o) "Radioactive waste" means wastes that contain radioactive material;

(p) "Risk waste" means infectious waste, pathological waste, sharps, pharmaceutical waste, genotoxic waste, chemical waste, and radioactive waste and liquid waste;

(q) "Schedule" means schedule appended to these rules.

(r) "section" means a section of the Act.

(s) "sharp" includes whether infected or not, needles, syringes, scalpels, infusion sets, saws and knives, blades, broken glass and any other item that could cut or puncture; and

(t) "waste management" includes waste segregation, waste collection, waste transportation, waste storage, waste treatment, waste disposal and waste minimization.

(2) The words and expressions used but not defined in these rules shall have the same meaning as are assigned to them in the Act.

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

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(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.

10. **Accidents and spillages.-** (1) In case of accidents or spillages the emergency procedures mentioned in the Hospital Waste Management Plan shall be implemented immediately and same shall be reported to the Agency.

11. **Maintenance of Record:- (1)** Every Hospital shall maintain records related to the management of hospital waste in accordance with these rules.

(2) All records shall be subject to inspection and verification by the Agency at any time.

12. **Immunization.** A course of Hepatitis B vaccine should be offered to all employees responsible for managing of hospital waste who are at risk of exposure to human blood, blood products, or body secretions and the

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employees may also be intimated from time to time for tetanus, diphtheria, and polio. In facilities where employees are in contact with animals and their wastes, employees shall be offered rabies vaccine.

13. **Inspection**.-(1) An Authorized Officer may inspect any Hospital, located within the area of his jurisdiction to check that the provisions of these rules are complied with by the Hospital.

(2) If an Authorized Officer found any contravention of any provision of these rules, he shall take legal action as per the sub-section (2) of section 22.

14. **Applicability of section 13 and 14.**- Each Hospital generating risk waste shall apply to the Agency for issuance of license for handling hazardous substances and the provision of section 13 and 14 shall apply for the purpose of granting such license.

DIRECTOR GENERAL
SINDH ENVIRONMENTAL PROTECTION AGENCY

SCHEDULE I
(see rule 2(f))
CATEGORIES OF Hospital WASTE

Category Number	Type of Waste Category	Color Coding	Container Type	Treatment	Disposal
1.	pathological waste (tissues, organs, body parts, fetuses, blood and	Yellow	Metal or tough Plastic bag	-	Cremation/ Incineration/d eep burial

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Category Number	Type of Waste Category	Color Coding	Container Type	Treatment	Disposal
	body fluids)				
2.	infectious waste (waste contaminated by any type of pathogens such as bacteria, viruses, parasite or fungi and includes cultures from laboratory work, waste from surgeries and autopsies, waste from infected patients, discarded or disposable materials and equipment which have been in contact with such patients and infected animals from laboratories)	Red	Disinfected container High density plastic container resistant to penetration and leakage	Autoclaving / micro-waving.	Incineration/Landfill
3.	Sharp (whether infected or not, needles, syringes, scalpels, infusion sets, saws and knives, blades, broken glass and any other item that could cut or puncture)	Red	Disinfected container High density plastic container resistant to penetration and leakage	All shall be cut or broken and rendered non-reusable at the point of use; disinfection by chemical treatment autoclaving/ microwaving and mutilation/ shredding	Landfill
4.	Pharmaceutical waste (expired or unused pharmaceutical products, spilled	Yellow	Metal or tough Plastic bag	destruction	incineration/landfill

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Category Number	Type of Waste Category	Color Coding	Container Type	Treatment	Disposal
	contaminated pharmaceutical products, surplus drugs, vaccines or sera, and discarded items used in handling pharmaceutical such as bottles, boxes, gloves, masks, tubes, or vails)				
5.	genotoxic waste (cytotoxic drugs and outdated materials, vomitus, faeces or urine from patients treated with cytotoxic drugs or chemicals, and materials such as syringes and vails contaminated from the preparation and administration of such drugs)	Yellow		Return to supplier for treatment	Incineration (>1300°C) Landfill
6.	chemical waste (Chemicals from diagnostic and experimental work, cleaning processes, housekeeping and disinfecting procedures, mercury waste such as from broken clinical equipment and spillage, and cadmium waste such as from discarded	Yellow	Metal or tough Plastic bag	Photo-chemicals should be de-silvered and vaporized.	Landfill

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Category Number	Type of Waste Category	Color Coding	Container Type	Treatment	Disposal
	batteries)				
7.	radioactive waste (liquid, solid and gaseous waste contaminated with radio nuclides generated from in-vitro analysis of body tissue and fluid, in-vivo body organ imaging and tumour localization, and investigation and therapeutic procedures.	Yellow	Metal or tough Plastic bag	Treated in facility with lead walls	
8.	non-risk waste (paper and cardboard, packaging, food waste and the like)	Black / White	Any Suitable	Recycling plant	Landfill
9.	Incineration Ash (ash from incineration of any bio-medical waste)	Yellow	Metal or tough Plastic bag	-	Landfill
10.	Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)	-	-	disinfection by chemical treatment	Discharge into drains/ sewage system.

Explanation:

- Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.
- Multilation/shredding must be such so as to prevent unauthorised reuse.
- There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

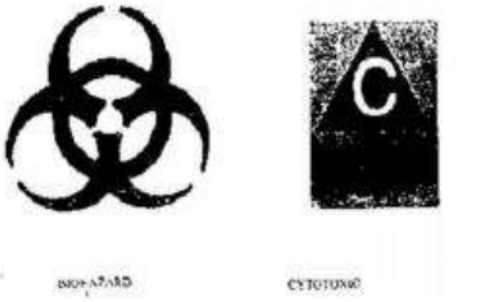
8

- Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
- Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
- Category 9 (liquid) do not require containers/bags.
- **Labelling** : date, point of production, ward and hospital, quantity and description of waste and prominently displaying the biohazard symbol

SCHEDULE II

(see rule 4(2)(f)

LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS



HANDLE WITH CARE

Note :Lable shall be non-washable and prominently visible.

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ANNEXURE 5-A: SEQS for Municipal and Industrial Effluents

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PART-I

GOVERNMENT OF SINDH
SINDH ENVIRONMENT PROTECTION
AGENCY

NOTIFICATION

NO.EPA/TECH/739/2014:- In exercise of the powers conferred under clause (g) of sub-section (1) of section of 6 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Sindh Environmental Protection Council, is pleased to establish the following standards:-

1. (1) These Standards may be called the Sindh Environmental Industrial Waste Water, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Airs, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015.

(2) These Standards shall come into force at once.

2. In these Standards, unless there is anything repugnant in the subject or context –

(a) "Government" means the Government of Sindh;

(b) "Standards" means the Sindh Environmental Quality Standards.

L iv-158 Ext -I-8 (23) Price Rs. 70.00

SINDH ENVIRONMENTAL QUALITY STANDARDS FOR MUNICIPAL AND LIQUID INDUSTRIAL EFFLUENTS (mg/L, UNLESS OTHERWISE DEFINED)

S. No.	Parameter	Standards		
		Into Inland Waters	Into Sewage Treatment [5]	Into Sea [ ]
1	2	3	4	5
1.	Temperature 40°C or Temperature Increase *	≤3°C	≤3°C	≤3°C
2.	pH value (H^+)	6-9	6-9	6-9
3.	Biochemical Oxygen Demand (BOD)5 at 20°C [1]	80	250	80**
4.	Chemical Oxygen Demand(COD) [1]	150	400	400
5.	Total Suspended Solids (TSS)	200	400	200
6.	Total Dissolved Solids (TDS)	3500	3500	3500
7.	Oil and Grease	10	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3	0.3
9.	Chloride (as Cl^-)	1000	1000	SC***
10.	Fluoride (as F^-)	10	10	10
11.	Cyanide (as CN^-) total	1.0	1.0	1.0
12.	An-ionic detergents (as MBAS)[2]	20	20	20
13.	Sulphate (SO_4^{2-})	600	1000	SC***
14.	Sulphide (S^{2-})	1.0	1.0	1.0
15.	Ammonia (NH_3)	40	40	40
16.	Pesticides [3]	0.15	0.15	0.15
17.	Cadmium [4]	0.1	0.1	0.1
18.	Chromium (trivalent and hexavalent [4]	1.0	1.0	1.0
19.	Cooper [4]	1.0	1.0	1.0
20.	Lead [4]	0.5	0.5	0.5
21.	Mercury [4]	0.01	0.01	0.01
22.	Selenium [4]	0.5	0.5	0.5
23.	Nickel [4]	1.0	1.0	1.0
24.	Silver [4]	1.0	1.0	1.0
25.	Total toxic metals	2.0	2.0	2.0
26.	Zinc	5.0	5.0	5.0
27.	Arsenic [4]	1.0	1.0	1.0
28.	Barium [4]	1.5	1.5	1.5
29.	Iron	8.0	8.0	8.0
30.	Manganese	1.5	1.5	1.5
31.	Boron [4]	6.0	6.0	6.0
32.	Chlorine	1.0	1.0	1.0

ANNEXURE 5-B: SEQS for Industrial Gaseous Emissions, Motor Vehicle Exhaust, Noise and Ambient Air Quality.

Explanations:

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Sindh Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.
2. Methylene Blue Active Substances; assuming surfactant as biodegradable.
3. Pesticides include herbicides, fungicides, and insecticides.
4. Subject to total toxic metals discharge should not exceed level given at S. N. 25.
5. Applicable only when and where sewage treatment is operational and BOD5=80mg/l is achieved by the sewage treatment system.
6. Provided discharge is not at shore and not within 10 miles of mangrove or other important estuaries.

* The effluent should not result in temperature increase of more than 3^0C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.

** The value for industry is 200 mg/l

*** Discharge concentration at or below sea concentration (SC).

Note: 1. Dilution of liquid effluents to bring them to the STANDARDS limiting values is not permissible through fresh water mixing with the effluent before discharging into the environment.

2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the STANDARDS limits".

"SINDH ENVIRONMENTAL QUALITY STANDARDS FOR INDUSTRIAL GASEOUS EMISSION (mg/Nm^3, UNLESS OTHERWISE DEFINED)."

S. No.	Parameter	Source of Emission	Standards
1	2	3	4
1.	Smoke	Smoke opacity not to exceed	40% or 2 Ringleman Scale or equivalent smoke number
2.	Particulate matter	(a) Boilers and Furnaces	
(1)		(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement Kilns	300

		(b) Grinding, crushing, Clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas	500
3.	Hydrogen Chloride	Any	400
4.	Chlorine	Any	150
5.	Hydrogen Fluoride	Any	150
6.	Hydrogen Sulphide	Any	10
7.	Sulphur Oxides [4] [5]	Sulfuric acid/ Sulphonic acid plants	
		Other Plants except power Plants operating on oil and coal	1700
8.	Carbon Monoxide	Any	800
9.	Lead	Any	50
10.	Mercury	Any	10
11.	Cadmium	Any	20
12.	Arsenic	Any	20
13.	Copper	Any	50
14.	Antimony	Any	20
15.	Zinc	Any	200
16.	Oxides of Nitrogen	Nitric acid Manufacturing unit.	3000
	(3)	Other plants except power plants operating on oil or coal:	
		Gas fired	400
		Oil fired	600
		Coal fired	1200

Explanations:-

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent Sulphur content in fuel oil. Higher content of Sulphur will case standards to be pro-rated.
3. In respect of emissions of Sulphur dioxide and Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to Standards specified above, comply with the following standards:-

A. **Sulphur Dioxide**

Sulphur Dioxide Background levels Micro-gram per cubic meter (ug/m^3) Standards.

Background Air Quality (SO_2 Basis)	Annual Average	Max. 24-hours Interval	Criterion I Max. SO_2 Emission (Tons per Day Per Plant)	Criterion II Max. ground level increment to ambiegt (One year Average)
Unpolluted Moderately Polluted*	<50	<200	500	50
Low	50	200	500	50
High	100	400	100	10
Very Polluted**	>100	>400	100	10

* For intermediate values between 50 and 100 ug/m^3 linear interpolations should be used.
** No projects with Sulphur dioxide emissions will be recommended.

B. **Nitrogen Oxide**

Ambient air concentrations of Nitrogen oxides, expressed as NO_X should not be exceed the following:-

Annual Arithmetic Mean 100ug/m^3 (0.05 ppm)

Emission level for stationary source discharge before missing with the atmosphere should be maintained as follows:-

For fuel fired steam generators as Nanogram (10^0-gram) per joule of heat input:

Liquid fossil fuel	130
Solid fossil fuel	300
Lignite fossil fuel	260

Note:- Dilution of gaseous emissions to bring them to the STANDARDS limiting value is not permissible through excess air mixing blowing before emitting into the environment.

Sindh Environmental Quality Standards for Motor Vehicle Exhaust and Noise

(i) For in-use Vehicles

S. No.	Parameter	Standards (maximum permissible limit)	Measuring Method	Applicability
1	2	3	4	5
1.	Smoke	40% or on the Ringleman Scale during engine acceleration mode	To be compared with Ringleman Chart at a distance of 6 meters or more.	Immediate effect
2	Carbon Monoxide	6 %	Under idling conditions: Non-dispersive infrared detection through gas analyzer.	
3.	Noise	85 db (A)	Sound-meter at 7.5 meter from the source.	

For new Vehicles

EMISSION STANDARDS FOR DIESEL VEHICLES

(a) For passenger Cars and Light Commercial Vehicles (g/Km)

Type of Vehicle	Category/Class	Tiers	CO	HC+ NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8
Passenger Cars.	M 1: with reference mass (RW).	Pak-II, IDI	1.0	0.7	0.08		All imported and local manufactured
	up to 2500 kg. Cars with RW over 2500 kg. to meet NI Category standards	Pak-II DI	1.0	0.9	0.10	NEDC (ECE 15+ EUDCL)	Diesel vehicles with effect from 01-07-2012
Light Commercial Vehicles	NI-I (RW<1250 Kg)	Pak-II IDI	1.0	0.70	0.08		
		Pak-II DI	1.0	0.90	0.10		
	NI-II(1250kg< RW < 1700 Kg)	Pak-II IDI	1.25	1.0	0.12		
		Pak-II DI	1.25	1.3	0.14		
	NI-III(RW< 1700 Kg)	Pak-II IDI	1.50	1.2	0.17		
		Pak-II DI	1.50	1.6	0.20		

Parameter Standards (maximum permissible limit) Measuring method

Noise	85 db (A)	Sound-meter at 7.5 meters from the source

(b) For Heavy Duty Diesel Engines and Large Goods Vehicles (g/Kwh)

Type of Vehicle	Catogry/ Class	Tiers	CO	HC	NOx	PM	Measuring Method	Applicability
1	2	3	4	5	6	7	8	9
Heavy Duty Diesel Engines	Turks and Buses	Pak-II	4.0	1.1	7.0	0.15	ECE-R-49	All Imported and local manufactured diesel vehicles with the effect 1-7-2012
Large goods Vehicles	N2(2000 and up	Pak-II	4.0	7.0	1.10	0.15	EDC	

Parameter Standards (maximum permissible limit) Measuring method

Noise **85 db (A)** **Sound-meter at 7.5 meters from the Source**

Emission Standards for Petrol Vehicles (g/km)

Type of Vehicle	Category/ Class	Tier	Co	HC+ NOx	Measuring Method	Applicability
1	2	3	4	5	6	7
Passenger Cars.	M 1: with reference mass (RW), upto 2500 kg. Cars with RW over 2500 kg. to meet N1 Category standards	Pak-II	2.20	0.5	NEDC (ECE 15+ EUDC)	All imported and new models * locally manufactured petrol vehicles with effect from 1st July, 2009**

Light Commercial Vehicles	NI-I (RW<1250 kg) NI-II (1250kg> kg RW < 1700 Kg)	Pak-II	2.20	0.5	
		Pak-II	4.0	0.65	
		Pak-II	5.0	0.08	
	NI-III(RW> 1700 kg)				
Motor Rickshaws & Motor Cycles	2,4 strokes < 150 cc	Pak-II	5.5	1.5	ECER 40
	2,4 strokes > 150cc	Pak-II	5.5	1.3	

Parameter	Standards (maximum permissible limit)	Measuring method
Noise source	85 db (A)	Sound-meter at 7.5 meters from the

Explanations:

DI:	Direct Injection.
IDI:	Indirect Injection.
EUDCL:	Extra Urban Driving Cycle.
NEDC:	New European Driving Cycle.
ECE:	Urban Driving Cycle.
M:	Vehicles designed and constructed for the carriage of passenger and Comprising no more than eight seats in addition to the driver's seat.
N:	Motor vehicles with at least four wheels designed and constructed for the carriage of goods.
*	New model means both model and engine type change.
**	The existing models of petrol driven vehicles locally manufactured will immediately switch over to Pak-II emission standards but no late than 30th June, 2012.

SINDH ENVIRONMENTAL QUALITY STANDARDS FOR AMBIENT AIR

Pollutants	Time-weight average	Concentration in Ambient Air	Method of measurement
Sulphur Dioxide(SO2)	Annual Average*	80 µg/m³	Ultraviolet Fluorescence method
	24 hours**	120 µg/m³	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	40 µg/m³	
Oxides of Nitrogen as (NO2)	Annual Average*	40 µg/m³	Gas Phase Chemiluminescence
	24 hours**	80 µg/m³	
O³	1 hour	130 µg/m³	Non dispersive UV absorption method
Suspended Particulate Matters(SPM)	Annual Average*	360 µg/m³	High Volume Sampling (Average flow rate not less than 1.1 in 3/minutes)
	24 hours**	500 µg/m³	
Respirable Particulate Matter PM10	Annual Average*	120 µg/m³	β -Ray absorption method
	24 hours**	150 µg/m³	
Respirable Particulate Matter PM2.5	Annual Average*	40 µg/m³***	β Ray absorption method
	24 hours**	75 µg/m³	
Lead Pb	Annual Average*	1 µg/m³	ASS Method after sampling using EPM 2000 or equivalent filter paper
	24 hours**	1.5 µg/m³	
Carbon Monoxide(CO)	8 hours**	5 mg/m³	Non Dispersive Infra Red(NDIR) method
	1 hours**	10 mg/m³	

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week, 24 hourly and at uniform interval.

** 24 hourly/8 hourly values should be met 98% in a year, 2% of the time. It may exceed but not on two consecutive days.

***Annual Average limit of 40µg/m³ or background annual average concentration plus allowable allowance of 9µg/m³, whichever is lower.

Sindh Standards for Drinking Water Quality

Properties / Parameters	Standard Values for Sindh	WHO Standards	Remarks
Bacterial			
All water intended for drinking (e.Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E.coli or thermo tolerant coliform and total 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 present in 95% of the samples taken throughout any 12-month period	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period	Most Asian countries also follow WHO standards
Physical			
Colour	≤ 15 TCU	≤ 15 TCU	
Taste	Non objectionable/Acceptable	Non objectionable/Acceptable	
Odour	Non	Non	

	objectionable/Acceptable	objectionable/Accep table
Turbidity	< 5 NTU	< 5 NTU
Total hardness as $CaCO_3$	< 500 mg/l	---
TDS	< 1000	< 1000
pH	6.5 - 8.5	6.5 - 8.5
Chemical		
Essential Inorganic	***mg/Litre***	***mg/Litre***
Aluminium (Al) mg/l	≤ 0.2	0.2

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Antimony (Sb)	≤ 0.005 (P)	0.02	
Arsenic (As)	≤ 0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium(Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	< 250	250	
Chromium (Cr)	≤ 0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	***mg/Liter***	***mg/Litre***	
Cyanide (CN)	≤ 0.05	0.07	Standard for Pakistan similar to Asian developing countries
Fluoride (F)*	≤ 1.5	1.5	
Lead (Pb)	≤ 0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤ 0.001	0.001	
Nickel (Ni)	≤ 0.02	0.02	

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Nitrate (NO_3)	< 0.50	50	
Nitrite (NO_2)	< 3 (P)	3	
Selenium (SE)	0.01 (P)	0.01	
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	---	
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries

Properties / Performance	Standard Values for Pakistan	Who Standards	Remarks
Organic			
Pesticides mg/L		PSQCA No. 4639-2004 Page No. 4 Table No. 3 Serial No. 20-58 may be consulted.***	Annex II
Phenolic compounds (as Phenols) mg/L		< 0.002	
Polynuclear aromatic hydrocarbons (as PAH g/L)		0.01 (By GC/MS method)	
Radioactive			
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

*** PSQCA- Pakistan Standards Quality Control Authority

Proviso:

The existing drinking water treatment infrastructure is not adequate to comply with WHO guidelines. The Arsenic concentrations in some parts of Sindh have been found high then Revised WHO guidelines. It will take some time to control arsenic through treatment process. Lead concentration in the proposed standards is higher than WHO Guidelines. As the piping system for supply of drinking water in urban centers are generally old and will take significant resources and time to get them replaced. In the recent past, Lead was completely phased out from petroleum

ANNEXURE 5-C: SEQS for Ambient Noise Level

products to cut down Lead entering into environment. These steps will enable to achieve WHO guidelines for Arsenic, Lead, Cadmium and Zinc. However, for bottled water, WHO limits for Arsenic, Lead, Cadmium and Zinc will be applicable and PSQCA Standards for all the remaining parameters.

Sindh Environmental Quality Standards for Noise

S. No.	Category of Area / Zone	Effective from 1st Jan, 2015		Effective from 1st January, 2015	
		Limit in dB(A) Leq *			
		Day Time	Night Time	Day Time	Night Time
1.	Residential Area (A)	65	50	55	45
2.	Commercial Area (B)	70	60	65	55
3.	Industrial Area (C)	80	75	75	65
4.	Silence Zone (D)	55	45	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 6:00 a.m

3. Silence zone: Zones which are declared as such by the 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.

3. **Repeal and Savings.**

(1) The provisions of the Statutory Notification dated 10th August, 2000 and 18th October, 2010, issued by the Ministry of Environment, Government of Pakistan, to the extent of the Province of Sindh are hereby repealed.

(2) All actions taken, proceedings initiated shall be deemed to have been taken and initiated validly under the the provisions of these Rules.

DIRECTOR GENERAL,
SINDH ENVIRONMENTAL PROTECTION AGENCY

Karachi: Printed at the Sindh Government Press
28-1-2016

ANNEXURE 6: Ownership Document



VO18599

100 Rupees ۱۰۰

TENANCY AGREEMENT

یہ کرایہ نامہ آج 02-06-20[illegible] کو کراچی میں تحریر کیا گیا ہے۔

(BETWEEN) مابین

فریق اول مسمی نظیر احمد ولد لطیف، قوم مسلم، پیشہ حکومتی ملازمت، شناختی کارڈ نمبر 42501-1515020-3، سکنہ گلی نمبر 3 داؤد کریم [illegible]

(AND) اور

فریق دوم مسمی محمد ارشد عالم ولد عبدالرزاق حسن، قوم مسلم، پیشہ حکومتی ملازمت، شناختی کارڈ نمبر 42101-3129672-5، (DIRECTOR ENVIRO WASTE BUSTERS PVT LTD) (ڈائریکٹر، انوائرو ویسٹ بسٹرز (پرائیویٹ) لمیٹڈ) سکنہ مکان نمبر A-238، سٹریٹ نمبر 4، بلاک 12، فیڈرل بی ایریا، کراچی ساؤتھ، مرقومہ جو کہ اس معاہدے میں فریق دوم (کرایہ دار) کہلائے گا۔

(CONFIRMED PROPERTY) متعلقہ جائیداد

جائیداد/پلاٹ بابت سروے نمبر 118 (4000 مربع گز) گلی دادگارڈن، نزد مرغی چورنگی، لینڈ مارک نورانی مسجد سیکٹر 20 کورنگی انڈسٹریل ایریا، کراچی

یہ کہ فریق اول بوقت تحریر ہذا جائیداد مذکورہ بالا کا کلیتہً مالک و مختار ہے اور فریق دوم کو ماہانہ کرائے کی بنیاد پر دینے کیلئے تیار ہے جبکہ فریق دوم یہ جائیداد کرائے پر لینے کیلئے تیار ہے۔

[illegible]

پاکستان کے قوانین کے تحت تکمیل دیا گیا ہے اور شرائط پر مندرجہ ذیل ہے، جو بھی کیا جا سکتا ہے۔

Nayeem

دستخط فریق دوم ..... دستخط فریق اول .....

ANNEXURE 7: Ambient Air Quality



IERL=SEPA License No	101/2021	Invoice No.	IERL/ECS/EWR/56/2023
Lab Reference No.	IERL/EWR032/2023	Site ID.	Enviro Waste Pariyre
Report to.	Director Environmental Consultancy Services	Sample Collection Time	11:00 AM
Sample Collection Date	10.07.2023	Reporting Date	17.07.2023
Location 1	Proposed Project	Sample Type	Ambient Air
Sample Collected/Submitted by:	IERL Representative	Sample Duration	8 Hours

Analytical Test Report of Ambient Air Quality

Parameters	Methods	Unit	SEQS Limit	Average	Remarks
SO_2	EPA EQSA0486-060	$\mu g/m^3$	120	8.865	Within Limit
NO	EPA RFNA1289-074	$\mu g/m^3$	40	15.095	Within Limit
NO_2	EPA RFNA1289-074	$\mu g/m^3$	80	25.25	Within Limit
CO	EPA RFCA 098-064	mg/m^3	10	2.085	Within Limit
O_3	EPA 50230;1999	$\mu g/m^3$	130	7.805	Within Limit
$PM_{2.5}$	EPA 40CFR50,APP L&J	$\mu g/m^3$	75	31.48	Within Limit
PM_{10}	EPA 40CFR50,APP L&J	$\mu g/m^3$	150	128.41	Within Limit
SPM	EPA 40CFR50,APPB	$\mu g/m^3$	500	185	Within Limit
Lead	EPA 40CFR50,APPB	$\mu g/m^3$	1.5	ND	Within Limit

SEQS= Sindh Environmental Quality Standards
Methods* = EPA United State Environmental Protection Agency Methods

Sample Analyzed by	Head of Chemical Environment Research Lab

Terms & Condition:

Report is valid for current batch(sample).
This Report is not valid for any other certification, or court matters.

Office No 302-A, 3rd Floor Al-Rehman Centre Plot # A-10, Block 7/8, K.C.H.S.U. Shahrah-e-Faisal Karachi South Pakistan
Cell No 0341-9900614 Email imperial.sel@hotmail.com



IERL=SEPA License No	001/2021	Invoice No.	IERL/ECS/EWM/55/2023
Lab Reference No.	IERL/EWM/07/2023	Site ID.	Excise Waste Baseline
Report to.	Director Environmental Consultancy Services	Sample Collection Time	12:00 PM
Sample Collection Date	12-07-2023	Reporting Date	19-07-2023
Location	Sharafi Road	Sample Type	Ambient Air
Sample Collected/Submitted by:	IERL Representatives.	Sample Duration	8 Hours

Analytical Test Report of Ambient Air Quality

Parameters	Methods	Unit	SEQS Limits	Average	Remarks
SO_2	EPA EQSA0486-060	µg/m³	120	8.25	Within Limit
NO	EPA RENA1289-074	µg/m³	40	12.25	Within Limit
NO_2	EPA RENA1289-074	µg/m³	80	19.22	Within Limit
CO	EPA RFCA 098-056	mg/m³	10	1.61	Within Limit
O_3	EPA 50270;1999	µg/m³	130	6.6	Within Limit
$PM_{2.5}$	EPA 40CFR50,APP L&J	µg/m³	75	27.28	Within Limit
PM_{10}	EPA 40CFR50,APP L&J	µg/m³	150	109.95	Within Limit
SO56	EPA 40CFR50,APPB	µg/m³	200	149.9	Within Limit
Lead	EPA 40CFR50,APPB	µg/m³	1.5	ND	Within Limit

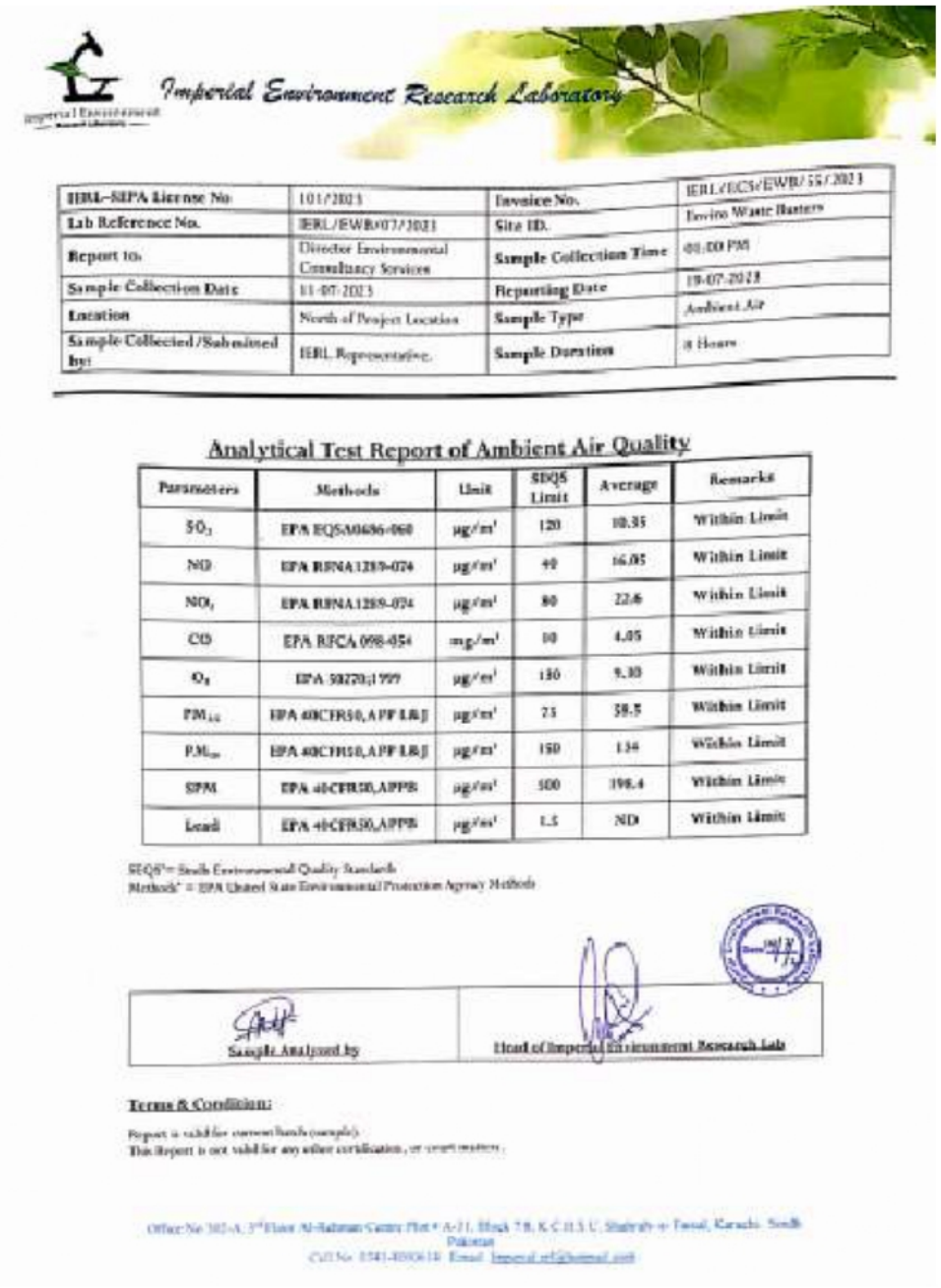
SEQS= Sindh Environmental Quality Standards
Methods' = EPA United State Environmental Protection Agency Methods

Sample Analyzed By	Head of Imperial Environment Research Lab

Terms & Condition:

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Office No 102-A, 1st Floor Al-Rehman Centre Plot # A-7/1 Block 7 & 8 C.H.S.E. Shahrah-e-Faisal, Karachi South Pakistan
Cell No. 0341-8000814 Email: imperial.ehs.lab@gmail.com



Imperial Environment Research Laboratory

IERL-SEPA License No:	101/2023	Invoice No.	IERL/ECS/EWB/55/2023
Lab Reference No.	IERL/EWB/07/2023	Site ID.	Enviro Waste Busters
Report to:	Director Environmental Consultancy Services	Sample Collection Time	08:00 PM
Sample Collection Date	11-07-2023	Reporting Date	19-07-2023
Location	North of Project Location	Sample Type	Ambient Air
Sample Collected /Submitted by:	IERL Representative.	Sample Duration	8 Hours

Analytical Test Report of Ambient Air Quality

Parameters	Methods	Unit	SEQS Limit	Average	Remarks
SO_2	EPA EQSAM0486-060	µg/m³	120	10.35	Within Limit
NO	EPA RSNA 1289-024	µg/m³	40	16.05	Within Limit
NO_2	EPA RSNA 1289-024	µg/m³	80	22.6	Within Limit
CO	EPA RFCA 098-054	mg/m³	10	4.05	Within Limit
O_3	EPA 50720:1999	µg/m³	130	9.10	Within Limit
PM_{10}	EPA 40CFR50, APP J&J	µg/m³	75	58.5	Within Limit
$PM_{2.5}$	EPA 40CFR50, APP J&J	µg/m³	150	134	Within Limit
SPM	EPA 40CFR50, APPB	µg/m³	500	198.4	Within Limit
Lead	EPA 40CFR50, APPB	µg/m³	1.5	ND	Within Limit

SEQS* = Sindh Environmental Quality Standards
Methods* = EPA United State Environmental Protection Agency Methods

Sample Analyzed by

Head of Imperial Environment Research Lab

Terms & Condition:

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This Report is not valid for any other certification, or court matters.

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ANNEXURE 8: Ambient Noise Levels



IERL-SEPA License No	104/2021	Invoice No.	IERL/ECS/EWB/XX/2023
Lab Reference No.	IERL/EWB/07/2023	Site ID.	Ensure Waste Busters
Reported to,	Director Environmental Consultancy Services	Sample Collection Time	11:00 AM
Sample Collection Date	10-07-2023	Reporting Date	19-07-2023
Location	Proposed Project Location	Sample Type	Ambient Noise
Sample Collected / Submitted by:	IERL Representative.		

Analytical Test Report of Ambient Noise Quality

Sr. #	Acoustic Source Description	Method*	SEQS Limit*	Unit	Results	Remarks
1.	West Side	ASTM E1503	75.0	dB(A)	59	Within Limit
2.	East Side	ASTM E1503	75.0	dB(A)	64	Within Limit
3.	South Side	ASTM E1503	75.0	dB(A)	63	Within Limit
4.	North Side	ASTM E1503	75.0	dB(A)	56.5	Within Limit

SEQS= Sindh Environmental Quality Standards.
ASTM= American Society for Testing and Materials.

Sample Analyzed by

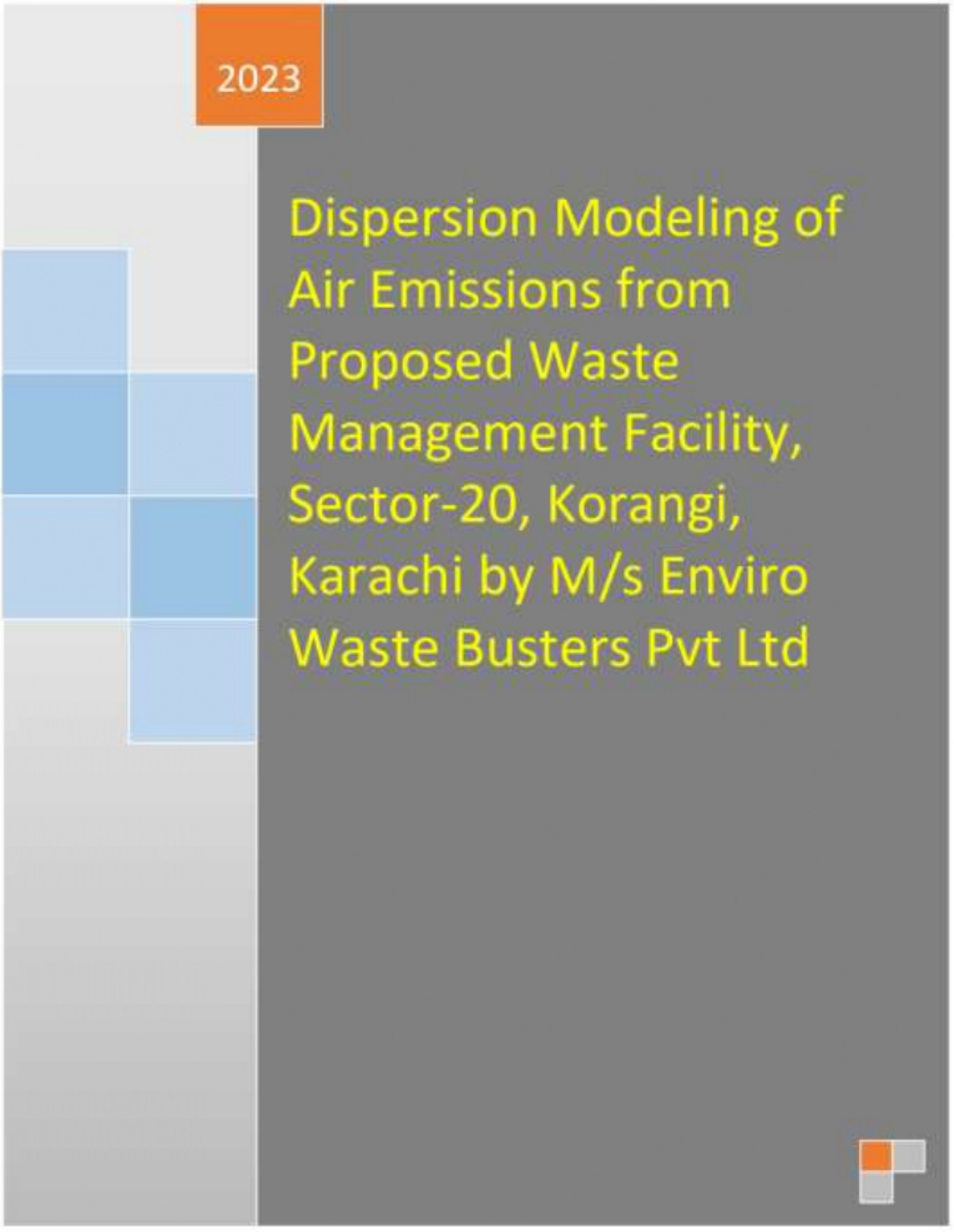
Head of Imperial Environment Research Lab

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ANNEXURE 9: Air Dispersion Modeling



Dispersion Modeling of Air Emissions from Proposed Waste Management Facility at Korangi, Karachi

PROJECT AND PROCESS DESCRIPTION:

1. M/s Enviro Waste Busters (Pvt) Ltd intends to install the incineration units facility to treat the industrial, pharmaceutical/Hospital, hazardous and non-hazardous waste. The proposed project will be located at Survey No. 118, Sharafi Road, Near Murtaza Chowrangi, Sector-20, Korangi, Karachi at geological coordinates of 24°51'21.3"N 67°10'35.8"E. During this planning phase, M/s Enviro Waste Busters (Pvt.) Limited has hired the services of M/s Environmental Consultancy and Services (ECS), which is a reputable consultancy firm, for the preparation of Environmental Impact Assessment (EIA) Study for the proposed project in compliance with the promulgated environmental legislation of Sindh Environmental Protection Act 2014.
2. Waste Management Facility comprises of 2 units of same capacity of 500 kg/hr of waste to be incinerated. Each of the units is fired with dual (gas/oil) fuel. In the plant, first the waste is burned in primary chamber at temperature of 600-800 degrees C, the gases produced are then burned in the secondary chamber at temperature of 1200 degree C, which finally pass on to another chamber where the gases are showered with water through high speed jets for cleaning of the gases and this part acts as a wet scrubber. The gases then finally are emitted through a chimney which has its outlet at height of 15 m.
3. The whole process is supplemented by blower motors which provide a mix of Oxygen to achieve complete combustion. At the end of the process, there is 90-95% reduction in weight of the waste incinerated and 90% reduction in volume of the waste. The diameter of the chimney attached to the incinerator is 0.45 m. The

temperature in the chimney before emission is around 150 degrees C. The incineration process is shown in Figure 1.

4. Although the incinerator units would be operated on natural gas where there will be no Sulphur emissions but dispersion of emissions has been done with assuming that it would be operated of oil which is therefore considered as worst case-scenario of emissions from the proposed facility. As process involve the combustion of these fuels, therefore, the potentially major pollutants generated from the project. These selected criteria pollutants include the Carbon monoxide (CO), Oxides of Nitrogen (NOx), Sulfur dioxide (SO2) and Particulate Matter as TSP.

5. M/s Enviro Waste Busters (Pvt) Ltd is committed to protect, conserve the environmental resources through effective controls of the emissions by state of the art technology selection and control device installations for incineration of the hazardous waste and to comply the environmental emission regulations of Sindh EPA. The location of the plant is shown in Google Map in Figure 2.

6. The monitoring and control of these emissions to protect the surrounding environment settlements existing around the project site and also it is the regulatory requirement of the Sindh Environmental Protection Act 2014 and Sindh Environmental Quality Standards (SEQS) published in 2014

7. In order to comply, the Sindh Environmental Protection Act 2014, the quantitative analysis (simulation) of impact of the expected demission on air quality of the surrounding of the project site has been carried out using the United States Environmental Protection Agency (USEPA) approved regulatory air quality model i. e. AERMOD.

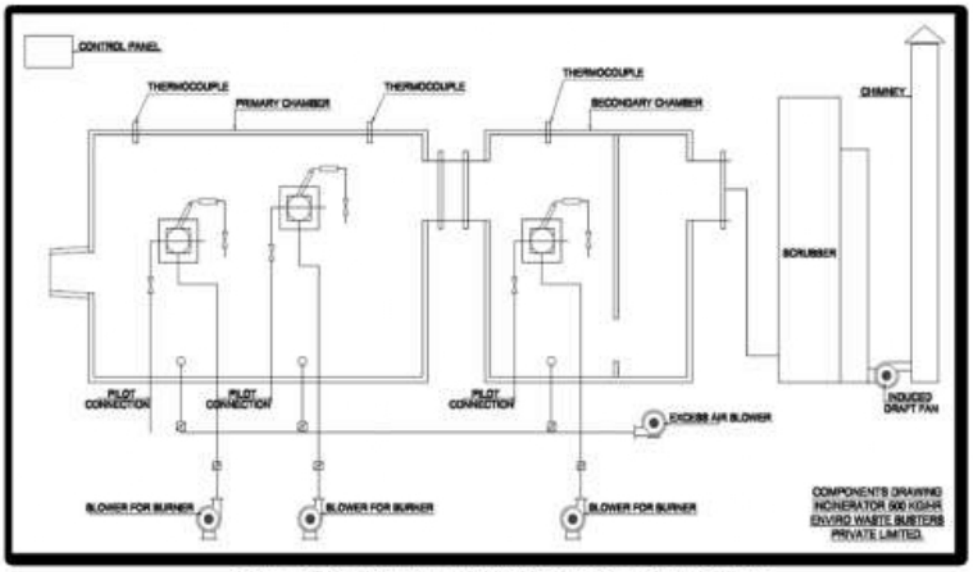


Figure-1: Flow diagram of Incineration Process of Proposed Plant

OBJECTIVES OF DISPERSION MODELING STUDY:

8. The objective of the current study of air dispersion modeling of emission from the Waste Management Facility proposed by M/s Enviro Waste Busters (Pvt) Ltd at Karachi is to;

   (a) Predict the impact (quantitatively) of the proposed Project on the air quality of the surrounding area

   (b) Determine the compliance status to SEQS guidelines for ambient air when proposed plant would be operational.

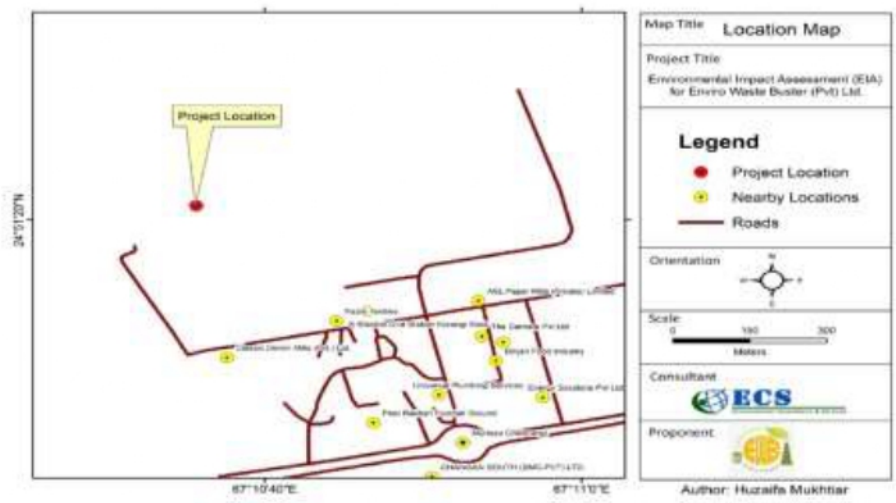


Figure 2: Geological Location of Proposed Waste Management Facility at Korangi, Karachi.

AN OVERVIEW OF SOFTWARE USED IN STUDY-AERMOD:

9. "AERMOD" (**A**merican Meteorological Society/**E**nvironmental Protection Agency **R**egulatory **MO**del) is a steady state regulatory air dispersion plume model developed by USEPA. It assumes the concentrations at all distances during a modeled hour which are governed by the temporally averaged meteorology of the hour. The AERMOD modeling system consists of two pre-processors and the dispersion model (i) AERMET-meteorological preprocessor and (ii) AERMAP for characterizing the terrain and generates receptor grids for the dispersion model. Figure 3 shows the GUI of Web Lakes Environmental's AERMOD, USA.

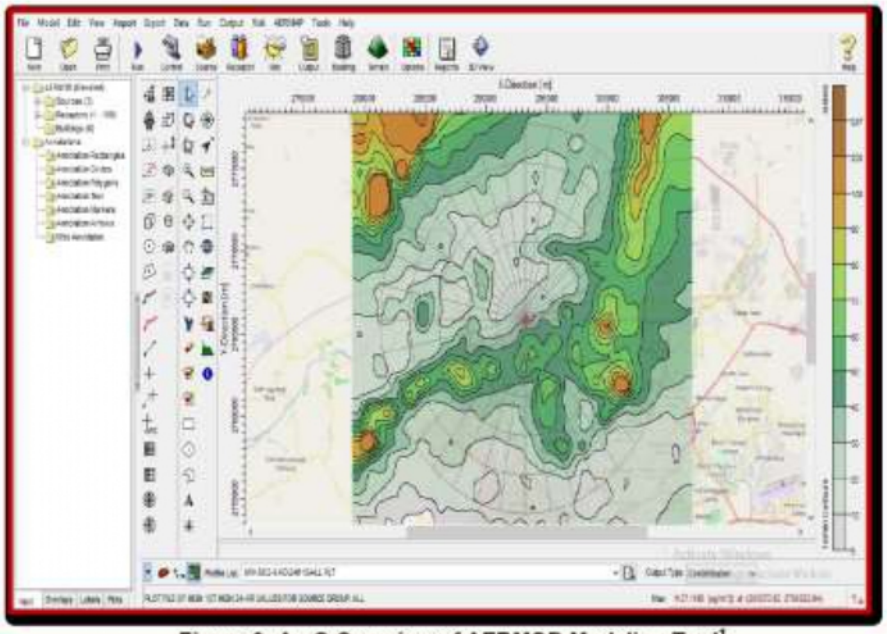


Figure 3: An O Overview of AERMOD Modeling Tool[1]

[1] https://www.weblakes.com/products/aermod/resources/lakes_aermod_view_release_notes.pdf

DISPERSION MODELING METHODOLOGY:

Modeling Input Data

Following three types of necessary input data of emissions modeling has been used in present study;

Stack and Emission Data

10. The stack design (stack dia, exit temperature, exit volumetric flow rate, stack height) and emission data (for CO, NOx, SO2 and TSP) used is given in Table-1 as provided by client.

Table-1 Stack and Emission Input Data

S. No	Units	Dia	Height	Exit Velocity	Temp	NOx	CO	SO2	TSP
		m	m	m/Sec	C	g/s			
1	Unit-1	0.45	15	15	150	0.2	0.09	0.15	0.54
2	Unit-2	0.45	15	15	150	0.2	0.09	0.15	0.54

Meteorological Input Data

11. The hourly surface meteorological data (in SAMSON format) and Upper Air Met Profiling data (in fsl format) of Karachi acquired during 2018 was used in the present study. The met analysis indicate that the prevailing dominant wind is blowing from W-SW direction on annual basis

Baseline Air Quality Data

12. Following baseline ambient air quality data collected by EPA certified lab in the project area is used as input in modeling the study (Table 2).

Table 2: Baseline Ambient Air Quality Measurement Data at Project Site

S. No.	Parameters	Unit	Avg Time	SEQS	Measuring Value	Method/Instrument
1.	Carbon Monoxide, (CO)	mg/m^3	1 hr	10	1.10	GFC Spectroscopy
			8 hrs	5	2.085	

2	Nitrogen Oxides (NOx)	ug/m3	24 hrs	120	31.97	Chemiluminesce
3	Sulphur Dioxide, (SO_2)	$\mu g/m^3$	24 hrs	120	8.865	Fluorescence
5	Particulate Matter as TSP	$\mu g/m^3$	24 hrs	150	123.41	β Ray Absorption

Modeling Assumptions

13. In order to predict dispersion modeling results over the entire modeling area (5 km radius from the project site. The study area was divided into a Uniform Polar Grid Network with total 180 grids and 36 radial directions. The terrain elevation (i.e DEM) effect in the dispersion was incorporated using AERMAP tool (built in tool of AERMOD suit).
14. Following are model inputs in each of the assumed scenario;
    i. Universal Transverse Mercator (UTM) as projection for zone class of 42 in datum of World Geodetic System 1984 (WGS 84) was used to define the modeling domain
    ii. The model output was selected as 1st Highest Ranke values are plotted in form of counters in selected modeling domain (5 km radius from the project site)
    iii. Output emissions concentrations are modeled for 24-hrs and annual averaged period for NOx, SO2 and TSP while 1-hr and 8-hrs averaged for CO.
    iv. Ground Level Concentrations (GLCs) of each pollutant was compared with SEQS for compliance status of the projected emissions in project surroundings localities.
    v. It is also assumed that emissions sources are operational throughout the year considering as the worst case scenario of the emissions and its impacts on the air quality

Modeling Output Data

15. The output data of model is present in two forms;

i. In Contour plots of each pollutants showing the Ground Level Concentrations (GLCs) determining the impact area of emissions for 1-hr average,8-hrs (for CO), 24 hrs and annual average for NOx, SO2, and TSP whichever is applicable in compliance with Sindh Environmental Protection Act, 2014

ii. Tabular form showing the source contribution, magnitude of impact and compliance level of SEQS for each pollutant.

Modeling Scenarios;

16. The impact of emissions from the stacks of proposed waste incineration facilities of one incinerator (with capacity of 500 kg/hr) operate and when two incinerators operate at full cumulative capacity of 1000 kg/hr were quantified through dispersion modeling by assuming the followings emission scenarios

Scenario-I: Impact of Emissions when **only 1x incinerator** is operational at project site (Normal Scenario) for 24 hrs throughout the year

Scenario-II: Impact of Emissions when **2x incinerators** are operational at project site (worst case scenario) for 24 hrs throughout the year

RESULTS AND DISCUSSION

17. In present study, the model predicted the ground level concentrations of CO, NOx, SO2 and TSP as using designed emission, meteorological and baseline ambient quality datasets (Table 2). The predicted ambient air quality concentrations of these pollutants in/around the proposed project area was determined by sum of concentrations of emissions of these pollutants predicted by model and baseline ambient quality concentrations collected through field survey at the project site.

18. **Scenario-I:** The model estimated maximum incremental concentrations of emissions of CO, NOx, SO2 and TSP from the incinerator unit are 0.000979 mg/m3 (8-hr averaged), 0.301 ug/m3 (24-hr averaged), 0.226 ug/m3 (24-hr averaged), and 0.814 (24-hr averaged) respectively. This study predicted the ambient concentrations of CO, NOx, SO2 and TSP when incinerator would be operational are 3.471 mg/m3 (8-Hrs averaged), 32.271 ug/m3 (24-hr averaged), 9.091 ug/m3 (24-hr averaged) and 124.224 ug/m3 respectively. The other details are given in Table 3. The spatial distribution of incremental GLCs of CO, NOx, SO2 and TSP incremental GLCs for 24 hourly and annual averaged are given in Annexure-I

Table-3: Model Predicted Results and SEQS Compliance-Scenario-I

Pollutants	Averaging Time	Unit	Model Predicted Concentrations	SEQS	Baseline Concentrations	Predicted Ambient Concentrations
CO	1-hrs	mg/m3	0.000979	10	3.47	3.470979
	8-hrs		0.00029		2.085	
NOx	24-hrs		0.301	120	31.97	32.271
	Annual		0.033	80	-	-
SO2	24-hrs	ug/m3	0.226	120	8.865	9.091
	Annual		0.025	80	-	-
TSP	24-hrs	ug/m3	0.814	150	123.41	124.224
	Annual		0.0898	-	-	-

19. **Scenario-II:** this is the operational scenario when it is assumed that all 2x units of incinerators would be operational for 24 hours throughout the year. This is the worst case scenario of emissions impact on the air quality from the proposed project. The maximum incremental emission concentrations of CO, NOx, SO2 and TSP would be 0.0032 mg/m3 (8-hrs averaged), 0.603 ug/m3 (24 hrs averaged), 0.452 ug/m3 (24 hrs averaged) and 0.1.628 ug/m3 (24 hrs averaged) respectively.

20. In Scenario-II, the predicted ambient concentrations of CO, NOx, SO2 and TSP when 2xunits would be operational t full capacity of 1000kg/h of waste would be 3.4807 mg/m3 (8-Hrs averaged), 32.573 ug/m3 (24-hr averaged), 9.317 ug/m3 (24-hr averaged) and 125.038 ug/m3 (24-hr averaged) respectively as given in Table 3. The spatial distribution of CO emissions from the project site for 1-hrs, 8-hrs and annually average respectively while spatial distribution of NOx, SO2 and TSP for 1 hourly, 24 hourly and annual averaged are given in in **Annexure-II.**.

Table-4: Model Predicted Results and SEQS Compliance-Scenario-II

Pollutants	Averaging Time	Unit	Model Predicted Concentrations	SEQS	Baseline Concentrations	Predicted Ambient Concentrations
CO	1-hrs	mg/m3	0.0107	10	3.47	3.4807
	8-hrs		0.0032		2.085	
NOx	24-hrs	ug/m3	0.603	120	31.97	32.573
	Annual		0.066	80		
SO2	24-hrs		0.452	120	8.865	9.317
	Annual		0.049	80	-	-
TSP	24-hrs	ug/m3	1.628	150	123.41	125.038
	Annual		0.178	-	-	-

21. The AERMOD depicted that the predicted ground levels ambient air concentrations of CO, SO2 and TSP would be within the SEQS limits of ambient air in the study area which is characterized due to the dilution because of prevailing meteorological conditions and control measure built in the selected incinerator technology by the proponent.

CONCLUSION:

22. The current dispersion modeling of emissions dispersion from proposed project of installation of Incinerators by M/s Enviro Waste Busters (Pvt) Ltd of capacity of 500 Kg/hr each to be planned in Sector-20, Korangi, Karachi.

23. The model output results (with designed emission, meteorological and terrain datasets) indicate that proposed Waste Management Facility would contribute very slightly into airshed in/around the plant. The modeling results indicate that the concentrations CO, NOx, SO2 and TSP would be within SEQS limits for ambient air.

24. It is concluded that the impact of emission from proposed project to ambient air within domain of 05 km radius is predicted as insignificant with the given prevailing meteorological conditions within modeling domain and comply with SEQS limits for ambient air from the proposed Waste Management Facility by M/s Enviro Waste Busters (Pvt) Ltd at proposed project location.

ANNEXURE-I

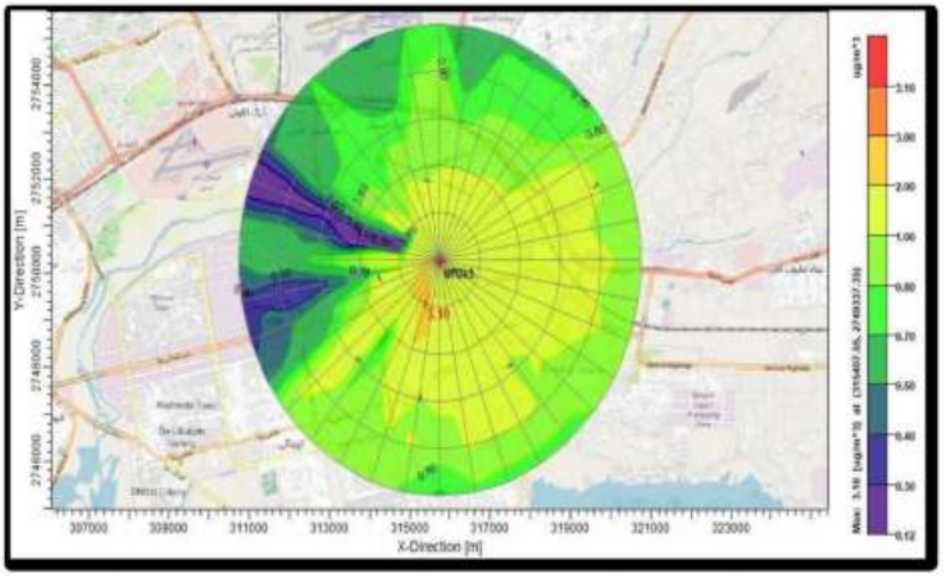


Figure 4: Spatial Dispersion of 1st Highest Concentrations (incremental) of CO for 1-Hrly Averaged for Scenario-I

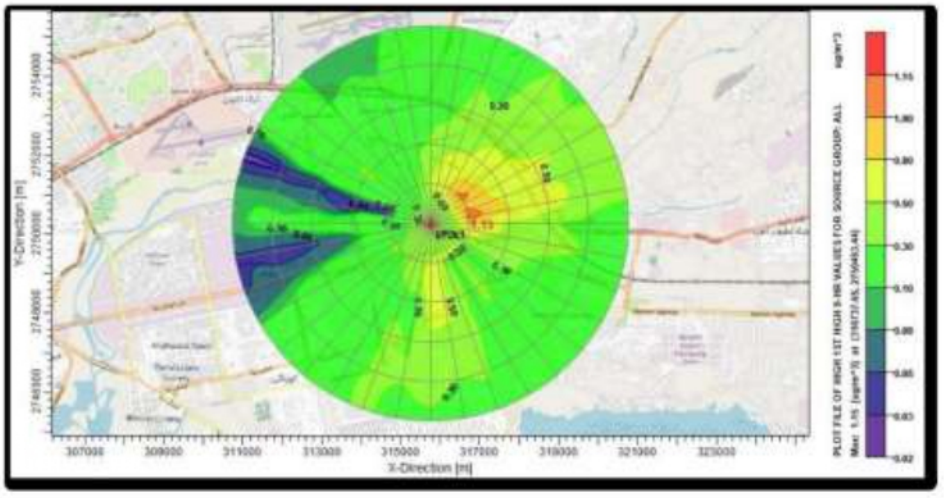


Figure 5: Spatial Dispersion of 1st Highest Concentrations of CO for 8-Hrly Averaged for Scenario-I

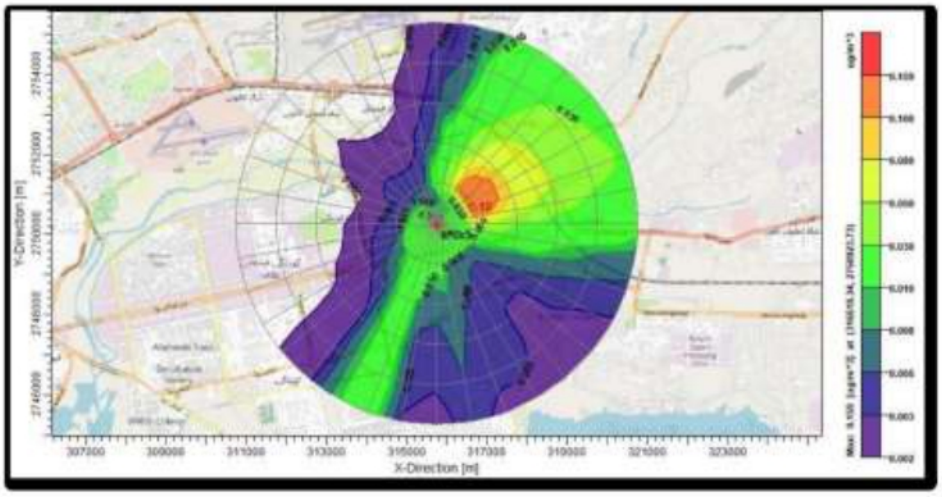


Figure 6: Spatial Dispersion of Incremental Concentrations of CO for Annually Averaged for Scenario-I

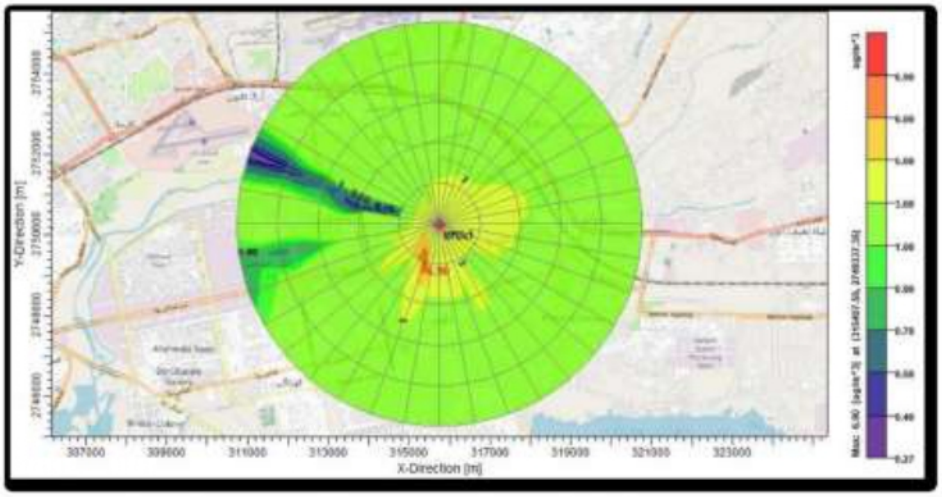


Figure 7: Spatial Dispersion of 1st Highest Concentrations of NOx for 1-Hrly Averaged for Scenario-I

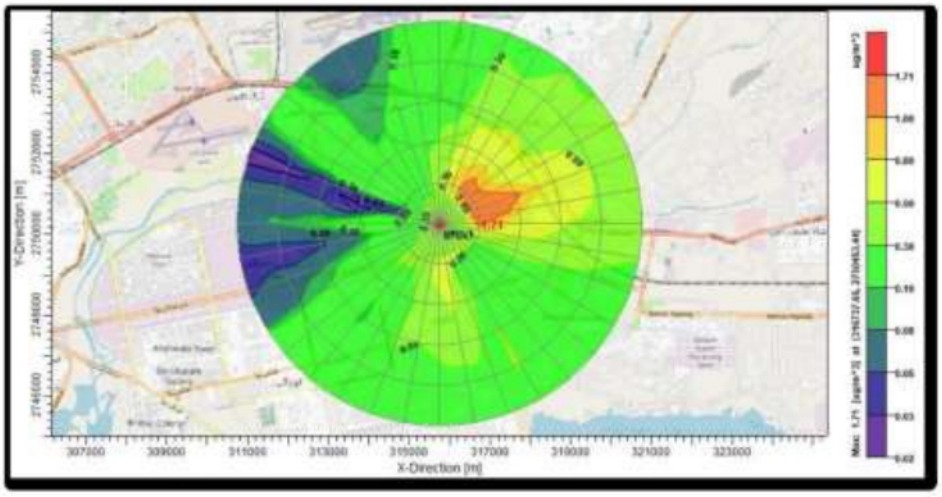


Figure 8: Spatial Dispersion of 1st Highest Concentrations of NOx for 24-Hrly Averaged for Scenario-I

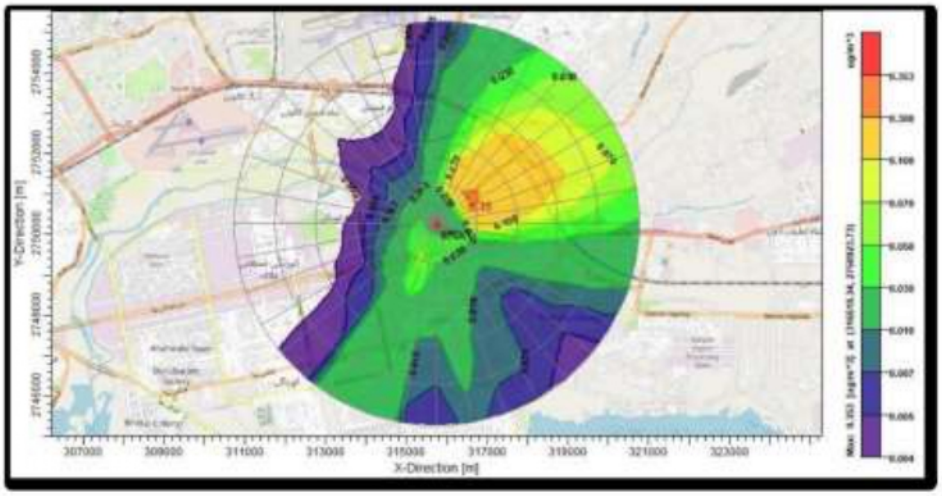


Figure 9: Spatial Dispersion of Incremental Concentrations NOx for Annual Averaged for Scenario-I

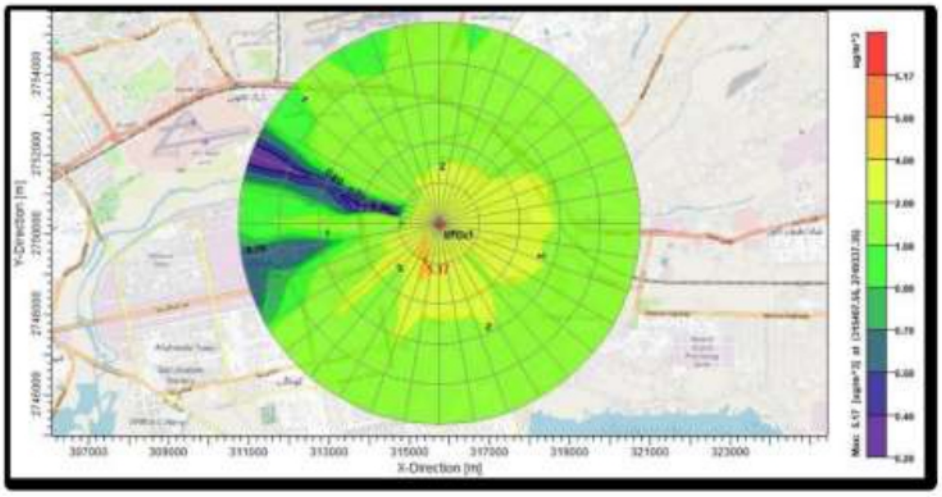


Figure 10: Spatial Dispersion of 1st Highest Concentrations of SO2 for 1-Hrly Averaged for Scenario-I

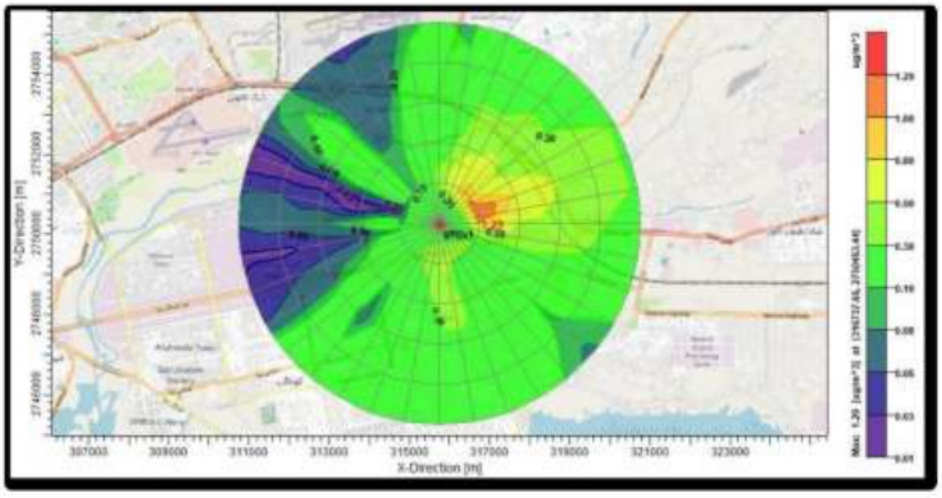


Figure 11: Spatial Dispersion of 1st Highest Concentrations of SO2 for 24-Hrly Averaged for Scenario-I

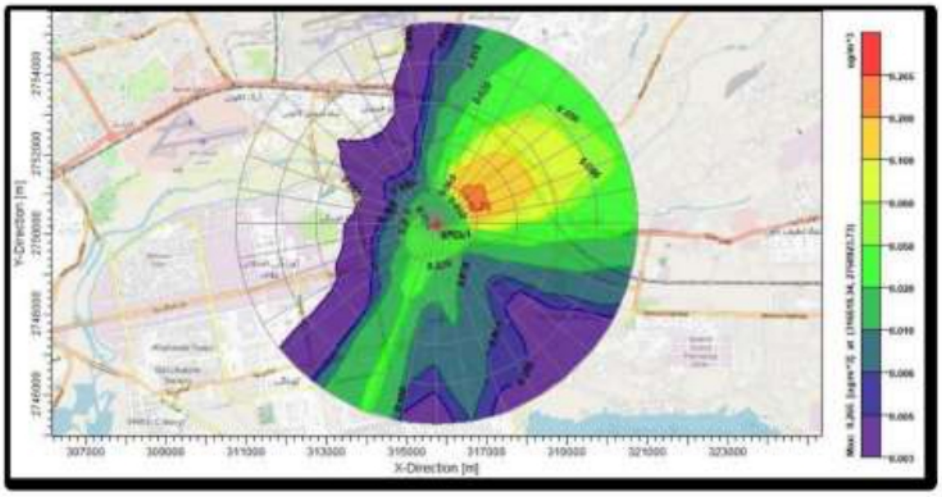


Figure 12: Spatial Dispersion of Incremental Concentrations SO2 for Annual Averaged for Scenario-I

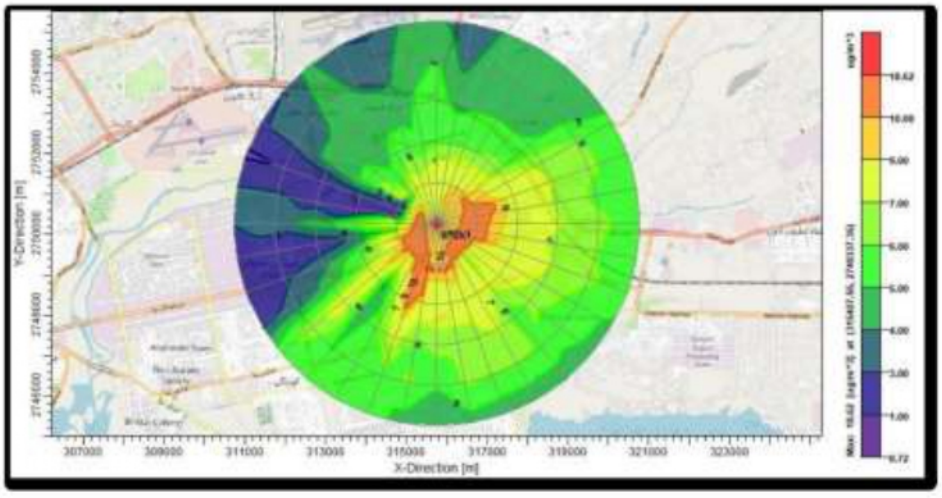


Figure 13: Spatial Dispersion of 1st Highest Concentrations of TSP for 1-Hrly Averaged for Scenario-I

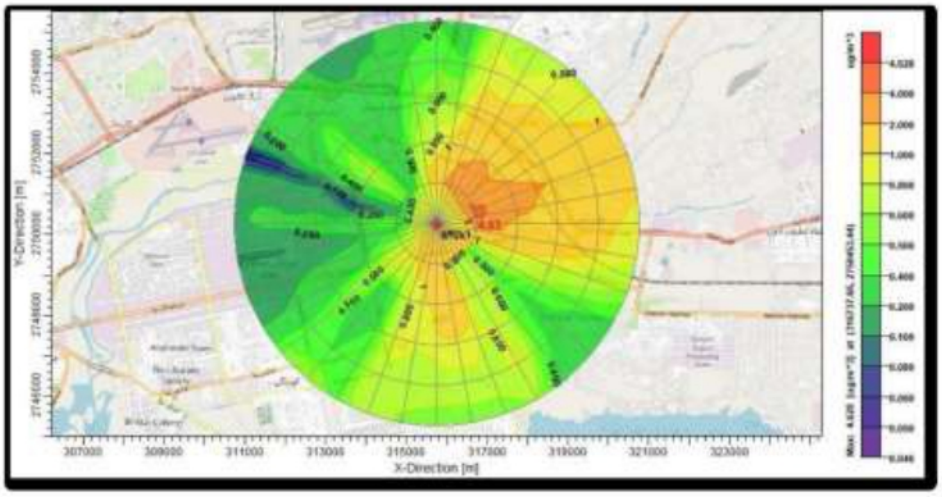


Figure 14: Spatial Dispersion of 1st Highest Concentrations of TSP for 24-Hrly Averaged for Scenario-I

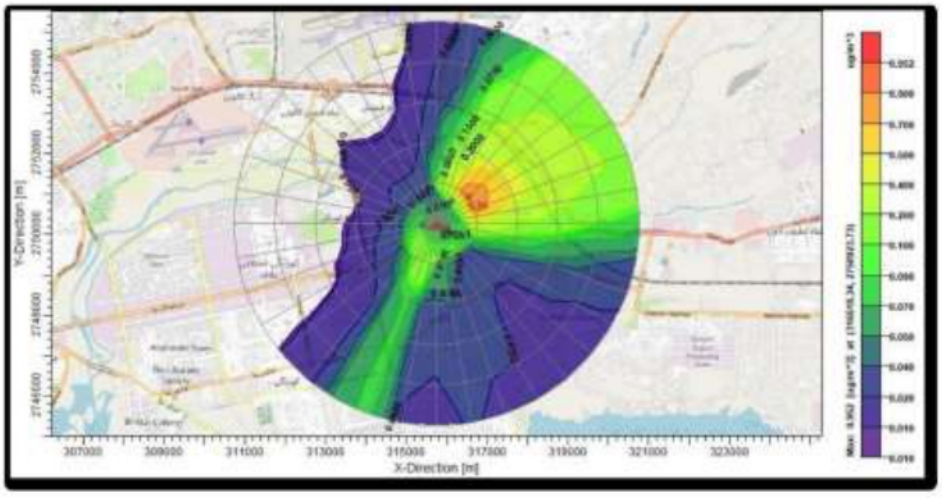


Figure 15: Spatial Dispersion of Incremental Concentrations of TSP for Annual Averaged for Scenario-I

ANNEXURE-II

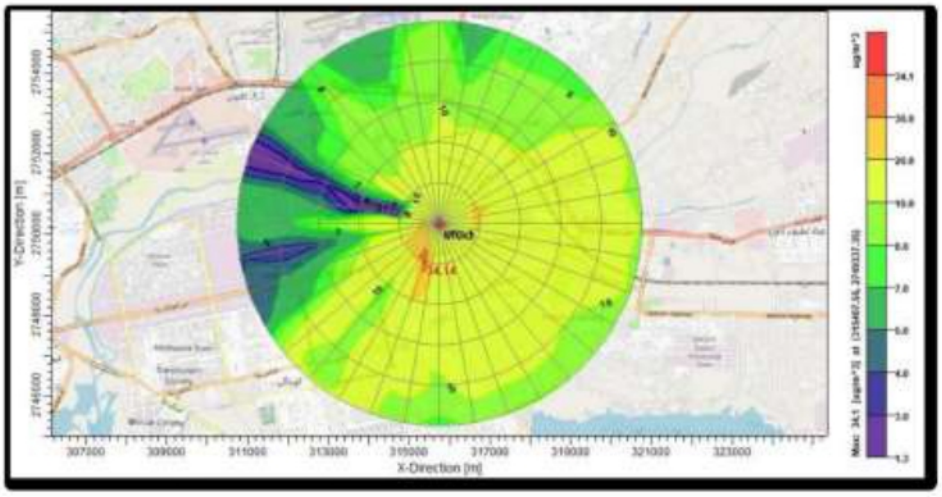


Figure 16: Spatial Dispersion of Incremental 1st Highest Concentrations of CO for 1-Hrly Averaged for Scenario-II

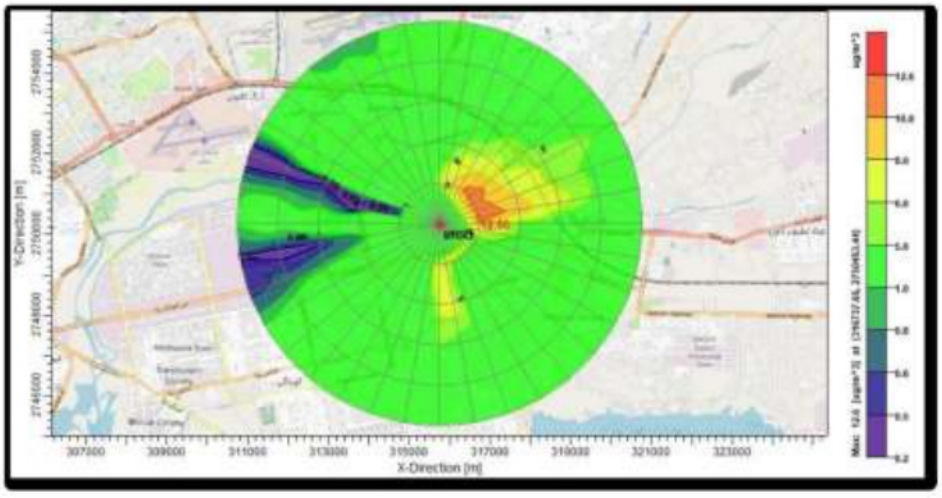


Figure 17: Spatial Dispersion of 1st Highest Concentrations of CO for 8-Hrly Averaged for Scenario-II

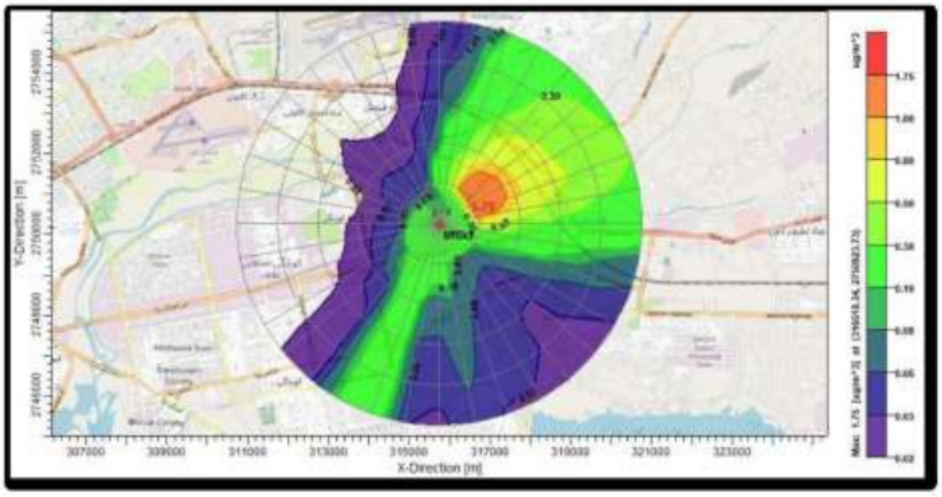


Figure 18: Spatial Dispersion Incremental Concentration of CO for Annual Averaged for Scenario-II

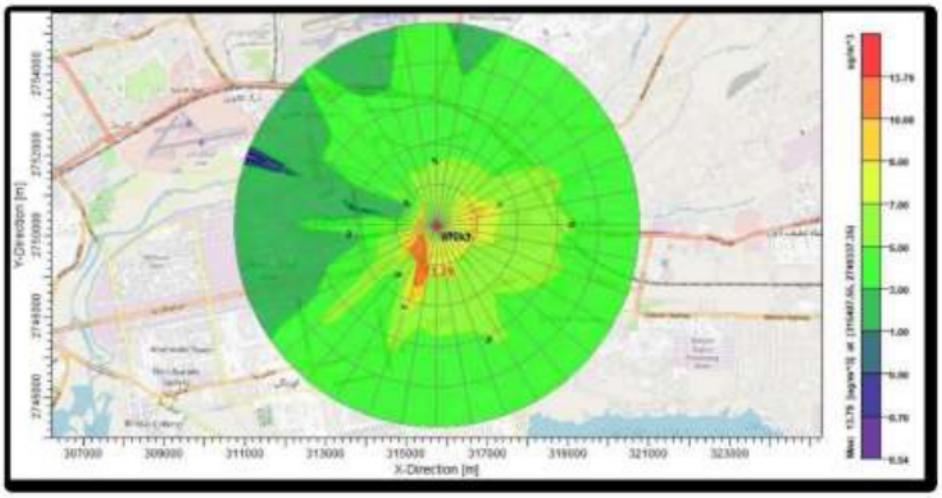


Figure 19: Spatial Dispersion of 1st Highest Concentrations of NOx for 1-Hrly Averaged for Scenario-II

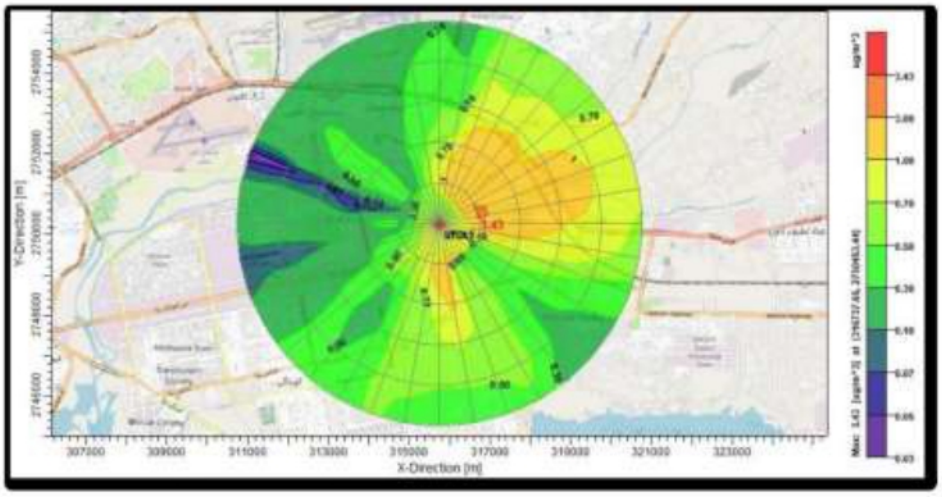


Figure 20: Spatial Dispersion of 1st Highest Concentrations of NOx for 24-Hrly Averaged for Scenario-II

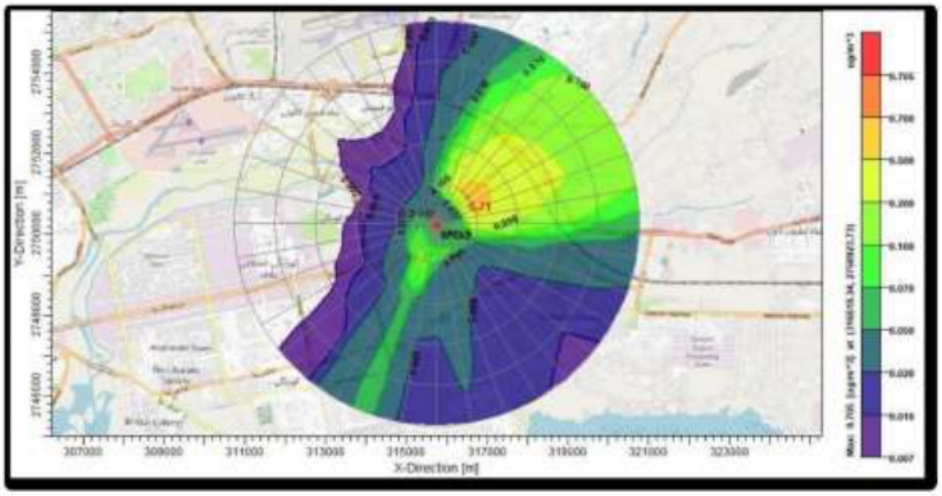


Figure 21: Spatial Dispersion of Incremental Concentration NOx for Annual Averaged for Scenario-II

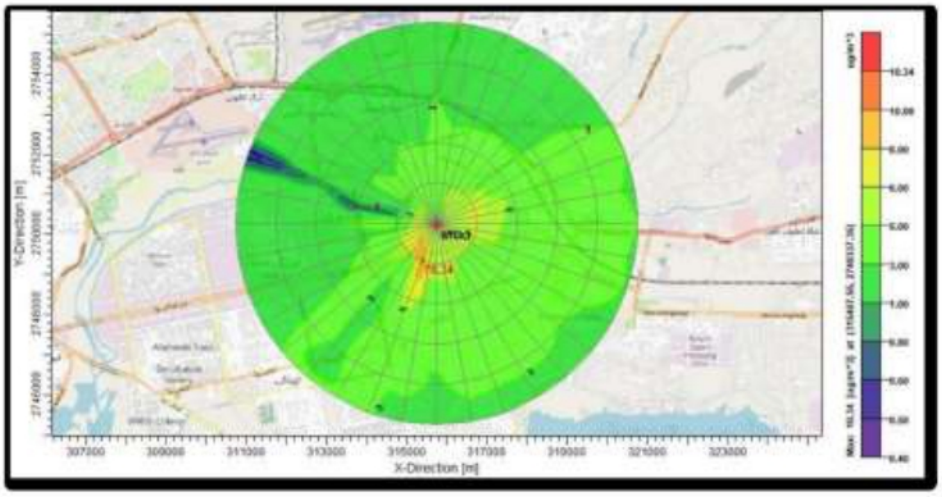


Figure 22: Spatial Dispersion of 1st Highest Concentrations of SO2 for 1-Hrly Averaged for Scenario-II

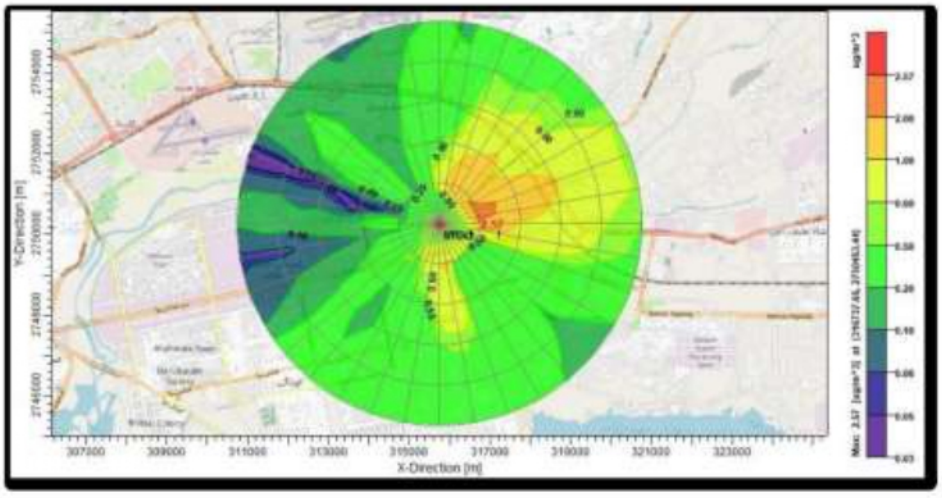


Figure 23: Spatial Dispersion of 1st Highest Concentrations of SO2 for 24-Hrly Averaged for Scenario-II

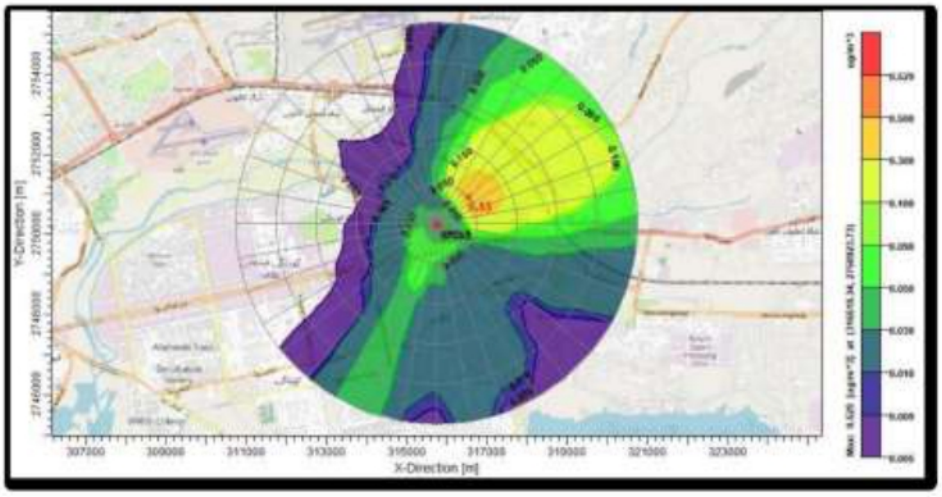


Figure 24: Spatial Dispersion of Incremental Concentration SO2 for Annual Averaged for Scenario-II

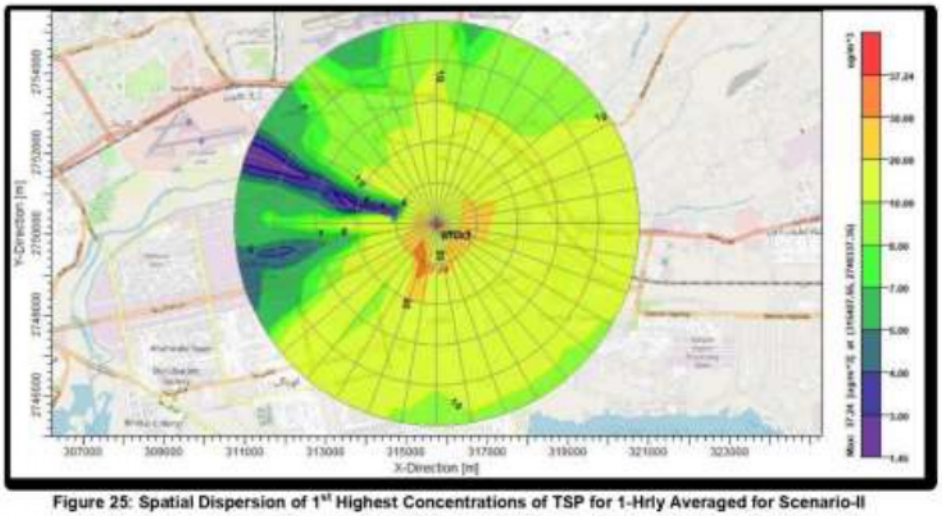


Figure 25: Spatial Dispersion of 1st Highest Concentrations of TSP for 1-Hrly Averaged for Scenario-II

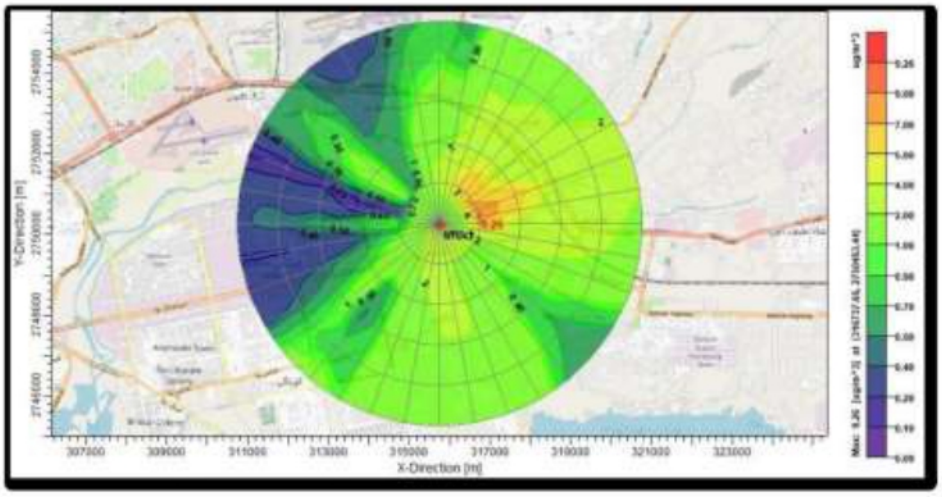


Figure 26: Spatial Dispersion of 1st Highest Concentrations of TSP for 24-Hrly Averaged for Scenario-II

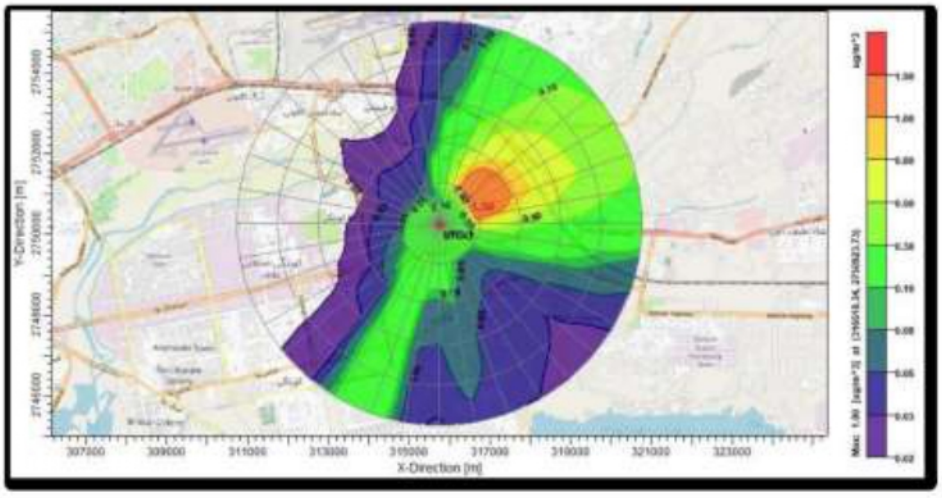


Figure 27: Spatial Dispersion of Incremental Concentration of TSP for Annual Averaged for Scenario-II