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CHAPTER # 1. INTRODUCTION

This Environmental Impact Assessment (EIA) has been prepared for the proposed capacity expansion of the Modern Oral Nicotine Pouch (VELO) manufacturing facility owned and operated by Pakistan Tobacco Company Limited (PTC) at G.T. Road Kala Gujran District Jhelum Punjab Pakistan. The facility hereafter referred to as the PTC Jhelum Factory has been operational for several years under an existing Environmental Compliance Certificate and No Objection Certificate (NOC) issued by the Punjab Environmental Protection Agency (EPA). The existing plant currently produces VELO oral nicotine pouches at a rate of 500 million pouches per year supported by an integrated largely closed loop waste and effluent management system and continuous environmental monitoring against the Punjab Environmental Quality Standards (PEQS).

In response to growing export demand and increased local consumption Pakistan Tobacco Company Limited proposes to extend the facility's production capacity. The extension will add a third mixer and an ion pairing dosing system (IONBOURNE package) including powder feeding stations pneumatic conveying dilution and dosing equipment and a dedicated dust collection arrangement. New raw materials in powder form Benzoic Acid (BA) Sodium Benzoate (SB) and Citric Acid (CA) will be incorporated into the process. Nicotine the most sensitive material handled on site will continue to be managed under the existing rigorous storage transportation and disposal protocols. Upon completion of the extension the facilities total manufacturing capacity will rise to 2,700 million pouches per year. The proposed expansion will operate within the sites existing boundary wall security framework and approved Environmental Management and Monitoring Plan ensuring that all mitigation measures waste tracking procedures and regulatory reporting requirements remain continuous and enhanced to match the increased operational scale.

This EIA assesses the incremental environmental impacts associated with the capacity increase and evaluates the adequacy of proposed control measures monitoring programmes and management plans to maintain compliance with all applicable environmental standards and the conditions of the previously granted NOC.

1.1 PURPOSE OF THE REPORT

The report aims to ensure that environmental considerations are integrated into the planning and decision-making processes prior to the commencement of project activities. It provides a detailed analysis of the project's potential impacts on the physical, biological, and socio-economic environment during the construction and operational phases. Furthermore, this EIA outlines strategies and an Environmental Management Plan (EMP) to minimize adverse effects, enhance positive outcomes, and ensure compliance with the **Punjab Environmental Protection Act (PEPA), 1997**, and the **IEE/EIA Regulations, 2022**.

1.2 TYPE AND CATEGORY OF THE PROJECT

Based on the nature, scale, and activities of the proposed development. In accordance with the Environmental Protection Agency, Government of the Punjab, Lahore, "List of Projects Requiring an EIA", the project under consideration falls into Schedule II, which is the category of projects requiring an EIA. Therefore, to fulfill the legal requirements of Section 12 of the Punjab Environment Protection Act (amended 2012), the client is required to submit the EIA report to the Environmental Protection Agency, Government of the Punjab, Lahore, to obtain the required EA.

1.3 IDENTIFICATION OF PROJECT AND PROPONENT

"Extension of the nicotine pouches (VELO / Modern Oral) manufacturing plant by M/s Pakistan Tobacco Company Limited (PTC), at G.T. Road, Kala Gujran, District Jhelum, Punjab"

Proponent details as follows:

Proponent: Mr. Asad Ijaz - Manager Sustainability

Address: Pakistan Tobacco Company Limited (PTC), at G.T. Road, Kala Gujran, District Jhelum, Punjab

1.4 DETAILS OF CONSULTANT

Environmental Services of Pakistan Private Limited (ESPAK) is an independent company that conducts IEE, EIA, EMP, and other environmental investigations through its panel of environmental consultants, public participation practitioners, and experienced environmental managers. The company has its own recommended instruments to check the baseline environmental data/PEQS and a lab analysis facility for water, wastewater, and priority parameters.

Environmental Services Pakistan Pvt. Ltd (ESPAK)

Office No. 731, Block 2, Sector D1, Shahjilani Road Township, Lahore

Contact: 042-35154012, 0312-0849999

The current study was carried out by the following professionals:

Table 1-1: Name of Team Members Preparing Report

#	Name of Team Members	Designation	Qualification
1	Ali Ramzan	Senior Environmentalist	B.S Environmental Sciences
2	Nabia Farrukh Sohail	Environmentalist	M.S Environmental Science
3	Qurat Ul Ain	Project Coordinator	MBA Marketing

1.5 BRIEF DESCRIPTION OF NATURE SIZE AND LOCATION OF PROJECT

Pakistan Tobacco Company Limited (PTC) proposes to undertake an expansion and technological enhancement of its existing environmentally approved Modern Oral / VELO nicotine pouch manufacturing facility located at the Company's Jhelum Factory on G.T. Road, Kala Gujran, District Jhelum, Punjab through letter No AD(EIA)/F-10(EIA)/EPA/2010/2020/608 dated 28-12-2020 and valid until 16-02-2028. The proposed project is an extension of the existing manufacturing operation and will be implemented within the established industrial premises of PTC. The project does not involve development of a new greenfield industrial facility or a change in the fundamental nature of the existing manufacturing activity.

The existing facility manufactures oral nicotine pouches under the VELO brand, with an existing production capacity of approximately 500 million pouches per annum. Under the proposed expansion, the overall production capacity of the Modern Oral facility will be increased to approximately 2,700 million pouches per annum, representing an additional production capacity of approximately 2,200 million pouches per annum. This is equivalent to a 440% increase over the existing approved capacity of 500 million pouches per annum, resulting in a proposed total capacity approximately 5.4 times the existing approved capacity. The enhanced capacity will primarily be achieved through the integration of advanced process technology and equipment, including an Ion Pairing Machine supplied as the IONBOURNE package, together with the installation of a third mixer within the Production and Manufacturing Department (PMD) cell.

The proposed Ion Pairing system will incorporate powder feeding stations, pneumatic conveying, dilution and controlled dosing arrangements and a dedicated dust collection system. The technology will facilitate higher-rate and controlled processing of the raw materials used in the Modern Oral manufacturing process. The principal powdered raw materials associated with the proposed process include Benzoic Acid (BA), Sodium Benzoate (SB) and Citric Acid (CA). Nicotine, being the most sensitive material handled at the facility, will continue to be managed through controlled storage, transfer, dosing and handling arrangements incorporating appropriate engineering and occupational exposure controls.

The expansion will make substantial use of the existing infrastructure at the Jhelum Factory. The existing W.M. Warehouse measuring approximately 78'-0" × 49'-6" will be utilised for installation of the proposed Ion Pairing Machine and its associated equipment. The existing F.G. Warehouse measuring approximately 78'-0" × 37'-2" will be converted for use as the W.M. Warehouse. The latter facility will be provided with the required Air Handling Unit (AHU) and chillers to support its intended use and maintain the required environmental conditions.

In addition to the equipment and warehouse modifications, PTC proposes an extension to the existing building measuring approximately 95' × 27'. The proposed extension will accommodate supporting operational, personnel and administrative facilities, including a

Change Room, NCM Area, Staging Area, Matlock, Store Return Material Area, Conference Room, Training Centre, Reception and Toilets. The extension will therefore provide the ancillary infrastructure required to support the expanded manufacturing operation.

The project site is an established and secured industrial facility. The factory premises are enclosed by a boundary wall and provided with round-the-clock security, controlled site access and designated emergency exit arrangements. The existing facility has established systems for material receiving, storage, internal movement, production, finished-product handling, wastewater management and waste storage and transportation. These existing arrangements will continue to support the expanded operation, with modifications or capacity enhancements made where required.

From an environmental perspective, the proposed project primarily constitutes an increase in production throughput and process-equipment enhancement within an existing approved facility. Consequently, the principal environmental considerations relate to the incremental environmental load resulting from the increased production capacity, including increased consumption of raw materials, nicotine and other process inputs, energy and water requirements, generation of process-related and contaminated waste, wastewater generation, powder handling, dust emissions, noise and occupational health and safety risks.

The existing facility operates an established environmental management system, including environmental monitoring through EPA-certified laboratories for relevant parameters such as particulate matter, gaseous emissions, wastewater quality and noise. Existing waste and effluent management arrangements, including authorised collection, transportation, recycling, treatment and disposal systems, will be extended to accommodate the additional quantities generated as a result of the proposed capacity enhancement. Particular attention will continue to be given to nicotine-containing and nicotine-contaminated wastes and Modern Oral manufacturing waste.

The proposed project is therefore considered an expansion and technological upgrading of an existing environmentally approved Modern Oral manufacturing facility, with the primary

objective of enhancing production capacity through advanced process technology while maintaining the established environmental safeguards, waste-management arrangements and regulatory compliance framework applicable to the PTC Jhelum Factory.

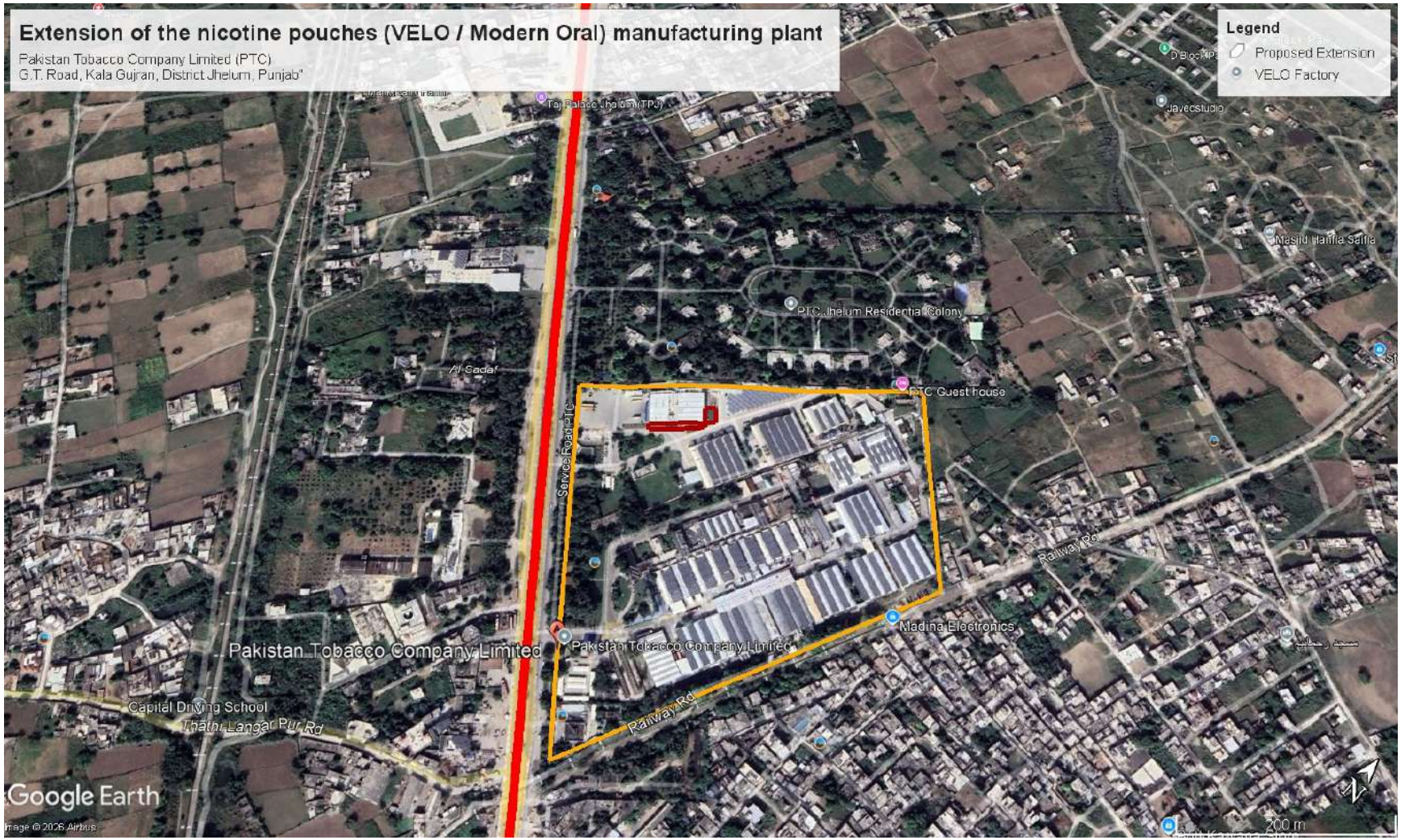
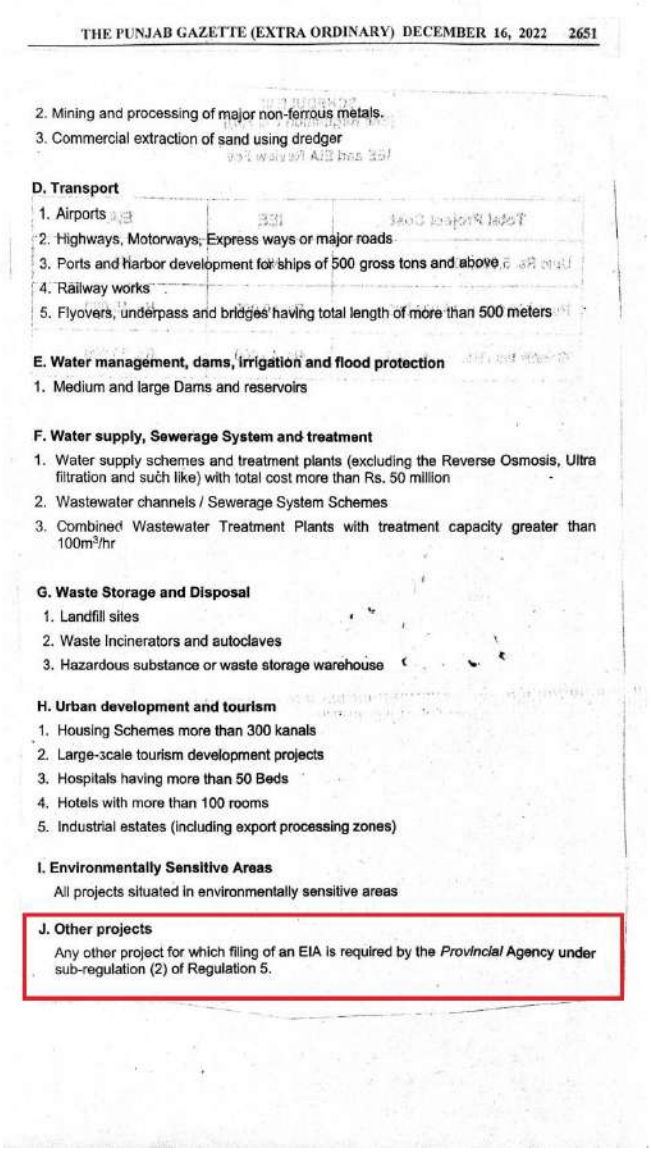


Figure 1-1 Location of the Project

CHAPTER # 2. SCREENING OF THE PROJECT

Based on the Punjab Environmental Protection Act 1997 and the Review of IEE/EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II class J (Other Projects) . Following list shows the projects included in Class J.



THE PUNJAB GAZETTE (EXTRA ORDINARY) DECEMBER 16, 2022 2651

2. Mining and processing of major non-ferrous metals.
3. Commercial extraction of sand using dredger

D. Transport

1. Airports
2. Highways, Motorways, Express ways or major roads
3. Ports and harbor development for ships of 500 gross tons and above
4. Railway works
5. Flyovers, underpass and bridges having total length of more than 500 meters

E. Water management, dams, irrigation and flood protection

1. Medium and large Dams and reservoirs

F. Water supply, Sewerage System and treatment

1. Water supply schemes and treatment plants (excluding the Reverse Osmosis, Ultra filtration and such like) with total cost more than Rs. 50 million
2. Wastewater channels / Sewerage System Schemes
3. Combined Wastewater Treatment Plants with treatment capacity greater than $100m^3/hr$

G. Waste Storage and Disposal

1. Landfill sites
2. Waste Incinerators and autoclaves
3. Hazardous substance or waste storage warehouse

H. Urban development and tourism

1. Housing Schemes more than 300 kanals
2. Large-scale tourism development projects
3. Hospitals having more than 50 Beds
4. Hotels with more than 100 rooms
5. Industrial estates (including export processing zones)

I. Environmentally Sensitive Areas

All projects situated in environmentally sensitive areas

J. Other projects

Any other project for which filing of an EIA is required by the *Provincial* Agency under sub-regulation (2) of Regulation 5.

CHAPTER # 3. SCOPING OF THE PROJECT

Scoping is a key stage of the EIA process that identifies the significant environmental and social issues requiring detailed evaluation during the assessment. It establishes the scope and boundaries of the study by identifying potential environmental impacts associated with the proposed project and determining the environmental components that may be affected during the installation, waste collection and transportation, and operational phases.

For the proposed extension at the PTC, the scoping exercise involved a review of the project design, operational processes, baseline environmental conditions, applicable environmental regulations, and consultations with relevant stakeholders. The process focused on identifying key issues related to air emissions, wastewater generation, nicotine management, waste handling, occupational health and safety, noise, and emergency preparedness. The outcomes of the scoping exercise provide the basis for the detailed impact assessment and the development of appropriate mitigation measures and an EMP to ensure environmentally sound and sustainable project implementation.

3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

The environmental assessment for the proposed expansion of the Pakistan Tobacco Company Limited (PTC) Modern Oral / VELO manufacturing facility has been scoped to evaluate the environmental and social implications associated with the proposed increase in production capacity and installation of additional process and supporting infrastructure. The assessment considers the existing environmentally approved facility as the baseline condition and focuses particularly on the incremental impacts arising from increasing production capacity from approximately 500 million pouches per annum to 2,700 million pouches per annum.

The scoping process has considered the geographical area potentially influenced by project activities, the duration and stages of the proposed development, the environmental receptors likely to be affected, and the potential cumulative interaction between the proposed expansion and the existing factory operations.

The assessment covers the construction/installation phase associated with the proposed building extension, equipment installation and modification of existing warehouse facilities, as well as the operational phase following commissioning of the expanded Modern Oral manufacturing facility.

3.1.1 Spatial Boundary

The primary spatial boundary of the assessment comprises the existing PTC Jhelum Factory premises located at G.T. Road, Kala Gujran, District Jhelum, Punjab. The proposed expansion will be undertaken within the established industrial premises and will utilise existing buildings and infrastructure to a significant extent.

The immediate project influence area includes the locations where physical modification, construction, equipment installation, material handling, production, storage, wastewater management, waste storage and transportation activities associated with the expansion will occur. Particular attention will be given to the proposed building extension, the existing W.M. Warehouse, where the Ion Pairing Machine will be installed, and the existing F.G. Warehouse, which will be utilised as the W.M. Warehouse following the required installation of an Air Handling Unit (AHU) and chillers.

The spatial assessment will also consider the surrounding environment and receptors potentially affected by emissions, noise, traffic, wastewater, waste transportation, accidental releases and other project-related activities. These receptors include neighbouring industrial/commercial and residential areas, road users, workers, nearby communities, surface and groundwater resources, ecological receptors and other environmentally sensitive features, where applicable.

For environmental quality parameters such as ambient air, noise and wastewater, the assessment will consider the existing monitoring regime and available environmental monitoring data from the PTC facility. The assessment will also consider the potential for impacts beyond the factory boundary where project activities have the potential to influence the surrounding environment.

The spatial boundary for individual environmental parameters will therefore vary according to the nature and pathway of the potential impact. For example, occupational health and safety impacts will primarily be assessed within the workplace, while noise, air emissions, traffic and accidental-release risks will also be evaluated with respect to receptors outside the immediate process areas.

The assessment will additionally consider the transportation routes used for the movement of raw materials, finished products, wastes and other materials where such activities form an integral part of the expanded operation. Particular consideration will be given to the transportation and authorised disposal/recycling of nicotine-containing and nicotine-contaminated wastes and other Modern Oral process wastes.

Accordingly, the spatial boundary is not restricted solely to the footprint of the proposed building extension. It encompasses the project footprint, existing production and utility areas influenced by the expansion, waste and wastewater management systems, material and waste transportation pathways, and potentially affected environmental and social receptors surrounding the facility.

3.1.2 Temporal Boundary

The temporal boundary of the environmental assessment covers the complete lifecycle of the proposed expansion, including the installation/construction phase, commissioning phase and operational phase.

The installation/construction phase comprises the activities required to establish the proposed building extension and modify the existing facilities. These activities may include civil works, building modifications, installation of the Ion Pairing Machine and third mixer, installation of powder-feeding and conveying systems, dust-collection equipment, AHU and chillers, electrical and mechanical works, internal material movement, testing and commissioning.

Although the construction/installation phase is expected to be temporary, potential environmental aspects such as dust, noise, construction waste, worker health and safety, traffic and accidental spills will be considered in the assessment.

The operational temporal boundary extends from commissioning of the expanded facility throughout its operating life. During this phase, the assessment will consider the environmental implications of the increased manufacturing capacity of approximately 2,700 million pouches per annum, including increased raw-material consumption, nicotine handling, energy and water requirements, wastewater generation, solid and process waste generation, powder handling, noise and occupational health and safety considerations.

The assessment will also consider the long-term implementation of the existing Environmental Management and Monitoring Plan and the proposed measures required to manage the incremental environmental loads associated with the expansion.

Environmental impacts will be considered according to their expected duration and behaviour, including temporary, intermittent, continuous, short-term and long-term impacts, as applicable. Where relevant, impacts that may persist beyond individual operational activities, such as contamination resulting from accidental spills or improper waste handling, will also be considered.

The temporal scope will therefore cover:

- Pre-construction and installation activities associated with the expansion;
- Construction and equipment installation phase;
- Testing and commissioning of the expanded systems;
- Routine operation of the expanded Modern Oral facility;
- Periodic maintenance and replacement of process and utility equipment; and
- Long-term environmental monitoring and management throughout the operational life of the expanded facility.

The assessment will place particular emphasis on the operational phase because the principal environmental change associated with the project is the substantial increase in

production throughput from the existing approved capacity of 500 million pouches per annum to approximately 2,700 million pouches per annum.

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The scoping of the proposed expansion has identified the environmental, occupational health and safety and community-related issues that require particular attention during the EIA process. Consultation and engagement with relevant stakeholders, regulatory authorities, workers and other potentially affected parties will be used to verify these issues and identify any additional concerns associated with the proposed expansion.

Given that the proposed project will be implemented within an existing and environmentally approved PTC manufacturing facility, the principal concerns are expected to relate to the increase in production throughput and the resulting incremental environmental loads, rather than the establishment of a new industrial activity.

The key issues identified during the scoping process include the following:

3.2.1 Increased Production Capacity

The proposed increase from 500 million to 2,700 million pouches per annum represents a substantial increase in production throughput. Stakeholders and regulatory authorities may therefore require assurance that existing environmental-management systems, utilities, waste-management arrangements and emergency-response systems are capable of accommodating the increased production load.

3.2.2 Nicotine Handling and Occupational Exposure

Nicotine is the most sensitive material handled within the Modern Oral manufacturing operation. Particular attention is therefore required regarding its storage, transfer, dosing, handling, occupational exposure, spill prevention, emergency response and management of nicotine-contaminated waste.

The assessment will examine the engineering and administrative controls provided for nicotine handling, including controlled transfer and dosing systems, local exhaust

ventilation, appropriate PPE, operating procedures, training, spill-control arrangements and waste-management procedures.

3.2.3 Powder Handling and Fugitive Dust

The proposed Ion Pairing system will involve powder feeding, pneumatic conveying, dilution and dosing of materials including Benzoic Acid, Sodium Benzoate and Citric Acid. The potential for dust generation during receiving, transfer, feeding, conveying and dosing will therefore be assessed.

Particular attention will be given to the dedicated dust collection system, containment of material-transfer points, local exhaust ventilation, housekeeping and worker exposure controls.

3.2.4 Waste Generation and Disposal

The increased production capacity will result in increased quantities of Modern Oral manufacturing waste, nicotine-contaminated waste, contaminated PPE and containers, plastic cans and lids, process residues and other associated waste streams.

The adequacy of the existing waste-management chain will therefore be evaluated in relation to the additional quantities generated by the expansion. Existing contractual arrangements, authorised contractors, gate-pass systems, reconciliation records, disposal/destruction certificates and periodic contractor audits will be considered as part of the assessment.

3.2.5 Wastewater and Effluent Management

The assessment will determine whether the existing wastewater and effluent-management arrangements have adequate capacity for the expanded operation. Existing treatment, reuse and disposal arrangements will be reviewed with respect to increased production-related loads and continued compliance with applicable PEQS.

3.2.6 Air Emissions and Environmental Quality

Potential impacts associated with powder handling, dust generation, ventilation systems and other relevant emission sources will be evaluated. Existing environmental monitoring results will be reviewed to establish the performance of the facility and determine whether additional monitoring or control measures are required following expansion.

3.2.7 Noise

The installation and operation of mixers, pneumatic conveying systems, dust collection equipment, AHUs, chillers and other mechanical equipment may increase workplace and potentially boundary noise levels. Noise impacts will therefore be assessed, with particular emphasis on worker exposure and compliance at the facility boundary.

3.2.8 Energy and Resource Consumption

The increase in production throughput will increase demand for electricity, HVAC, cooling and other utilities. Resource efficiency, energy consumption and opportunities for optimisation will therefore be considered in the EIA.

3.2.9 Traffic and Transportation

The increase in raw-material handling, finished-product movement and waste transportation may result in increased vehicle movements. The assessment will therefore consider traffic safety, vehicle movement within the factory, loading/unloading activities and potential impacts on G.T. Road and surrounding areas.

3.2.10 Emergency Preparedness and Fire Safety

The expansion will introduce additional process equipment, electrical loads, powder-handling systems and associated infrastructure. Emergency response, fire prevention, fire detection and suppression, evacuation routes, emergency exits, spill response and worker training will therefore be reviewed.

3.2.11 Community and Worker Safety

Potential risks to workers and nearby communities arising from routine operation, transportation, accidental releases, fire and other emergencies will be considered. Existing security arrangements and emergency response mechanisms will be reviewed and strengthened where necessary.

The above issues will be further evaluated through stakeholder consultation, baseline investigations, review of existing monitoring data, technical assessment and risk analysis. Any additional concerns raised during formal consultation will be incorporated into the final EIA and reflected in the Environmental Management Plan.

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

The EIA will determine the significance of potential environmental and social impacts associated with the proposed expansion by considering the nature, magnitude, extent, duration, frequency, reversibility, likelihood and sensitivity of affected receptors.

The assessment will distinguish between the environmental conditions associated with the existing approved facility and the incremental impacts attributable to the proposed expansion. This approach is particularly relevant because the project will increase production capacity substantially while remaining within an established industrial facility.

The following impact categories have been identified as significant issues for detailed assessment:

3.3.1 Construction and Installation Phase

Potential impacts during construction and installation include:

- Generation of dust and particulate matter from civil and installation activities;
- Noise and vibration from construction equipment;
- Generation and disposal of construction waste;
- Increased movement of construction vehicles and equipment;

- Occupational health and safety risks;
- Electrical, mechanical and lifting hazards during equipment installation;
- Temporary disruption to existing factory operations;
- Potential spills of fuels, lubricants or other materials; and
- Fire and emergency risks during construction and commissioning.

These impacts are expected to be predominantly temporary and manageable through appropriate construction-phase controls.

3.3.2 Operational Phase

The operational phase represents the principal focus of the impact assessment. Key factors to be determined include:

Production and Process Impacts:

The environmental implications of increasing production from 500 million to 2,700 million pouches per annum and the introduction of the Ion Pairing Machine and third mixer will be assessed.

Air Quality and Dust:

Potential emissions associated with powder handling, feeding, pneumatic conveying, dosing, ventilation and dust collection systems will be evaluated.

Nicotine Exposure and Risk:

The potential for occupational and environmental exposure to nicotine during storage, transfer, dosing, production, maintenance and waste handling will be assessed.

Wastewater:

The effect of increased production on wastewater quantity and quality, existing treatment/reuse arrangements and compliance with applicable PEQS will be determined.

Solid and Process Waste:

Additional quantities of blend and pouch waste, nicotine-contaminated materials, plastic cans/lids, containers, PPE and other wastes will be quantified where data are available and the adequacy of existing management arrangements will be assessed.

Noise:

Noise generated by mixers, pneumatic conveying, dust collectors, AHUs, chillers and other equipment will be evaluated against applicable requirements.

Water and Energy Consumption:

The incremental requirement for water, electricity, cooling and HVAC services will be determined and opportunities for resource efficiency will be considered.

Traffic and Transportation:

Potential changes in traffic associated with increased raw-material deliveries, product transportation and waste movement will be evaluated.

Fire, Chemical and Process Safety:

The risks associated with nicotine, powdered materials, machinery, electrical systems, storage and process operations will be assessed.

Cumulative Impacts:

The assessment will consider the interaction of the proposed expansion with the existing PTC Jhelum Factory operations and existing environmental loads. This will include the adequacy of existing wastewater, waste-management, ventilation, environmental monitoring, emergency response and utility systems.

- **Impact Significance Assessment**

The significance of identified impacts will be determined using a systematic assessment considering:

Assessment Factor	Consideration
Nature	Beneficial or adverse

Assessment Factor	Consideration
Magnitude	Low, moderate or high
Spatial extent	Site-specific, local or wider
Duration	Short-term, medium-term or long-term
Frequency	Occasional, intermittent or continuous
Likelihood	Unlikely, possible or likely
Reversibility	Reversible or irreversible
Sensitivity	Sensitivity of the affected receptor
Consequence	Environmental, health, safety or social consequence
Significance	Low, moderate, substantial or high

Where impacts are identified as potentially significant, appropriate mitigation measures will be incorporated into the Environmental Management Plan and their effectiveness will be verified through environmental monitoring.

3.4 DEVELOPMENT OF AN ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) will be developed as an integral component of the EIA to provide a practical framework for implementation of mitigation, monitoring and management measures during the construction/installation, commissioning and operational phases of the proposed expansion.

The EMP will build upon the existing environmental management arrangements of the PTC Jhelum Factory and will incorporate additional measures required to address the environmental aspects associated with the increased production capacity and new process equipment.

The EMP will establish clear responsibilities for implementation, monitoring, documentation, reporting and corrective action. It will also provide mechanisms for evaluating environmental performance and ensuring continued compliance with applicable environmental requirements and conditions of approval.

The EMP will cover, as applicable:

- Air emissions and fugitive dust management;

- Powder handling and dust-control measures;
- Nicotine storage, transfer, dosing and spill prevention;
- Occupational exposure prevention and workplace safety;
- Waste segregation, storage, transportation, recycling and disposal;
- Management of nicotine-contaminated and Modern Oral waste;
- Wastewater and effluent management;
- Water conservation and resource efficiency;
- Energy management;
- Noise management;
- Chemical storage and spill response;
- Fire prevention and emergency preparedness;
- Construction and equipment-installation controls;
- Traffic and transportation management;
- Worker health and safety;
- Environmental monitoring and laboratory testing;
- Contractor and waste-vendor management;
- Environmental record keeping and documentation;
- Training and awareness;
- Incident reporting and corrective action; and
- Periodic review and continual improvement of environmental performance.

The EMP will specifically address the additional environmental load associated with the proposed increase in production capacity. Existing environmental safeguards that have demonstrated effective performance will be retained, while their adequacy will be reassessed against the projected production throughput of **2,700 million pouches per annum**.

Particular emphasis will be placed on the existing integrated waste-management system. Modern Oral blend and pouch waste, after appropriate neutralisation, will continue to be

managed through the established authorised treatment/disposal route. Plastic cans and lids will continue to be segregated and processed through authorised recycling arrangements, while nicotine-contaminated drums and other nicotine-containing waste will continue to be managed through approved contractors and documented disposal/recycling procedures.

All waste-management activities will remain subject to appropriate documentation, including gate passes, reconciliation records, contractor documentation, destruction/disposal certificates and periodic audits, as applicable. The increased waste quantities resulting from the proposed expansion will be incorporated into the EMP once final production and waste-generation data are confirmed.

The EMP will also establish an environmental monitoring programme covering relevant parameters such as particulate matter, gaseous emissions, wastewater quality, noise and other parameters identified through the impact assessment and regulatory requirements. Monitoring will be undertaken at appropriate locations and frequencies, and results will be compared with applicable environmental standards and approval conditions.

A dedicated implementation matrix will be developed in the final EIA identifying the environmental aspect, potential impact, mitigation measure, monitoring parameter, monitoring frequency, responsible department/person, applicable standard and record/documentation requirement.

The EMP will therefore serve as the principal management instrument for ensuring that the proposed capacity enhancement is implemented and operated in an environmentally responsible manner while maintaining the compliance status of the existing PTC Jhelum Factory.

CHAPTER # 4. ALTERNATIVES OF THE PROJECT

In accordance with the terms of reference for Environmental Impact Assessment (EIA), this chapter evaluates alternative scenarios and options regarding the proposed expansion of the Pakistan Tobacco Company Limited (PTC) facility in Kala Gujran, District Jhelum. The objective is to demonstrate that the selected option—the physical and operational expansion of the existing approved site—is the most environmentally sound, socially responsible, and technically feasible solution compared to other viable alternatives.

The alternatives considered include:

- No Project Option
- Alternative Location Option
- Alternative Capacity/Technology Options
- Alternative Waste Management Approaches

4.1 ALTERNATIVE 1: NO PROJECT OPTION

This scenario assumes that PTC does not proceed with the expansion and continues operations at the current capacity of 500 million pouches per year.

- **Environmental Implications:** The environmental footprint remains static. Current mitigation measures remain sufficient, and pollution levels do not increase.
- **Economic and Social Implications:** PTC would fail to meet growing local demand and export pressures, leading to potential loss of market share.
- Missed opportunity for economies of scale, potentially increasing the unit cost of production.
- Limited contribution to regional economic growth, employment generation, and foreign exchange earnings via exports.
- **Conclusion:** While environmentally neutral in terms of additional impact, the "No Project" option is rejected because it stifles business growth, fails to leverage existing infrastructure efficiencies, and does not align with the national interest in boosting

manufacturing exports from Punjab. The current project offers a controlled, managed increase in output with robust safeguards, which is preferable to unregulated market expansion elsewhere if PTC were to outsource production.

4.2 ALTERNATIVE 2: ALTERNATIVE LOCATION OPTION

This scenario involves establishing a new greenfield manufacturing facility for the additional capacity at a different location.

Proposed Alternatives Considered:

- Setting up a new plant in another industrial zone within Punjab.
- Outsourcing production to third-party manufacturers.
- Environmental Implications:

Greenfield Development: Establishing a new plant requires land clearance, construction of new buildings, and installation of new utilities, resulting in significant upfront carbon emissions, habitat disruption, and resource consumption (cement, steel, water).

Duplication of Infrastructure: A new plant would require its own wastewater treatment systems, waste disposal contracts, and emergency services, leading to higher aggregate environmental load compared to optimizing an existing site.

Social and Economic Implications:

Higher capital expenditure (CAPEX) due to land acquisition and new construction.

Loss of skilled workforce familiarity with the specific proprietary technology and safety protocols of the existing Jhelum facility.

Advantages of the Selected Option (Existing Site Expansion):

Brownfield Advantage: Utilizing the existing boundary wall, security infrastructure, emergency exit points, and access gates minimizes new land disturbance.

Infrastructure Synergy: The expansion leverages existing utility connections (power, water, drainage) and established vendor relationships for waste management.

Reduced Transport Footprint: Raw materials (Nicotine, Benzoic Acid) are already cleared for import into this specific logistics hub under the Federal EPA NOC. Shifting locations would require re-establishing these logistical chains, increasing transportation-related emissions.

Conclusion: The alternative location is rejected. Expanding within the existing enclosed perimeter at Kala Gujran is the most sustainable choice as it maximizes asset utilization, minimizes new ecological footprints, and adheres to the principle of urban industrial zoning efficiency.

4.3 ALTERNATIVE 3: ALTERNATIVE CAPACITY AND TECHNOLOGY OPTIONS

This scenario explores different methods to achieve the required production volume or technological approaches to the ion-pairing process.

4.3.1.1 Manual vs. Automated Processing

Alternative: Increasing labor intensity manually to boost output without significant machinery upgrades.

Rejected Reason: Manual processing cannot safely handle the increased volumes of sensitive materials like Nicotine and fine powders (BA, SB, CA). It poses higher risks of human error, cross-contamination, and occupational exposure. The proposed IONBOURNE package (pneumatic conveying, automated dosing) ensures precision, reduces dust emission, and enhances worker safety through engineering controls (Local Exhaust Ventilation).

4.3.2 Batch Mixing vs. Continuous Ion-Pairing Dosing

Alternative: Using traditional batch mixing methods for the increased volume.

Rejected Reason: The proposed IONBOURNE system introduces powder feeding stations and pneumatic conveying. This closed-loop technology significantly reduces fugitive dust emissions (Particulate Matter) compared to open batch mixing. Given the sensitivity of

Nicotine and the fine nature of Citric Acid powders, the automated dosing system provides superior containment and environmental control.

4.3.3 Partial Expansion vs. Full Capacity Optimization (2,700 million Units)

Context: As noted by PTC, the initial NOC was based on a conservative estimate of 500 million units, despite machinery having higher potential.

Alternative: Limiting production to the originally approved 500 million units.

Rejected Reason: This would result in idle capacity and inefficiency. The proposed expansion officially recognizes the true technical capacity of the installed base plus the new IONBOURNE addition. By formalizing the 2,700-million-unit capacity in the EIA, PTC ensures that all monitoring standards (air, water, noise) are designed for the *peak* actual load, rather than understating impacts. This transparent approach allows for better regulatory oversight and ensures compliance throughout the entire lifecycle of the high-volume operation.

4.4 ALTERNATIVE 4: ALTERNATIVE WASTE MANAGEMENT APPROACHES

This section evaluates different methods for handling the waste streams generated by the expanded production of 2,700 million pouches.

4.4.1 Incineration vs. Anaerobic Digestion/Vermicomposting

Alternative: Open burning or incineration of organic blend/pouch waste.

Rejected Reason: Incineration would require a suitably permitted facility, air-emission controls and management of combustion residues. The selected waste route is assessed as more consistent with the existing controlled waste-management arrangement, subject to regulatory authorization and treatment-performance verification. PTC’s chosen method neutralization followed by anaerobic biogas digestion may recover biogas and produce treated organic material, subject to the vendor's actual process and documented treatment performance. This route is selected because it provides a controlled and documented

waste-management pathway, subject to the contractor's authorization, treatment capacity and verification of treatment performance.

4.4.2 Landfill Disposal vs. Closed-Loop Recycling

Alternative: Sending segregated packaging waste (cans/lids) to landfills.

Rejected Reason: Landfilling plastics contributes to long-term soil and groundwater pollution. PTC's protocol of **shredding, washing, extruding, and granulating** by authorized recyclers keeps materials in the economic loop and prevents plastic leakage into the environment.

4.4.3 Third-Party Treatment vs. Vendor-Based Bioremediation for Nicotine Waste

Alternative: Treating nicotine-contaminated drums/waste on-site without specialized biological treatment.

Rejected Reason: Nicotine requires controlled handling because of its toxicological properties; treatment and disposal arrangements shall therefore be based on the waste characteristics, approved treatment route and documented contractor controls. On-site simple storage poses spill risks. The selected method uses vendor-site washing, smelting for foundry recycling, and bioremediation for residual organics. This specialized handling is intended to prevent uncontrolled release of nicotine and other contaminants; its effectiveness shall be supported by documented treatment records and, where applicable, analytical verification. The existing the applicable regulatory approvals and documented waste-management arrangements support the established chain of custody, subject to verification.

Table 4-1: Summary Comparison Table

Criteria	Selected Option (Expansion at Existing Site)	**Alternative 1 (No Project)**	**Alternative 2 (New Location)**	**Alternative 3 (Manual/Low-Tech)**

Environmental Impact	Controlled brownfield expansion with incremental impacts managed through existing and enhanced controls.	No incremental project impacts, but existing environmental performance and business objectives remain unchanged.	Greater land disturbance, construction impacts and requirement for new environmental infrastructure.	Potentially greater dust, spill and occupational exposure risk unless equivalent engineering controls are provided.
Waste Management	Established controlled waste-management route with segregation, authorized transfer and documented treatment/recycling.	Existing arrangements retained.	New waste-management infrastructure and contractor arrangements would be required.	Potentially greater waste generation and manual handling requirements.
Occupational Health	Enhanced via LEV, Dust Collectors, and Automation.	**Status quo.**	**Standard, but lacks institutional knowledge transfer.**	**Higher exposure risk due to manual handling of Nicotine/Powders.**
Economic Viability	High (Economies of scale, export growth).	Low (Stagnant growth).	High CAPEX, longer payback period.	Lower efficiency, higher labor costs.

Regulatory Compliance	Aligns with PEPA & FEPA guidelines; updates existing NOC.	Compliant but non-productive.	Requires entirely new NOCs and clearances.	May struggle to meet stricter air quality norms for particulates.

4.5 CONCLUSION ON ALTERNATIVES

After a thorough evaluation, the Expansion of the Existing Facility at G.T. Road, Kala Gujran is identified as the preferred alternative. It offers the best balance of environmental stewardship, technological advancement, and economic benefit.

The integration of the IONBOURNE ion-pairing system ensures that the increase in capacity to 2,700 million pouches per year is achieved with state-of-the-art emission controls. Furthermore, the continuation of the closed-loop waste management system guarantees that hazardous materials, particularly Nicotine, are handled safely and sustainably. Therefore, the selected alternative provides a practicable brownfield expansion route with established environmental controls and avoids the additional land disturbance associated with a new site.

CHAPTER # 5. DESCRIPTION OF THE PROJECT

5.1 BACKGROUND

Pakistan Tobacco Company Limited (PTC) is a leading manufacturer of tobacco and modern oral nicotine products in Pakistan. The company operates an environmentally approved manufacturing facility for Nicotine Pouches (VELO/Modern Oral) located at G.T. Road, Kala Gujran, District Jhelum, Punjab.

Historically, the existing unit was granted an Environmental No Objection Certificate (NOC) based on a conservative production estimate of 500 million pouches per year. However, technical audits revealed that the installed machinery possessed significantly higher theoretical capacity. Driven by intense export pressure and increasing local consumption trends, PTC has identified the need to unlock this latent capacity to remain competitive and compliant with market demands.

The current project represents a strategic expansion to bridge the gap between the permitted capacity (500 million units) and the actual operational potential of the plant. By installing advanced automation technologies, specifically the IONBOURNE ion-pairing dosing system, and optimizing existing infrastructure, PTC aims to scale production to a peak value of 2,700 million pouches per year. This expansion is not merely an addition of volume but a technological upgrade to ensure that higher throughput is achieved with superior environmental controls, particularly regarding dust management and occupational safety.

5.2 OBJECTIVE OF THE PROJECT

The primary objectives of this expansion project are multifaceted, targeting economic growth, operational efficiency, and environmental compliance:

- **Capacity Enhancement:** To increase the annual manufacturing capacity from 500 million to 2,700 million VELO nicotine pouches to meet domestic demand and fulfill export orders.

- **Technological Upgrade:** To install state-of-the-art manufacturing equipment, including a third mixer and the IONBOURNE package (ion-pairing dosing system), which features automated powder feeding, pneumatic conveying, and dedicated dust collection systems.
- **Optimization of Existing Assets:** To utilize the underutilized capacity of existing machines recognized during previous NOC assessments, thereby improving capital efficiency without unnecessary greenfield construction.
- **Infrastructure Development:** To construct essential auxiliary facilities (Change Rooms, Conference Room, Training Centre, etc.) and reconfigure warehouse spaces to support the increased operational load.
- **Occupational Health Improvement:** To enhance worker safety through improved engineering controls (Local Exhaust Ventilation) and dedicated handling systems for sensitive materials like Nicotine and fine powders (Benzoic Acid, Sodium Benzoate, Citric Acid).

5.3 LOCATION AND SITE LAYOUT OF THE PROJECT

5.3.1 Geographical Location

Site Name: Pakistan Tobacco Company Limited (PTC) Factory.

Address: G.T. Road, Kala Gujran, District Jhelum, Punjab, Pakistan.

Coordinates: 32.97810299902366, 73.68586301272926

Surroundings: The site is enclosed by a boundary wall ensuring security and containment. It is strategically located on the Grand Trunk (G.T.) Road, facilitating heavy transport logistics for raw material intake and finished goods dispatch.

5.3.2 Site Layout and Infrastructure

The factory site is designed for secure and efficient manufacturing operations. Key structural elements include:

Boundary & Security: A continuous boundary wall surrounds the entire premise, monitored by round-the-clock security personnel.



Figure 5-1: Demarcation of Proposed Extension

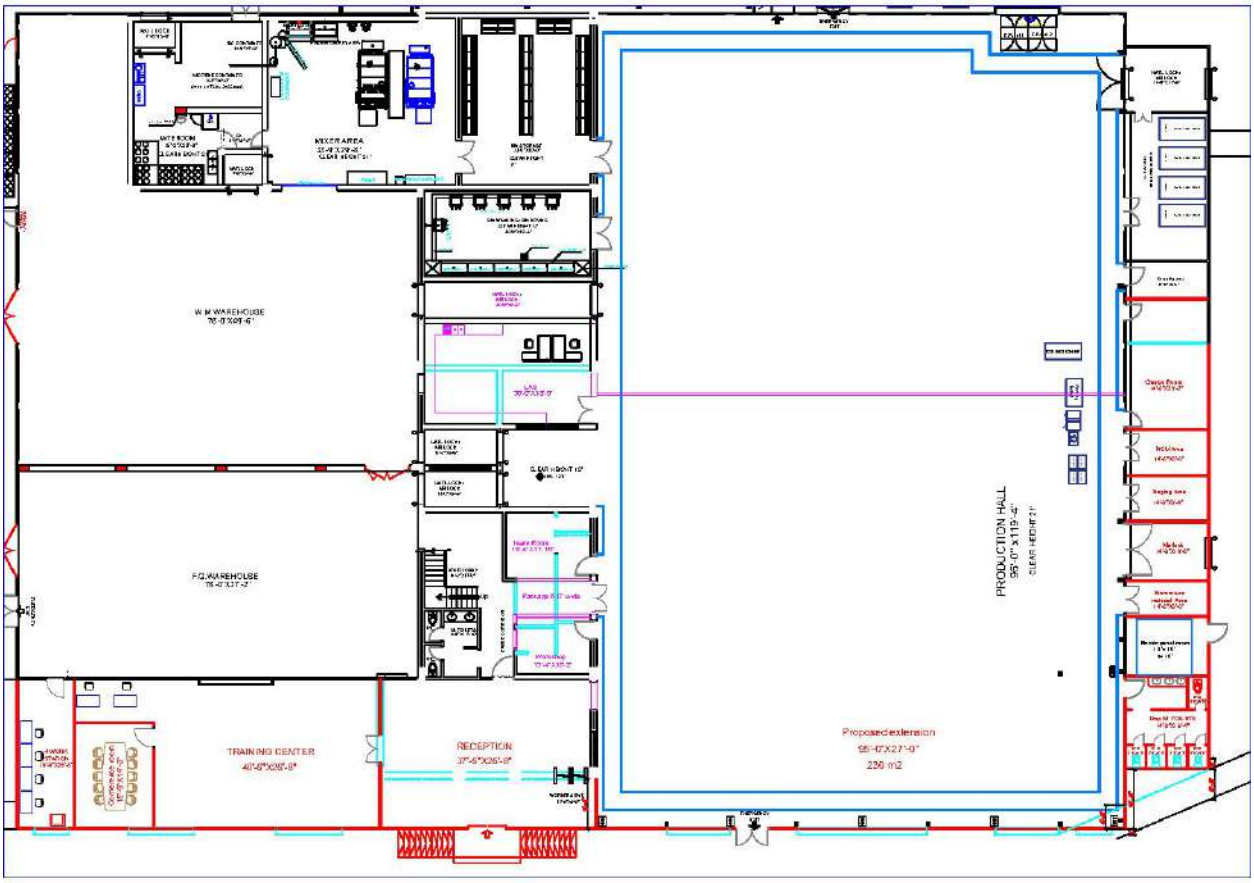


Figure 5-2: Proposed Layout

5.3.3 Access Points:

Main Gate: Sized specifically for heavy transport vehicles, loading docks, and unloading operations.

Emergency Exits: Designated evacuation points strategically placed to ensure rapid employee egress in case of emergencies.

5.3.4 Existing Buildings Reconfigured for Expansion:

W.M. Warehouse (Current): Dimensions 78'-0" x 49'-6". This space will be repurposed to house the new Ion Pairing Machine and associated IONBOURNE equipment.

F.G. Warehouse (Future W.M. Storage): Dimensions 78'-0" x 37'-2". This structure will convert from Finished Goods storage to Raw Material (W.M.) storage, requiring the

installation of Air Handling Units (AHUs) and Chillers to maintain optimal humidity and temperature conditions for sensitive raw materials.

5.3.5 New Construction Extension:

Dimensions: 95 feet (Length) x 27 feet (Width).

Purpose: To create essential administrative, hygiene, and storage facilities.

Components: Change Rooms, NCM Area, Staging Area, Matlock, Store Return Material Area, Conference Room, Training Centre, Reception, and Toilets.

5.4 LAND USE ON THE SITE

The primary objectives of this expansion project are multifaceted, targeting economic growth, operational efficiency, and environmental compliance:

Capacity Enhancement: To increase the annual manufacturing capacity from 500 million to 2,700 million VELO nicotine pouches to meet domestic demand and fulfill export orders.

Technological Upgrade: To install state-of-the-art manufacturing equipment, including a third mixer and the IONBOURNE package (ion-pairing dosing system), which features automated powder feeding, pneumatic conveying, and dedicated dust collection systems.

Optimization of Existing Assets: To utilize the underutilized capacity of existing machines recognized during previous NOC assessments, thereby improving capital efficiency without unnecessary greenfield construction.

Infrastructure Development: To construct essential auxiliary facilities (Change Rooms, Conference Room, Training Centre, etc.) and reconfigure warehouse spaces to support the increased operational load.

Environmental Compliance: To maintain strict adherence to Punjab Environmental Quality Standards (PEQS) and Federal EPA regulations by extending existing closed-loop waste management and monitoring protocols to the new, higher production volumes.

Occupational Health Improvement: To enhance worker safety through improved engineering controls (Local Exhaust Ventilation) and dedicated handling systems for sensitive materials like Nicotine and fine powders (Benzoic Acid, Sodium Benzoate, Citric Acid).





Figure 5-3Current Land Use

5.5 ROAD ACCESS

5.5.1 Internal Road Network

The factory possesses an internal road network designed to handle high-volume traffic associated with a 2,700 million unit/year operation.

Heavy Vehicle Lanes: Dedicated asphalt/concrete roads connect the main gate to the raw material warehouses (W.M.), production floors, and finished goods dispatch areas. These lanes are engineered to withstand the load of heavy trucks carrying Nicotine drums, bulk powder containers, and outbound pallets.

Pedestrian Walkways: Segregated walkways ensure safe movement of employees between the new change rooms, training centers, and production zones, minimizing interaction with heavy machinery and transport vehicles.

Fire Tunnels/Emergency Roads: Clear access routes are maintained around all buildings, including the new extension, to allow emergency fire tenders immediate access to any point

5.5.2 External Connectivity

Connection to G.T. Road: The main access gate opens directly onto the Grand Trunk Road, one of Pakistan's major highways. This provides excellent connectivity to:

Jhelum City: For local labor force recruitment.

Port Cities (Karachi/Kasport): For export shipments and import of raw materials (Nicotine, Packaging).

Traffic Flow Management: Given the increased production volume, PTC will implement a scheduled logistics plan to stagger truck arrivals and departures, preventing congestion on G.T. Road near the factory entrance.

5.5.3 Loading and Unloading Facilities

Docking Stations: The existing main gate area includes designated docking bays equipped with hydraulic levelers to facilitate safe and efficient loading/unloading of raw materials and finished goods.

Staging Area: The newly constructed "Staging Area" (part of the 95' x 27' extension) will serve as a buffer zone for temporary storage of incoming raw materials before they enter the processing line, reducing clutter at the main dock.

5.5.4 Emergency Evacuation Routes

Primary Exit: Main Gate for regular and emergency vehicle movement.

Secondary Exits: Dedicated emergency exit points along the boundary wall, clearly marked with illuminated signage, leading to open assembly points outside the factory perimeter. These routes are kept free of obstructions at all times.

5.6 RAW MATERIAL, PROCUREMENT AND SUPPLY CHAIN

5.6.1 Key Raw Materials

The production process utilizes the following critical inputs, whose procurement volumes will increase proportionally with the capacity jump to 2,700 million units:

Nicotine: The most sensitive and regulated input. Imported under Federal EPA NOC (Approved import limit: 20,000 kg/year (20 ton/year)). Stored in specialized, secured containers.

Benzoic Acid (BA): Used as a preservative/flavor enhancer. Handled in powder form.

Sodium Benzoate (SB): Used as a preservative. Handled in powder form.

Citric Acid (CA): Used for pH adjustment. Handled in powder form.

Plant Fiber/Base Material: The carrier matrix for the pouches.

Packaging Materials: Plastic cans, lids, and outer cartons.

5.6.2 Supply Chain Logistics

Import Channel: All imports clear through designated ports under Federal EPA supervision. Documentation includes Manifests, SDS (Material Safety Data Sheets), and Import Permits.

Local Sourcing: Non-hazardous base materials and packaging are sourced from certified vendors within Punjab to reduce transportation carbon footprint.

5.7 RAW MATERIAL CONSUMPTION AND INVENTORY

To accurately assess the environmental impact of the expansion from 500 million to 2,700 million pouches per year, the estimated raw material consumption quantities are detailed below. These projections are based on the typical mass composition of VELO nicotine pouches and the operational peak capacity of 2,700 million units.

Table 5-1:Estimated Raw Material Consumption (Annual)

S. No.	Raw Material Category	Chemical / Material Name	Estimated / Authorized Quantity (Tons/Year)	Hazard Classification	Handling Requirement
1	Active Ingredient	Nicotine	20.00*	Highly toxic / regulated substance	Secured storage, LEV/containment, spill control, PPE, applicable Federal EPA authorization
2	Acids & Salts	Purox* B (Benzoic Acid)	675.00	Irritant / dust hazard; verify from current SDS	Enclosed handling, dust control, LEV, PPE
3		Purox* S (Sodium Benzoate)	405.00	Dust/irritant hazard; verify from current SDS	Dust control, enclosed conveying, PPE
4		Citric Acid	270.00	Dust/irritant hazard; verify from current SDS	Dust control, LEV, PPE
5		Ammonium Chloride	135.00	Irritant; verify from current SDS	Dust control, ventilation, PPE
6	Sweeteners	ACESULFAME K (Sunett A)	135.00	Low hazard / verify SDS	Standard chemical handling and PPE
7		Sucralose	81.00	Low hazard / verify SDS	Standard chemical handling and PPE
8		Xylitol	270.00	Low hazard / verify SDS	Standard chemical handling and PPE
9	Binders / Fillers	Endurance VE-090 (MCC)	1,350.00	Combustible dust hazard	Dust collection, LEV, housekeeping, ignition/static control
10		White Tobacco	405.00	Dust/organic material; verify SDS	Ventilation, enclosed handling, PPE
11		Sodium Alginate	108.00	Low hazard / dust	Standard PPE, dust control
12	Flavor Blends	SF-CARREM to SF-TUNBEO (17 blends)	765.00 (Combined)	Low hazard / irritant; verify SDS	Enclosed conveying, LEV, PPE
13	Buffers	Sodium Bicarbonate	108.00	Low hazard / dust	Standard PPE, dust control

14		Sodium Chloride	108.00	Low hazard / dust	Standard PPE, dust control
15	Packaging	Plastic Cans/Lids (HDPE/PET)	1,500.00	Low hazard / combustible packaging	Segregation, good housekeeping, authorized recycling route

** The 20 tonnes/year figure represents the applicable nicotine import authorization limit. It is not automatically equivalent to actual annual consumption. Actual annual consumption shall be reconciled with PTC import records, inventory and production records.*

Note: *The applicable Federal EPA import authorization permits up to 20,000 kg (20 tonnes) of nicotine per year. This is an import authorization limit and should not automatically be treated as actual annual consumption. Actual consumption shall be maintained through PTC production, inventory and import records. At the proposed maximum production of 2.7 billion pouches/year, the full 20,000 kg authorization would mathematically correspond to approximately 7.41 mg nicotine per pouch if the entire quantity were incorporated into finished product; this is a mathematical upper-limit check, not a statement of formulation.*

5.7.1 Justification of Estimates

For environmental mass-balance purposes, the finished-pouch mass should be based on the verified PTC formulation and production records. For reference, at 0.5–0.8 g per pouch, 2,700 million pouches/year correspond to approximately 1,350–2,160 tonnes/year of finished pouch content. The final EIA should use the verified average pouch mass and actual formulation records rather than a generic formulation assumption.

5.8 INCREMENTAL ENVIRONMENTAL LOAD AND CAPACITY BASIS

The principal environmental significance of the project arises from the increase from the existing approved 500 million pouches/year to 2,700 million pouches/year. The following comparison is included to ensure that the assessment distinguishes the existing baseline from the incremental project load. Where quantitative utility or waste data are not yet supported by verified PTC records, the item is identified for confirmation before final regulatory submission.

Parameter	Existing Approved / Baseline	Incremental Project Load	Total / Final Basis
Production	500 million pouches/year	+2,200 million pouches/year	2,700 million pouches/year

Capacity change	—	+440% over existing approved capacity	5.4 times existing approved capacity
Nicotine authorization	20,000 kg/year import authorization	Additional actual use to be confirmed from formulation/records	20,000 kg/year remains authorization ceiling
Finished pouch content	Verify from PTC formulation/records	Additional mass associated with +2.2 billion pouches	Use verified pouch mass/formulation
Process / powder waste	Existing facility records	Incremental quantity to be managed within vendor capacity	Verify against actual records and vendor capacity
Water / wastewater	Existing consumption and treatment capacity to be confirmed	Incremental demand/load to be confirmed	Engineering/water balance required
Electricity / utilities	Existing connected and peak load to be confirmed	Incremental load from mixer, IONBOURNE, AHUs/chillers etc.	Final load study required
Traffic	Existing logistics movements to be confirmed	Incremental deliveries/dispatch to be confirmed	Final logistics plan required
Air / dust	Existing monitoring performance	Incremental powder-handling emissions managed by new controls	Verify through monitoring after commissioning

Noise	Existing monitoring results	Additional equipment noise	Verify by representative workplace/boundary monitoring

5.9 WASTE GENERATION AND MANAGEMENT STRATEGY

A critical component of this EIA is the quantification of waste streams resulting from the 440% increase in production capacity, and the demonstration that the existing waste management infrastructure can accommodate the additional volume.

5.9.1 Comprehensive Waste Disposal via A.T Waste Management

Pakistan Tobacco Company Limited (PTC) has consolidated its waste management operations by channeling all waste streams, including hazardous and non-hazardous categories, to the A.T Waste Management facility. This ensures a single, highly regulated, and auditable chain of custody for all byproducts generated at the Jhelum factory.

A.T Waste Management utilizes an integrated Bio-Conversion model. Rather than conventional incineration or landfilling, the facility processes organic and nicotine-contaminated waste through Anaerobic Biogas Digestion followed by Vermicomposting. This method not only is intended to provide controlled treatment of nicotine-containing waste; treatment performance shall be demonstrated through vendor records and applicable analytical verification but also generates renewable energy (biogas) and organic fertilizer (vermicompost), aligning with circular economy principles.

5.9.2 Estimated Waste Generation (Annual)

Based on industry standard rejection rates (typically 2-5% for pouch/packaging defects and 1-2% for raw material residue), the following waste volumes are projected at peak capacity (2,700 million pouches/year):

Table 5-2: Estimated Waste Generation (Annual)

S. No.	Waste Category	Waste Stream Source	Recorded / Estimated Generation	Disposal / Management Route
1	Nicotine-containing process waste	VELO Blend Waste (powder)	19,816 kg recorded Dec 2025–Jul 2026; ≈29.724 t/year on simple annualization	Segregated, securely stored and transferred through the authorized A.T. Waste Management route; treatment method and acceptance criteria documented
2	Nicotine-containing process waste	Nicotine Pouches Waste	42,637 kg recorded Dec 2025–Jul 2026; ≈63.956 t/year on simple annualization	Segregated, securely stored and transferred through authorized waste-management route
3	Nicotine-containing container waste	Used Nicotine Glass Bottles	40.3 kg recorded Dec 2025–Jul 2026; ≈0.060 t/year on simple annualization	Segregated and managed through authorized contractor; decontamination/recycling/disposal documented
4	Nicotine-containing container waste	Empty Nicotine Containers/Drums	267 units recorded Dec 2025–Jul 2026	Controlled storage and transfer to authorized contractor; decontamination/recycling/disposal documented
5	Nicotine-containing bulk container waste	IBC Containers with leftover nicotine	1,820 recorded in July 2026; source unit shown as “Liters (KG)”	Do not convert to tonnes without confirmed density/measurement basis; secure storage and authorized contractor management
6	Packaging Waste	Off-spec plastic cans, lids and film	75.00 t/year (existing EIA estimate; verify against records)	Segregated and transferred for authorized recycling
7	Metal / Drum Waste	Nicotine drums and chemical containers	40.00 t/year (existing EIA estimate; verify against records)	Decontamination and authorized recycling/disposal
8	General / Municipal Waste	Canteen, office and general packaging waste	50.00 t/year (existing EIA estimate; verify against records)	Segregation, recycling and authorized disposal

5.9.3 Processing of Hazardous Waste at A.T Waste Management

The disposal of nicotine-contaminated waste is the most sensitive element of the waste stream. The process at A.T Waste Management is as follows:

1. **Segregation and Gate Pass:** Nicotine-contaminated waste (PPE, absorbents, spill kits, residues) is double-bagged in hazard-labeled containers at the PTC generation point. It leaves the Jhelum facility on a strict gate-pass system with full reconciliation records.
2. **Transfer:** Transported via authorized hazardous waste carriers to the A.T Waste Management facility.
3. **Neutralization and pH Adjustment:** Upon receipt, alkaline organic/nicotine waste (pH 9.0-9.5) is neutralized using carbonic and phosphoric acid to a pH of 6.5-7.5. This chemical step begins the degradation of nicotine and prepares the organic matrix for biological breakdown.
4. **Anaerobic Biogas Digestion:** The neutralized slurry is fed into anaerobic digesters. Microbial action breaks down the organic matter, including the nicotine and flavor compounds (SF-blends). The biogas (primarily methane and carbon dioxide) captured is utilized by A.T Waste Management for on-site energy generation (e.g., UPVC pipe production).
5. **Vermicomposting: The remaining digestate is dewatered. The dried sludge is transferred to windrow vermicomposting beds where earthworms and beneficial microbes further degrade any residual complex organics, converting it into treated organic material; any claim regarding residual nicotine shall be supported by documented analytical results. The separated water is reused internally or as pesticide spray.**
6. **5.19.4 Audit and Compliance Verification**

To ensure the expanded volumes are managed without environmental compromise, PTC will enforce the following:

- **Quarterly Audits:** PTC Environmental Managers will conduct physical audits of the A.T Waste Management facility to verify that biogas digesters and vermicomposting beds are operating within capacity and that no untreated waste is stockpiled.
- **Vendor Destruction Certificates:** For every consignment dispatched, A.T Waste Management must provide a formal Destruction and Disposal Certificate confirming the waste was processed via the biogas/vermicomposting route.
- Residual Nicotine Testing: Periodic lab testing of the final vermicompost output will be conducted to verify that nicotine residues are below detectable limits (per applicable documented regulatory or vendor acceptance criteria), confirming the complete efficacy of the bio-remediation process.

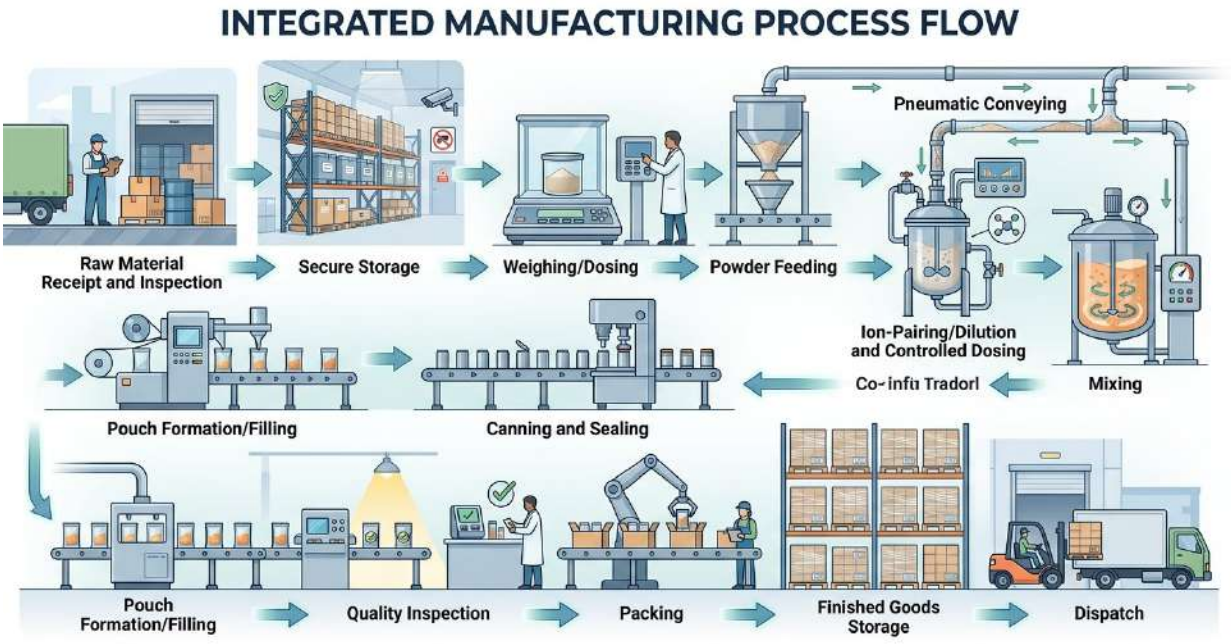
5.10 MANUFACTURING PROCESS DESCRIPTION

5.10.1 Process Overview

The manufacturing of Modern Oral Nicotine Pouches involves mixing nicotine salts with fibers and flavorings, followed by portioning into pouches and packaging. The expanded process introduces higher precision and automation.

5.10.2 Detailed Process Steps

Process Flow and Environmental Aspects: Raw Material Receipt and Inspection → Secure Storage → Weighing/Dosing → Powder Feeding → Pneumatic Conveying → Ion-Pairing/Dilution and Controlled Dosing → Mixing → Pouch Formation/Filling → Canning and Sealing → Quality Inspection → Packing → Finished Goods Storage → Dispatch. Environmental control points include enclosed powder transfer and dust collection, controlled nicotine handling, segregation of off-specification and contaminated waste, controlled wastewater/cleaning-water generation, and documented waste transfer to authorized vendors.



Raw Material Receipt & Inspection:

Nicotine drums and powder bags (BA, SB, CA) are received at the W.M. Warehouse.

Quality Control checks verify weight, integrity, and purity.

Dusting and Conveying (IONBOURNE System):

Powder Feeding: BA, SB, and CA powders are fed into the IONBOURNE system via automated powder feeding stations.

Pneumatic Conveying: Powders are transported through sealed pipes to the mixing bins, minimizing dust release.

Dust Collection: Dedicated bag filters capture any fugitive emissions at transfer points.

Ion-Pairing and Mixing:

Ion-Pairing Dosing: The IONBOURNE dosing system precisely adds Nicotine solution/powder to the base matrix. This step is critical for controlling nicotine release rates.

Mixing: The third mixer blends the ingredients uniformly. The system ensures homogeneous distribution of Nicotine and acids.

Pouch Forming and Filling:

The blended mix is fed into pouch-forming machines.

Automated sensors ensure consistent fill weight per pouch.

Canning and Sealing:

Pouches are deposited into plastic cans.

Lids are applied and sealed using induction or mechanical methods.

Quality Assurance:

Online checks for can weight, seal integrity, and visual defects.

Laboratory sampling for nicotine content and pH levels.

Packaging and Dispatch:

Cans are packed into outer cartons.

Palletized and stored in the F.G. Warehouse (now repurposed for efficient flow) before dispatch.

5.11 MACHINERY AND EQUIPMENT LIST

S. No.	Equipment Name	Function	Current Status / New Addition
	Third Mixer	Homogenizing nicotine-powder blend	New Addition
	IONBOURNE Package	Ion-pairing dosing system	New Addition
	Powder Feeding Stations	Automated intake of BA, SB, CA	Part of IONBOURNE
	Pneumatic Conveying System	Transporting powders via air pressure	Part of IONBOURNE
	Dust Collection System	Capturing particulate matter at source	Part of IONBOURNE
	Existing Pouch Machines	Forming and filling pouches	Existing (Optimized)
	Existing Pouch Machines	Forming and filling pouches	Existing (Optimized)
	AHUs & Chillers	Climate control for W.M. Warehouse	New Installation (in F.G. Warehouse)
	Shredder/Extruder	Plastic recycling for cans/lids	Existing (Vendor Link)

5.12 UTILITIES AND INFRASTRUCTURE SUPPORT

5.12.1 Power Supply

Source: Grid supply from KE/PEPCO + Backup DG Sets.

Load Increase: The additional mixers, conveyors, AHUs, and chillers will increase electrical load. A load calculation study confirms that existing transformers/substations can handle the peak load, or minor upgrades have been planned.

5.12.2 Water Supply

Source: Groundwater via deep tube wells (licensed).

Usage: Primarily for cleaning, humidification in AHUs, and utility cooling. Potable water for staff.

Conservation: Water reuse systems for cooling towers (if applicable) and rainwater harvesting considerations for the new roof area.

5.12.3 HVAC and Ventilation

New Installations: High-efficiency Air Handling Units (AHUs) and Chillers in the converted F.G. Warehouse to control humidity and temperature, crucial for powder stability and worker comfort.

Process Ventilation: Local Exhaust Ventilation (LEV) hoods installed at all manual intervention points in the IONBOURNE system to capture airborne particulates immediately.

5.13 Utility and Water Balance – Client Verification

For final regulatory submission, PTC shall provide/confirm the existing and post-expansion utility balance, including connected and peak electrical load, transformer/substation capacity, backup generation, compressed-air capacity, AHU/chiller capacity, groundwater abstraction rate and tube-well/pump details, daily domestic/process/cleaning/HVAC water demand, wastewater generation, existing treatment/handover capacity, and the incremental load attributable to the 2,700 million pouch/year production rate. The final EIA shall be updated from these verified records before submission to EPA Punjab.

5.14 HUMAN RESOURCES AND TRAINING

Staffing: The expansion may require additional operators for the new machinery, though automation reduces manual labor intensity.

Training Centre: The newly constructed Training Centre will be used to:

- Train staff on safe handling of Nicotine and hazardous powders.
- Conduct drills for spill response and emergency evacuation.
- Educate workers on the operation of the IONBOURNE system and dust collection maintenance.

5.15 CHEMICAL INVENTORY AND RAW MATERIALS

5.15.1 Complete Chemical List

The following chemicals are utilized in the manufacturing process of VELO nicotine pouches at the expanded facility:

Acids and Acid Salts:

a. Purox B Food/Pharma-Ultra pure grade benzoic acid (preservative)
b. Purox S grains - Pure grade sodium benzoate (preservative)
c. Citric acid - pH adjuster and preservative
d. Ammonium chloride - pH buffering agent

Sweeteners:

a) ACESULFAME K (SUNETT A FOOD) - Artificial sweetener
b) Sucralose - Artificial sweetener
c) Xylitol - Natural sweetener

Nicotine Base:

a) Nicotine - Active ingredient / regulated substance

Plant Fiber/Binding Agents:

a) Endurance VE-090 - Microcrystalline cellulose (carrier matrix)
b) SF-CARREM - Specialized fiber blend
c) SF-CORCOD - Specialized fiber blend
d) SF-DARIBI - Specialized fiber blend
e) SF-DOORNO - Specialized fiber blend
f) SF-DRYJAN - Specialized fiber blend
g) SF-GAMATO - Specialized fiber blend
h) SF-LINMID - Specialized fiber blend
i) SF-LOIBUR - Specialized fiber blend

j) SF-LOLLYN - Specialized fiber blend
k) SF-PELIRI - Specialized fiber blend
l) SF-POTTER - Specialized fiber blend
m) SF-REVLED - Specialized fiber blend
n) SF-SHARON - Specialized fiber blend
o) SF-TANHIR - Specialized fiber blend
p) SF-TOVIEV - Specialized fiber blend
q) SF-ZOLBIN - Specialized fiber blend
r) SF-TUNBEO - Specialized fiber blend

Additional Compounds:

a) Sodium Alginate - Thickening/gelling agent
b) Sodium Bicarbonate - Buffering agent
c) Sodium Chloride - Flavor enhancer
d) WhiteTobbaco - Proprietary tobacco extract/fiber blend

5.15.2 Hazard Classification and Risk Assessment

High Concern Chemicals:

a) Nicotine - Highly toxic, regulated substance

Classification and hazard statements shall be taken directly from the current supplier SDS and applicable GHS classification

Handling Requirements: Specialized storage, transport documentation, spill response procedures

b) Benzoic Acid (Purox B) * - hazard classification to be confirmed from current supplier SDS

Classification: as specified in current supplier SDS

Handling Requirements: Dust control, personal protective equipment

c) **Citric Acid - powder exposure hazard classification to be confirmed from current supplier SDS**

Classification: as specified in current supplier SDS

Handling Requirements: Dust extraction systems, LEV at transfer points

Moderate Concern Chemicals:

- Sodium Benzoate (Purox S) * - Generally low toxicity but can cause skin/eye irritation
- Ammonium Chloride - Respiratory irritant in high concentrations
- ACESULFAME K - Generally recognized as safe but requires proper handling

Low Concern Chemicals:

- Sucralose, Xylitol - Food-grade sweeteners with minimal environmental impact
- Microcrystalline Cellulose - Biodegradable plant fiber
- Sodium Alginate, Sodium Bicarbonate, Sodium Chloride - Generally safe compounds

5.15.3 Storage and Handling Protocols

Special Storage Requirements:

a) **Nicotine Storage Area:**

- Secure, locked storage room within the W.M. Warehouse
- Spill containment trays and secondary barriers
- Temperature-controlled environment
- Emergency shower/eyewash stations nearby

b) **Powder Storage Areas:**

- Elevated platforms to prevent flood damage
- Proper ventilation to prevent dust accumulation
- First-in-first-out (FIFO) rotation system
- Humidity control systems (especially important for new AHU installation)

c) Material Safety Data Sheets (SDS):

- Comprehensive SDS documents for each chemical are maintained on-site
- All SDS will be attached as Annexures to this EIA report
- SDS information has been incorporated into the Occupational Health and Safety protocols
- Emergency response procedures are based on SDS recommendations

5.15.4 Environmental Fate and Transport

a) Air Emissions Potential:

Particulate Matter: Fine powders (citric acid, benzoic acid, sodium benzoate) pose inhalation risks and fugitive dust emissions

Mitigation: IONBOURNE pneumatic conveying system with dedicated dust collection prevents atmospheric release

Water Contamination Risk:

Process Wastewater: May contain trace amounts of sweeteners and nicotine

Spill Risk: Improper storage or handling could lead to groundwater contamination

Mitigation: Secondary containment, spill response kits, and existing anaerobic digestion treatment system

Soil Contamination Risk:

Direct Spills: Improper disposal or accidental releases could contaminate soil

Leakage: Damaged containers or piping systems

Mitigation: Impermeable flooring in storage areas, regular inspection protocols

5.16 INTEGRATION WITH WASTE MANAGEMENT SYSTEM

The expanded chemical inventory will be fully integrated with the existing closed-loop waste management system:

5.16.1 Organic Waste Stream:

- Blend and pouch waste containing: Citric acid, benzoic acid, sodium benzoate, sweeteners, plant fibers
- Treatment: pH neutralization (9.0-9.5 to 6.5-7.5) → Anaerobic biogas digestion → Vermicomposting
- **Benefit:** Conversion to renewable energy and fertilizer

5.16.2 Packaging Waste:

- **Containers for:** Nicotine drums, powder bags, sweetener containers
- **Treatment:** Decontamination → Shredding → Extrusion → Granulation by authorized recyclers

5.16.3 Hazardous Waste:

Nicotine-contaminated materials: Spill residues, contaminated PPE, drum washings

Treatment: Vendor-site washing → Smelting → Bioremediation

Documentation: Gate passes, reconciliation records, vendor certificates

This comprehensive chemical inventory ensures that all potential environmental impacts are identified and appropriate mitigation measures are implemented as part of the Environmental Management and Monitoring Plan (EMMP).

5.17 VEGETATION FEATURES OF THE SITE

The proposed project site is an already designated and prepared open area within the premises of the PTC Jhelum Factory. The site currently does not contain any significant natural vegetation, tree cover, or ecologically sensitive flora. In order to improve the aesthetic value of the site and to contribute positively to the local microclimate, a landscaping and plantation plan has been proposed as part of the project design.

5.17.1 Existing Vegetation Inventory

The Pakistan Tobacco Company Limited (PTC) facility in Kala Gujran, District Jhelum, is situated within an urban-industrial corridor along the G.T. Road. The site's vegetation profile reflects a mix of natural riparian remnants typical of the Indus basin fringe and managed institutional landscaping.

A. **Native Tree Species:** The existing boundary perimeter and internal open spaces are dominated by native deciduous trees that provide significant shade and ecological services.
B. Ornamental and Landscaped Vegetation:

Green Lawn Areas: As noted in Section 5.4, significant portions of the available land are currently maintained as green lawn. These areas consist primarily of Zoysia matrella or Cynodon dactylon (Bermuda grass), which provides low-maintenance ground cover, reduces dust generation from exposed soil, and lowers ambient noise levels through absorption.

Flowering Shrubs: Seasonal flowering plants such as Bougainvillea and Hibiscus are planted along internal pedestrian walkways to enhance the visual appeal and mental well-being of employees.

Hedges: Manicured hedges of Pyrethrum or similar hardy shrubs line the main access gate and emergency exit paths, serving as visual guides and minor windbreaks.



Figure 5-4: Existing Plantation Area

5.17.2 Ecological Functions of Current Vegetation

The existing vegetation plays a critical role in mitigating the environmental footprint of the industrial operations:

1. **Air Quality Buffering:** The dense tree line along the boundary wall acts as a physical barrier against fugitive dust emissions from the external G.T. Road traffic and internal manufacturing processes. The leaf surfaces trap particulate matter, improving local air quality.
2. **Microclimate Regulation:** The shade provided by mature Peepal and Shisham trees reduces the island heat effect inside the factory complex, lowering the cooling load required for office and change room areas.

3. **Stormwater Management:** The root systems of the established trees and the porous nature of the lawn areas facilitate groundwater recharge. This is particularly important in District Jhelum, where water table management is a regional concern. The vegetation helps filter runoff before it enters the municipal drainage system.
4. **Wildlife Habitat:** While limited, the site provides habitat for small mammals, birds (such as sparrows and doves), and insects, maintaining a minimal level of biodiversity within the urbanized area.

5.17.3 Impact of Proposed Construction on Vegetation

The proposed expansion involves the construction of a 95' x 27' extension over a section currently designated as **green lawn**.

A. Area Affected:

- Approximately 2,565 square feet of turf will be removed for foundation work.
- No large or medium-sized trees are located directly within this specific plot, ensuring that no mature canopy cover is lost due to the new construction.
- Minor shrubbery bordering the proposed building footprint may require relocation or removal during site preparation.

B. Mitigation and Compensation Measures: To ensure that the net environmental benefit of the site remains positive despite the conversion of lawn to built-up area, PTC proposes the following measures:

1. **On-Site Greening Intensification:**
    - New ornamental trees (fast-growing varieties suitable for Punjab climate, such as Neem or Jacaranda) will be planted in the newly created pathways and around the periphery of the new extension.
    - Additional lawn areas will be developed in adjacent unused corners of the W.M. Warehouse yard to compensate for the loss of the original lawn area.

2. **Boundary Wall Enhancement:**
    - Vines and climbing plants will be encouraged on the exterior faces of the boundary wall to increase the green surface area without consuming floor space.
3. **Dust Suppression Planting:**
    - A strip of hardy grasses will be maintained between the new building and the nearest internal road to capture any residual dust from construction activities and future vehicle movement.

5.17.4 Sustainability Commitments

PTC commits to maintaining a minimum **15% green cover ratio** within the total site area post-expansion. This target aligns with best practices for industrial facilities in semi-urban zones. Regular horticultural maintenance schedules, including pruning, watering, and pest control using eco-friendly methods, will be part of the Environmental Management Plan (EMP) to ensure the health and longevity of both existing and new plantations.

5.18 COST OF THE PROJECT

The estimated cost of the proposed VELO/Modern Oral facility expansion is PKR 675 million. This cost covers procurement, installation, commissioning and associated requirements of the proposed process and facility enhancement.

5.19 SITE SUITABILITY

The proposed site is an existing, enclosed industrial facility in Kala Gujran, District Jhelum, already used for Modern Oral / VELO manufacturing. The project does not require new land acquisition or conversion of agricultural land. On the information presently available, the brownfield location is considered suitable for the proposed expansion because it uses established industrial infrastructure and minimizes additional land disturbance. Final site-suitability confirmation shall be supported by the verified land-use/zoning documentation,

receptor survey, drainage/water-source information and applicable environmental approvals.

5.20 RESTORATION AND REHABILITATION PLAN

Construction areas shall be cleared of temporary materials, packaging, surplus soil and debris after completion. Reusable materials shall be returned to the project inventory and recyclable wastes transferred through authorized routes. Exposed areas not required for permanent structures shall be stabilized and restored. The affected lawn/green area shall be compensated through reinstatement or enhancement of on-site landscaping in accordance with the approved site landscaping plan. At future equipment end-of-life, equipment and associated systems shall be safely isolated, decontaminated where required, dismantled and transferred for reuse, recycling or authorized disposal. Any contaminated soil or residual material identified during decommissioning shall be assessed and managed before site clearance.

5.21 IMPLEMENTATION SCHEDULE

The project will be implemented through sequential civil works, equipment installation, utility integration, testing/commissioning and operational ramp-up. The current EIA assumes approximately six months for construction/civil works and approximately two to three months for equipment installation and commissioning; the final schedule shall be confirmed by PTC from the approved project execution plan before regulatory submission.

5.22 LAND ACQUISITION

5.22.1 Ownership Status

The proposed expansion project does not involve any new land acquisition. The entire development, including the new 95' x 27' extension and the reconfiguration of existing warehouses, will be executed within the existing legal boundary of the Pakistan Tobacco Company Limited (PTC) factory at G.T. Road, Kala Gujran. The land is already owned by PTC and holds valid title documents and industrial zoning permits.

5.22.2 Resettlement and Social Impact

Since no new land is being acquired:

No Displacement: There is zero displacement of local communities, households, or agricultural lands.

No Livelihood Loss: No farmers, tenants, or informal workers lose access to resources or income sources due to this project.

No Cultural Heritage Impact: The construction footprint lies entirely within the established industrial zone, avoiding any archaeological sites, graveyards, or culturally sensitive areas.

This "brownfield" expansion approach eliminates the social risks typically associated with greenfield projects and significantly reduces the overall environmental footprint by utilizing existing infrastructure.

5.23 PROJECT AREA

5.23.1 Core Manufacturing Zone

The primary operational area encompasses the existing production hall and the repurposed W.M. Warehouse (78'-0" x 49'-6"), which will house the new IONBOURNE ion-pairing dosing system and third mixer. This zone is equipped with Local Exhaust Ventilation (LEV), pneumatic conveying systems, and dedicated dust collectors to manage particulate emissions from Benzoic Acid, Sodium Benzoate, Citric Acid, and Nicotine handling.

5.23.2 New Civil Extension Zone

A distinct 95' x 27' (approx. 2,565 sq. ft.) footprint previously occupied by green lawn has been designated for auxiliary infrastructure. This zone includes:

- Change Rooms and Hygiene Facilities
- NCM (Non-Conforming Material) Area
- Staging Area for raw material buffering
- Matlock and Store Return Material Area

- Conference Room and Training Centre
- Reception and Toilets

5.23.3 Repurposed Finished Goods Warehouse

The existing F.G. Warehouse (78'-0" x 37'-2") is transitioning to serve as a climate-controlled Raw Material (W.M.) storage facility. This area requires the installation of Air Handling Units (AHUs) and Chillers to maintain strict temperature and humidity parameters essential for preserving the stability of Nicotine, sweeteners, and specialized fiber blends (SF-series materials).

5.23.4 Buffer and Green Zones

Despite the construction on the former lawn, the site maintains perimeter green belts, internal landscaped corridors, and vegetated buffers along the boundary wall to support air quality mitigation and stormwater infiltration as detailed in Section 5.13.

5.24 GREEN ENERGY SOLUTIONS

5.24.1 Solar Photovoltaic (PV) System

PTC has installed a 3 MW solar photovoltaic (PV) power system at the Jhelum Factory. The system contributes renewable electricity to the site's energy requirements, reduces dependence on conventional grid electricity and supports the facility's energy-efficiency and greenhouse-gas-reduction objectives.

The 3 MW solar installation is an existing environmental enhancement measure at the PTC site. Its electricity generation, operation and maintenance shall be included in the facility's energy records and environmental performance reporting. Any associated covered parking or other dual-use arrangement shall be described only where confirmed by the site layout.




Figure 5-5: Green Energy Solutions

5.24.2 High-Efficiency HVAC Systems

The new AHUs and Chillers installed in the repurposed F.G. Warehouse are specified as high-efficiency units with variable frequency drives (VFDs). These systems adjust cooling output dynamically based on real-time thermal loads rather than running at constant full capacity, providing variable-capacity operation that can reduce unnecessary energy use under part-load conditions; actual savings shall be verified through utility and equipment performance records.

5.24.3 Pneumatic Conveying Optimization

The IONBOURNE package utilizes enclosed pneumatic conveying for powder transport. While pneumatic systems consume compressed air, the selected design incorporates energy-efficient blowers and optimized pipe routing to minimize pressure drop. This reduces both electrical demand and fugitive dust emissions simultaneously, delivering dual environmental benefits.

5.24.4 LED Lighting and Smart Controls

All new construction areas (extension building, repurposed warehouse) will be fitted with LED lighting integrated with occupancy sensors and daylight harvesting controls. This ensures artificial lighting operates only when and where needed, reducing unnecessary lighting operation; actual energy savings shall be verified through electricity records where applicable.

5.25 FIRE SAFETY ARRANGEMENTS

5.25.1 Hazard-Specific Fire Suppression Systems

Given the diverse chemical inventory (Nicotine, organic powders, plastics), fire protection is zoned according to material classification:

Nicotine Storage Area: Equipped with clean agent suppression systems (e.g., FM-200 or Novec 1230) that extinguish fires without water damage or chemical residue, protecting both personnel and high-value regulated substances.

Powder Handling Zones (IONBOURNE/Mixers): Dry chemical powder extinguishers and CO_2 systems are positioned at all powder transfer points and mixing stations, appropriate for Class B and C fires involving combustible dusts and electrical equipment.

Warehouse Areas: Wet sprinkler systems designed per NFPA 13 standards cover both the W.M. and repurposed F.G. warehouses, sized to accommodate the increased storage density of raw materials and finished goods.

Office/Admin Extension: Standard wet sprinklers and portable ABC extinguishers protect the new training centre, conference room, and reception areas.

5.25.2 Detection and Alarm Infrastructure

Aspirating Smoke Detection: Installed in critical process areas where fine powder dust could interfere with conventional optical detectors.

Heat and Flame Detectors: Positioned above mixers, conveyors, and electrical panels for early warning.

Manual Call Points: Strategically located at all exits, stairwells, and high-risk zones throughout the expanded facility.

Centralized Fire Alarm Panel: Integrated with the building management system to trigger automatic shutdown of HVAC, pneumatic conveying, and process equipment upon alarm activation.

5.25.3 Passive Fire Protection

Fire-Rated Construction: The new 95' x 27' extension and warehouse partitions meet minimum 2-hour fire resistance ratings per Pakistan Building Code.

Fire Doors: Self-closing, rated doors separate high-hazard process zones from administrative and egress corridors.

Compartmentation: Warehouses are subdivided with fire walls and curtains to limit potential fire spread and protect adjacent operations.

5.25.4 Emergency Egress and Evacuation

Primary and Secondary Exits: All occupied spaces have at least two independent escape routes leading directly to open assembly areas outside the boundary wall.

Emergency Lighting and Signage: Photoluminescent exit signs and battery-backed emergency lighting ensure visibility during power failure or smoke conditions.

Assembly Points: Clearly marked, unobstructed muster stations located upwind of potential hazard zones.

5.25.5 Training and Drills

The newly constructed Training Centre will host mandatory fire safety programs covering:

- Chemical-specific fire response procedures (per SDS annexures)
- Proper use of portable extinguishers and hose reels
- Evacuation drills conducted quarterly for all shifts
- Specialized spill and fire response training for HSE team members handling Nicotine and reactive powders

5.25.6 Regulatory Compliance

All fire safety arrangements comply with:

- Punjab Factories Rules, 2017

- Pakistan Building Code (Fire Safety Provisions)
- NFPA standards referenced in Federal EPA NOC conditions
- Insurance carrier requirements for industrial manufacturing facilities

Annual third-party fire audits and quarterly internal inspections are mandated under the updated Environmental Management and Monitoring Plan (EMMP) to verify continued compliance and system functionality.





Figure 5-6: Fire Fighting Arrangements

CHAPTER # 6. BASELINE ENVIRONMENTAL PROFILE

This section describes the baseline conditions, which cover the existing Physical, ecological and socio-economic environment of the project as well as study area. Data was collected by reviewing secondary data and field survey.

6.1 PHYSICAL ENVIRONMENT/ RESOURCES

6.1.1 History

Jhelum, a district in the Punjab province of Pakistan, boasts a rich historical background. It is believed that Jhelum is the site of the famous Battle of the Hydaspes between Alexander the Great and King Porus in 326 BCE. The area has seen the rise and fall of numerous empires, from the Mauryans to the Mughals, and later the British Empire, which established significant military cantonments in the region. Jhelum has long been known for its contributions to the military, often referred to as the "Land of Martyrs" due to the large number of soldiers it has produced for the Pakistani armed forces.

6.2 GEOGRAPHY

Jhelum district is located in the northern part of Punjab, Pakistan, bordered by the districts of Rawalpindi to the north, Chakwal to the west, and Gujrat to the south. The district is bisected by the Jhelum River, which flows through it, providing a key water source for agriculture and other activities. The district covers an area of approximately 3,587 square kilometers and features a mix of plains and rolling hills, particularly in the northern and western parts.

6.3 TOPOGRAPHY

The topography of Jhelum is diverse, ranging from fertile plains along the Jhelum River to undulating hills in the northwestern part of the district. The Salt Range, a series of hills with significant deposits of rock salt, extends into the district. The region's terrain influences its land use, with agriculture being concentrated in the flatter areas, while the hilly regions are

less densely populated and more sparsely cultivated. The area is known for its scenic beauty, with numerous small streams, ravines, and lush green landscapes, particularly during the monsoon season.

6.4 CLIMATE

Jhelum experiences a semi-arid climate characterized by hot summers, mild winters, and a distinct monsoon season. The summer months, from May to September, see temperatures often exceeding 40°C, while winter temperatures can drop to around 4-6°C in December and January. The monsoon season, which typically occurs from July to September, brings most of the district's annual rainfall, averaging around 750-1000 mm per year. The climate supports both rain-fed and irrigated agriculture, with crops such as wheat, maize, and sugarcane being commonly grown.

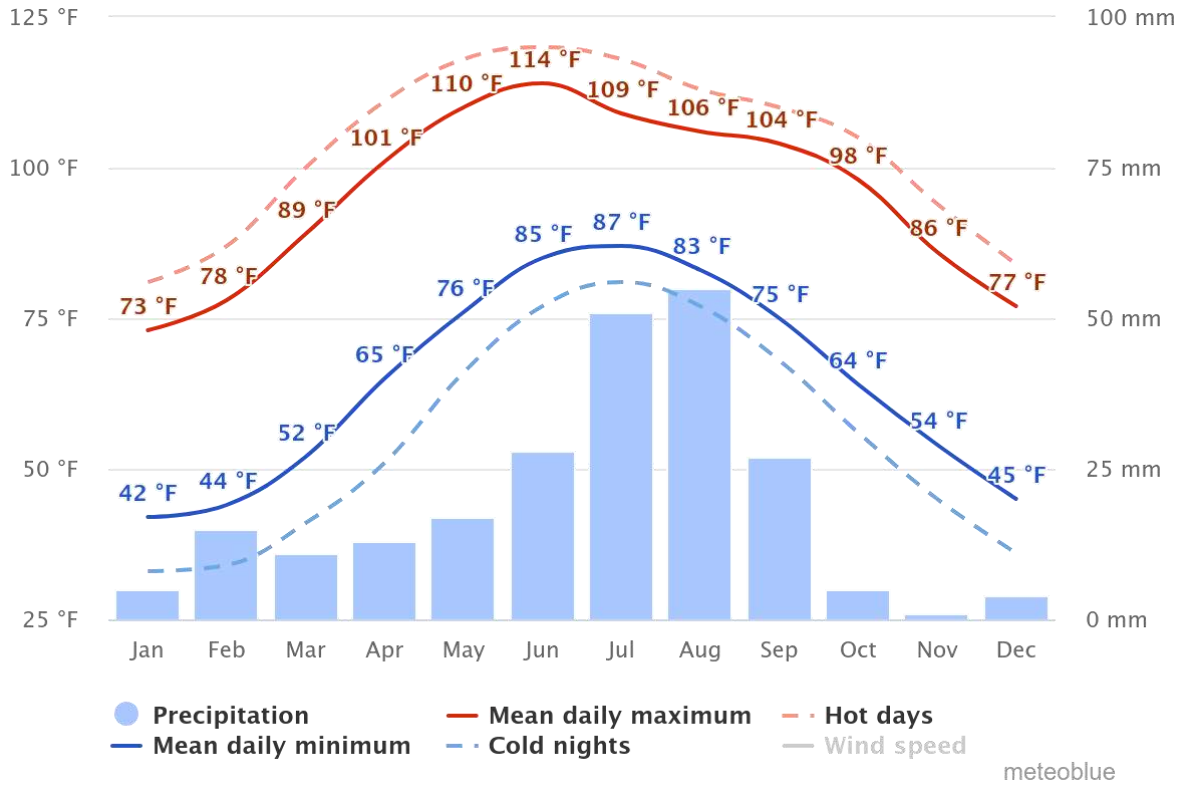


Figure 6-1: Climate Data (Source meteoblue)

6.4.1 Rainfall

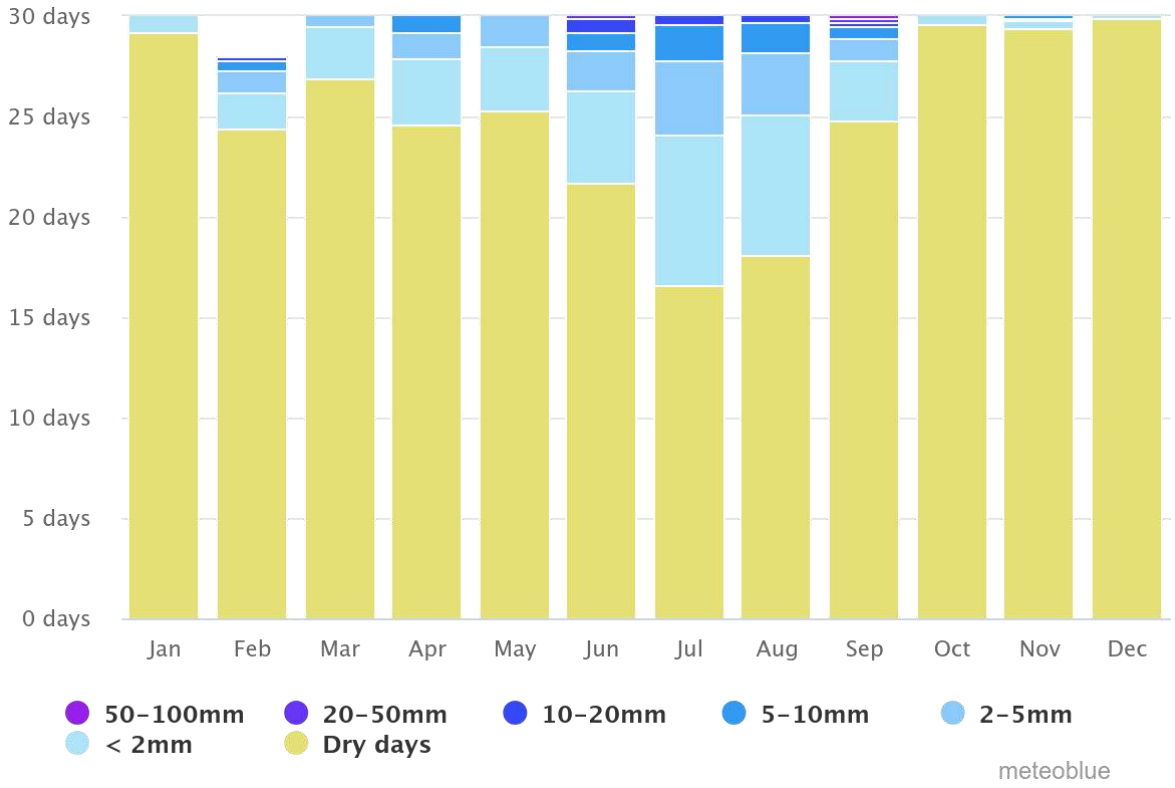


Figure 6-2: Rainfall Data (Source metoblue)

6.4.2 Wind

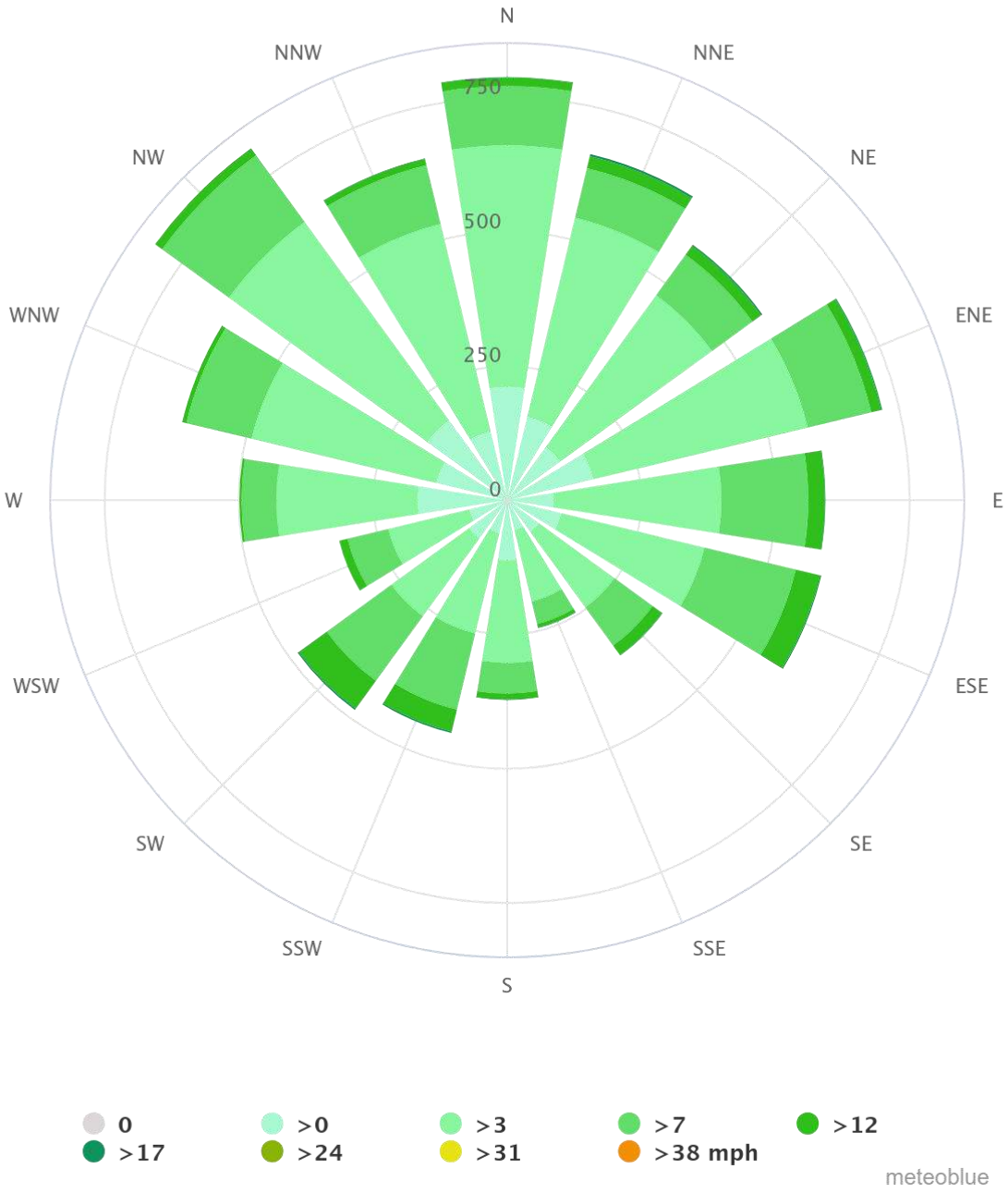


Figure 6-3: Wind Speed (Source: www.meteoblue.com)

6.5 ECOLOGICAL RESOURCES

This section describes the biodiversity existing ecosystem and existing ecological conditions in the project area of influence.

6.5.1 Flora

The flora of Jhelum is characteristic of the semi-arid regions of Punjab. The plains and agricultural areas feature crops like wheat, barley, and maize, along with orchards of citrus fruits and mangoes. In the more hilly and less cultivated areas, native vegetation includes species such as Acacia, Prosopis, and various grasses and shrubs. In areas with better water availability, particularly near the Jhelum River, more lush vegetation can be found, including riverine forests that feature trees like Shisham (Dalbergia sissoo) and Kikar (Acacia nilotica).

6.6 FAUNA

Jhelum hosts a variety of fauna, particularly in its riverine and hilly regions. The district is home to various bird species, including migratory birds that frequent the wetlands during the winter months. Mammals such as wild boar, jackals, and hares are common in the rural and forested areas, while reptiles such as snakes and lizards are also found. The Jhelum River supports aquatic life, including fish species like Rohu, Catla, and various local species, which are important for both local consumption and the regional fishing industry.

6.7 SOCIAL AND CULTURAL STUDY

6.7.1 Demographics

Jhelum district has a population of approximately 1.2 million people, with a mix of rural and urban settlements. The majority of the population is Muslim, with smaller communities of Christians and other religious groups. The population is predominantly Punjabi-speaking, though other languages like Urdu and Potohari are also spoken. The district has a relatively high literacy rate compared to other parts of Pakistan, reflecting its strong educational infrastructure.

6.7.2 Education

There are 20 Public Sector Colleges available for the education of males and females. While Private Sector Colleges are almost 14.

Notable educational institutes of the city include:

- Ch. Adalat Hussain (Shaheed) Education School
- Guides Education School
- The Lyceum LGCS
- Jhelum College of Nursing and Health Sciences
- The Educators

6.7.3 Culture

The culture of Jhelum is deeply rooted in Punjabi traditions, with a strong emphasis on agriculture, family, and community life. The district is known for its contributions to the military, and a significant portion of the population serves or has served in the armed forces. Traditional Punjabi festivals, such as Eid, Basant, and weddings, are celebrated with enthusiasm, featuring music, dance, and elaborate feasts. Folk music, particularly Bhangra and Gidda, is popular, and the region also has a rich tradition of storytelling and poetry.

6.8 ENVIRONMENTAL MONITORING

There are no signs of water logging in the project site.

6.8.1 Air Quality

To record the baseline ambient air quality of the project area, sample was collected at different location to observe the level of CO, SO_2, NO_2 and Particulate Matter (PM_{10}).

6.8.2 Noise Level

Major source of noise generation is vehicular traffic along the main road. Noise levels were monitored at different location of the project site.

6.8.3 Ground water

Underground water at the project site is available and source of water for the project is the water pump. Project proponent has tested the ground water sample from the ESPAK Laboratory. According to the ESPAK ground water is fit only for the industrial use. Laboratory reports are attached as Annexure-

CHAPTER # 7. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

7.1 GENERAL

The screening of potential environmental impacts is a systematic process conducted to identify, categorize, and evaluate the likely effects—both positive and negative—that the proposed expansion of Pakistan Tobacco Company Limited's (PTC) nicotine pouch manufacturing facility may have on the surrounding environment. This analysis focuses on the increase in production capacity from 500 million to 2,700 million pouches per year through technological enhancement (IONBOURNE system) and infrastructure expansion within the existing factory boundary.

The screening exercise follows a structured matrix approach that examines impacts across various environmental media: air, water, soil, noise, and socio-economic factors. Each identified impact is evaluated in terms of its significance, duration, and spatial extent, and appropriate mitigation measures are proposed to reduce, eliminate, or manage the adverse consequences.

Key guiding principles for the screening process include:

- **Proportionality**: The magnitude of environmental impacts is commensurate with the 440% increase in production volume.
- **Precautionary Principle**: Potential risks associated with sensitive materials (especially Nicotine) are conservatively assessed to prevent harm.
- **Best Available Techniques (BAT)**: Mitigation strategies are aligned with internationally recognized practices for pharmaceutical and food-grade manufacturing.
- **Life Cycle Thinking**: Impacts are traced not only to the factory gate but also to the end-of-life treatment of all materials through the A.T Waste Management facility.

This chapter forms the foundation for the more detailed Environmental Impact Statement in subsequent chapters and ensures compliance with the Punjab Environmental Protection

Act and Federal EPA directives governing industrial manufacturing and hazardous material handling.

7.2 PROJECT AREA OF INFLUENCE

Defining the "Area of Influence" is critical for focusing the environmental assessment where impacts are most likely to occur. For the PTC Jhelum expansion project, this area extends beyond the immediate factory boundary but is geographically constrained due to the site's secure, enclosed nature and strategic location.

7.2.1 Primary Zone of Influence (0-500 meters radius)

This includes the immediate project site and contiguous surroundings:

- **Factory Premises**: Entire area bounded by the perimeter wall, including production halls, warehouses, new extension building, and green spaces.
- **Immediate Vicinity**: Residential neighborhoods within 500 meters along G.T. Road, including Kala Gujran village outskirts. These communities are most exposed to potential noise, odor (though minimal), and fugitive dust impacts.
- **Road Network**: Sections of G.T. Road within 200 meters of the main factory gate, experiencing increased heavy vehicle traffic.
- **Drainage Basins**: The nearest municipal stormwater drains and seasonal nullahs receiving runoff from the factory compound and surrounding road areas.

Primary impacts assessed here include:

- Air quality changes from stack emissions and fugitive dust
- Increased noise during operational hours
- Ground-level vibration from heavy machinery
- Traffic congestion at the main gate during peak delivery/dispatch times
- Potential stormwater runoff effects on local drainage channels

7.2.2 Secondary Zone of Influence (500m - 2km radius)

This broader area accounts for indirect and cumulative impacts:

Upstream Supply Chain: Locations involved in raw material production and transport (e.g., Nicotine import ports, powder suppliers in Lahore/Faisalabad region).

Downstream Disposal Chain: A.T Waste Management facility and its associated transport corridors for waste haulage.

Local Economy and Employment: Broader Jhelum town and tehsil-level impacts of increased production capacity on jobs, local procurement, and tax revenue.

Regional Biodiversity Habitats: Nearest natural scrublands and cultivated fields affected by increased transport movement or minor habitat fragmentation if boundary fencing impacts wildlife corridors.

Secondary impacts assessed here include:

- Cumulative regional air emissions (in coordination with other industries along G.T. Road)
- Socioeconomic changes affecting the wider community (positive employment, possible negative effects like increased traffic speed concerns)
- Indirect carbon footprint due to supply chain transportation (raw material import logistics, waste transport to A.T facility)

7.2.3 Spatial Extent Summary Table

Impact Area	Distance Range	Key Components	Dominant Environmental Concerns
Immediate (Within Boundary Wall)	0 - Site Limit	Production lines, Mixers, IONBOURNE system, Storage tanks, Offices, New extension, Waste holding area	Occupational exposure to Nicotine/powders, Fugitive dust from conveying systems, Equipment noise, Electrical load impacts
Adjacent (Perimeter + 500m Radius)	Up to 500 m from factory wall	Nearby residential plots, G.T. Road segment, Drainage lines	Ambient noise during night shifts, Dust deposition, Possible light spill, Minor vibrations from heavy trucks

Regional (>500m - 2km)	500m – 2km radius	Surrounding villages, Small farms, Local schools, Markets, Other industries	Indirect health risks from increased industrial activity, Traffic safety for pedestrians/cyclists, Cumulative air quality effects with neighboring factories

7.2.4 Temporal Considerations

The impacts are categorized temporally into three phases:

1. **Construction Phase (Short-term)** *(Chapter 8: Construction Phase Impacts)*
    - Duration: ~6 months
    - Impacts concentrated within the factory site boundary
    - Dust, noise, and construction vehicle movements as key concerns
2. **Operational Phase (Long-term)** *(Focus of this Screening Matrix)*
    - Duration: throughout the operational life of the equipment
    - Continuous low-level impacts (noise, effluent, waste) requiring sustained monitoring
3. **Decommissioning Phase (End-of-Life)** *(Assumed negligible due to repurposing rather than demolition)*
    - Planned closure unlikely within project horizon unless superseded by newer technology

By clearly defining these zones, the EIA team ensures that baseline studies and ongoing monitoring efforts are appropriately targeted to capture the true extent of environmental change attributable to the proposed expansion.

7.3 METHODOLOGY FOR IMPACT ASSESSMENT

The methodology employed for assessing potential environmental impacts of the proposed expansion project follows a standardized, science-based approach aligned with international EIA best practices and Pakistani regulatory frameworks. This methodology

ensures that the evaluation is comprehensive, quantifiable where possible, and defensible against stakeholder scrutiny.

7.3.1 Screening Approach

- The screening methodology implements a Qualitative and Quantitative Hybrid Matrix that categorizes impacts into Significance Levels (Negligible, Minor, Moderate, Significant) based on:
- **Magnitude** of the impact
- **Duration** of the impact
- **Spatial Extent** of the impact
- **Reversibility** of the impact
- **Temporal Proximity** to sensitive receptors

Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

Figure 7-1Risk Assessment Matrix

7.3.2 Impact Assessment Framework

A structured framework consisting of:

1. **Environmental Media Analysis**:
    - **Air Quality**: Particulate matter, gaseous emissions, VOCs
    - **Water Resources**: Surface water, groundwater, stormwater runoff, effluent discharge

- **Soil Quality**: Contamination potential, erosion, compaction
- **Noise Environment**: Operational noise, traffic noise, construction noise
- **Waste Management**: Solid, liquid, and hazardous waste generation and disposal
- **Occupational Health**: Worker exposure to chemicals, machinery, and working conditions
- **Socio-Economic**: Community health, employment, education, cultural assets

2. **Stakeholder Engagement Component**:
   - Consultation with local residents, business owners, government agencies (PEPA, FEPA)
   - Community feedback sessions and public hearings as needed
   - Review of historical environmental data from the existing facility for trend analysis
3. **Compliance Monitoring Tools**:
   - Alignment with Punjab Environmental Quality Standards (PEQS)
   - Adherence to Federal EPA NOC conditions for Nicotine imports
   - Review of the existing Environmental Management and Monitoring Plan (EMMP)
   - Reference to ISO 14001 and OSHA occupational health standards
4. **Risk-Based Evaluation**:
   - Focus on worst-case scenarios for hazardous materials (particularly Nicotine)
   - Scenario-based modeling for accident conditions (spills, fire incidents)
   - Integration with hazard identification matrix and process safety management

5. **Performance Benchmarking**:
    - Comparison with baseline data from current plant (500-million-unit capacity)
    - Industry-standard benchmarking against similar facilities in the region
    - Establishment of Environmental Performance Indicators (EPIs) and Key Performance Indicators (KPIs)

7.3.3 Data Sources

The impact assessment methodology draws upon:

- **Historical Data**: EPA monitoring reports from the existing facility (2020-2024)
- **Technical Specifications**: Plant design drawings, engineering specifications for IONBOURNE system
- **Industry Standards**: WHO guidelines, OECD Best Practice Guidelines
- **Scientific Literature**: Studies on pharmaceutical powder handling, biogas generation from organic waste
- **Regulatory Documents**: FEPA NOC for Nicotine import, PEPA regulations, National Environmental Policy

7.3.4 Quantification Techniques

Where feasible and appropriate:

- **Mass Balance Calculations** for raw materials and waste streams
- **Emission Factors** from ISDM and EPA databases for estimating particulate and gaseous emissions
- **Dispersion Modeling** for stack emissions using AERMOD or CALPUFF models
- **Flow Simulation Models** for wastewater and stormwater discharge
- **Noise Prediction Software** for operational and traffic-related noise levels
- **Risk Assessment Tools** for evaluating occupational and environmental exposure

7.3.5 Mitigation Prioritization Matrix

For each identified impact, a prioritization matrix considers:

- **Severity Index**: Based on human health risk, environmental damage, economic cost
- **Feasibility of Mitigation**: Cost, technical possibility, timeline
- **Effectiveness**: Probability of achieving target reduction/elimination
- **Compliance Status**: Required for regulatory approval

7.3.6 Documentation and Reporting

All findings will be systematically documented in:

- Impact Assessment Matrix Tables
- Scenarios and Thresholds for Acceptance
- Monitoring Programs and Quality Assurance Plans
- Corrective Action Protocols for Non-compliance
- Management Decision Criteria

7.4 IMPACTS DURING CONSTRUCTION PHASE

(Duration: ~6 months – civil works, new 95'×27' extension, IONBOURNE staging area preparation)

Table 7-1: Screening of Possible Impacts during Construction Phase

Potential Impacts	Likelihood	Consequences	Risk Level
Dust generation (PM_{10}/$PM_{2.5}$) from excavation, concrete mixing, material handling	Likely	Minor	Low
Noise from construction equipment (excavator, crane, concrete pump, trucks)	Likely	Minor	Low
Clearance of 2,565 sq ft green lawn for new extension	Certain	Minor	Low
Generation of construction debris (wood, metal, concrete off-cuts)	Unlikely (low volume)	Minor	Low
Stormwater runoff with sediments during monsoon season	Unlikely	Minor	Low
Increased heavy vehicle movement (cement, steel, equipment)	Likely	Minor	Low

7.4.1 Dust Generation During Earthworks and Concrete Operations

Excavation for foundation, mixing of concrete, loading/unloading of aggregates, and transport of fill materials may generate significant amounts of fine particulate matter (PM_{10}/$PM_{2.5}$), particularly under dry and windy conditions. Dust can settle on nearby equipment, infrastructure, and adjacent land, potentially impacting air quality within the factory perimeter and very near boundary (the final receptor survey shall be used to confirm the relevant distance). While impact is localized and short-term, it may violate applicable PEQS requirements if uncontrolled.

Mitigation Measures

- Apply water sprays at active work zones at least every 2 hours during dry weather.
- Use enclosed or covered hoppers for concrete mixing and transport.
- Install silt fences and straw wattles around the periphery of exposed soil areas.
- Cover stockpiles of sand, cement, and fine aggregates with tarpaulins.
- Site supervisors to conduct daily dust control audits and log corrective actions.

7.4.2 Noise Emissions from Construction Equipment

Noise from excavators, cranes, concrete pumps, loaders, and heavy trucks may exceed 85 dBA at the equipment source and reach 65–72 dBA at the site boundary (200–500 m). This may cause temporary discomfort to workers in nearby offices and minimal disturbance to the nearest residential clusters (the final receptor survey shall be used to confirm the relevant distance away). Peak noise is expected during daylight hours only.

Mitigation Measures

- Limit noisy operations (e.g., pile driving, demolition) to 07:00–16:00 only — no night work unless approved by FEPA.
- Install temporary noise barriers (3 m high acoustic panels) between high-noise work zones and boundaries.
- Use low-noise equipment where available (e.g., electric-powered compactors).

- Conduct monthly noise mapping at four cardinal boundary points and retain records for compliance audit.

7.4.3 Vegetation Clearance and Green Lawn Removal

Approximately 2,565 sq ft of non-native lawn (Zoysia/Cynodon) will be removed to accommodate the new extension and auxiliary facilities. While the lawn is non-native and provides minimal ecological value, its removal reduces minor stormwater infiltration and visual mitigation capacity.

Mitigation Measures

- No tree removal — only turf stripping and topsoil stockpiling for reuse.
- Topsoil (15 cm layer) will be separately stockpiled, protected from erosion, and re-deposited post-construction.
- Compensatory afforestation: plant 25 fast-growing native saplings (Neem, Peepal, Shisham) along internal pathways — double the tree loss equivalent.
- Document clearance activities in Construction Environmental Management Plan (CEMP) log.

7.4.4 Construction Waste Generation

Temporary construction waste (wood packaging, metal off-cuts, concrete debris, plastic wraps) is expected but limited in volume (construction waste quantities shall be tracked from contractor records). No hazardous waste is anticipated.

Mitigation Measures

- Segregate waste at source: non-hazardous inert (concrete, bricks), recyclable (metal, wood), and general dry waste.
- Recycle ≥70% of waste through licensed vendors (e.g., brick kilns for concrete, scrap dealers for metal).
- Dispose of residual inert waste only at designated municipal landfill sites with proper gate passes and landfill depletion certificate.

– Maintain a Waste Movement Register signed by vendor and PTC EHS Officer.

7.4.5 Stormwater Runoff and Erosion Control

During monsoon months (July–September), exposed soil and uncompacted fill areas may generate sediment-laden runoff, potentially clogging adjacent storm drains and contributing to temporary local drainage issues.

Mitigation Measures

– Construct temporary diversion swales and sediment traps at outfall points.
– Lay erosion control mats or straw mulch on all bare slopes and areas.
– Schedule earthworks to avoid heavy rainfall periods where feasible.
– Inspect stormwater controls weekly and after each >25 mm rainfall event.

7.4.6 Increased Vehicle Movement and Traffic Impact

Approximately construction traffic shall be confirmed from contractor delivery records are expected (cement, steel, aggregates). Most deliveries will occur during off-peak hours (07:00–10:00, 15:00–17:00) to minimize conflict with G.T. Road peak traffic.

Mitigation Measures

– Designate dedicated delivery corridor within factory gates to avoid pedestrian zones.
– Use traffic marshals during high-volume periods to manage internal vehicle flow.
– Schedule large deliveries on weekends/holidays where possible.
– Maintain a 5 m buffer zone along internal road edges for material storage to reduce road overhang.

Impact Category	Description	Magnitude	Duration	Significance	Key Mitigation Measures
Dust Generation	Soil excavation, concrete mixing, material handling, demolition of temporary barriers	Moderate	Short-term (peak: 2–3 months)	Minor–Moderate	Water sprinkling, covered material storage, windbreak nets, rapid shuttering

Noise Emissions	Operations of excavators, concrete pumps, cranes, material trucks	Moderate	Short-term (daytime & limited night work)	Minor–Moderate	Acoustic barriers, scheduling during non-residential hours, noise monitoring at boundary
Vegetation Clearance	Removal of 2,565 sq ft green lawn (Section 5.4)	Minor	Short-term (2–4 weeks)	Minor	Compensatory afforestation (see Section 5.13), no tree removal required
Waste Generation	Construction debris (wood, metal, plastic packaging, concrete off-cuts)	Minor	Short-term	Negligible–Minor	Segregation on-site, recycling of metals & wood, landfill-bound only inert fines
Stormwater Runoff	Increased sediment-laden runoff from exposed soil	Minor	Short-term (during monsoon season)	Minor	Silt fences, temporary detention basin, erosion control blankets
Traffic & Access	Increased movement of heavy trucks (steel, cement, equipment)	Minor	Short-term	Minor	Coordinated delivery schedules, temporary traffic marshal, route optimization

Key Mitigation Commitment:

PTC will implement a Construction Environmental Management Plan (CEMP) before commencing civil works. This plan includes daily monitoring logs, designated waste segregation zones, and a pre-monsoon soil stabilization checklist.

7.5 IMPACTS DURING INSTALLATION & COMMISSIONING PHASE

(Duration: ~2–3 months — IONBOURNE setup, third mixer installation, AHU/Chiller commissioning)

Table 7-2:Screening of Possible Impacts during Installation & Commissioning Phase

Potential Impacts	Likelihood	Consequences	Risk Level

Spill/leak of Nicotine during initial loading into IONBOURNE system	Unlikely	Major	Medium
Fugitive dust release during powder bin unloading (BA, SB, CA) before full pneumatic containment	Unlikely	Minor	Low
Noise and vibration from crane lifts & equipment mounting	Unlikely	Minor	Low
Temporary loss of dust collection effectiveness during filter setup	Unlikely	Minor	Low
Electrical or pneumatic line testing (leaks, pressure tests)	Unlikely	Minor	Low
Human error during first-time material handling or system calibration	Unlikely	Moderate	Medium

7.5.1 Nicotine Handling and Spill Risk During System Commissioning

The first loading of Nicotine (Grade Pharma, 10–20 g batches) into the IONBOURNE dosing unit is a high-consequence but low-likelihood event. Although the IONBOURNE system is sealed, human error (e.g., improper connector alignment, valve misoperation) could result in a minor spill (the final receptor survey shall be used to confirm the relevant distanceL), causing localized contamination of staging floor, tools, or PPE.

Mitigation Measures

- Nicotine transfer only conducted with A.T Waste Management or OEM vendor on-site (pre-qualified).
- Pre-staged spill kit: absorbent pads, nicotine-neutralizing solution (dilute NaOH), sealed disposal bags, and PPE (butyl rubber gloves, face shield).
- Conduct pre-commissioning dry-run simulation (without Nicotine) to validate SOPs and emergency response.
- Work area isolated, restricted to 2 trained personnel only — video monitored if possible.

7.5.2 Fugitive Dust During Powder Pre-Loading

Before full IONBOURNE integration, bulk powder bags (Citric Acid, Benzoic Acid, etc.) may be manually opened and transferred to intermediate hoppers. This stage lacks full LEV integration and poses a transient dust release risk.

Mitigation Measures

- Perform powder handling inside a dedicated, enclosed staging bay with negative pressure and temporary dust curtain.
- Use wet wiping for floor cleanup; no dry sweeping allowed.
- Personnel wear N95 respirators and eye protection during powder transfer.
- Conduct pre-commissioning filter performance/integrity test against the OEM design specification before full operation.

7.5.3 Noise and Vibration from Heavy Lifting Operations

Crane-assisted installation of mixers, AHUs, and IONBOURNE components (up to 3–5 ton units) may generate high-intensity intermittent noise (up to 90 dBA at source) and ground-borne vibration.

Mitigation Measures

Use hydraulic crawler cranes (lower vibration vs. truck-mounted).

Install rubber isolators on all heavy equipment mounts pre-bolting. Limit crane operations to 08:00–16:00 and away from offices (e.g., not near admin wing).

Perform vibration monitoring if any sensitive instrumentation is in proximity.

7.5.4 Temporary Inefficiency in Dust Control Systems

During filter bag installation and ductwork final connections, bag filters may operate sub-optimally, resulting in short-term (>24 hrs) dust escape during system checkout.

Mitigation Measures

- Conduct filter integrity test (dye test or smoke pencil) before releasing each line.
- Use dust suppressant (mist spray) at test points during commissioning.
- Label lines under commissioning with “Caution: Not Fully Enclosed” signage.

7.5.5 Utility Testing (Electrical/Pneumatic Lines)

Pressure testing of compressed air lines (≥8 bar) and high-voltage power-up may cause short-duration leaks or arcing hazards if not controlled.

Mitigation Measures

- Conduct pneumatic tests with nitrogen or clean dry air only — never hydrocarbon gas.
- Implement Lock-Out/Tag-Out (LOTO) for electrical energization — certified electrician only.
- Have fire extinguishers (CO_2) and arc-flash kits within 3 m of test zones.

7.5.6 Human Error During Calibration and SOP Adoption

As operators learn new workflows, procedural deviations (e.g., incorrect dosing ratios, bypass of LEV) may occur, temporarily increasing exposure or emission risk.

Mitigation Measures

- all operators must pass competency assessment before solo operation on IONBOURNE.
- Provisional "shadow shift" period (first 3 shifts with senior HSE/tech support).
- Emergency stop buttons and alarms tested daily during ramp-up.

7.6 IMPACTS DURING OPERATIONAL PHASE

Table 7-3: Screening of Possible Impacts during Operational Phase

Potential Impacts	Likelihood	Consequences	Risk Level
Particulate Matter (PM) emissions from powder handling (Benzoic Acid, Sodium Benzoate, Citric Acid, Microcrystalline Cellulose) affecting ambient air quality if dust control systems (LEV, bag filters) are not properly maintained or operated	Likely	Moderate	Significant
Inadequate handling or maintenance of IONBOURNE system resulting in fugitive dust release and non-compliance with PM standards	Unlikely	Major	Medium
Hazardous waste (Nicotine-contaminated materials) generation and improper handling or disposal resulting in soil or groundwater contamination if containment systems fail	Unlikely	Major	Medium
Effluent with elevated COD and trace nicotine entering wastewater stream if A.T Waste	Rare	Major	Medium

Management treatment fails, affecting downstream biogas digestion or compost quality			
Occupational exposure to Nicotine, fine powders, and moving machinery causing respiratory effects, dermal absorption, or physical injury	Unlikely	Moderate	Medium
Noise generated by mixers, AHUs, chillers, pneumatic conveyors, and auxiliary equipment causing temporary disturbance to workers	Certain	Minor	Low
Odor generation from flavor compound (SF-blends) handling or minor off-spec batch purging causing nuisance within facility	Unlikely	Minor	Low

7.6.1 Air Emissions from Powder Handling and Mixing Operations

During normal operation, handling, dosing, and mixing of fine chemical powders — particularly Benzoic Acid (Purox* B), Sodium Benzoate (Purox* S), Citric Acid, and Microcrystalline Cellulose (Endurance VE-090) — may generate fugitive dust emissions if engineering controls are compromised. While the IONBOURNE system features enclosed pneumatic conveying and integrated bag filters, any failure in maintenance (e.g., filter clogging, seal degradation, or LEV inefficiency) could result in localized PM exceedances, particularly inside the production hall and near transfer points. Ambient PM at the site boundary may also be impacted over the long term due to cumulative operation of 2,700 million pouches/year — a 440% increase from baseline. Chronic exposure to fine particulate matter can affect worker respiratory health and potentially violate Punjab Environmental Quality Standards (PEQS).

Mitigation Measures

- Operate the IONBOURNE package in closed-loop mode with negative pressure in powder zones.
- Install and maintain dual-stage bag filters on all mixers, dosing units, and transfer chutes — inspection and replacement per manufacturer schedule (quarterly).
- Implement continuous PM monitoring at high-risk zones using portable or fixed particulate sensors; data logged and reviewed weekly by HSE.

- Conduct ambient air sampling for PM_{10} and $PM_{2.5}$ quarterly at all four perimeter points; results submitted to PEPA as part of compliance reporting.
- Use compressed air cleaning (with dust extraction attachment) instead of compressed air blow-down during maintenance to prevent resuspension.

7.6.2 IONBOURNE System Integrity and Dust Containment Failures

The IONBOURNE package — while designed for dust control — relies on correct installation, calibration, and routine upkeep. Malfunctions such as misaligned hoppers, worn conveyor seals, or damaged ductwork could allow micropowder leakage during powder feeding or dosing. A worst-case scenario (e.g., unmitigated Nicotine-contaminated dust release during ion-pairing) could pose inhalation hazards and risk of cross-contamination. Such events are unlikely given the closed, sealed design of the system but remain plausible if preventive maintenance lapses occur.

Mitigation Measures

- **Commissioning validation:** Verify system airtightness with pressure decay test and dye-tracer study before first run.
- Daily visual inspection checklist for leaks, dust trails, and seal integrity — documented in operation log.
- Monthly non-destructive testing (NDT) of pneumatic lines and joints by certified vendor technician.
- Install dust detection cameras at high-risk transfer points for early visual alert.
- Maintain Spare Seals & Gaskets inventory and training for rapid field repair (≤2 hours turnaround).

7.6.3 Hazardous Waste Handling and Storage (Nicotine-Contaminated Materials)

Waste streams including used PPE, spill absorbents, filter bags, and minor off-spec residues may contain trace Nicotine and classified as hazardous (Acute Tox. 3). Improper

storage (e.g., damaged bags, open containers, or combined with general waste) could lead to soil contamination, worker exposure, or accidental releases during internal transfer. While double-bagging, secondary containment trays, and a dedicated Nicotine Waste Area mitigate risk, human error remains the primary vulnerability.

Mitigation Measures

- Store all Nicotine-contaminated waste in color-coded (Red), sealable HDPE bags inside secondary impermeable pallets — located in the newly constructed Matlock/Return Material Area.
- Enforce strict Gate-Pass System: Every consignment dispatched to A.T Waste Management must be recorded with date, weight, container ID, and vendor receipt.
- Train all production and maintenance staff on hazardous waste classification (per MSDS) and emergency spill response using ANSI Z400.1 standard.
- Conduct monthly internal audits of hazardous waste logs and physical storage conditions.

7.6.4 Effluent and Treatment Compliance with A.T Waste Management Vendor

All process wastewater, cleaning effluents, and neutralized slurry from bioremediation (pH-adjusted blend/pouch waste) are routed to A.T Waste Management for anaerobic digestion and vermicomposting. Although the current process is robust and has operated effectively at baseline capacity, scaling to 2,700 million pouches/year increases influent load, potentially overwhelming digestion kinetics if not balanced. A rare but high-consequence failure such as microbial toxicity due to Nicotine surges — could impair biogas yield and vermicompost quality, leading to non-compliant disposal or environmental runoff if stored improperly.

Mitigation Measures

- Establish a pre-qualified monitoring protocol with A.T Waste Management:

- Weekly sampling for COD, pH, Nicotine residue (as specified in the approved vendor acceptance criteria, if applicable).
- Bi-monthly digester performance reports (biogas volume, volatile solids reduction).
- Pre-dilute high-strength waste (e.g., filter backwash) before transfer to maintain consistent organic loading rate (OLR).
- Include a contractual clause requiring third-party annual verification of final compost safety (EC, heavy metals, pathogens, Nicotine).

7.6.5 Occupational Health and Safety (Chemical & Mechanical Hazards)

Workers involved in mixer loading, IONBOURNE maintenance, and canning line operation may be exposed to Nicotine (dermal absorption, nausea, tachycardia), fine powders (respiratory sensitization), and moving machinery (entanglement, crush injuries). Though engineering controls and PPE reduce risk, lapses in training, fatigue, or procedural deviation may result in incidents. The new Training Centre will support mitigation, but compliance is dynamic and relies on management culture.

Mitigation Measures

- Enforce mandatory use of PPE: N95/P2 respirators (for powders), nitrile gloves (Nicotine-resistant), safety goggles, and slip-resistant footwear.
- Conduct competency-based training before solo operation on IONBOURNE or mixers — documented in online LMS with refresher every 6 months.
- Install gas detection alarms (Nicotine vapor) and dust arrest units at operator workstations.
- Implement a “Stop Work Authority” policy empowering any employee to halt operations if unsafe conditions are observed — no reprisal.

7.6.6 Noise Emissions from Machinery

Mixers, AHUs, chillers, compressors, and pneumatic conveyors generate continuous mechanical and aerodynamic noise. While all new equipment is specified as low-noise

(equipment noise specifications shall be verified against OEM data), prolonged exposure in unbuffered areas could exceed occupational exposure limits (85 dBA over 8 hours). Temporary disturbance to workers is certain, but health impact is minor and reversible with control. Ambient noise at the property boundary is predicted to be ≤68 dBA within applicable PEQS limits.

Mitigation Measures

- Install acoustic enclosures around mixers and AHU compressors (acoustic-control performance shall be verified where enclosures are installed).
- Use vibration isolators on all rotating equipment and flexible duct connectors to prevent structure-borne noise.
- Provide hearing protection devices (HPDs) in zones where noise exceeds 80 dBA — enforced through zone signage and PPE audits.
- Conduct quarterly personal noise exposure monitoring for 10% of operators (randomly selected).

7.6.7 Odor Generation from Flavor Blends (SF-Series)

Although SF-CARREM through SF-TUNBEO are low-concentration flavor matrices, minor releases during bin unloading or purging of off-spec batches could produce transient, noticeable odors particularly in warm, stagnant conditions. These odors are not toxic but may cause discomfort or perceived “pollution” among workers in adjacent zones. No impact on off-site receptors is expected (residential receptor distance shall be verified against the final site survey, and odor thresholds high).

Mitigation Measures

- Maintain positive pressure in flavor compound storage cabinets with HEPA filtration.
- Purge lines only during shift breaks with LEV active; avoid purging during meal or break periods.

- Clean flavor transfer lines after each batch change to prevent build-up and microbial odor sources.
- Include odor descriptor logs in batch records to track frequency and trigger review of formulations if complaints arise.

7.6.8 Equipment Failure and Process Downtime

Critical failures in mixers, IONBOURNE dosing unit, pneumatic conveying blowers, or PLC-controlled automation could cause operational disruption, uncontrolled material buildup, or off-spec production potentially increasing waste and resource use. While redundancy exists for essential functions (e.g., dual chillers), single-point failures remain possible.

Mitigation Measures

- Implement a Preventive Maintenance Schedule (PMS) aligned with OEM recommendations digitized via CMMS for task assignment and overdue alerts.
- Maintain a minimum 30-day inventory of critical spare parts (seals, sensors, motor mounts) on-site.
- Train senior operators on manual override and emergency shutdown procedures (per SOP-OP-007).
- Conduct a quarterly "Failure Modes and Effects Analysis" (FMEA) for production-critical equipment.

This fully structured, phase-specific narrative aligns with regulatory expectations and demonstrates a rigorous, proactive approach to environmental and occupational risk management.

7.7 IMPACTS DURING DECOMMISSIONING & END-OF-LIFE PHASE

(Duration: Event-based, >10 years — equipment retirement, building modification if required)

Table 7-4:Screening of Possible Impacts during Decommissioning Phase

Potential Impacts	Likelihood	Consequences	Risk Level
Equipment disposal (mixers, AHUs, conveyors) with hazardous components (oils, metals)	Very Rare	Minor	Low
Building demolition (hypothetical future expansion)	Very Rare	Moderate	Low
Long-term soil accumulation of Nicotine if A.T Waste Management compliance lapses	Rare	Major	Medium
Storage tank abandonment (if site repurposed)	Rare	Minor	Low
Landscaping removal (if new phase alters green layout)	Unlikely	Minor	Low

7.7.1 Equipment Decommissioning and Disposal

At end of life (e.g., mixer after 10–12 years), equipment may contain residual oils, lubricants, or trace Nicotine residues in seals or filters.

Mitigation Measures

- Drain and clean all oils/lubricants on-site; store as hazardous waste and dispose via licensed handler.
- Separate ferrous/non-ferrous metals for recycling; maintain certificates of recycling.
- Neutralize filter media with alkaline solution before disposal.
- No incineration on-site — all waste shipped to A.T Waste Management or certified scrap facilities.

7.8 Structural Modification or Building Demolition (Future-Only)

If a future expansion requires partial demolition of the current extension or repurposing of the F.G. Warehouse, soil disturbance and dust could occur.

Mitigation Measures

- Comply with Punjab Building Demolition Guidelines: wet cutting, sealed debris chutes, perimeter fogging.
- Asbestos/lead survey prior to demolition (standard under PECR).
- Dust and noise monitoring at nearest receptor (the final receptor survey shall be used to confirm the relevant distance) during works.

7.8.1 Soil and Compost Quality Assurance (Indirect Long-Term Impact)

If A.T Waste Management fails to maintain effective bioremediation (e.g., due to operational lapses), trace Nicotine could accumulate in final vermicompost if sold as fertilizer — potentially entering agricultural soil over decades.

Mitigation Measures

- Include clause in vendor agreement: "Final compost shall be tested quarterly for
- Nicotine (HPLC method, laboratory detection/quantification limit appropriate to the documented acceptance criterion). Batch shall be managed in accordance with the documented vendor/regulatory acceptance criterion."
- PTC reserves right to conduct independent sampling and cease dispatch if non-compliant.
- Maintain a 5-year traceability log linking each waste consignment to final compost batch.

7.8.2 Tank and Utility Abandonment

If certain tanks (e.g., neutralization tank) are replaced or decommissioned, residual slurry or wastewater may remain.

Mitigation Measures

- Clean and decontaminate tanks before decommissioning (3 rinse cycles with neutral pH water).
- Store cleaning wastewater in hazardous stream for treatment at A.T facility.
- Seal abandoned tanks with inert material (e.g., expanded clay grout) and mark on site as "Abandoned – Do Not Disturb."

7.8.3 Landscape Reconfiguration

Future modifications may require minor repositioning of green plants or lawn areas.

Mitigation Measures

- Maintain minimum 15% green cover per site area no net loss.
- Relocate plants in situ where possible; otherwise, nursery-grown replacement saplings.

7.8.4 Cumulative and Regional Impacts

Impact Category	Medium	Magnitude	Duration	Significance	Contributing Factors	Monitoring Requirement
Air Quality in District Jhelum	Atmospheric	Minor	Ongoing	Minor	Accumulation with nearby industries	Quarterly regional air quality assessment
Land Use Changes	Land/Environmental	Negligible	Permanent	Negligible	Minimal conversion (lawn → construction)	Annual site condition surveys
Water Resource Use	Hydrological	Minor	Continuous	Minor	Consistent with current use	Annual water use reports

Mitigation Strategy: Continuous cooperation with PEPA ensures that the expanded operations do not exacerbate regional environmental stressors. The site's green belt management maintains ecological balance.

7.8.5 Summary of Identified Impacts

Category	Significance Level	Primary Mitigation Approach	Control Mechanism
Particulate Matter	Significant	Dust Control Systems	Bag Filters, LEV
Hazardous Waste Management	Significant	Vendor Compliance	Gate Pass, Vendor Certificates
Chemical Exposure	Significant	Engineering Controls	PPE, Training
Operational Noise	Minor	Sound Dampening	Enclosures, Vibration Control
Water Effluent	Moderate	Biogas Treatment	Anaerobic Digestion
Soil Contamination	Negligible	Preventative Protocols	Spill Kits, Isolation
Community Impact	Minor	Public Engagement	Community Meetings

This operational phase impact assessment demonstrates that while the expansion increases production by 440%, all environmental impacts remain manageable within

current regulatory frameworks and have mitigation measures aligned with international best practices and the current EMMP structure.

7.9 PHASE-WISE SCREENING RISK MATRIX FOR ENVIRONMENTAL IMPACTS

Potential Impact	Likelihood	Consequence	Risk Level	Justification & Key Mitigation Measures
Construction (0–6 months)				
Dust generation (PM10/PM2.5) from excavation, concrete mixing, material handling	Likely	Minor	Low	Temporary controls: water sprinkling, covered stockpiles, silt fencing. PEQA-compliant within site boundary. No sustained ambient exceedance expected.
Noise from heavy equipment (excavator, concrete pump, trucks)	Likely	Minor	Low	Limited to daylight hours; noise barrier walls; monitoring at boundary. Boundary noise levels shall be verified through monitoring during representative construction activities — within applicable PEQS limits for industrial zones.
Clearing of 2,565 sq ft green lawn for 95'×27' extension	Certain	Minor	Low	Non-native turf only; no mature trees impacted. Compensatory afforestation planned (see

				5.13.3). Net green cover maintained.
Construction debris (wood, metal, concrete off-cuts)	Unlikely (low volume)	Minor	Low	On-site segregation: metals/wood recycled; inert fines landfilled. Construction waste shall be classified from actual materials used; any hazardous waste shall be segregated and managed through the applicable authorized route
Stormwater runoff with sediments during monsoon	Unlikely	Minor	Low	Erosion control: silt fences, temporary detention basin, compaction. No surface drainage discharge without pretreatment.
Increased heavy vehicle movement (cement, steel, equipment)	Likely	Minor	Low	Coordinated deliveries; limited night work; internal traffic routing avoids residential edges. No disruption to G.T. Road capacity.
Installation & Commissioning (2–3 months post-construction)				
Spill/leak of Nicotine during initial loading into	Unlikely	Moderate	Medium	No bulk transfer without vendor (A.T) on-site. Small-volume batch loading in

IONBOURNE system				sealed containers. Spill kits, LEV, and sealed drains in staging area. Historical incident performance shall be confirmed from PTC HSE records
Fugitive dust release during powder bin unloading (BA, SB, CA) before full pneumatic containment	Unlikely	Minor	Low	Wet wiping, temporary dust curtains, negative pressure in staging zone. Only during pre-commissioning; total duration <72 hours.
Noise and vibration from crane lifts & equipment mounting	Unlikely	Minor	Low	Isolation pads, low-noise rigging, and scheduled windows. Sensitive-receptor distances shall be verified against the final site survey and receptor map.
Temporary loss of dust collection effectiveness during filter setup	Unlikely	Minor	Low	Pre-commissioning performance testing of bag filters and LEV is mandatory before first run. Verified by HSE audit.
Operational (10+ years, continuous)				
Particulate Matter (PM) emissions	Likely	Moderate	Significant	High-volume handling increases risk, but mitigated

from powder handling (BA, SB, CA, MCC, Nicotine dust)				by IONBOURNE closed-loop conveying + bag filters + LEV. periodic process-emission monitoring in accordance with approval conditions and the applicable monitoring programme and quarterly ambient air sampling required. Filter maintenance SOP is critical.
Effluent with elevated COD and trace nicotine if A.T Waste Management treatment fails	Rare	Major	Medium	No direct discharge. Waste shall be transferred to A.T Waste Management under the documented treatment route, with treatment performance verified through vendor records and applicable requirements. Mitigated by third-party verification at a frequency established by the approved monitoring programme and vendor/regulatory requirements of digestate nicotine the applicable documented criterion, if required.

Hazardous waste mismanagement (e.g., Nicotine-contaminated PPE, drum residues)	Unlikely	Major	Medium	Double-bagged, sealed drums, secondary containment. Gate-pass and vendor reconciliation ensure traceability. Training and audits reduce human-error risk.
Noise exceedance at boundary (AHUs, mixers, chillers)	Unlikely	Minor	Low	New AHUs/chillers are low-noise + vibration isolators. Final boundary noise levels shall be verified through monitoring after commissioning — within applicable PEQS limits. Annual noise mapping required.
Increased truck traffic (raw material deliveries, dispatch)	Likely	Minor	Low	Final incremental truck movements shall be confirmed from PTC logistics records and the approved production/logistics plan Off-peak scheduling, dedicated gate scheduling. Traffic effects at the G.T. Road access point shall be verified during peak delivery/dispatch periods

Worker chemical exposure (inhalation/skin contact to Nicotine, acids)	Unlikely	Moderate	Medium	LEV, enclosed dosing, and PPE protocols (masks, gloves, coveralls). New Training Centre ensures SOP adherence. Occupational health surveillance shall be undertaken at a frequency determined by the occupational-health programme, exposure assessment and applicable requirements
Fire/explosion due to nicotine dust accumulation	Rare	Major	Low	Combustible-dust hazard controls shall be confirmed through the applicable process safety assessment, equipment specifications and fire/explosion protection design Good housekeeping + static control eliminates ignition sources.
Off-site community impact (odor, vibration, noise)	Unlikely	Minor	Low	Low-VOC flavorants; no persistent odors. Residential-receptor distance shall be verified against the final site survey and receptor map.

				Presence and distance of schools, hospitals and other sensitive receptors shall be verified from the final receptor survey. Community grievance cell active.
Groundwater contamination from hypothetical flooring failure + spill	Rare	Catastrophic	Low	Impermeable concrete with slope to neutralization tank; secondary containment in Nicotine store; no direct discharge path. Routine integrity checks.
Decommissioning (long-term, >10 years)				
End-of-life equipment disposal (mixers, AHUs, conveyors)	Very Rare	Minor	Low	Vendor buy-back or local scrap recycling planned. Non-hazardous metals only. End-of-life waste shall be minimized through reuse/recycling and managed through authorized routes
Building demolition (hypothetical future renovation)	Very Rare	Moderate	Low	Future compliance with Punjab Demolition Guidelines; >75% waste recycling; dust and noise controls applied.

Long-term soil accumulation of nicotine if A.T Waste Management compliances lapse	Rare	Major	Medium	Unlikely due to vendor contract and audit cycle. Mitigated by annual vermicompost testing and contract clause requiring Nicotine against the applicable documented criterion.

7.10 SUMMARY OF RISK DISTRIBUTION

Risk Level	Number of Impacts	Phases Covered
Significant	1	Operational (dust emissions)
Medium	4	Commissioning (1), Operational (3)
Low	14	All phases (Construction: 5, Commissioning: 3, Operational: 7, Decommissioning: 3)
Total	18	—

This phase-wise matrix ensures that every distinct activity from excavation to daily manufacturing is assessed for environmental risk, enabling precise targeting of mitigation, monitoring, and reporting responsibilities. It directly feeds into the development of the Environmental Management and Monitoring Plan (EMMP) in Chapter 8.

CHAPTER # 8. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

8.1 GENERAL

The Environmental Management and Monitoring Plan (EMMP) presented in this chapter translates the findings of the impact screening and mitigation analysis (Chapter 7) into a structured, implementable framework for environmental management throughout the life-cycle of the project. It has been prepared in accordance with the requirements of the Punjab Environmental Protection Act, 1997, the Punjab Environmental Protection Act, 1997, and the IEE/EIA Regulations, 2022, and reflects the conditions typically prescribed by the Environmental Protection Agency (EPA), Punjab, for approval of Environmental Impact Assessments.

The EMMP is intended to function as a living management document rather than a static compliance record. It consolidates the mitigation measures identified against each significant and moderate impact in the screening matrix into a defined set of institutional responsibilities, monitoring parameters, monitoring frequencies, and reporting mechanisms. The project proponent shall ensure that the EMMP is integrated into the day-to-day operational and management systems of the facility, including induction training, standard operating procedures (SOPs), contractor obligations, and vendor agreements, particularly with respect to nicotine-contaminated waste handled through A.T Waste Management.

The EMMP addresses environmental management requirements separately for each phase of the project construction, installation and commissioning, operational, and decommissioning recognising that the nature, magnitude, and duration of impacts, and consequently the management response required, differs materially across these phases. The plan further establishes an internal audit and corrective action mechanism, whereby non-conformances identified through monitoring or inspection are logged, assigned to a responsible person, and closed out within a defined timeframe, with periodic reporting to EPA Punjab as required under the terms of environmental approval.

8.2 OBJECTIVES OF EMMP

The Environmental Management and Monitoring Plan has been developed to achieve the following objectives:

- To ensure that the mitigation measures identified in the impact screening (Chapter 7) are implemented in a timely, verifiable, and accountable manner across all phases of the project.
- To ensure continued compliance with the Punjab Environmental Quality Standards (PEQS) and Punjab Environmental Quality Standards (PEQS) for ambient air quality, stack/process emissions, industrial effluent, and noise.
- To establish clear institutional responsibility for environmental management, monitoring, and reporting at each level of project management, from site supervisory staff to senior management.
- To provide an early-warning system, through routine monitoring, capable of detecting deviations from acceptable environmental performance before they develop into significant impacts, particularly in respect of nicotine handling, dust containment (IONBOURNE system integrity), and effluent quality.
- To safeguard occupational health and safety of the workforce, with particular emphasis on nicotine exposure control, powder-handling hazards, and machinery-related risks identified during screening.
- To ensure that waste, including hazardous nicotine-contaminated waste, is managed in accordance with the Hazardous Substances Rules and the vendor agreement with A.T Waste Management, and that vendor compliance is independently verified.
- To maintain a documented record of environmental performance, monitoring results, training, incidents, and corrective actions, sufficient to demonstrate compliance during EPA inspection or audit.

- To provide a mechanism for stakeholder and community engagement, including a grievance redressal procedure, consistent with concerns raised during the scoping and consultation process (Chapter 3).
- To allocate adequate financial and human resources for the implementation of environmental management and monitoring activities over the operational life of the project.

8.3 ROLES AND RESPONSIBILITIES

Successful implementation of the EMMP requires a clearly defined institutional structure with unambiguous lines of responsibility and accountability. The roles and responsibilities of the key stakeholders involved in implementation of this plan are summarised in Table 8-1.

Table 8-1:Roles and Responsibilities for EMMP Implementation

Entity / Position	Key Responsibilities
Project Proponent / Top Management	Overall accountability for environmental compliance; approval and allocation of budget for environmental management and monitoring; ensuring EMMP is integrated into company policy; liaison with EPA Punjab at senior level.
Environmental, Health and Safety (EHS) Manager	Day-to-day implementation and oversight of the EMMP; coordination of internal and third-party monitoring; maintenance of monitoring and training records; preparation of periodic compliance reports to EPA Punjab; investigation of non-conformances and coordination of corrective action.
Production / Site Supervisors	Implementation of mitigation measures within respective work areas; enforcement of SOPs relating to nicotine handling, powder containment, and machine safety; day-to-day supervision of housekeeping, PPE compliance, and immediate reporting of incidents or spills to the EHS Manager.
Construction / Installation Contractor(s)	Compliance with contractual environmental clauses during civil works and IONBOURNE system installation, including dust suppression, noise control, construction waste management, and worker safety; submission of a site-specific construction environmental management plan prior to mobilisation.
Workers and Employees	Compliance with SOPs, use of prescribed PPE, participation in training and drills, and reporting of hazards, near-misses, or environmental incidents through the established reporting channel.
A.T Waste Management (Waste Vendor)	Collection, transport, treatment, and disposal of hazardous and non-hazardous waste, including nicotine-contaminated materials, in

	accordance with the vendor agreement and applicable regulatory requirements; provision of waste manifests and compliance certificates; cooperation with periodic vendor audits.
Third-Party Environmental Monitoring Consultant / Accredited Laboratory	Independent monitoring of ambient air quality, stack emissions, effluent quality, and noise levels at the frequency specified in this EMMP; issuance of laboratory reports referenced against NEQS/PEQS limits.
EPA Punjab	Review of periodic compliance/monitoring reports; conduct of regulatory inspections; verification of compliance with EIA approval conditions; enforcement action in case of non-compliance.

Overall accountability for environmental performance rests with the Project Proponent; however, the EHS Manager shall serve as the designated focal person for coordination with EPA Punjab and shall be authorised to halt any activity found to be in material non-compliance with this EMMP pending corrective action.

8.4 ENVIRONMENTAL MANAGEMENT DURING EACH PHASE OF THE PROJECT

8.4.1 Environmental Management During Construction Phase

During the construction phase, environmental management will focus on the civil works associated with the new 95'×27' extension and preparation of the IONBOURNE staging area, over an anticipated duration of approximately six months. Dust generation from excavation, concrete mixing, and material handling will be controlled through regular water sprinkling of exposed soil and unpaved haul routes, covering of sand, cement, and aggregate stockpiles, and use of covered trucks for transport of loose material to and from the site. Noise from construction equipment, including excavators, cranes, and concrete pumps, will be managed by restricting high-noise activities to normal working hours, ensuring equipment is properly maintained and fitted with functional silencers, and providing hearing protection to workers operating in close proximity to noisy machinery. The clearance of the existing green lawn area required for the new extension will be offset through the plantation programme described elsewhere in this EIA, with replacement plantation carried out at a ratio and within a timeframe to be agreed with EPA Punjab. Construction debris, including wood, metal, and concrete off-cuts, will be segregated at source and disposed of through licensed waste handlers, with scrap metal and reusable materials salvaged for resale wherever feasible.

Stormwater runoff during the monsoon season will be managed through temporary silt fencing and diversion drains around excavated areas to prevent sediment-laden water from leaving the site boundary. Increased heavy vehicle movement associated with delivery of cement, steel, and equipment will be scheduled to avoid peak traffic hours on the surrounding road network, and a designated traffic marshal will be deployed at the site entrance during major deliveries. The EHS Manager will conduct weekly site inspections during the construction phase to verify implementation of these measures and will maintain a construction-phase inspection log available for EPA Punjab review.

8.4.2 Environmental Management During Installation and Commissioning Phase

The installation and commissioning phase will focus on the safe integration of the IONBOURNE system and associated utilities, and management measures will be directed principally at the elevated handling risk associated with this activity. Nicotine handling and spill risk during system commissioning will be managed through the presence of trained personnel at all stages of system charging and testing, availability of spill-response kits at fixed locations near the commissioning area, and a documented spill-response procedure rehearsed prior to first charge of the system. Fugitive dust arising during powder pre-loading of the system will be controlled by conducting pre-loading activities with local exhaust ventilation and dust extraction operating, and by restricting pre-loading to designated, contained areas of the facility. Noise and vibration from heavy lifting operations associated with equipment placement will be managed through the use of certified lifting equipment, exclusion of non-essential personnel from the lifting zone, and scheduling of major lifts during hours agreed with facility management to minimise disruption. Temporary inefficiency in dust control systems, which may occur while the IONBOURNE system is being calibrated and is not yet operating at full containment efficiency, will be managed by limiting production trial runs to short, supervised durations and by verifying containment performance through interim monitoring before the system is cleared for continuous operation. Utility testing of electrical and pneumatic lines will be carried out under a documented commissioning checklist, with lock-out/tag-out procedures applied to isolate

energised or pressurised systems from personnel not directly involved in testing. The risk of human error during calibration and adoption of new SOPs will be addressed through structured, competency-based training of operators prior to hand-over of the system from the installation contractor to production staff, with a formal sign-off required before the system is transferred to routine operational control.

8.4.3 Environmental Management During Operational Phase

During the operational phase, which represents the long-term, steady-state condition of the facility over the design life of the new equipment, environmental management will be embedded into routine production and maintenance activities. Air emissions from powder handling and mixing operations, identified as the single significant risk in the screening matrix, will be managed through continuous operation and preventive maintenance of the dust extraction and filtration system, with differential pressure across filters monitored to detect early signs of filter loading or failure, and ambient particulate monitoring conducted at the facility boundary at the frequency specified in Table 8-2. The integrity of the IONBOURNE system and its dust containment performance will be verified through a scheduled preventive maintenance programme, including inspection of seals, ducting, and containment enclosures, with any breach or containment failure treated as a reportable incident requiring immediate corrective action. Hazardous waste handling and storage, particularly nicotine-contaminated materials, will be managed through use of dedicated, labelled, and secured storage areas pending collection, adherence to maximum on-site storage durations, and maintenance of a waste tracking register cross-referenced against manifests issued by A.T Waste Management. Effluent generated by the facility will be monitored for compliance with NEQS/PEQS parameters prior to discharge or handover to the treatment vendor, with the vendor's compliance independently verified through periodic third-party audit and annual testing of treated effluent and vermicompost end-product for residual nicotine content, in line with the contractual threshold of less than 0.1 ppm referenced in Chapter 7. Occupational health and safety risks arising from chemical and mechanical hazards will be managed through mandatory use of prescribed PPE, provision

of material safety data sheets (MSDS) for all chemicals listed in the chemical inventory, periodic medical surveillance of workers with nicotine exposure potential, and regular safety drills. Noise emissions from machinery will be controlled through routine equipment maintenance, acoustic enclosures where practicable, and provision of hearing protection in designated high-noise zones, supported by periodic workplace noise monitoring. Odour generation from flavour blends (SF-series) will be managed through containment of blending operations and adequate ventilation, with odour complaints, if any, logged and investigated through the grievance mechanism. Equipment failure and associated process downtime will be minimised through a preventive maintenance schedule and availability of critical spares, with any failure event assessed for environmental consequence and recorded in the incident log maintained by the EHS Manager.

8.4.4 Environmental Management During Decommissioning and End-of-Life Phase

Although the project is not anticipated to undergo decommissioning within the planning horizon considered in this EIA, given that the new extension and equipment are intended to remain in productive use over their full design life, provision has been made for environmental management of an eventual decommissioning or end-of-life scenario. Should decommissioning occur, equipment removal and disposal will be carried out in accordance with the waste management hierarchy applicable at that time, with functional equipment prioritised for resale or reuse and non-functional components disposed of through licensed scrap and hazardous waste handlers as appropriate. Any structural modification or partial demolition of buildings will be preceded by a pre-demolition environmental assessment to identify materials requiring special handling, with demolition waste managed to maximise recycling and minimise landfill disposal. Soil and any residual compost material will be tested to confirm the absence of nicotine or other contamination above acceptable limits prior to site clearance or repurposing, consistent with the annual vermicompost testing regime already established during the operational phase. Tanks and utilities no longer required will be safely isolated, purged, and decommissioned in accordance with recognised industry practice to prevent residual contamination, and any

reconfiguration of the landscape following decommissioning will incorporate reinstatement of green cover to the extent practicable, consistent with the sustainability commitments described in Chapter 5.

Table 8-2:Environmental Monitoring Programme

Parameter	Location	Frequency	Applicable Standard	Responsibility
Ambient air quality (PM10, PM2.5)	Facility boundary / IONBOURNE area	Quarterly	NEQS / PEQS ambient air standards	Third-party accredited laboratory, coordinated by EHS Manager
Stack / process emissions (dust extraction outlet)	Dust extraction and filtration system outlet	Quarterly	NEQS / PEQS emission standards	Third-party accredited laboratory, coordinated by EHS Manager
Industrial effluent quality	Pre-discharge / pre-handover point	Quarterly	NEQS / PEQS effluent standards	Third-party accredited laboratory, coordinated by EHS Manager
Noise levels	Facility boundary and identified high-noise work areas	Quarterly	NEQS / PEQS noise standards	EHS Manager
Treatment-output quality / residual nicotine where required, where required by approval/vendor acceptance criteria	A.T Waste Management treatment output / vendor records	Annually	Applicable documented vendor/regulatory acceptance criterion, if any	A.T Waste Management, audited by EHS Manager
IONBOURNE system containment integrity	System seals, ducting, enclosures	Monthly inspection	Internal SOP	Maintenance / EHS Manager
Occupational health surveillance (nicotine-exposed workers)	Occupational health clinic	Annually	Occupational health guidelines	EHS Manager / occupational physician
Hazardous waste manifest reconciliation	Waste storage area	Monthly	Hazardous Substances Rules	EHS Manager

Monitoring results shall be compiled by the EHS Manager into a periodic compliance report, benchmarked against the relevant NEQS/PEQS limits, and submitted to EPA Punjab in accordance with the reporting schedule specified in the EIA approval. Any exceedance shall

trigger an internal investigation, identification of root cause, and implementation of corrective action, with the outcome documented and reported to EPA Punjab within the timeframe prescribed by the approval conditions.

Table 8-3: Environmental Management Plan (Construction Phase)

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility of Implementation	Responsibility of Monitoring
1	Dust generation (PM_{10}/$PM_{2.5}$) from excavation, concrete mixing, material handling	Regular water sprinkling of exposed soil and haul routes; covering of sand/cement/aggregate stockpiles; use of covered trucks for loose material	Construction Contractor	EHS Manager
2	Noise from construction equipment (excavator, crane, concrete pump, trucks)	Restriction of high-noise activities to normal working hours; regular equipment maintenance and functional silencers; hearing protection for nearby workers	Construction Contractor	EHS Manager
3	Clearance of green lawn area for new extension	Offset plantation at agreed ratio and timeframe within the facility premises	Project Proponent / Construction Contractor	EHS Manager
4	Generation of construction debris (wood, metal, concrete off-cuts)	Segregation of debris at source; disposal through licensed waste handlers; salvage of scrap metal and reusable material	Construction Contractor	EHS Manager
5	Stormwater runoff with sediments during monsoon season	Temporary silt fencing and diversion drains around excavated areas	Construction Contractor	EHS Manager
6	Increased heavy vehicle movement (cement, steel, equipment deliveries)	Scheduling of deliveries outside peak traffic hours; designated traffic marshal at site entrance	Construction Contractor	EHS Manager

Table 8-4: Environmental Management Plan (Installation Phase)

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility of Implementation	Responsibility of Monitoring
7	Nicotine handling and spill risk during	Trained personnel present during charging/testing; spill-	Installation Contractor / EHS Manager	EHS Manager

	IONBOURNE system commissioning	response kits at fixed locations; rehearsed spill-response procedure		
8	Fugitive dust during powder pre-loading of the system	Pre-loading conducted with local exhaust ventilation and dust extraction operating; restriction to designated contained areas	Installation Contractor	EHS Manager
9	Noise and vibration from heavy lifting operations	Use of certified lifting equipment; exclusion of non-essential personnel from lifting zone; scheduled lift timings	Installation Contractor	EHS Manager
10	Temporary inefficiency in dust control systems during calibration	Short, supervised production trial runs; interim monitoring before clearance for continuous operation	EHS Manager / Production Supervisor	EHS Manager
11	Utility testing (electrical/pneumatic lines)	Documented commissioning checklist; lock-out/tag-out procedures for isolated systems	Installation Contractor	EHS Manager

12	Human error during calibration and SOP adoption	Structured, competency-based operator training prior to hand-over; formal sign-off before transfer to operational control	Installation Contractor / EHS Manager	EHS Manager

Table 8-5: Environmental Management Plan (Operational Phase)

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility of Implementation	Responsibility of Monitoring
13	Air emissions from powder handling and mixing operations	Continuous operation and preventive maintenance of dust extraction/filtration system; differential pressure monitoring across filters; ambient particulate monitoring at facility boundary	Production Supervisor / EHS Manager	EHS Manager / Third-Party Laboratory
14	IONBOURNE system integrity and dust containment failures	Scheduled preventive maintenance of seals, ducting, and enclosures; containment breach treated as reportable incident	Maintenance Department	EHS Manager
15	Hazardous waste handling and storage (nicotine-contaminated materials)	Dedicated, labelled, secured storage; maximum on-site storage duration; waste tracking register cross-referenced against A.T Waste Management manifests	EHS Manager	EHS Manager / EPA Punjab
16	Effluent and treatment compliance with A.T Waste Management vendor	Pre-discharge/pre-handover effluent monitoring; periodic third-party vendor audit; annual testing of treated effluent and vermicompost for residual nicotine against the applicable documented criterion, if required	EHS Manager	Third-Party Laboratory / EHS Manager
17	Occupational health and safety (chemical and	Mandatory PPE; MSDS availability for all listed chemicals; periodic medical	Production Supervisor / EHS Manager	EHS Manager

	mechanical hazards)	surveillance of nicotine-exposed workers; regular safety drills		
18	Noise emissions from machinery	Routine equipment maintenance; acoustic enclosures where practicable; hearing protection in high-noise zones; periodic noise monitoring	Maintenance Department	EHS Manager / Third-Party Laboratory
19	Odour generation from flavour blends (SF-series)	Containment of blending operations; adequate ventilation; complaint logging and investigation through grievance mechanism	Production Supervisor	EHS Manager
20	Equipment failure and process downtime	Preventive maintenance schedule; availability of critical spares; incident logging and environmental consequence assessment	Maintenance Department	EHS Manager

Table 8-6: Environmental Management Plan ((Decommissioning and End-of-Life Phase — future scenario only))

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility of Implementation	Responsibility of Monitoring
21	Equipment decommissioning and disposal	Functional equipment prioritised for resale/reuse; non-functional components disposed of through licensed scrap/hazardous waste handlers	Project Proponent	EHS Manager
22	Structural modification or building demolition	Pre-demolition environmental assessment; maximisation of recycling of demolition waste	Demolition Contractor	EHS Manager
23	Soil and compost quality assurance (indirect long-term impact)	Testing for relevant contaminants where indicated by the site history, incident records, regulatory requirements or decommissioning assessment	EHS Manager	Third-Party Laboratory
24	Tank and utility abandonment	Safe isolation, purging, and decommissioning in accordance with	Project Proponent / Contractor	EHS Manager

		recognised industry practice		
25	Landscape reconfiguration	Reinstatement of green cover to the extent practicable	Project Proponent	EHS Manager

8.5 ENVIRONMENTAL MONITORING PROGRAM

The Environmental Monitoring Program constitutes the verification arm of this EMMP, providing objective, measurable evidence of environmental performance against the mitigation commitments set out in table above. The programme has been designed around the specific risk profile of the PTC nicotine pouch (VELO / Modern Oral) manufacturing expansion at Kala Gujran, District Jhelum, with particular emphasis on parameters relevant to powder handling, nicotine exposure, and the performance of the IONBOURNE containment system, in addition to the conventional ambient air, effluent, and noise parameters required under NEQS/PEQS.

Monitoring will be conducted through a combination of internal, routine checks carried out by facility staff (e.g., visual inspection of containment integrity, filter differential pressure readings, housekeeping audits) and independent third-party monitoring carried out by an EPA-recognised or accredited laboratory for parameters that require calibrated instrumentation and formal reporting against regulatory standards. All monitoring data will be logged in a centralised environmental monitoring register maintained by the EHS Manager, trended over time to identify adverse patterns before they result in non-compliance, and compiled into periodic compliance reports for submission to EPA Punjab in accordance with the reporting schedule specified in the EIA approval. Where monitoring results approach or exceed the applicable standard, the matter will be escalated immediately under the non-conformance and corrective action procedure described in Section 8.1, rather than awaiting the next scheduled reporting cycle.

8.6 ENVIRONMENT MANAGEMENT TEAM

Implementation of this EMMP will be carried out by a dedicated Environment Management Team, established by the Project Proponent and operating under the overall sustainability

function of Pakistan Tobacco Company Limited (PTC). The team will be headed by the EHS Manager, who will report directly to the Manager Sustainability (or equivalent senior management position) for matters of environmental compliance, and will be supported by an Environmental Officer, a Safety Officer, and a Waste Management Coordinator, each assigned specific functional responsibilities as summarised in Table 8-3.

Table 8-7:Composition of the Environment Management Team

Position	Reporting Line	Key Function
Manager Sustainability	Reports to Manager Sustainability	Overall coordination of EMMP implementation, monitoring, and EPA liaison
Environmental Officer	Reports to EHS Manager	Day-to-day environmental monitoring, record-keeping, and coordination with third-party laboratories
Safety Officer	Reports to EHS Manager	Occupational health and safety, PPE compliance, incident investigation
Waste Management Coordinator	Reports to EHS Manager	Hazardous and non-hazardous waste tracking, liaison and audit of A.T Waste Management
Production/Site Supervisors (all shifts)	Reports to EHS Manager for environmental matters	Enforcement of SOPs and mitigation measures at the work-area level

The Environment Management Team will meet on a monthly basis to review monitoring results, incident reports, and outstanding corrective actions, with minutes of these meetings retained as part of the compliance record available for EPA Punjab inspection.

8.7 MONITORING PARAMETERS AND FREQUENCY

Table 8-8:Environmental Monitoring Plan

Sr. No.	Parameter	Monitoring Location	Applicable Standard	Frequency	Responsibility
1	Ambient air quality (PM_{10}, $PM_{2.5}$, SO_2, NO_x)	Facility boundary (upwind/downwind)	NEQS / PEQS Ambient Air Quality Standards	Quarterly	Third-Party Laboratory / EHS Manager
2	Process/stack emissions (dust extraction outlet)	Dust extraction and filtration system outlet	NEQS / PEQS Emission Standards	Quarterly	Third-Party Laboratory / EHS Manager
3	Industrial effluent quality	Pre-discharge / pre-handover point	NEQS / PEQS Effluent Standards	Quarterly	Third-Party Laboratory / EHS Manager

4	Noise levels	Facility boundary and identified high-noise work areas	NEQS / PEQS Noise Standards	Quarterly	EHS Manager
5	Treatment-output quality / residual nicotine where required, where required by approval/vendor acceptance criteria	A.T Waste Management treatment output / vendor records	Vendor contractual limit (< 0.1 ppm)	Annually	A.T Waste Management, audited by EHS Manager
6	IONBOURNE system containment integrity (seals, ducting, enclosures)	System components	Internal SOP / Manufacturer specification	Monthly	Maintenance Department / EHS Manager
7	Filter differential pressure (dust extraction system)	Dust extraction and filtration units	Manufacturer specification	Weekly	Maintenance Department
8	Occupational health surveillance of nicotine-exposed workers	Occupational health clinic	Occupational health guidelines	Annually	EHS Manager / Occupational Physician
9	Hazardous waste manifest reconciliation	Hazardous waste storage area	Hazardous Substances Rules	Monthly	EHS Manager / Waste Management Coordinator
10	Workplace air quality (nicotine dust exposure) in powder handling areas	IONBOURNE staging and blending areas	Occupational exposure limits	Semi-annually	Third-Party Laboratory / Safety Officer
11	Fire and safety equipment functional check	Fire suppression, alarm, and detection systems	Regulatory compliance / manufacturer specification	Monthly	Safety Officer

8.8 ENVIRONMENTAL POLICY

Pakistan Tobacco Company Limited (PTC) is committed to conducting its manufacturing operations at the Kala Gujran facility in a manner that protects the environment, safeguards the health and safety of its employees and the surrounding community, and complies fully

with applicable Pakistani environmental legislation, including the Pakistan Environmental Protection Act, 1997, and the rules and regulations issued thereunder. In furtherance of this commitment, PTC undertakes to: implement and continually improve the mitigation and monitoring measures set out in this EMMP; allocate adequate financial and human resources for environmental management; ensure compliance with NEQS/PEQS and all conditions attached to its environmental approvals; minimise waste generation and manage unavoidable waste, including nicotine-contaminated materials, responsibly through licensed vendors; provide appropriate training to all employees and contractors on environmental and occupational safety requirements; engage transparently with EPA Punjab and the surrounding community, including through the grievance redressal mechanism described in this EIA; and periodically review this policy and the EMMP to reflect changes in operations, regulatory requirements, or lessons learned from monitoring and incident investigation. This policy shall be displayed at the facility, communicated to all employees and relevant contractors, and endorsed by senior management as evidence of the company's commitment at the highest level.

8.9 TRAINING NEEDS

Training needs for the project have been identified on the basis of the impacts and hazards screened in Chapter 7 and the mitigation measures described in this chapter, with particular attention to the elevated risk associated with nicotine handling and the IONBOURNE system. Priority training needs include: safe handling of nicotine and nicotine-containing powders, including spill response; correct selection, use, and maintenance of personal protective equipment; SOPs for operation and calibration of the IONBOURNE system; hazardous waste segregation, labelling, and handover procedures consistent with the A.T Waste Management vendor agreement; general environmental awareness, including the objectives of this EMMP and individual roles within it; occupational health and safety, including machine guarding and manual handling; and emergency response, including fire, spill, and medical emergency procedures. Training needs will be reassessed annually by the

EHS Manager, and following any incident, near-miss, or process modification, to ensure the training programme remains aligned with actual operating conditions.

8.10 TRAINING SCHEDULES

Table 8-9:Training Schedules

Training Module	Target Audience	Frequency	Duration	Responsible Personnel
Nicotine Handling and Spill Response	Production staff, IONBOURNE operators	Bi-annually	2 hours	Safety Officer
Personal Protective Equipment (PPE) Use and Maintenance	All facility staff and contractors	Annually (and at induction)	1 hour	Safety Officer
IONBOURNE System Operating and Calibration SOPs	System operators, maintenance staff	Annually (and on system modification)	4 hours	EHS Manager / Equipment Vendor
Hazardous Waste Handling and Segregation	Waste handling staff, Waste Management Coordinator	Bi-annually	2 hours	Waste Management Coordinator
General Environmental Awareness and EMMP Orientation	All new employees and contractors	At induction; refresher annually	1 hour	Environmental Officer
Occupational Health and Safety (machine guarding, manual handling)	Production and maintenance staff	Annually	2 hours	Safety Officer
Fire Safety and Emergency Response	All facility staff	Bi-annually, with mock drills	2 hours (plus drill)	Safety Officer / Fire Warden
First Aid and Medical Emergency Response	Designated first-aiders per shift	Annually	4 hours	Safety Officer / Occupational Physician

8.11 EMERGENCY RESPONSE & DISASTER MANAGEMENT PLAN

The facility will maintain a documented Emergency Response and Disaster Management Plan addressing the specific hazard scenarios relevant to the expanded manufacturing operation, including nicotine spills, fire, chemical exposure, equipment-related incidents, and natural hazards such as earthquake or flooding. The plan is built around a clear chain of

command, with the EHS Manager or designated Emergency Coordinator responsible for activating the response, directing evacuation if required, and liaising with external emergency services, including the Fire Brigade, Rescue 1122, and, where applicable, EPA Punjab.

For fire emergencies, the response will follow raising of the alarm, activation of fire suppression systems described in Chapter 5, orderly evacuation to designated assembly points via marked emergency egress routes, and a headcount against the shift attendance register before all-clear is given. For nicotine or chemical spills, response personnel trained under Section 8.12 will contain the spill using dedicated spill kits, restrict access to the affected area, and coordinate safe clean-up and disposal of contaminated material through the established hazardous waste procedure, with exposed personnel referred for medical evaluation as a precaution. For IONBOURNE system-related incidents, including containment failure, the system will be shut down under the documented lock-out procedure pending investigation and repair. In the event of natural disasters such as earthquake or flash flooding, the plan provides for immediate cessation of hazardous operations, structural safety assessment before re-entry, and protection of nicotine and chemical storage areas from water ingress. The plan will be supported by a facility emergency contact list (internal responders, Fire Brigade, Rescue 1122, nearest hospital, EPA Punjab), clearly displayed at key locations, and tested through mock drills conducted in conjunction with the training schedule at Section 8.12. Lessons learned from drills and actual emergencies will be incorporated into subsequent revisions of the plan.

8.12 ENVIRONMENTAL BUDGET

An indicative annual environmental budget has been developed to support implementation of this EMMP, presented in consolidated form to reflect the principal environmental management functions rather than individual line items. The Project Proponent shall review and adjust this budget periodically to reflect actual monitoring costs, vendor contract terms, and any additional measures identified through the corrective action process.

Table 8-10:Indicative Annual Environmental Management Budget

Sr. No.	Budget Head	Estimated Annual Cost (PKR)
1	Environmental Monitoring (ambient air, emissions, effluent, noise — third-party laboratory)	1,800,000
2	Waste Management (A.T Waste Management vendor contract, including hazardous/nicotine waste)	3,500,000
3	Personal Protective Equipment and Occupational Health Surveillance	1,200,000
4	Training and Capacity Building	600,000
5	Environment Management Team (salaries and administrative overhead)	4,500,000
6	Emergency Response Equipment, Maintenance, and Mock Drills	800,000
7	IONBOURNE System Preventive Maintenance (containment-related)	1,000,000
8	Contingency / Miscellaneous	600,000
	Total	14,000,000

8.13 OCCUPATIONAL HEALTH AND SAFETY PLAN

The Occupational Health and Safety (OHS) Plan for the facility addresses the specific hazards associated with nicotine pouch manufacturing, powder handling, and the operation of the IONBOURNE system, in addition to conventional industrial hazards such as machinery, electrical systems, and manual handling. The plan is implemented through the Safety Officer under the overall supervision of the EHS Manager and comprises hazard identification and risk assessment prior to any new activity or process change, provision and enforcement of appropriate personal protective equipment, medical surveillance of workers exposed to nicotine, incident and near-miss reporting and investigation, and periodic internal safety audits. All contractors working on-site, including during construction and installation, are required to comply with the same OHS standards as PTC employees, with compliance verified by the Safety Officer prior to and during the course of their work.

Table 8-11:Personal Protective Equipment

Sr. No.	Work Area / Activity	Primary Hazard	PPE Required

1	IONBOURNE system operation / powder handling	Nicotine dust inhalation and skin contact	Respirator (P2/N95 or higher), nitrile gloves, coveralls, safety goggles
2	Nicotine spill response	Direct nicotine exposure	Chemical-resistant suit, chemical-resistant gloves, full-face respirator, safety boots
3	Production/blending floor (general)	Dust, noise	Dust mask, ear plugs/muffs, safety shoes
4	Maintenance and mechanical work	Moving machinery parts, sharp edges	Safety helmet, gloves, safety shoes, eye protection
5	Electrical maintenance	Electric shock	Insulated gloves, safety footwear, arc-rated clothing (as applicable)
6	Material handling and warehousing	Manual handling injury, falling objects	Safety helmet, gloves, safety shoes
7	Construction and civil works	Dust, falling objects, noise	Safety helmet, high-visibility vest, dust mask, ear protection, safety shoes
8	Fire-fighting response	Heat, smoke inhalation	Fire-retardant suit, self-contained breathing apparatus (SCBA), safety helmet
9	Wastewater/effluent handling	Chemical exposure	Chemical-resistant gloves, apron, safety goggles, safety boots

PPE will be provided free of cost to all employees and relevant contractors, replaced in accordance with manufacturer-recommended service life or immediately upon damage, and its correct use enforced by shift supervisors as part of routine floor supervision.

CHAPTER # 9. STAKEHOLDER CONSULTATION

Stakeholder consultation is a key component of the Environmental Impact Assessment (EIA) process and plays a vital role in ensuring environmentally sustainable and socially responsible project development. For the proposed project, stakeholder consultation was conducted to engage relevant stakeholders, including local communities, workers, nearby businesses, and concerned authorities. The process aimed to share information about the project, identify potential environmental and social concerns, and incorporate stakeholder feedback into project planning and mitigation measures. This consultative approach supports transparency, informed decision-making, and compliance with national environmental regulations as well as international best practices, thereby enhancing the overall acceptability and sustainability of the project.

9.1 OBJECTIVES OF STAKEHOLDER CONSULTATION

In 1992, the United Nations Conference on the Environment and Development (UNCED) supported the idea of involving the public in decision-making, and this was outlined in one of the key documents of the conference called Agenda 21.

Agenda 21 is a comprehensive plan for global actions focused on sustainable development and deals with how people interact with the environment. It highlights the importance of including the public in making decisions about the environment to achieve sustainable development.

In line with the principles of Agenda 21 and national environmental regulations, stakeholder consultation for the proposed project was undertaken with the following objectives:

- To inform stakeholders about the nature, scope, and potential environmental and social impacts of the proposed project
- To identify concerns, expectations, and perceptions of affected communities and relevant stakeholders at an early stage

–To incorporate stakeholder feedback into project planning, design, and mitigation measures where feasible

–To promote transparency, trust, and accountability between the project proponent and local communities

–To ensure compliance with environmental legislation and international best practices related to public participation

–To reduce potential conflicts by fostering mutual understanding and cooperation

–To enhance the project's environmental and social sustainability through inclusive decision-making



Figure 9-1: Stakeholder Management

By achieving these objectives, stakeholder consultation contributes to the overall success and sustainability of the project, enhancing its social, environmental, and economic outcomes while fostering positive relationships with the communities it impacts.

9.2 METHODOLOGY

- Meetings were held with key representatives of PTC management and government regulatory authorities.
- Structured interviews were used to collect specific concerns and suggestions from stakeholders.
- All comments, concerns, and suggestions were recorded and analyzed to inform project planning and mitigation strategies.

9.3 THE RESPONSIBLE AUTHORITY

Table 9-1: Stakeholders and Their Roles and Responsibilities

Stakeholders	Roles
Proponent/Responsible Authority	Engaged in discussions regarding the project's design, proposed mitigation measures, and alternative options to minimize environmental, social, and operational disparities. The proponent conducted site surveys to collect environmental and social data, assessed perspectives of nearby industrial employees, and evaluated potential socio-economic and environmental impacts of the project.

9.4 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

The team carried out systematic site visits to assess existing environmental conditions, including soil, water, air quality, vegetation, and fauna. They also evaluated the land use, infrastructure, and surrounding industrial activities to understand the operational context of the project.

In addition, the experts conducted structured consultations with key stakeholders, including the proponent, government authorities, and employees of nearby industrial units, to gather information on perceived environmental, social, and occupational concerns. These consultations helped in identifying potential risks, opportunities for mitigation, and strategies to minimize adverse impacts during both the construction and operational phases.

The findings from the field surveys and stakeholder consultations were analyzed and integrated into the EMP, ensuring that the project design incorporates effective measures to protect the environment, safeguard worker health and safety, and comply with PEQS regulations.







Figure 9-2: Pictorial Evidence of Stakeholder Consultation

9.5 Grievance Redress Mechanism

The Grievance Redress Mechanism (GRM) is an essential component of the project's EIA. It provides a formal, transparent, and accessible process for addressing complaints, concerns, or suggestions from stakeholders, including local communities, workers, contractors, and other interested parties. The GRM ensures that any issues arising during the construction or operational phases of the project are identified, recorded, and resolved in a timely and effective manner.

9.6 KEY FEATURES OF GRM

- Stakeholders can submit grievances through multiple channels, including in-person at the project office, email, telephone, or suggestion boxes placed within the facility.
- All grievances are recorded in a grievance register, including details of the complainant, nature of the grievance, and date of submission.
- Each grievance is acknowledged within a predefined time frame (e.g., 5 working days) to inform the complainant that their concern has been received.
- Grievances are investigated promptly by the project management team, in coordination with relevant departments, and appropriate corrective measures are implemented.
- Stakeholders are informed of the resolution and any action taken. If the grievance requires further escalation, it can be referred to higher management or local authorities.
- The GRM process is monitored regularly, and periodic summaries of grievances and resolutions are included in project environmental and social monitoring reports.

9.7 OBJECTIVES OF GRIEVANCE REDRESS MECHANISM

The GRM is designed to ensure that all concerns, complaints, and suggestions from stakeholders related to the project are addressed in a timely, transparent, and effective manner. The main objectives of the GRM are:

- Provide a structured platform for stakeholders, including local communities, employees, contractors, and visitors, to voice grievances related to project activities.
- Ensure timely acknowledgment and resolution of complaints to minimize potential environmental, social, and operational impacts.
- Promote transparency and accountability in project management by maintaining proper records of all grievances and their outcomes.
- Strengthen stakeholder trust and engagement by demonstrating responsiveness to concerns and proactive problem-solving.
- Support compliance with national and international environmental, social, and occupational health standards, ensuring sustainable and responsible project implementation.

9.8 MECHANISM OF FILING COMPLAINT

To ensure that all stakeholders can easily and effectively submit grievances, the project has established multiple accessible channels for complaint submission. The mechanism is designed to be simple, transparent, and responsive to address issues in a timely manner.

Stakeholders may file complaints through the following channels:

- Written complaints submitted at the project site or administrative office
- Verbal complaints communicated directly to site management or designated grievance focal persons
- Telephone or mobile contact numbers displayed at prominent locations within the project site
- Email communication, where applicable, for documented submission and follow-up
- Suggestion or complaint register maintained at the project site for record-keeping

Upon receipt, each complaint will be formally recorded in a grievance log, including details of the complainant, the nature of the issue, and the date of submission. The complaint will

be reviewed by the designated Grievance Redress Committee (GRC), which will assess the issue and determine appropriate corrective actions.

9.9 Roles and Responsibilities

Table 9-2: Roles and Responsibilities

	Responsible for receiving, documenting, and tracking all grievances and ensuring their resolution within specified timelines.
	Evaluates grievances, coordinates with relevant departments, and ensures timely resolution.
	Provide clear information about the grievance and cooperate during the resolution process.

9.9.1 Grievance Resolution Procedure

The grievance resolution procedure has been established to ensure that all complaints received from stakeholders are addressed in a fair, transparent, and timely manner. The procedure follows a structured approach to promote effective communication and accountability throughout the grievance handling process.

- All grievances received through verbal, written, telephone, or electronic means will be formally recorded in the grievance register, noting the date, nature of the complaint, and contact details of the complainant (if provided).
- An acknowledgment of receipt will be communicated to the complainant within a specified timeframe, confirming that the grievance has been registered for review.
- The GRC will review the complaint to assess its nature, severity, and potential environmental or social implications, and determine the appropriate course of action.
- Where required, site inspections, consultations, or internal reviews will be conducted to investigate the issue and identify corrective or preventive measures.
- Based on the findings, appropriate corrective actions will be implemented in a timely manner to resolve the grievance and prevent recurrence.

- The outcome of the grievance, along with actions taken, will be communicated to the complainant through the appropriate channel.
- Follow-up will be carried out to verify the effectiveness of the resolution. Once the complainant confirms satisfaction or reasonable efforts have been made to resolve the issue, the grievance will be formally closed and documented.
- If a grievance remains unresolved, it may be escalated to higher management or relevant regulatory authorities for further review.



Figure 9-3: Grievance Redress Mechanism

CHAPTER # 10. CONCLUSION AND RECOMMENDATION

The EIA for the proposed project indicates that the project is environmentally and socially feasible. The project is located within an existing industrial facility and does not require new land acquisition. The proposed expansion is compatible with the established industrial use, subject to implementation of the mitigation measures and verification of site-specific environmental and receptor information. Available baseline information and monitoring records shall be interpreted against the applicable standards. Site-specific ecological, receptor and cultural-resource statements shall be supported by field verification and the relevant laboratory/site records included in the final submission package.

With the implementation of recommended mitigation measures during construction and operational phases, including dust and noise control, waste management, wastewater treatment, green belt development, and adherence to occupational health and safety standards, the project is expected to have minimal adverse environmental or social impacts.

10.1 Recommendations:

- Implement the Environmental Management Plan (EMP) fully, including monitoring of air, water, soil, noise, and occupational health parameters.
- Maintain the Grievance Redress Mechanism (GRM) to ensure timely resolution of stakeholder concerns and promote transparent communication.
- Develop green belts and landscaping within the facility to restore minor ecological functions and improve aesthetics.
- Ensure proper storage, handling, and disposal of industrial waste and chemicals to prevent contamination of soil and groundwater.
- Conduct regular environmental audits and reporting to ensure compliance with national regulations and continuous improvement in environmental performance.

- Provide training and awareness programs for all staff and contractors regarding environmental protection, health, and safety measures.
- Continuously review and update the EMP and GRM to address any emerging environmental or social issues during the project lifecycle.