Environmental Impact Assessment (EIA) Report for the Project "Manufacturing of Electric 2 & 3 Wheeler and Battery, at Plot No. 10-D, Quaid e Azam Business Park, Sheikhupura, Punjab, Pakistan"

JOLTA ELECTRIC

Jolta Electric Private Limited through its CEO
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PAK EPA GUIDELINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS, 1997

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List of Abbreviations / Acronyms

Abbreviation	Full Form
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Program
PEQS	Punjab Environmental Quality Standards issued by Government of Punjab via Punjab Environmental Protection Agency
NEQS	National Environmental Quality Standards defined under federal law
ETP/ETP	Effluent Treatment Plant
OWS	Oil Water Separator
HSE	Health, Safety & Environment
RCA	Root Cause Analysis
FGDs	Focused Group Discussions
KIIs	Key Informant Interviews
PIEDMC	Punjab Industrial Estates Development & Management Company (Estate & Utilities Stakeholder)
QABP	Quaid-e-Azam Business Park (Planned Industrial Estate)
LBDC	Lower Bari Doab Canal
UCC	Upper Chenab Canal
LESCO	Power utility stakeholder: Lahore Electric Supply Company
SNGPL	Gas utility stakeholder: Sui Northern Gas Pipelines Limited
WHO	World Health Organization
USEPA	United States Environmental Protection Agency reference methods
ISO	International Organization for Standardization
HVAC	Heating, Ventilation and Air Conditioning
VOC	Volatile Organic Compounds
TDS	Total Dissolved Solids
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
TSS	Total Suspended Solids
MSL	Mean Sea Level
SMP	Social Management Plan
SOPs	Standard Operating Procedures
PPE	Personal Protective Equipment
IBIS	Indus Basin Irrigation System
GIS	Geographic Information System tools typically including software comparable to ESRI GIS platforms

Executive Summary

1. Title and Location of Project

The proposed project, Manufacturing of Electric 2 & 3 Wheelers and Lithium Iron Phosphate ($LiFePO_4$) Batteries, will be established at Plot No. 10-D, Quaid-e-Azam Business Park, Sheikhupura, Punjab, Pakistan at coordinates 31°44′02.5″N, 74°04′32.0″E.

Fig E-1: Location map of the Project site

2. Name of the Proponent

The project proponent is Jolta Electric (Private) Limited, which will own and operate the proposed manufacturing and battery assembly facility.

The **project proponent** is the:

Dr. Mohammad Amjad (Chief Executive Officer)
Office No.1, 13th Floor, Askari Corporate Tower, Main Boulevard, Gulberg-III, Lahore.
92-300-8507407 / +92-334-7766057
dramjad1@live.com, mehta.bakhtawar@joltaelectric.com

3. Name of the Organization Preparing the Report

This EIA report has been prepared by an independent environmental consultancy firm employing qualified environmental engineers and assessment experts, following standard industrial EIA formats accepted by provincial regulators.

Table E-1: Details of Consultant

Name of Consultant	**Eco Sphere Management Consultant Private Limited.**
Address	95, Street 50 Sector G-13/2, Islamabad.
Tel:	+92-300-8577650
Cell:	+92-321-4521413
Email:	jamalesiaspecialist@gmail.com

4. Brief Outline of the Proposal

The facility involves manufacturing and assembly of high-performance electric mobility units and assembly of advanced lithium battery packs. Key products include: high-performance electric 2-wheelers (motorcycles & scooters), electric 3-wheelers (commercial rickshaws and last-mile delivery units), and $LiFePO_4$ lithium battery packs. The manufacturing process includes metal frame fabrication, welding, surface coating, paint booth operations, motor and electronic integration, battery assembly, pack balancing/charging, testing, warehousing and dispatch. The project adopts clean and cobalt-free battery chemistry, airtight negative-pressure paint booth technology supported by activated carbon-based VOC filtration, and localized welding fume ventilation systems. Land requirement is 4.97 acres (4.97 acres ≈ 20,121–20,121 m² / 4.97 m²) already allotted for industrial use within Quaid-e-Azam Business Park. The total project cost is PKR 1.187 Billion, with breakdown for land, construction, machinery, and raw materials. The facility will create permanent operational employment rising from 117 employees in Year-1 to 255 employees by Year-5, with foreign technical experts gradually decreasing from 12 → 3 as skills localize.

5. Major Impacts Identified

Screened impacts include temporary dust generation, localized noise, soil disturbance, construction debris, VOC and welding fume emissions (controlled), sanitary and minor process wastewater, solid and hazardous wastes (battery rejects, oils, e-waste), and increased industrial logistics movement. Ecological sensitivity is low, as the site is barren without sensitive habitats. Socio-economic impacts are majorly positive due to job creation, technology transfer, fossil-fuel displacement, import substitution, and EV adoption support.

6. Recommendations for Mitigation Measures

Recommended mitigation includes water sprinkling and covered transport for dust control, daytime scheduling and hearing PPE for noise exposure, paved bunded chemical/oil pads and spill trays with kits for soil protection, airtight negative-pressure paint booths with activated carbon VOC filters and fume ventilators for emissions, installation and commissioning of on-site Effluent Treatment Plant (ETP) before trial production, 100% waste segregation, labeling, manifests and recycling/disposal through licensed vendors, no direct soil or groundwater discharge, battery rejects handled only on impermeable floors, and greenbelt plantation after construction as compensatory and enhancement measure.

7. Proposed Monitoring Program

The monitoring program links directly to EMP performance outputs and includes monthly air/noise/dust inspections during construction, quarterly occupational noise surveys, annual groundwater sampling, quarterly ETP inlet/outlet testing (pH, BOD, COD, TSS, oil & grease), 75%+ recycling tracking for solid wastes, VOC filter efficiency validation ≥90% uptime, hazardous waste manifests maintained 100%, and soft/hard environmental registers archived for 5+ years, with reports formally signed and escalated to the Punjab EPA annually or within 24 hours if incident triggered.

8. Recommendations for Monitoring and EMP Implementation

EMP performance is recommended to be monitored continuously through comparative tables, with corrective action cycles triggered if any trend deviates ≥20% from baseline or filter efficiency falls below 90%.

The plot lies in an allowable industrial zone, not prohibited, not environmentally sensitive, and compatible to surroundings, confirming high site suitability with manageable reversible impacts once mitigation is deployed and monitored.

The project activity will be carried out in a designated industrial zone under the environmental legislative authority of the Punjab Environmental Protection Agency. The project plot lies on industrial allotment and does not fall under any prohibited or ecologically sensitive receptors. Baseline monitoring and multidisciplinary screening confirm that there are no major or significant irreversible impacts from the proposed project development. Therefore, environmental approval shall be granted in accordance with the consultation and approval provisions of the IEE/EIA Regulations 2022 and the Punjab Environmental Protection Act 1997 (Amended 2012).

It is hereby concluded that the project activity will be carried out in designated industrial zones, with no major significant environmental impacts from the proposed project development. Therefore, Environmental Approval/NOC shall be granted as per the IEE/EIA Regulations 2022 notified under the Ministry of Climate Change Pakistan, and the Punjab Environmental Protection Act 1997 (amended 2012).

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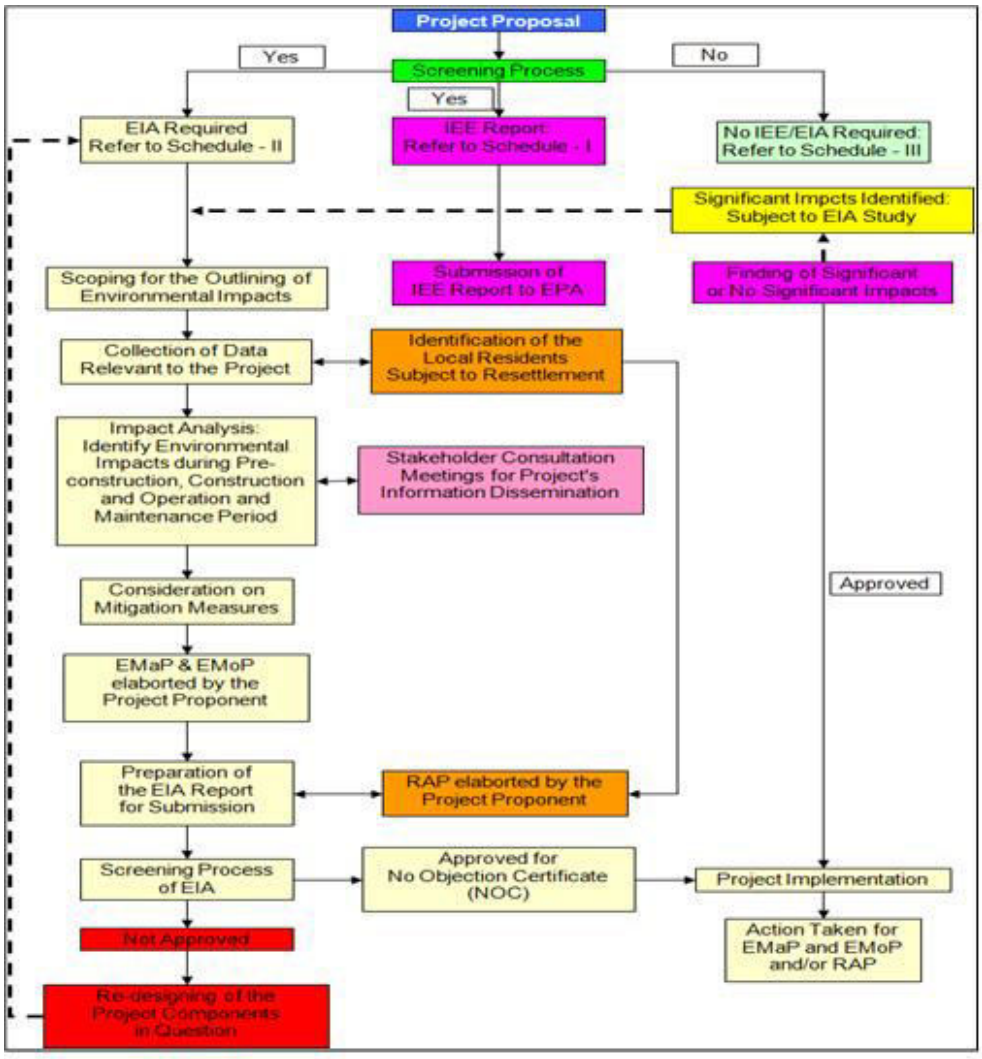
CHAPTER 0: SCREENING & SCOPING

0.1 Whether the Project Requires IEE or EIA as per Regulations

Screening is the stage which determines whether an EIA is necessary by establishing whether the potential impacts associated with the project are clearly so insignificant as to permit a categorical exclusion. If this is not the case the agency undertakes an environmental assessment, which in essence is an abridged EIA (not subject to the same levels of consultation and participations as a full EIA).

Figure 0.1: Methodology of EIA/IEE



The project is engaged with the establishment of ***Environmental Impact Assessment (EIA) Report of 2 & 3 Wheeler & Battery Manufacturing Plant by M/s Jolta Electric (Private) Limited, QABP, Sheikhupura.***. EPA Punjab has categorized the projects for EIA or IEE in "Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2022" in Schedule I and II. According to the Environmental Protection Agency, Government of the Punjab, Lahore- "List of Projects Requiring an IEE", and the project under consideration categories falls in the category of the projects requiring Environmental Impact Assessment (EIA). Screening of the proposed Electric Vehicle and battery manufacturing project was carried out to determine the level of environmental assessment required under national regulatory instruments. As per the Punjab

Environmental Protection Agency notified IEE/EIA Regulations 2022, manufacturing or assembly of electric 2-wheelers, 3-wheelers, and lithium battery systems falls under projects that have potential to generate industrial emissions, effluents, noise, solid scrap, and occupational health and safety risks. The project includes large-scale manufacturing infrastructure, paint booth operations, welding and fabrication units, hazardous material inventory, battery pack assembly and charging systems, and a 5-year operational footprint expansion trend. Due to the scale of capital investment (PKR 1.187 Billion), industrial production nature, and presence of controlled emission/effluent sources, the project qualifies under Schedule-II (EIA-requiring category) rather than Schedule-I. Therefore, a full Environmental Impact Assessment (EIA) study is required for this project. Since the project lies within a designated industrial estate, does not intersect sensitive or prohibited ecological receptors, and all stressor impacts remain localized and reversible once mitigation is applied, the activity remains eligible for approval processing under EIA submission requirements. Hence, this project requires EIA approval and issuance of Environmental NOC by the provincial environmental authority.

0.2 Scoping

The scoping exercise was undertaken to define the area of influence, duration of assessment, key stakeholder concerns, potential environmental stressors, and impact-determining factors for the proposed EV and $LiFePO_4$ battery manufacturing facility, ensuring that all relevant environmental and social receptors are considered in a structured, transparent, and technically defensible manner.

1. Spatial and Temporal Boundaries of Environmental Assessment

The spatial boundary of the Environmental Impact Assessment covers the project site (4.97 acres) and its 10-kilometer radius area of influence, the industrial landscape and estate planning area of Sheikhupura, and regional receptors linked with the Ravi River basin gradient. No environmentally prohibited or sensitive zones intersect the plot or immediate buffer. The project lies fully within the industrial zoning jurisdiction of Punjab, categorized under Schedule-II requiring full EIA review. The spatial boundary includes potential air, water, soil, and noise, ecological, occupational, and logistics-linked receptors.

The temporal boundary assesses:

- Construction phase impacts (6–10 months),
- Operational phase impacts (full 5-year progressive employment and production magnitude build-up), and
- Post-construction rehabilitation sustainability trend (5+ years).

Impact monitoring considers short-term reversible construction stressors and long-term controlled industrial operational stressors, including filter, ETP, and waste-management compliance uptime benchmarks over the project life cycle.

2. Important Issues and Concerns Raised During Consultation

Key public and institutional concerns were identified through stakeholder discussions at nearby villages and estate officials, without any displacement or cultural heritage objections. Concerns raised include temporary dust during construction, daytime restriction for high-noise activities, no open burning, safe handling and recycling of lithium battery rejects, waste segregation, traffic scheduling, protecting groundwater from spills through containment pads, factory effluent treatment prior to discharge, hearing PPE for workers, and inclusion of

female technicians and skill localization, reducing dependence on early-year foreign experts (12 → 3). These issues were recorded and formally embedded into EMP and monitoring KPIs for corrective action triggers, ensuring all stressor impacts remain localized, reversible, and manageable.

3. Significant Impacts and Factors to be Determined

The scoping exercise identified the following potentially significant impact factors requiring assessment and controls:

Factor to Be Determined	Rationale
Air emissions (PM, VOC, welding fumes)	Industrial fabrication and coating exhaust screening under PEQS/NEQS
Wastewater quality (ETP inlet/outlet)	Potential impact to industrial wastewater system if untreated
Groundwater quality trends	To verify no contamination relative to baseline
Occupational noise exposure	Assembly lines, compressors, testing bay safety
Solid and hazardous waste generation	Scrap, used oils, battery rejects, e-waste inventory and manifesting
Battery charging and fire safety risk	Thermal/electrical safety, sensor uptime, emergency shutdown
Traffic load on estate access corridors	Day-peak logistics, congestion avoidance
Plantation survival rates	Compensatory greenbelt and biodiversity enhancement commitments
Employment and skill localization trends	Social inclusion, training effectiveness, foreign-dependency reduction

All above factors will be evaluated in the detailed impact assessment phase to determine impact significance, PEQS/NEQS conformity, probability, risk rating, duration, extent, and magnitude, reversibility, and mitigation performance indicators.

The Screening and Scoping determine that the project requires a full EIA study**,** its impacts remain localized and reversible with controls**,** and all key environmental, safety, social-inclusion, and pollution-linked factors have been identified for detailed impact evaluation and mitigation design under regulatory review cycles.

CHAPTER 1: INTRODUCTION

1.1 Purpose of the report

Pakistan Environmental Protection Agency (PEPA) 1997 enforced EIA as a mandatory document for the mega projects that needed to be approved by the respective environmental protection agencies (EPAs). EIA is an organized procedure to evaluate environmental impacts to promote sustainability and the decision-making process of a proposed project (Ferreira et al., 2016; Kuitunen et al., 2008). An EIA is a model to categorize the socioeconomic and environmental impacts of a project and provides measures to reduce these impacts (Alamgir et al., 2017; Fitzpatrick & Sinclair, 2009).

The purpose of this Environmental Impact Assessment (EIA) report is to evaluate and document the potential environmental and socio-economic impacts associated with the proposed 2 & 3 Wheeler & Battery Manufacturing Plant by M/s Jolta Electric (Private) Limited at Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura, Punjab over an area of 4.97 Acres. This report is prepared in compliance with the legal requirements of the Pakistan Environmental Protection Act, 1997 (Amended 2012), and the Punjab Environmental Protection Agency (Punjab EPA) regulations and guidelines, specifically the IEE/EIA Regulations, 2022.

The primary objective of this EIA is to identify, predict, and evaluate the likely environmental impacts of the proposed operations during both construction and operational phases. The assessment aims to ensure that environmental considerations are integrated into the planning and decision-making process and that appropriate mitigation measures are designed to minimize adverse effects on the surrounding environment and communities.

This report also serves to:

- Provide a detailed description of the proposed project and its associated activities;
- Establish the existing baseline environmental and socio-economic conditions of the project area;
- Identify and assess the nature and magnitude of potential environmental impacts arising from the project;
- Propose practical and cost-effective mitigation and enhancement measures to avoid, reduce, or offset significant adverse impacts;
- Develop an Environmental Management and Monitoring Plan (EMMP) to ensure effective implementation of mitigation measures;
- Facilitate stakeholder engagement and ensure that concerns of the local community and relevant authorities are addressed.

Ultimately, the EIA report is intended to support the proponent in obtaining environmental approval from the Punjab EPA and to ensure sustainable and environmentally responsible resource extraction in the project area.

1.2 Identification of project and proponent

The proposed project involves the Manufacturing of 2 & 3 Wheeler & Battery aims to reduce Pakistan's reliance on fossil fuels and create a cleaner, greener future for the country through local manufacturing and innovation. Jolta Electric operates within the electric vehicle (EV) and energy storage industries, focusing on the manufacturing of electric vehicles and high-

performance batteries. The project is categorized in Schedule-II Section B, project under the Punjab Environmental Assessment Regulations, 2022**,** requiring a detailed Environmental Impact Assessment (EIA) prior to commencement.

The **project proponent** is the:

Dr. Mohammad Amjad (Chief Executive Officer)
Office No.1, 13th Floor, Askari Corporate Tower, Main Boulevard, Gulberg-III, Lahore.
92-300-8507407 / +92-334-7766057
dramjad1@live.com, mehta.bakhtawar@joltaelectric.com

This EIA has been prepared on behalf of the proponent to seek formal environmental approval from the Punjab Environmental Protection Agency (Punjab EPA)**,** ensuring the project is environmentally sustainable and socially acceptable.

1.3 Details of consultant

The services of Environmental Consultancy Company Eco Sphere Management Consultant Private Limited have been engaged to carry out an Environmental Impact Assessment of the proposed project.

Most of the specialists tapped by the consultants are experts in various fields, in addition to full-time staff that compiles the environmental reports and feasibility studies on the basis of input provided by specialists and professionals. The contact details of the consultant are as follow:

TABLE 1.1: DETAILS OF CONSULTANT

Name of Consultant	**Eco Sphere Management Consultant Private Limited.**
Address	95, Street 50 Sector G-13/2, Islamabad.
Tel:	+92-300-8577650
Cell:	+92-321-4521413
Email:	jamalesiaspecialist@gmail.com

The team shown in Table 1.2 overleaf collaborated during survey of the project site, discussions with the proponent and the stake-holders, collection and analysis of data, and preparation of this report. The core team was also assisted in the process by a number of experts available to the environmental consultants to provide technical input and information, and assembled a number of times for discussions to finalize the report.

Figure 1.1: Desktop Survey of the Project Area

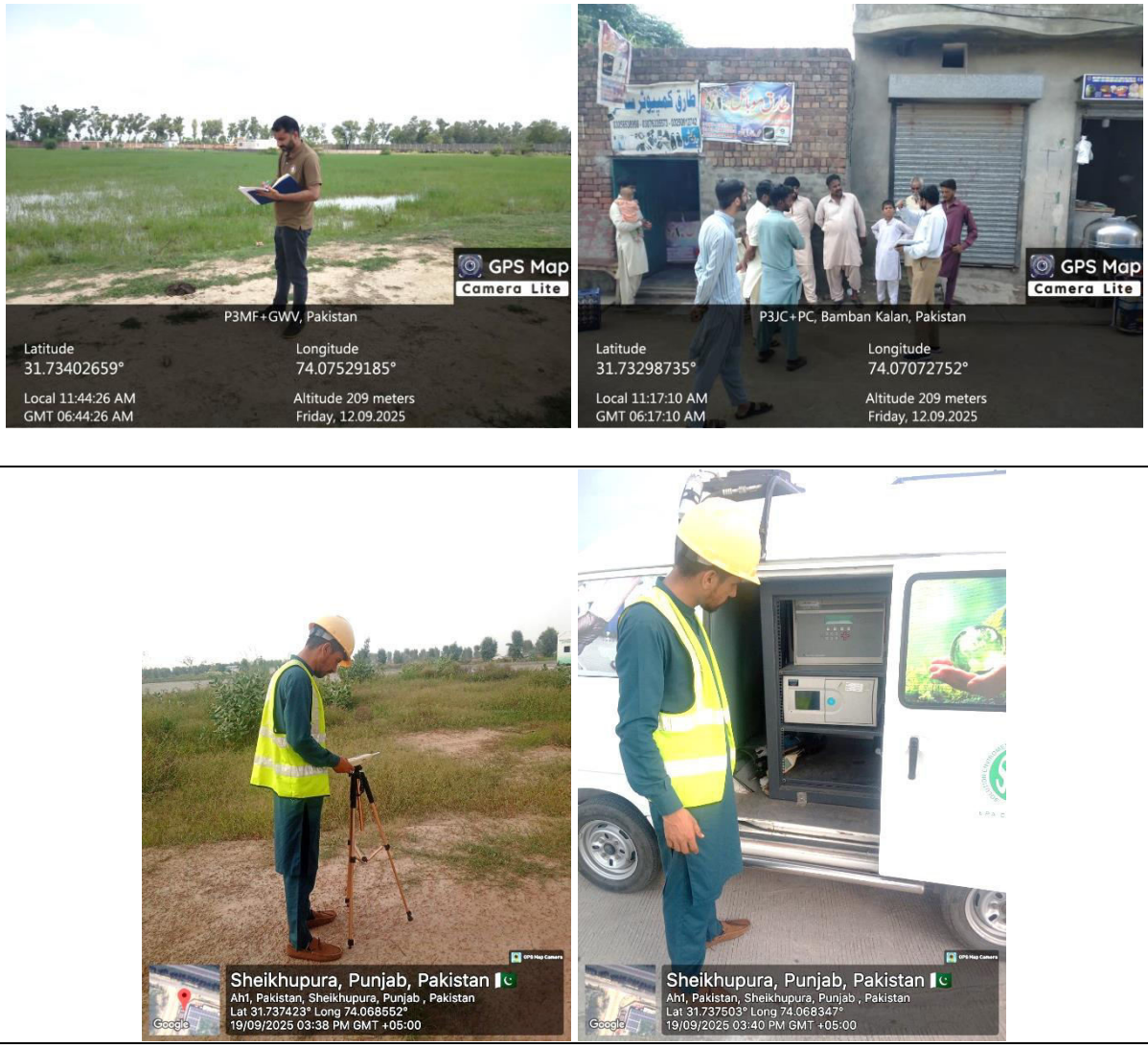


Table 1.2: Team of Experts

Name	**Designation**	**Qualification**
Jamal ud Din Qureshi	Team Leader	MS in Environmental Sciences
Zaigham Abbas	Environmentalist & Socio Economic Expert	MS in Environmental Sciences
Prof. Dr. Asad Ghufran	Ecologist	PhD in Plant Taxonomy
Sadia Sheikh	Social Expert	BS in Environmental Sciences

1.4 Brief Description of Nature, Size, and Location of Project

1.4.1 Nature of the Project

The proposed facility involves the manufacture and assembly of electric vehicles and associated battery systems**,** encompassing the following major production lines:

- **Electric 2-Wheelers:**
  High-performance electric motorcycles and scooters providing a sustainable, affordable, and zero-emission alternative to conventional gasoline-powered two-wheelers.
- **Electric 3-Wheelers:**
  Electric rickshaws and commercial cargo vehicles designed for urban commuting, local deliveries, and last-mile transportation with minimal environmental footprint.
- **Lithium-Ion Phosphate ($LiFePO_4$) Batteries:**
  Production and assembly of advanced, long-lasting, and eco-friendly batteries for use in electric vehicles and renewable energy storage systems.

The facility will include manufacturing, assembly, testing, storage, and administrative blocks, supported by necessary utilities such as a power supply system, water supply, wastewater management, and waste handling units.

1.4.2 Size of the project

The proposed Manufacturing Facility for 2 & 3 Wheelers and Battery (Lithium-Ion Phosphate ($LiFePO_4$) by M/s Jolta Electric (Private) Limited is a medium-to-large-scale industrial project based on both the land area and the planned production capacity. The total land area allocated for the project is approximately 4.97 acres (20,110 m^2)**,** situated within the Quaid-e-Azam Business Park (QABP), Sheikhupura, Punjab — a fully developed industrial estate equipped with infrastructure and utilities.

Physical Scale

The proposed facility will include the following major physical components:

- Manufacturing and Assembly Blocks for 2-wheelers and 3-wheelers
- Battery Manufacturing and Testing Unit ($LiFePO_4$ batteries)
- Warehousing and Storage Areas (for raw materials, finished goods, and packaging)
- Administrative and Office Building
- Utility Area (power room, compressor, maintenance section, etc.)
- Waste Management and ETP Area
- Parking and Internal Roads
- Green Belt and Landscaping (minimum 10–15% of total site area)

Production Capacity

The project will be established in phases, with an initial phase focusing on local assembly and gradual indigenization of components. The proposed annual production capacities are as follows:

Table 1.3 Proposed Annual Production Capacities

Product Category	Description	Estimated Annual Production Capacity
Electric 2-Wheelers	Motorcycles & Scooters	~30,000 units per year
Electric 3-Wheelers	Rickshaws & Commercial Vehicles	~10,000 units per year
$LiFePO_4$ Batteries	For EVs & Energy Storage	~20,000 battery packs per year

(Note: Production figures are indicative and may be adjusted during implementation based on market demand and technology upgrades.)

Investment Scale

The total capital investment in land, civil works, machinery, utilities, and infrastructure is estimated to be approximately PKR 1.8 billion approximately. This includes:

Land Cost:	PKR. 250,000,000
Construction Cost:	PKR. 255,000,000
Machinery Cost:	PKR. 105,000,000
Raw Material Cost:	PKR. 577,000,000

Employment Potential

The project is expected to create significant employment opportunities at various stages:

Phase	Employment Type	Estimated Jobs
Construction Phase	Skilled & unskilled labor, engineers, contractors	~150–200 persons
Operational Phase	Technical staff, engineers, administrative & support staff	~300–350 persons

1.4.3 Location of the Project

The proposed project site for the Manufacturing of 2 & 3 Wheelers and Lithium-Ion Phosphate ($LiFePO_4$) Batteries by M/s Jolta Electric (Private) Limited is located at Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura, Punjab. The site lies within the industrial estate developed and managed by the Punjab Industrial Estates Development and Management Company (PIEDMC), which provides planned infrastructure, utilities, and environmental management systems for sustainable industrial operations.

The central coordinates of the project site are approximately:

- **Latitude:** 31°44'02.5" N
- **Longitude:** 74°04'32.0" E

These coordinates place the site within the Sheikhupura District**,** along the Lahore–Islamabad Motorway (M-2) corridor — about 40 km northwest of Lahore city and 15 km from Sheikhupura city center**.**

FIGURE 1.2: LOCATION MAP OF MANUFACTURING UNIT OF 2 & 3 WHEELERS AND BATTERIES BY M/S JOLTA ELECTRIC (PRIVATE) LIMITED IS LOCATED AT PLOT NO. 10-D, QUAID-E-AZAM BUSINESS PARK (QABP), SHEIKHUPURA, PUNJAB.

1.5 Study Approach & Methodology

1.5.1 Study Approach

The study has been conducted in accordance with Review of IEE and EIA Regulations; 2022.The study is based on both primary and secondary data and information. Discussions were held with stakeholders including government officials, community representatives and a wide range of road users and roadside dwellers.

1.5.2 Methodology

The following methodology was adopted for carrying out the EIA study:

a) Orientation

Meetings and discussions were held among the members of the EIA Consulting Team. This activity was aimed at achieving a common ground of understanding of various issues related to the project.

b) Planning for Data Collection

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the EIA Consulting Team. The plan included identification of specific data requirements and their sources, determined time schedules and responsibilities for their collection, and indicated the logistics and other supporting needs for the execution of the data acquisition plan.

c) Data Collection

In this step, primary and secondary data were collected through field observations, environmental monitoring in the field, concerned departments and published materials to establish baseline profile for physical, biological and socio-economic environmental conditions. The following activities were undertaken to gather the required data:

- Site Reconnaissance
- Analysis of Maps and Plans
- Literature Review
- Desk Research
- Public Consultations
- Field Observations & Studies
- Laboratory Analyses

Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality and noise.

Geology, Topography, Soils

A review was conducted of relevant literature on the geology, topography and soils in the Project Area.

Hydrology and Drainage

A literature review was conducted to identify the components of the hydrological cycle that are

likely to impact on the project and the possible impacts that the project could have on the hydrologic cycle. Field assessments included a determination and verification of all the existing inflows into the drain, assessment of drainage issues, interviews with local community members, and round-table discussions with stakeholders.

Air Quality

Ambient air quality measurements are essential to provide a description of the existing conditions, to provide a baseline against which changes can be measured and to assist in the determination of potential impacts of the proposed construction on air quality conditions. Ambient air quality was continuously monitored for Carbon Monoxide (CO), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10}), for 24 hours. An EPA Certified Lab SEAL was hired for air quality monitoring (Results are annexed as Annexure-III).

Noise

Noise level readings were taken for 2 hours with the interval of one second and hourly average data was reported. Sound level measurements were taken using a digital sound meter (TES 1350A).

Water Quality

Water quality monitoring was conducted to determine the water quality situation prior to construction. It has been observed that the surface water and air quality are the most important environmental variables to be affected in the project. The extent of surface water and groundwater contamination in the project area was assessed based on the test results of chemical and microbiological parameters for surface and groundwater. Dissolved oxygen (DO), pH and conductivity measurements were taken in situ at all sampling stations. Laboratory analyses were performed according to SOP based on recognized methods of ASTM, USEPA, or APHA methods. An EPA Certified Lab SEAL was hired for water quality sampling (Results are annexed as Annexure-III).

Biological Environment

The status of the flora and fauna of the study area were determined by ecological survey, a review of literature relevant to the area, and an assessment of terrestrial environments.

Flora

The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

Fauna

Information on fauna was gathered from existing literature on reported species as well as observations in the field.

Socio-Cultural Environment

The consultants utilized a combination of desk research, field investigations, census data, structured interviews, maps, and reports to generate the data required for description of the existing social environment and assessment of the potential impacts of the construction of the

proposed project. Data was gathered on the following aspects of the social environment:

- Land use and Municipal Status
- Traffic, Transportation and Access Roads
- Demographics
- Livelihoods
- Poverty
- Education
- Health
- Social Setup
- Community Facilities
- Solid Waste Management
- Proposed Developments
- Recreational Activities
- Archaeological and Cultural Heritage

d) Identification and Evaluation of Environmental Impacts

The impacts of the project on the physical, biological and socio-economic environment at the design, construction and operational phases were identified and evaluated based on their type and magnitude.

e) Mitigation Measures and Implementation Arrangements

Adequate mitigation measures and implementation mechanisms were proposed so that the Proponent could incorporate them beforehand in the design phase.

1.6 Structure of the Report

Section1: Introduction briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2: Consideration of Alternatives.

Section 3: Description of the Project furnishes project related information such as location, cost, size and major components. It also contains a description and evaluation of the various alternatives that were under consideration and a justification for selecting the proposed system.

Section 4: Environmental Baseline Profile establishes baseline conditions for physical, biological and socio-economic conditions prevalent in the project area

Section 5: Impact Assessment.

Section 6: Screening of potential Environmental Impacts and mitigation measures.

Section 7: Environmental management and monitoring program.

Section 8: Stakeholders Consultation.

Section 9: Conclusion and Recommendations.

CHAPTER 2: CONSIDERATION OF ALTERNATIVES

The consideration of alternatives was undertaken to evaluate feasible options for site selection, design and technology, environmental performance, and economic viability. The objective was to select the most sustainable, legally compliant, environmentally compatible, and cost-effective solution for the Electric 2 & 3 Wheeler manufacturing facility while rejecting options that presented greater environmental risks, regulatory conflicts, or financial and technical constraints.

2.1 Site Alternatives, Their Selection and Rejection Criteria

Multiple site alternatives were reviewed including Peri-urban industrial land, brownfield industrial plots outside planned estates, and available urban infill locations. Agricultural land options outside industrial zoning were rejected due to land-use incompatibility, potential impacts on soil integrity, absence of pre-planned drainage infrastructure, higher cost for independent utilities deployment, possible social nuisance due to proximity with dwellings, and potential conflicts in future environmental management planning.

Urban locations near Lahore city were also not selected due to elevated land procurement cost and increased risk of freight congestion. Brownfield industrial plots outside a notified industrial estate were rejected due to uncertainty regarding historical soil contamination, absence of consolidated stormwater linkages, unverified drainage routing, and expected higher restoration or rehabilitation cost prior to development.

The selected location at Plot No. 10-D, Quaid-e-Azam Business Park, Sheikhupura lies in a designated industrial zone equipped with estate-level utilities, consolidated drainage planning, minimal social or ecological receptor sensitivity, and a legally acknowledged zoning framework. This location was therefore selected as the preferred alternative.

2.2 Design/Technology Alternatives, Their Selection and Rejection Criteria

Technology alternatives evaluated included:

- SKD/CKD import-based vehicle assembly,
- Use of mixed lithium-ion battery chemistries (such as NMC/LCO),
- Open hall painting with uncontrolled VOC dispersal,
- Traditional welding processes without fume extraction systems, and
- Plant designs dependent on frequent diesel-based backup power.

Import-based assembly alternatives were rejected due to long-term reliance on imported kits, increased forex outflow, and limited localization benefit for Pakistan's manufacturing sector. Mixed lithium battery chemistries were not selected due to cobalt reliance, lower thermal stability compared to safer chemistries, and higher safety risks.

Open painting halls enabling direct VOC release without controls were rejected due to potential for unmanaged atmospheric dispersion and increased environmental management complexity. Traditional welding without localized fume capture was rejected because of occupational inhalation concerns and noise propagation. Diesel-dominant plant operation was rejected due to recurring emissions footprint, increased operations & maintenance (O&M) burden, and higher GHG intensity.

The selected technology includes closed mechanical assembly, adoption of cobalt-free $LiFePO_4$ battery chemistry, negative-pressure paint booths with carbon filtration, localized fume extractors for welding, and energy-efficient machinery design, minimizing long-term industrial OPEX and environmental risk.

2.3 Environmental Alternatives, Their Selection and Rejection Criteria

Environmental options evaluated included:

- Wastewater discharge without treatment,
- Mixed solid waste disposal without segregation,
- Absence of chemical or oil spill pads,
- Industrial halls without VOC or fume filtration,
- No restrictions on acoustic testing bays, and
- No development of boundary greenbelt buffers.

These alternatives were rejected because they increased the probability of soil and water contamination, landfill burden, fugitive emissions, uncontrolled occupational exposure, and long-term environmental management complexity, besides being inconsistent with EMP and regulatory expectations.

The adopted environmental strategy includes installation of an on-site Effluent Treatment Plant (ETP) prior to discharge into the estate wastewater network, complete waste segregation mechanisms, spill trays and spill response kits, carbon-based VOC filtration at paint booth stacks, daytime-restricted QC acoustic testing zones, and development of a minimum 33-ft native greenbelt corridor irrigated using treated ETP water.

2.4 Economic Alternatives, Their Selection and Rejection Criteria

Economic alternatives considered included:

- Fully imported EV assembly models,
- Procurement of foreign-assembled battery packs,
- Diesel-intensive backup power planning,
- Hiring models without structured female workforce onboarding, and
- Machinery designs lacking energy or operational efficiency.

These were rejected due to high foreign exchange leakage, increased long-term operational cost, higher emissions-related environmental compliance cost, lower job multipliers due to lack of gender-inclusive employment scaling, and suboptimal capital-to-output ratio.

The adopted economic option is based on local manufacturing, estate-metered utilities, female workforce participation planning (from 10 in Year 1 to around 60 by Year 5), in-plant lithium battery assembly enabling long-term import substitution, and energy-efficient machinery, thereby minimizing future OPEX and strengthening economic resilience.

2.5 Alternatives Consideration Conclusion

Screening and evaluation of alternatives confirm that the selected site, design, environmental, and economic options present the lowest reversible impact probability while offering maximum manufacturing localization, socioeconomic inclusion, safety, and environmental sustainability benefits. Rejected alternatives were screened out due to higher financial, environmental, or regulatory burden and reduced long-term sustainability.

CHAPTE 3: DESCRIPTION OF THE PROJECT

3.1 Type and Category of the Project

The proposed project, titled "Manufacturing of 2 & 3 Wheelers and Lithium-Ion Phosphate ($LiFePO_4$) Batteries" by M/s Jolta Electric (Private) Limited**,** falls under the industrial manufacturing sector**,** specifically within the sub-sector of automotive and electrical equipment production**.**

The project involves the establishment of a manufacturing and assembly facility for electric vehicles (EVs) — including electric 2-wheelers (motorcycles and scooters), 3-wheelers (rickshaws and cargo vehicles), and advanced $LiFePO_4$ battery systems — on a total area of 4.97 acres within Quaid-e-Azam Business Park (QABP), Sheikhupura, Punjab**.**

This project is classified as an industrial manufacturing and assembly project involving both mechanical fabrication and electrochemical processing**.** It encompasses:

- **Mechanical Assembly:** Fabrication, body fitting, chassis assembly, painting, and testing of electric 2- and 3-wheelers.
- **Battery Manufacturing:** Cell assembling, welding, electrolyte filling, battery pack balancing, and testing ($LiFePO_4$ batteries).
- **Support Facilities:** Warehousing, maintenance workshops, and administrative offices.

The project promotes clean and green industrialization through local production of zero-emission vehicles and renewable-energy-compatible batteries, in alignment with Pakistan's National Electric Vehicle Policy (NEVP) and Vision 2025 for sustainable growth.

According to the Punjab Environmental Protection Agency (EPA) under the *Review of IEE/EIA Regulations, 2000*, projects are classified into Schedule I (IEE) and Schedule II (EIA) categories based on their potential environmental impacts.

The proposed project involves large-scale industrial manufacturing of vehicles and batteries**,** which may include potential impacts on air quality, wastewater generation, and solid waste management. Therefore, it falls under:

Schedule II, Category – D (Industrial Projects):

"Projects involving large-scale manufacturing, assembly, and production of automobiles, machinery, and electrical equipment."

As such, the proponent is required to prepare a comprehensive Environmental Impact Assessment (EIA) for submission and approval by the Punjab EPA prior to project initiation.

3.2 Objectives of the Project

The proposed project by M/s Jolta Electric (Private) Limited *"Manufacturing of 2 & 3 Wheelers and Lithium-Ion Phosphate ($LiFePO_4$) Batteries"* has been conceived to address Pakistan's growing demand for sustainable, energy-efficient transportation and locally produced electric vehicle (EV) technology.

The project aims to promote environmentally responsible industrialization by introducing clean mobility solutions and supporting the country's transition toward a low-carbon economy.

The key objectives of the project are as follows:

- To reduce greenhouse gas (GHG) emissions and air pollutants from the transport sector by promoting zero-emission electric vehicles.
- To minimize dependency on fossil fuels and imported petroleum products, thereby supporting Pakistan's clean energy transition.
- To encourage local production of eco-friendly batteries ($LiFePO_4$**)** that are non-toxic, recyclable, and safer than conventional lead-acid batteries.
- To support climate resilience and align with Pakistan's commitments under the *Paris Agreement* and the *Sustainable Development Goals (SDGs)*, particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

Table 3.1: Summary of Project Objectives

Category	Key Objectives
Environmental	Reduce GHG emissions, promote clean energy, and minimize fossil fuel use.
Economic	Create jobs, enhance local manufacturing, and support industrial growth.
Technological	Localize 2 & 3 Wheeler and battery technology, promote innovation, and improve technical capacity.
Social	Enhance local livelihoods, public awareness, and community engagement.
Strategic	Support NEVP and Vision 2025 for sustainable industrialization.

The project is designed to operate under a model of responsible resource development that integrates economic efficiency, social responsibility, and ecological protection.

3.3 Alternatives Considered and Reasons for Their Rejection

During the project planning and feasibility stage, several alternatives were carefully examined to ensure that the selected option represents the most environmentally, socially, and economically sustainable choice.

The alternatives considered include:

1. Site Alternatives
2. Technology Alternatives
3. Process Alternatives
4. Design and Layout Alternatives

5. No-Project Alternative

Each is discussed below with justification for the selected option.

3.3.1 Site Alternatives

Alternatives Considered:

- Alternative Site 1: An industrial plot within Sundar Industrial Estate (SIE), Lahore).
- Alternative Site 2: A site within Quaid-e-Azam Business Park (QABP), Sheikhupura) — the current selected site.
- Alternative Site 3: A privately owned land parcel in the Sheikhupura–Lahore corridor outside planned industrial estates.

Evaluation:

- **Sundar Industrial Estate (SIE):** Fully developed but highly saturated, with limited availability of large contiguous plots. Land cost and operational overheads were significantly higher.
- **Private Land:** While available, it lacked infrastructure support (utilities, drainage, and waste management) and would require separate environmental clearances and off-site infrastructure development, increasing cost and environmental burden.
- **Quaid-e-Azam Business Park (QABP):** Offered a planned industrial environment, environmental infrastructure, PIEDMC management support, and compliance with land use zoning. It also provides direct motorway access, making logistics efficient.

Preferred Option:
QABP, Sheikhupura has been selected due to:

- Availability of fully serviced industrial land.
- Compliance with designated industrial zoning.
- Proximity to Lahore and Sheikhupura for workforce and supply chain access.
- Existing infrastructure for utilities, drainage, and waste management.
- Reduced potential for off-site environmental and social impacts.

3.3.2 Technology Alternatives

Alternatives Considered:

Alternative 1: Use of Lead-Acid Batteries for EVs.

Alternative 2: Use of Lithium-Ion Phosphate ($LiFePO_4$) Batteries (Selected).

Evaluation:

Parameter	Lead-Acid Batteries	$LiFePO_4$ Batteries
Energy Density	Low	High
Cycle Life	Short (300–400 cycles)	Long (2000–3000 cycles)
Environmental Impact	Contains lead, acid, toxic disposal	Environmentally safer, recyclable
Weight	Heavy	Lightweight

Safety	Acid leakage, gas emission	Thermally stable and safe

Preferred Option:
$LiFePO_4$ Battery Technology was selected because it:

- Provides higher performance and longer lifespan**.**
- Is non-toxic and environmentally safer.
- Aligns with international 2 & 3 Wheeler technology trends and clean production standards**.**
- Reduces waste generation and hazardous material handling requirements.

3.3.3 Process Alternatives

Alternatives Considered:

- Completely Knocked Down (CKD) Assembly Process.
- Semi-Knocked Down (SKD) Assembly Process (Selected).
- Full In-House Manufacturing.

Evaluation:

- **CKD Process:** Requires high investment in component manufacturing infrastructure, specialized tooling, and localized supplier networks, which are currently under development in Pakistan.
- **SKD Process:** Balances local assembly with imported key components**,** enabling rapid start-up while building local capacity over time.
- **Full Manufacturing:** Environmentally and financially more demanding at the initial stage; suitable only in expansion phase.

Preferred Option:
Semi-Knocked down (SKD) Assembly Process**,** as it allows:

- Gradual localization of production components.
- Efficient technology transfer and skill development.
- Controlled environmental footprint with manageable waste streams.

3.3.4 Design and Layout Alternatives

Alternatives Considered:

Two main layout configurations were considered during site planning:

1. Compact Linear Layout: All production units aligned in a single row.
2. Cluster-Based Layout (Selected): Segregation of functions into production blocks (2W/3W assembly, battery plant, utilities, admin, and green zone).

Evaluation:
The cluster-based layout was preferred because it:

- Optimizes internal logistics and workflow efficiency.

- Ensures better environmental control (separation of noisy and sensitive operations).
- Allows sufficient greenbelt development and internal traffic safety.
- Facilitates future expansion within available area.

Preferred Option:

Cluster-Based Layout**,** integrated with a green buffer zone**,** stormwater drainage**,** and waste handling areas**,** ensuring environmental compliance and operational flexibility.

3.3.5 No-Project Alternative

Under the No-Project Scenario, the proposed facility would not be developed. This would result in:

- Continued reliance on imported fossil-fuel vehicles.
- Missed opportunities for local job creation and technology transfer.
- Slower progress toward Pakistan's 2 & 3 Wheeler adoption targets.
- No contribution to reduction of GHG emissions from the transport sector.

Although this alternative would avoid short-term construction-related impacts, it would negatively affect long-term economic, technological, and environmental goals of the country.

Preferred Option:

Implementation of the Project is strongly justified, as it supports national environmental objectives, industrial development, and clean mobility transition.

3.4 Location and Site Layout of the Project

The proposed project site for the 2 & 3 Wheelers and Batteries Manufacturing plant is situated at:

Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura, Punjab
Total Area: 4.97 Acres (≈20,110 m²)
Coordinates: 31°44'02.5" N, 74°04'32.0" E

The site lies within the Quaid-e-Azam Business Park (QABP) — a modern, fully serviced industrial estate developed and managed by the Punjab Industrial Estates Development and Management Company (PIEDMC)**.** It is strategically located along the Lahore–Islamabad Motorway (M-2)**,** approximately 40 km northwest of Lahore and 15 km east of Sheikhupura city**.**

The project area falls within the jurisdiction of District Sheikhupura**,** Punjab Province**,** and has been zoned exclusively for industrial development**,** ensuring compatibility with land use and environmental planning regulations.

Figure 3.1: Location Map of the Project Site

3.4.2 Site Layout:

The proposed layout of the project has been designed considering environmental management, operational efficiency, and future expansion potential. The key layout elements include:

- **Main Entrance & Security Gatehouse:** Located on the southern boundary, providing controlled access to the facility.
- **Administrative Building:** Positioned near the entrance for visitor and staff convenience.
- **Manufacturing & Assembly Blocks:** Centrally located to optimize workflow between component assembly, painting, and final vehicle assembly.
- **Battery Manufacturing Unit:** Located adjacent to the main production hall but isolated by safety setbacks to reduce any potential risks associated with electrochemical processing.
- **Warehouse and Dispatch Area:** Situated on the western side for easy movement of goods and vehicles to and from loading bays.
- **Utility Area:** Includes generator room, water tanks, maintenance workshop, and electrical control room, located toward the rear of the facility.
- **Parking & Circulation:** Adequate space for employees, visitor parking, and internal transport circulation.

- **Green Belt and Plantation Zone:** Perimeter greenbelt and internal landscaping developed on approximately 20% of the site area to act as a dust and noise buffer**,** enhancing the environmental aesthetics.

Land use distribution within the project site:

The total project area of 4.97 acres will be utilized in accordance with industrial estate standards and environmental best practices. The proposed land use distribution is summarized below:

Table: 3.2: Land Use Distribution of the Project Area.

Component	Description	Approximate Area (Acres)	Percentage of Total Area
Manufacturing & Assembly Blocks	Production units for 2W & 3W assembly and $LiFePO_4$ battery plant	2.00	40%
Warehouse & Raw Material Storage	Covered storage for components and batteries	0.60	12%
Administrative & Office Block	Main building for management and staff facilities	0.30	6%
Utility & Maintenance Area	Power house, compressor room, water tank, etc.	0.40	8%
Parking & Internal Roads	For vehicles, staff, and logistics	0.67	13%
Green Belt & Landscaping	Buffer plantation around boundary and internal areas	1.00	20%
Total		**4.97 Acres**	**100%**

Figure 3.2: Site Layout Lease Plan

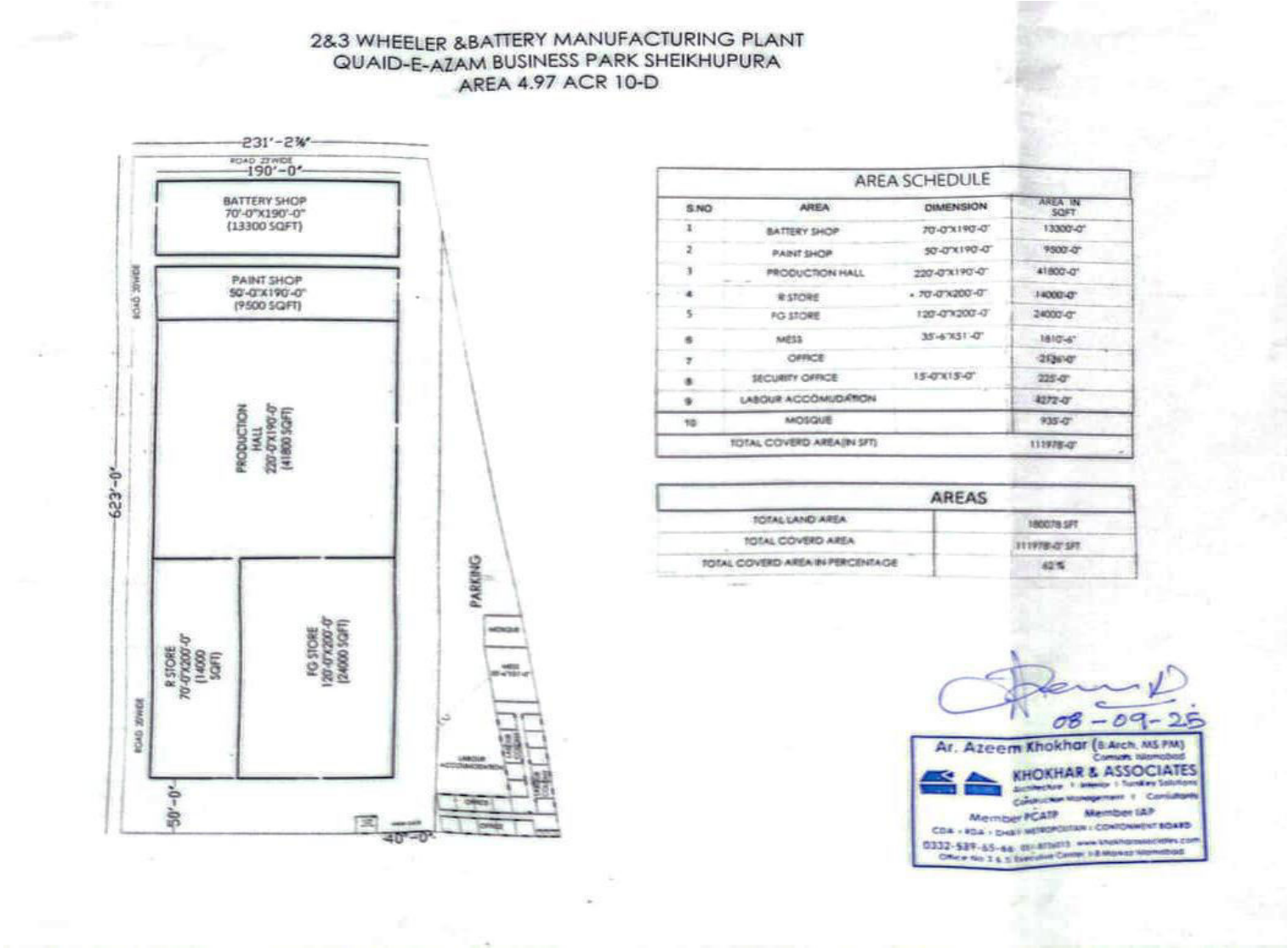
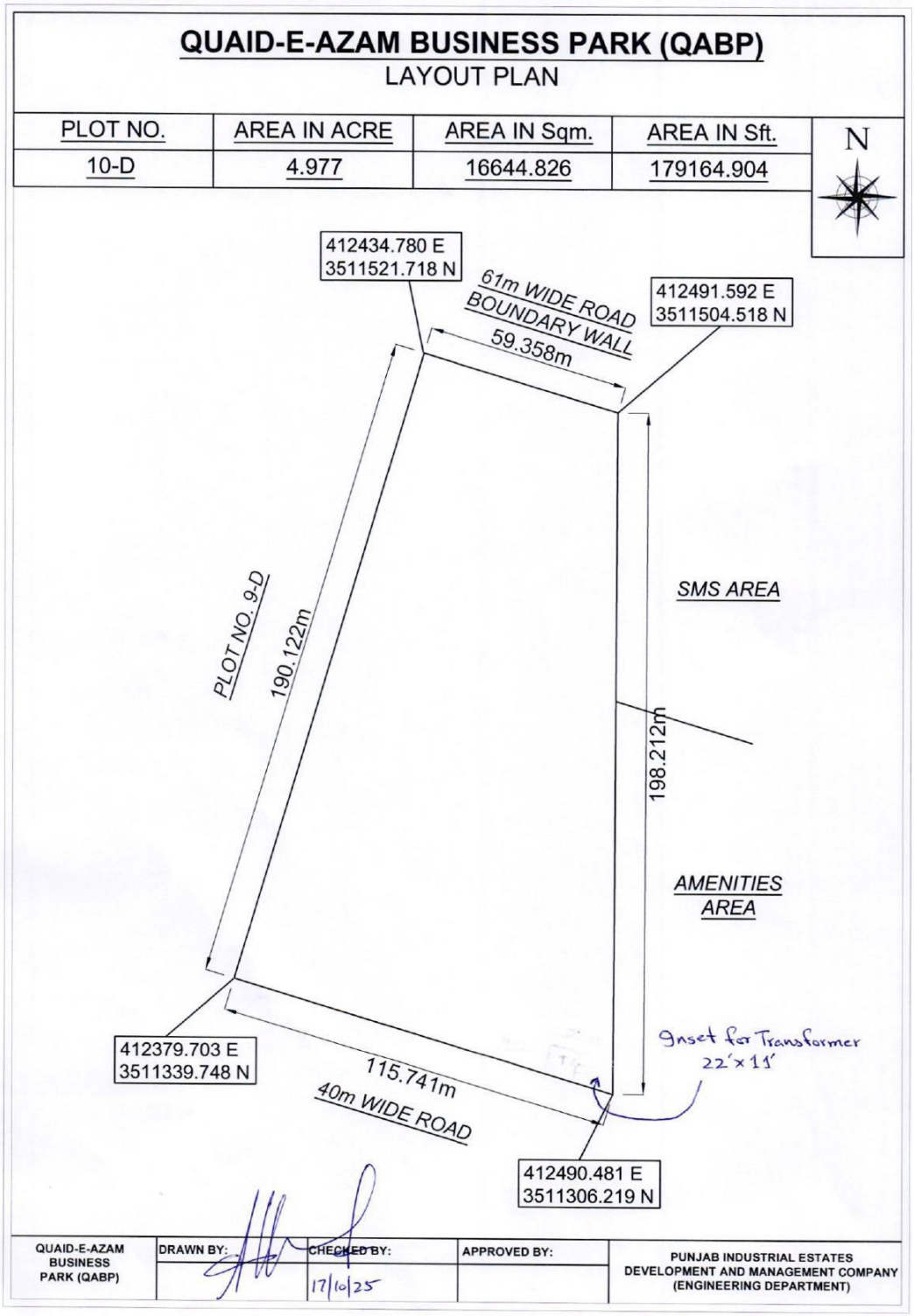


Figure 3.3: QABP Approved Layout Plan of the Proposed Project



3.5 Land Use

The project site is located within the premises of Quaid-E-Azam Business Park, Sheikhupura. All the area of Quaid-E-Azam Business Park, Sheikhupura is purpose built for industrial use by Government of the Punjab. Quaid-E-Azam Business Park, Sheikhupura is surrounded by residential and agricultural areas including Sahu Ki Malliyan, Chichoo Ki Malliiyan and Sheikhupura City. No agricultural activity has been observed at the project site. However, some agricultural patches can be found outside of the Quaid-E-Azam Business Park, Sheikhupura.

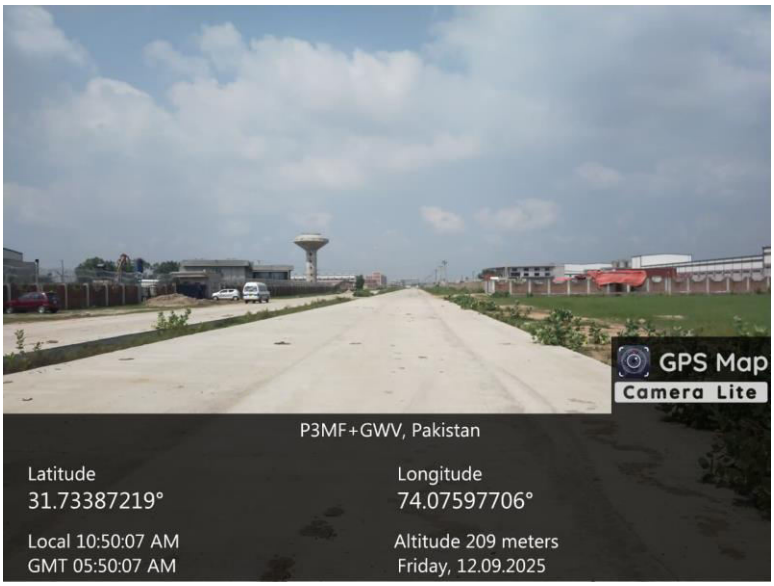
3.6 Road Access

The project site is easily accessible through:

- M-2 Motorway via the QABP Interchange**,** ensuring direct connectivity to major cities including Lahore, Sheikhupura, and Faisalabad.
- Sheikhupura–Kala Shah Kaku Road, providing linkage to local industrial and commercial centers.
- Sheikhupura Railway Station (approximately 12–15 km away) for freight and logistics support.

This excellent accessibility enhances raw material transportation, finished goods dispatch, and workforce mobility.

Figure 3.4: Approach Road to the Project Site



3.7 Vegetation Features of the Site

Currently, the natural vegetation cover at the site is sparse**,** consisting mainly of ruderal (disturbance-tolerant) and weedy species that commonly occur in dry, disturbed soils of central Punjab. The land surface is mostly bare soil**,** with patches of seasonal grass and scattered shrubs**.**

Figure 3.5: Floral Inventory of the Project Area

Vegetation features of the project area: *The area exhibits shrubs and bushes. No major tree plantation exist in the project area only few trees are located inside the study area.*

3.8 Cost and Magnitude of Operation

3.8.1 Project Cost

The total estimated cost of the proposed project, including land acquisition, civil works, machinery, and raw materials, amounts to approximately PKR 1,187 million (Rupees 1.187 billion)**.**

The investment reflects a significant commitment by M/s Jolta Electric (Private) Limited to establish a modern electric vehicle and battery manufacturing facility within Quaid-e-Azam Business Park (QABP), Sheikhupura**,** supporting local industrialization and clean mobility initiatives.

Table 3.3: The Detailed Cost Breakup

Sr. No.	Component	Estimated Cost (PKR)	Percentage of Total Cost
1	Land Cost	250,000,000	21.1%

2	Construction Cost (Buildings, Utilities, Infrastructure)	255,000,000	21.5%
3	Machinery and Equipment Cost	105,000,000	8.8%
4	Raw Material and Initial Inventory	577,000,000	48.6%
Total Estimated Project Cost		**1,187,000,000**	**100%**

The largest expenditure component is raw material procurement, highlighting the project's manufacturing-intensive nature, while the investment in land, infrastructure, and machinery ensures a robust and sustainable industrial foundation.

3.8.2 Magnitude of Operation

The proposed facility is a medium-to-large scale industrial project**,** categorized under Category "B" as per the Punjab Environmental Protection Agency (EPA) classification for vehicle and battery manufacturing/assembly units**.**

It will involve:

- Assembly of electric 2-wheelers and 3-wheelers**,** including body fitting, electrical installation, testing, and quality control.
- Manufacturing and assembly of $LiFePO_4$ batteries for internal use and external supply.
- Integration of automated and semi-automated processes ensuring safety, quality, and environmental compliance.

3.8.3 Production Capacity

The designed annual production capacity is as follows:

This production plan is designed to meet both specific orders and the increasing market demand for electric vehicles, ensuring that Jolta Electric (Private) Limited continues to lead the charge in Pakistan's transition to sustainable mobility solutions.

Table 3.4: Estimated Production Capacity of the Unit

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
2-Wheeler	12,000 Units	15,000 Units	18,000 Units	21,500 Units	25,000 Units
3-Wheeler	2,000 Units	3,000 Units	4,500 Units	6,500 Units	8,000 Units
Batteries	11,500 Units	15,000 Units	17,500 Units	21,000 Units	23,500 Units

The plant will initially operate on a single 8-hour shift**,** with the flexibility to expand to two-shift operation based on market demand.

3.8.4 Employment Generation

The proposed project will generate significant direct and indirect employment opportunities, contributing to the economic growth and social uplift of the Sheikhupura region and Punjab province. The project emphasizes inclusive employment, ensuring participation from male, female, and foreign professionals, with a strong focus on local capacity development and technology transfer.

Foreign employees will be engaged during the initial operational years to assist in technical collaboration, staff training, and transfer of advanced manufacturing technology. As local expertise strengthens, the dependence on foreign staff will gradually decline.

Table 3.5: Projected Operational Employment Plan (First Five Years)

Year	Male Employees	Female Employees	Foreign Employees	Total Employees	Remarks
Year 1	95	10	12	**117**	Commissioning phase; foreign staff for installation, training, and technology transfer
Year 2	102	30	10	**152**	Initial production scaling; increasing local and female participation
Year 3	138	35	8	**181**	Strengthening local capacity; reduced foreign dependency
Year 4	170	45	5	**220**	Full-scale operation; majority local technical and management workforce
Year 5	192	60	3	**255**	Localized workforce with minimal foreign support

Workforce Composition and Trends

- The total operational workforce is projected to increase from 117 employees in Year 1 to approximately 255 employees by Year 5, reflecting steady production expansion.
- The female workforce will grow from 10 in Year 1 to 60 in Year 5, highlighting the company's commitment to gender inclusivity and equal employment opportunities.
- The number of foreign employees will gradually decrease from 12 in Year 1 to only 3 in Year 5, demonstrating successful technology transfer and local skill development.
- An additional 10–15% temporary workforce will be engaged as required during peak demand or expansion periods, ensuring operational flexibility without compromising productivity.

3.9 Schedule of Implementation

The implementation of the proposed Electric 2 & 3 Wheeler and $LiFePO_4$ Battery Manufacturing Facility will be carried out in a phased manner over an estimated period of 18 to 24 months, starting from the date of project approval by the Punjab Environmental Protection Agency (EPA) and other relevant authorities.

The schedule has been developed to ensure timely completion while maintaining compliance with all environmental, safety, and quality standards. The project phases include planning, design, construction, equipment installation, testing, and commissioning.

Table 3.6: Implementation Phases and Timeline

Phase	Activity Description	Duration (Months)	Cumulative Period	Remarks
Phase I	Project Planning, Design & Approvals	0 – 4 months	4 months	Feasibility studies, environmental approval, building design, procurement planning
Phase II	Site Preparation & Civil Works	5 – 10 months	10 months	Land development, site clearance, boundary wall, utility connections, construction of foundations and main buildings
Phase III	Machinery Procurement & Installation	8 – 14 months	14 months	Import and installation of production line equipment, assembly machinery, and $LiFePO_4$ battery systems
Phase IV	Utilities, Infrastructure & Support Systems	12 – 16 months	16 months	Setup of electrical systems, HVAC, ETP, compressed air units, and internal roads
Phase V	Testing, Commissioning & Trial Production	17 – 20 months	20 months	Equipment testing, calibration, safety checks, and trial runs for production processes
Phase VI	Commercial Operation Commencement	21 – 24 months	24 months	Start of full-scale operations and gradual ramp-up to design capacity

3.10 Description of the Project (Process flow chart/steps)

The proposed project involves the manufacturing and assembly of electric 2-wheelers and 3-wheelers, as well as production of Lithium-Ion Phosphate ($LiFePO_4$) battery packs. The facility is designed to support local manufacturing, technology transfer, and sustainable industrial growth in Pakistan's electric mobility sector. The production process combines mechanical fabrication, electrical/electronic assembly, battery manufacturing, testing, and final quality assurance.

All processes will be conducted within enclosed industrial buildings, adhering to environmental, health, and safety (EHS) standards prescribed under the Punjab Environmental Quality Standards (PEQS).

3.10.1 Overview of the Manufacturing Process

The manufacturing and assembly process will consist of two major streams operating in parallel:

1. Electric 2 & 3-Wheeler Manufacturing Line
2. Lithium-Ion Phosphate ($LiFePO_4$) Battery Manufacturing and Assembly Line

Both streams will ultimately converge during the vehicle final assembly and testing stage.

3.10.2 Process Flow Chart

A. Electric 2 & 3-Wheeler Manufacturing Process

Import of CKD/SKD Components

↓

Receiving, Inspection & Quality Verification

↓

Frame Fabrication & Welding

↓

Surface Preparation & Painting

↓

Sub-Assembly (Handlebars, Suspension, Wheels, Brakes)

↓

Main Assembly (Motor, Battery Housing, Controller, Wiring)

↓

Electrical & Electronic Integration

↓

Functional Testing (Braking, Motor Efficiency, Electrical Systems)

↓

Quality Control & Inspection

↓

Packaging & Storage

↓

Dispatch to Dealers / Market

B. $LiFePO_4$ Battery Manufacturing Process

Raw Material Receipt (Cells, BMS, Connectors, Casings)

↓

Incoming Quality Check (IQC)

↓

Cell Sorting & Grading

↓

Module Assembly (Series/Parallel Connections)

↓

BMS Integration & Electrical Connections

↓

Battery Pack Casing & Sealing

↓

Charging, Balancing & Performance Testing

↓

Final Quality Control (Voltage, Capacity, Safety)

↓

Packaging, Labeling & Storage

↓

Supply to Vehicle Assembly Line or External Clients

3.10.3 Detailed Description of Key Steps

1. Import and Procurement of Raw Materials

- Major components such as frames, motors, controllers, tires, and body parts will be imported or locally sourced in Completely Knocked down (CKD) or Semi-Knocked Down (SKD) form.
- Battery cells, Battery Management Systems (BMS), and electronic controllers will be sourced from certified suppliers (local and international).
- Raw materials are received at the storage warehouse, inspected, and tagged for quality compliance before production.

2. Frame Fabrication and Welding

- Mild steel and aluminum alloy frames will be fabricated using CNC cutting, bending, and welding machines.
- Proper ventilation and exhaust systems will be provided to remove welding fumes.
- After fabrication, the frames undergo surface finishing and primer coating to prevent corrosion.

3. Surface Preparation and Painting

- Frames and metal parts will be degreased, cleaned, and painted using electrostatic spray painting or powder coating.
- A paint booth with filtration system will be installed to control VOC emissions and overspray.
- Painted components are dried in a controlled-temperature oven before proceeding to assembly.

4. Sub-Assembly Operations

- Individual components such as suspension, brakes, handlebars, and wheels are assembled separately at sub-assembly stations.

- These modules are then transferred to the main assembly line for integration with the body and electrical systems.

5. Main Assembly Line

- The motor, controller, $LiFePO_4$ battery pack, wiring harness, and lighting system are installed on the vehicle frame.
- Skilled technicians ensure proper alignment, fastening, and electrical safety compliance.
- Assembly stations are equipped with anti-static flooring and tool management systems for efficiency and safety.

6. Electrical and Electronic Integration

- This stage involves the installation and connection of the electric motor, throttle, battery, controller, and regenerative braking system.
- Functional checks are conducted for voltage output, connectivity, insulation resistance, and system performance.

7. Battery Manufacturing and Assembly

- Battery cells are sorted by voltage and internal resistance using automatic grading machines.
- Cells are assembled into modules, connected in series and parallel as per required voltage and capacity.
- A Battery Management System (BMS) is installed to monitor charging, discharging, and thermal performance.
- Completed packs are cased, sealed, and tested for safety and reliability.
- Proper handling procedures and fire safety equipment (Class D extinguishers) are maintained at all stages.

8. Testing and Quality Control

- All assembled vehicles undergo mechanical, electrical, and performance testing including:
    - Motor output and battery endurance
    - Braking efficiency
    - Load and stability tests
    - Waterproofing and insulation checks
- $LiFePO_4$ batteries are tested for capacity, voltage consistency, charge/discharge cycles, and thermal performance.
- Defective units (if any) are returned for rework in a designated area to minimize waste generation.

9. Packaging and Storage

- Approved products are labeled, packed, and stored in the finished goods warehouse under controlled environmental conditions.
- Packaging materials such as cartons, foams, and wraps are selected to be recyclable and eco-friendly.
- Waste from packaging is collected and sent for segregation and recycling.

10. Dispatch and Distribution

- Final products (electric 2-wheelers, 3-wheelers, and batteries) are dispatched to dealerships and distributors across Pakistan.
- Vehicles are transported via covered trucks to minimize dust exposure and mechanical damage.
- Proper documentation and tracking are maintained to ensure transparency and quality assurance.

3.11 Restoration and Rehabilitation Plans

The proposed project site is located within the Quaid-e-Azam Business Park (QABP), an industrial estate developed by PIEDMC, designated exclusively for industrial activities. Although permanent land-use change has already occurred under planned industrial zoning, temporary environmental disturbances may arise during the construction and installation phases due to site clearance, soil compaction, waste generation, and material handling.

The restoration and rehabilitation plan ensures that all such disturbances are minimized, mitigated, and fully restored before the site transitions into operational status. It also includes provisions for long-term environmental management, landscaping, and post-closure restoration, if applicable.

3.11.1 Restoration Measures during Construction Phase

To minimize environmental impacts during the construction phase, the following measures will be adopted:

Table 3.7: Restoration Measures during Construction Phase

Activity	Potential Impact	Restoration / Mitigation Measure
Site clearing and excavation	Soil disturbance, dust emissions	Minimize disturbed area, reuse topsoil for landscaping, water sprinkling for dust suppression
Construction waste generation	Visual pollution, soil contamination	Segregate and remove waste to designated disposal points; recycle metal, concrete, and wood
Fuel and oil spills	Soil and groundwater contamination	Use spill containment trays, absorbent pads, and proper waste collection
Temporary storage areas	Soil compaction, vegetation loss	Restore compacted soil by loosening and leveling; replant vegetation or turf
Worker camps (if any)	Sanitation and solid waste issues	Remove temporary structures; clean and rehabilitate area before demobilization

All disturbed surfaces will be graded, leveled, and compacted after construction, followed by topsoil spreading and plantation wherever feasible.

3.11.2 Rehabilitation Measures during Operational Phase

Once the facility is operational, continuous environmental rehabilitation and green management measures will be implemented, including:

- Development of greenbelts and buffer zones along internal roads, open spaces, and the periphery of the site.
- Plantation of native, drought-resistant species (e.g., neem, Kachnar, Amaltas, ficus, and bougainvillea) to enhance biodiversity and reduce dust emissions.
- Regular maintenance and irrigation of landscaped areas using treated wastewater from the Effluent Treatment Plant (ETP) where feasible.
- Establishment of stormwater drainage systems with sediment traps to prevent soil erosion.
- Ongoing solid waste segregation and recycling to maintain a clean environment.
- Noise and dust control through vegetation buffers and periodic environmental audits.

3.11.3 Post-Construction Site Rehabilitation

Upon completion of construction activities:

1. All temporary structures, machinery, and debris will be removed.
2. Topsoil stockpiled during site preparation will be reapplied to disturbed areas.
3. Revegetation and turfing will be conducted using local grasses and plant species.
4. A post-construction inspection will be conducted jointly by the project's HSE team and QABP environmental management unit to ensure compliance.
5. Documentation of restoration efforts (including photographs and reports) will be submitted to the EPA Punjab as part of compliance reporting.

3.11.4 Institutional Responsibility

The Project HSE & Environmental Management Team of M/s Jolta Electric (Pvt.) Ltd. will be responsible for implementing and monitoring the restoration and rehabilitation plan. Coordination will be maintained with:

- Quaid-e-Azam Business Park Environmental Management Cell (PIEDMC)
- Punjab Environmental Protection Agency (EPA)
- Local horticulture and forestry departments for greenbelt selection and maintenance support.

Regular reporting and environmental audits will ensure transparency, compliance, and sustainability**.**

3.12 Government Approvals

The proposed project — *Manufacturing of 2 & 3 Wheelers and Lithium-Ion Phosphate ($LiFePO_4$) Batteries* by M/s Jolta Electric (Private) Limited — will comply with all applicable regulatory requirements under the Punjab Environmental Protection Act, 1997 (Amended 2012) and other relevant industrial and environmental laws. The project requires an Environmental Impact Assessment (EIA) approval and No Objection Certificate (NOC) from the Punjab Environmental Protection Agency (Punjab-EPA) prior to commencement of construction. The industrial land, located at Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura**,** has been formally allotted by PIEDMC**,** with building layout and utility connection approvals to be obtained in accordance with QABP regulations. Additional operational permits, including fire safety, occupational health and safety (OHS) certification, and environmental monitoring compliance**,** will be secured from relevant authorities such as the Labour & Human Resource Department**,** Civil Defense Department**,** and PIEDMC Environmental Management Unit**.** The company is registered with the Securities and Exchange Commission of Pakistan (SECP) and will ensure compliance with the National Electric Vehicle Policy (NEVP 2019)**,** as well as all applicable Pakistan Environmental Quality Standards (PEQS) for emissions, effluents, and noise. M/s Jolta Electric (Pvt.) Ltd. is fully committed to obtaining all statutory approvals, maintaining continuous coordination with Punjab-EPA and QABP management, and adhering to all regulatory obligations throughout construction and operational phases.

CHAPTER 4: DESCRIPTION OF ENVIRONMENT

To assess the existing environmental conditions of the project area, a comprehensive baseline environmental survey was conducted for the proposed project *"Manufacturing of 2 & 3 Wheelers and Lithium-Ion Phosphate ($LiFePO_4$) Batteries"* by M/s Jolta Electric (Private) Limited at Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura.

The baseline survey was carried out on September 12, 2025, to document the prevailing physical, biological, and socio-economic characteristics of the project site and its surrounding environment. Subsequently, detailed environmental monitoring was conducted on September 19, 2025, covering key environmental parameters including ambient air quality, groundwater quality, and noise levels.

All sampling and analyses were performed by an EPA-approved environmental laboratory (SEAL), in accordance with the Punjab Environmental Quality Standards (PEQS) and international best practices. The results of this monitoring form the foundation for evaluating potential environmental impacts associated with the proposed development and for designing appropriate mitigation and management measures.

The following sections provide a detailed description of the existing environmental conditions in and around the project area, including:

- Physical Environment: Topography, geology, soil, climate, air, and noise levels
- Water Environment: Groundwater and surface water characteristics
- Biological Environment: Flora and fauna in the project's influence area
- Socio-Economic Environment: Demography, land use, and infrastructure feature

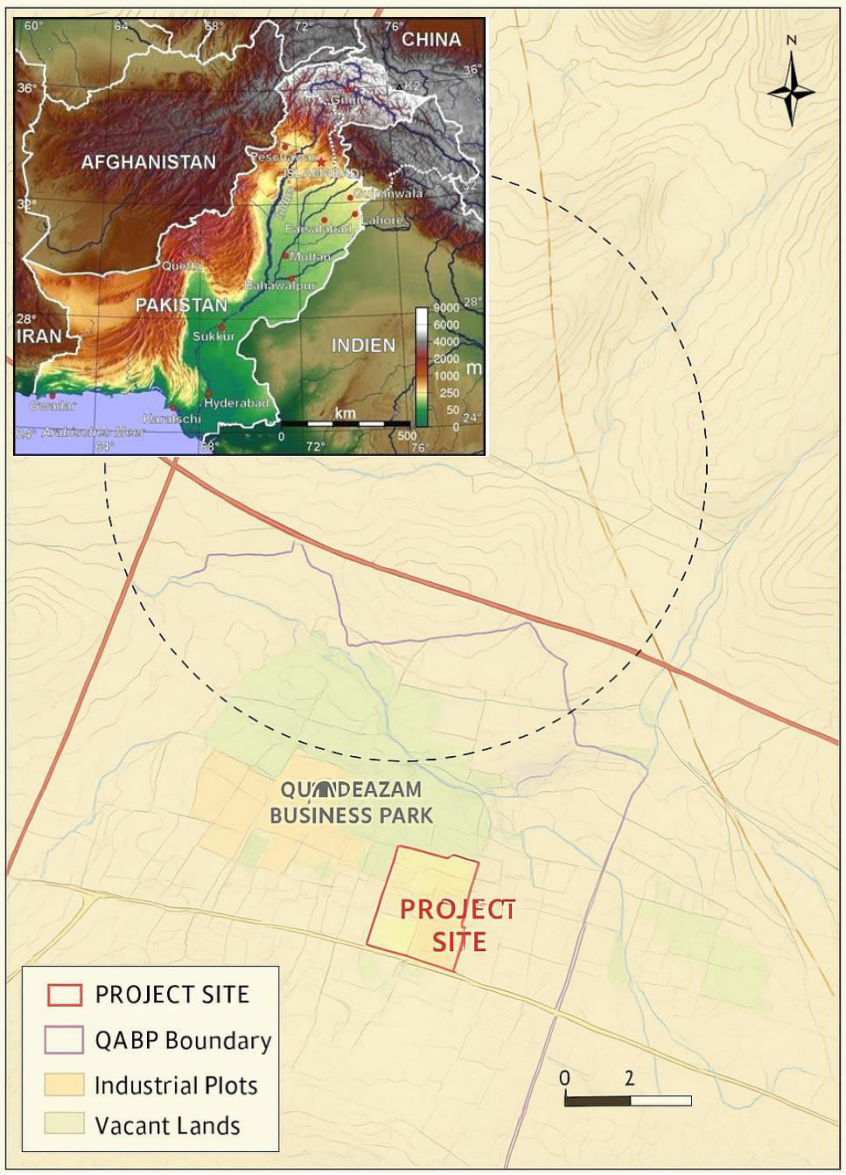
4.1 Physical Environment

4.1.1 Topography and Landform

The topography of the area is generally flat to gently undulating, typical of the alluvial plains of the Punjab region. The site lies at an elevation of approximately 210–220 meters above mean sea level (MSL) and is part of the active depositional floodplain of the River Ravi, situated to the southeast of Sheikhupura city.

The flat terrain provides a stable and suitable foundation for industrial construction and facilitates easy access, layout planning, and drainage management. The area does not exhibit significant topographical variations, hills, or depressions that could pose engineering or environmental challenges. The site's natural drainage pattern generally follows a gentle slope towards the southern and southeastern directions, consistent with the regional gradient.

Figure 4.1: Topographic Map of the Project Area

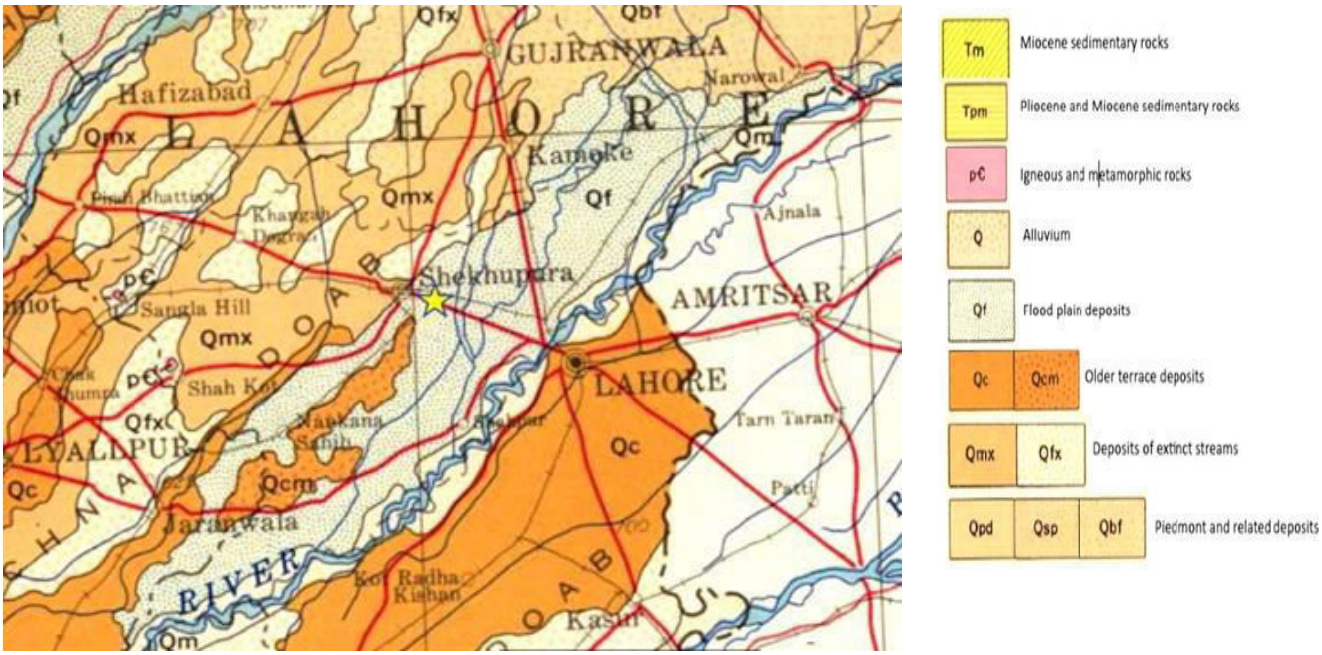


4.1.2 Geology of the Project Area

The project area lies within the Indo-Gangetic Alluvial Plain of the Punjab Basin, a sub-basin of the Indus Basin, which is one of the largest alluvial plains in the world. Geologically, the region is part of the Quaternary alluvial deposits formed by sedimentation from the Ravi and Chenab Rivers and their tributaries over thousands of years. These unconsolidated sediments rest upon older formations of the Siwalik Group (Miocene–Pliocene age), which are not exposed at the surface in this area but occur at significant depths.

The Punjab alluvial plain consists predominantly of sands, silts, clays, and occasional kankar (calcareous concretions). These materials have been deposited through repeated cycles of fluvial activity, resulting in stratified layers with varying permeability and composition.

Figure 4.2: Geological Map of the Project Area



4.1.3 Soils

The vegetation carried by these soils is influenced by moisture and aeration. The soil in the project area is cohesion-less and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients. Soil is rich in potential plant nutrients. Alluvium is soil or sediments deposited by the river or other running water. Alluvium is made up of variety of materials including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas where more particles are dropped are called alluvial or flood plains and the dropped particles are called alluvium.

The soil of the project area is fertile. Wheat and corn are the major crops. Rice at some places where water is available is also grown. However, vegetables, pulses legumes and fodder are the other crops.

Irrigation is largely dependent on the canals. Tube wells have also been sunk at the greater depths in the project area where fresh water is available.

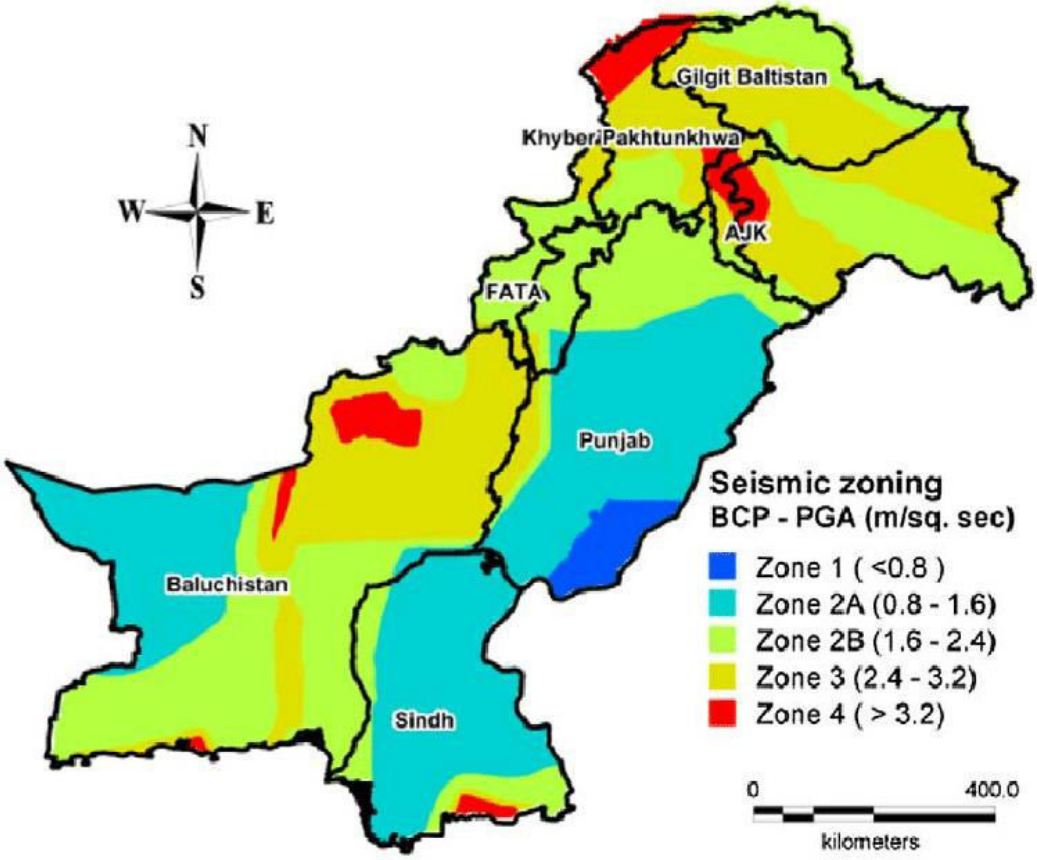
4.1.4 Seismology

The project area lies in Seismic Zone 2B, as per the Building Code of Pakistan (Seismic Provisions, 2007), representing a moderate seismic risk zone. This zone is characterized by low to moderate frequency seismic events originating from the Himalayan orogenic belt.

To ensure structural safety, the proposed project's design will incorporate:

- Seismic-resistant structural design features,
- Reinforced foundations based on geotechnical recommendations, and
- Compliance with PIEDMC and Pakistan Engineering Council (PEC) construction guidelines.

Figure 4.3: Seismic Zoning Map of Pakistan



Seismic Zoning Map of Pakistan, based on the Building Code of Pakistan (BCP 2007), which classifies the country into five seismic zones by level of seismic hazard.

Table 4.1: Seismic Zones of Pakistan (BCP-2007)

Seismic Zone	Estimated PGA (g)	Relative Hazard Level
Zone 1	0.05 – 0.08	Low
Zone 2A	0.08 – 0.16	Moderate

Zone 2B	0.16 – 0.24	Moderate–High
Zone 3	0.24 – 0.32	High
Zone 4	> 0.32	Very High

4.1.5 Climate

The climate of the Sheikhupura District, located in the central Punjab region of Pakistan, is classified as semi-arid subtropical, characterized by hot summers, mild winters, and distinct monsoon rainfall. The area experiences a marked seasonal temperature variation and relatively low annual precipitation.

The meteorological data presented in this section is based on long-term records from the Pakistan Meteorological Department (PMD), Lahore Observatory, and field observations made during the baseline survey (September 12–19, 2025).

The region's climatic conditions significantly influence air quality, soil moisture, drainage, vegetation cover, and construction planning, making this information essential for Environmental Impact Assessment.

4.1.6 Rainfall

The rainfall pattern in the area is seasonal and irregular, primarily influenced by the Southwest Monsoon system.

- The monsoon season extends from July to September, contributing approximately 65–70% of the total annual rainfall.
- The average annual precipitation in Sheikhupura is around 550–650 mm.
- Occasional winter rains occur due to western disturbances, mainly in January and February.

Heavy rainfall during the monsoon season may cause temporary waterlogging in low-lying areas; however, the QABP site is equipped with a proper drainage system, minimizing this risk.

4.1.7 Temperature

The temperature in the Sheikhupura region varies widely throughout the year, with hot summers (April–September) and cool winters (November–February).

- The mean maximum temperature ranges between 38°C and 45°C during May and June, the hottest months.
- The mean minimum temperature falls between 5°C and 8°C in January, the coldest month.
- The average annual temperature remains around 24°C–26°C.

Extreme heat during summer months can influence evaporation rates, airborne dust levels, and energy demands for industrial cooling systems.

Meteorological data for the project area has been purchased from Pakistan MET department, Lahore and is presented in the table 4.2 on next page.

TABLE 4.2: METEOROLOGICAL DATA OF THE STUDY AREA

Tele: 042-99205591
Fax: 042-99205594

NO.C2-1(2)/2021-A/
GOVERNMENT OF PAKISTAN
PAKISTAN METEOROLOGICAL DEPARTMENT
REGIONAL METEOROLOGICAL CENTRE
46-JAIL ROAD, LAHORE.

Station Name:- Sheikhupura Dated:-Lahore the 29th October, 2025.

RRR = MONTHLY TOTAL RAIN (MM)[-1=TRACE] [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	-1.0	13.9	26.3	22.2	7.9	10.6	140.4	189.5	47.5	7.8	0.0	3.2

TXTX = MONTHLY MEAN MAX TEMP. (oC) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	11.4	20.5	25.7	32.4	40.4	41.9	36.4	33.6	34.9	33.1	26.4	19.5

TNTN = MONTHLY MEAN MINIMUM TEMPERATURE (oC) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	5.1	6.8	11.0	17.0	23.4	27.7	27.2	26.2	25.7	20.1	13.9	5.4

UU2 = HUMIDITY AT 0800 AM (%) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	98.0	90.0	89.0	76.0	48.0	54.0	82.0	90.0	86.0	89.0	95.0	94.0

UU3 = HUMIDITY AT 0500 PM (%) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	86.0	63.0	55.0	39.0	21.0	29.0	61.0	76.0	59.0	56.0	66.0	61.0

FF2 = WIND SPEED AT 0800 AM (KNOTS) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	0.8	0.4	0.7	1.5	1.7	1.4	0.7	1.2	0.5	0.0	0.0	0.1

FF3 = WIND SPEED AT 0500 PM (KNOTS) [-100 Means data not available]

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2024	0.8	1.4	2.3	4.1	3.2	3.8	1.4	1.3	0.8	0.3	0.1	0.5

4.1.8 Humidity

Relative humidity in the region varies seasonally, with higher values during the monsoon and lower levels during summer.

- Morning humidity ranges between 60–85%, while
- Afternoon humidity typically drops to 30–50% during dry months.

The annual average relative humidity is approximately 55–60%. High humidity during monsoon months may affect storage and handling of raw materials and batteries, necessitating moisture control systems within production areas.

4.1.9 Wind Speed and Direction

The predominant wind direction in the Sheikhupura region is from the northwest to southeast during most of the year, shifting to southwest during the monsoon period.

- Average wind speeds range from 5 to 12 km/h**,** with occasional gusts exceeding 20 km/h during summer storms.
- Calm periods are observed during winter mornings.

The prevailing wind pattern supports effective natural dispersion of emissions from industrial operations, reducing the risk of local air stagnation

Table 4.3: Wind Speed and Direction

Season	Dominant Wind Direction	Average Speed (km/h)
Winter (Dec–Feb)	Northwest	6–8
Summer (Mar–Jun)	North/Northwest	10–12
Monsoon (Jul–Sep)	Southwest	8–10
Post-Monsoon (Oct–Nov)	Northwest	6–8

4.1.10 Hydrology

The hydrological characteristics of the study area are influenced by its flat topography, semi-arid climate, and alluvial geological setting. The area surrounding the project site lies within the Ravi–Chenab Doab, bounded by the Ravi River in the southeast and the Chenab River in the northwest. The hydrological regime is primarily governed by monsoonal rainfall, canal irrigation systems, and groundwater dynamics.

Understanding the local hydrology is crucial for assessing surface water availability, groundwater potential, drainage conditions, and water management needs during both construction and operational phases of the project.

Surface Water Hydrology

The project site and its surroundings are part of the Indus Basin Irrigation System (IBIS) — one of the largest irrigation networks in the world.

- The main surface water sources in the Sheikhupura District are canals, distributaries, and minor irrigation channels derived from the Upper Chenab Canal (UCC) and Lower Bari Doab Canal (LBDC).
- The nearest major surface water body is the Upper Chenab Canal, located approximately 5.8 km northwest of the project site.
- The Ravi River flows about 22 km south of the project area.

There are no natural streams or perennial surface water bodies within or immediately adjacent to the project site. However, artificial drainage channels and stormwater collection systems are developed within Quaid-e-Azam Business Park (QABP) to manage rainwater runoff and prevent localized flooding.

The stormwater drainage system at QABP includes:

- Lined channels and culverts for rapid runoff evacuation;
- A network of catch basins and storm drains connected to a centralized outfall system; and
- Proper slope grading of roads and plots to ensure smooth flow of stormwater.

These engineered features prevent stagnant water accumulation, which can otherwise contribute to soil erosion, mosquito breeding, or contamination risks.

Groundwater Hydrology

Groundwater is the primary source of fresh water in the Sheikhupura District, extracted for domestic, industrial, and agricultural uses. The aquifer system beneath the project site forms part of the Indus Plain Alluvial Aquifer, which consists of unconsolidated sand, silt, and clay layers of high permeability.

- Depth to groundwater: The water table in the project area varies between 90 and 120 feet (27–37 meters) below ground level, depending on seasonal fluctuations.
- Aquifer type: Unconfined to semi-confined, with moderate to high yield potential.
- Groundwater flow direction: Predominantly from northeast to southwest, following the regional topographic gradient.
- Recharge sources: Natural recharge occurs through rainfall infiltration, leakage from irrigation canals, and return flow from agricultural fields.
- Water quality: Groundwater samples collected during September 19, 2025, were analyzed by an EPA-approved environmental laboratory. Results indicated that the groundwater is fresh to slightly hard, suitable for industrial and domestic use after minimal treatment.

Table 4.4: Ground Water Analysis of the Study Area

Sr No	Parameters	Method	Unit	Result	PEQS
1	pH	APHA 4500-H B	..	7.36	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	784	1000
3	Chloride	4500-APHA Cl^- B	mg/l	60.50	250
4	Fluoride	APHA 4500-F^- D	mg/l	0.03	1.5
5	Taste	APHA 2120 B	Object./unobject.	Unobject.	Unobject.
6	Odor	APHA 2120 B	Object./unobject.	Unobject.	Unobject.
7	Colour	APHA 2120 B	TCU	0.12	15
8	Nitrate (as NO_3^-)	APHA 4500-NO_3^- E	mg/l	0.4	50
9	Nitrite (as NO_2^-)	APHA 4500-NO_2^- B	mg/l	0.003	3
10	Lead	APHA-Pb B	Mg/l	BDL	0.05
11	Total Hardness as CaCO	APHA 2340 C	Mg/l	92.76	500
12	Turbidity	APHA 2130 B	NTU	0.1	5
13	Zinc	APHA 3500-Zn B	mg/l	0.0	5
14	Aluminum	APHA 3111 D	mg/l	0.03	0.2
15	Chromium	APHA 3500-Cr B	mg/l	0.0	0.050
16	Cadmium	APHA 3500-Cr B	mg/l	0.0	0.01
17	Copper	APHA 3500-Cu C	mg/l	0.0	2
18	Boron	APHA 4500-B C	mg/l	0.046	0.300
19	Barium	APHA 3111 B	mg/l	0.067	0.700
20	Antimony	APHA 3114 C	mg/l	0.0	0.020
21	Arsenic	APHA 3114 C	mg/l	0.0010	0.050
22	Cyanide	APHA 4500-CN- D	mg/l	0.002	0.05

23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.0	0.020
25	Residual Chlorine	APHA 4500-C12	mg/l	0.25	0.2-0.5
26	Total Coliform	APHA 9222 B	Number/100ml	0	0/100ml
27	Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100ml
28	E.Coli	APHA 9222 C	Number/100ml	0	0/100ml

The results confirm that the groundwater quality meets the PEQS and WHO drinking water standards and is safe for industrial processes, once filtered and disinfected.

The details for sampling results are attached as Annexure-III.

4.1.11 Ambient Air Quality

The assessment of ambient air quality provides critical information on the existing atmospheric conditions in and around the project site prior to the commencement of industrial activities. The baseline air quality data establishes a reference to evaluate potential impacts resulting from the project's construction and operation phases.

Ambient air sampling was conducted on September 19, 2025, by SEAL an EPA-approved environmental laboratory, following methodologies prescribed by the Punjab Environmental Protection Agency (PEPA) and USEPA reference methods. Monitoring was carried out at three representative locations within and around the project boundary to capture both upwind and downwind conditions.

The results of the ambient air quality monitoring are summarized below and compared with the Punjab Environmental Quality Standards (PEQS, 2016).

Table 4.5: Ambient Air Quality

Sr. no.	Parameter	Method	Unit	Results	PEQS
1	Particulate Matter (PM10)	40 CFR Part 50, App J (US-EPA)	µg/m³	133.62	150
2	Particulate Matter (PM2.5)	40 CFR Part 50, App.J (US-EPA)	µg/m³	31.14	35
3	Carbon monoxide (CO)	40 CFR Part 50, App.C(US-EPA)	µg/m³	2.67	5
4	Oxides of Nitrogen as (NO & NO_2)	40 CFR Part 50, App F (US-EPA)	µg/m³	48.55	120
5	Sulphur dioxide (SO_2)	EQSA-0197-114 (US-EPA)	µg/m³	52.82	120

4.1.12 Noise levels

Noise is an important environmental parameter that affects the quality of life, occupational safety, and community well-being. The purpose of the baseline noise survey is to assess existing ambient noise levels in and around the proposed project site to establish a reference condition prior to the commencement of construction and operation activities.

Ambient noise monitoring was conducted on September 19, 2025, at selected locations in and around the Quaid-e-Azam Business Park (QABP), Sheikhupura, by an EPA-approved environmental laboratory. Measurements were taken using calibrated sound level meters following international standards (ISO 1996 and USEPA guidelines).

Table 4.4: Noise Levels at Various Locations of the Project Area

Location	Noise Level (dB(A))
North Boundary Site	62.8
South Boundary Site	64.2
East Boundary Site	67.1
Centre of Site	65.3

All recorded values are well within the PEQS allowable daytime limits (i.e., ≤75 dB (A) for Industrial area).

4.2 Biological Environment

A baseline ecological survey was conducted during the field study on September 12, 2025, covering the project site and its 10 km surrounding influence area. The survey included direct field observations, consultations with local residents, and reference to published data from the Punjab Wildlife & Parks Department and the Pakistan Forest Institute (PFI).

The project area is located within the Indus Plains eco-region, characterized by semi-arid subtropical climate, flat alluvial terrain, and sparse vegetation cover. Natural vegetation in this part of Sheikhupura District has been largely modified by agricultural development, industrial activity, and human settlement, resulting in secondary or disturbed ecosystems.

The proposed project site itself lies within Quaid-e-Azam Business Park (QABP), an industrial estate with planned infrastructure, paved roads, and designated green belts. The site is largely barren with patches of grasses and shrubs, indicating low biological diversity and no natural habitats for significant wildlife.

4.2.1 Vegetation Study

The vegetation of the project site and surrounding areas primarily consists of xerophytic and mesophytic plant species adapted to the semi-arid climate.

No natural forest, protected vegetation, or ecologically sensitive plant communities were recorded in or near the project site. Most of the vegetation observed is man-made or ruderal**,** typical of disturbed lands and roadside habitats.

Table 4.5: Floral Composition of the Study Area.

Category	**Scientific Name**	**Status**	**Remarks**
Trees	Kikar (Acacia nilotica), Shisham (Dalbergia sissoo), Neem (Azadirachta indica), Amaltas (Cassia fistula), Eucalyptus (Eucalyptus camaldulensis)	Common roadside and planted trees	Planted in QABP and nearby fields
Shrubs	Jantar (Sesbania bispinosa), Kana (Saccharum spontaneum), Dhatura (Datura metel), Lantana (Lantana camara)	Widely distributed	Common in waste areas
Grasses and Herbs	Bermuda Grass (Cynodon dactylon), Dub (Desmostachya bipinnata), Bathu (Chenopodium album), Clover (Trifolium alexandrinum)	Abundant	Found in open lands and field margins
Crops (Surroundings)	Wheat, Rice, Maize, Sugarcane, Vegetables	—	Cultivated in surrounding agricultural land

The area supports a moderate diversity of common plant species**.** The project site itself has no natural vegetation of ecological significance, and therefore no rare, endangered, or protected plant species were found.

4.2.2 Floral species in the Project area

Figure 4.5: Vegetation Overview in the Study Area

4.2.3 Fauna

The fauna of Sheikhupura District reflects species typically found in agricultural and semi-urban environments**.** Wildlife is generally limited to small mammals, reptiles, birds, and insects that have adapted to human presence.

No wildlife sanctuaries, game reserves, or protected areas exist within a 10 km radius of the project site. The nearest protected area is the Balloki Wildlife Sanctuary**,** approximately 38 km south**,** which lies well beyond the project's ecological influence zone.

Table 4.6: Faunal Composition of the Study Area

Group	**Common Species Observed / Reported**	**Scientific Name**	**Conservation Status (IUCN)**
Mammals	House Mouse, Indian Palm Squirrel, Common Mongoose, Jackal, Fruit Bat	*Mus musculus*, *Funambulus pennantii*, *Herpestes edwardsii*, *Canis aureus*, *Pteropus giganteus*	Least Concern
Birds	House Sparrow, Common Myna, Crow, Dove, Parakeet, Cattle Egret, Pond Heron, Black Drongo	*Passer domesticus*, *Acridotheres tristis*, *Corvus splendens*, *Streptopelia decaocto*, *Psittacula krameri*, *Bubulcus ibis*, *Ardeola grayii*, *Dicrurus macrocercus*	Least Concern
Reptiles	Garden Lizard, House Gecko, Rat Snake, Cobra (rarely sighted)	*Calotes versicolor*, *Hemidactylus frenatus*, *Ptyas mucosa*, *Naja naja*	Least Concern
Amphibians	Common Toad, Skittering Frog	*Bufo stomaticus*, *Euphlyctis cyanophlyctis*	Least Concern
Insects	Butterflies, Honeybees, Dragonflies, Mosquitoes, Ants	Various	Common species

Figure 4.6: Avifauna Observed During the Survey

Gyps fulvus (Griffon vulture) *Egretta garzetta* (Little Egret)

Black kite and crow species were observed in the area. The habitat and distribution range overlapping of two crow species, Jungle crow (Corvus macrorhynchos) and House crow (Corvus splendens) were also observed.

4.2.4 Ecological Sensitivity and Conservation Value

The study area does not include or border any ecologically sensitive zones, national parks, forests, or protected habitats. The ecological environment can be classified as low-sensitivity due to:

- Predominantly industrial and agricultural land use;
- Absence of natural habitats or significant biodiversity;
- Disturbed vegetation due to human activity; and
- Lack of rare or endangered species.

Thus, the project's construction and operational activities are not expected to cause significant ecological disturbance. However, ecological enhancement through greenbelt development and tree plantation is strongly recommended.

4.3 Socioeconomic and Cultural Environment

The study area for socioeconomic assessment includes nearby settlements within a 10 km radius of the project site in Sheikhupura District**,** supported by field observations and available statistical data from the Pakistan Bureau of Statistics (PBS), 2017 Census**.**

4.3.1 Demographic Characteristics

Sheikhupura District has a population of approximately 3.46 million**,** with:

- Rural: 64%
- Urban: 36%

Population within the immediate surroundings of QABP is sparse and primarily rural**,** with the nearest settlements including:

- Bhurban Kalaan
- Kala Shah Kaku region outskirts
- Small scattered villages and farm housing units

The area has a moderately young population**,** with a major proportion under 35 years of age, indicating strong labor availability.

4.3.2 Economic Profile

The economy of Sheikhupura District is driven by a mix of agriculture and industry**.** Major economic activities include:

- Agriculture: wheat, rice, sugarcane, dairy farming
- Industry: textiles, engineering goods, chemical production, food processing
- Transport and warehousing services due to strategic proximity of:
    - Lahore
    - M-2 Motorway
    - Major industrial estates including QABP

The establishment of Jolta Electric's 2 & 3 Wheeler manufacturing facility will contribute to:

- Increased industrial job opportunities
- Support for 2 & 3 Wheeler supply chain development
- Import substitution in fossil-fuel vehicle segment
- Boost to national 2 & 3 Wheeler transition aligned with NEVP 2019

4.3.3 Employment and Income Levels

The area exhibits a mix of:

- Skilled industrial workers
- Semi-skilled labor
- Agricultural workforce

Main occupations:

Sector	**Approx. Workforce Proportion**	**Remarks**
Industrial/Manufacturing	35%	Increasing due to QABP
Agriculture/Livestock	45%	Seasonal employment
Services & Trade	20%	Transport, shops, offices

Average household income in the area: PKR 30,000–60,000 per month

The proposed project will significantly enhance income stability and skilled employment.

4.3.4 Education and Health Facilities

The project lies in an area experiencing transition from rural land uses toward planned industrial development. Education and healthcare services for nearby communities are primarily accessed in the surrounding settlement clusters and district centers. Primary and middle-level schooling needs of adjacent villages are served through Government-run schools including Government Primary School Bhurban Kalaan and Government Girls Elementary School Rakh Bijli**,** providing basic literacy, co-education, and gender-based learning access. For secondary and higher secondary education, students commonly travel to institutions located in Sheikhupura city**,** such as Government College for Boys Sheikhupura and Government Post Graduate College for Women Sheikhupura**.**

Figure 4.7: Govt. primary school near thy QABP

Healthcare access for nearby communities is provided through Basic Health Units (BHUs**)** and rural dispensaries, with the closest being BHU Rakh Bijli and BHU Bhurban**,** offering maternal care, outpatient services, vaccination, and essential medicines. Major medical needs, diagnostic services, emergency trauma care, and specialized treatments are referred to hospitals in Sheikhupura city including District Headquarters Hospital Sheikhupura and Social Security Hospital Sheikhupura**.** Emergency response awareness among communities follows service formats comparable to the provincial emergency stakeholder model of Rescue 1122 for medical transport support.

Overall, the region exhibits adequate education and primary healthcare connectivity**,** with no major limitations on service availability, and demonstrates positive community receptiveness to additional industrial development provided environmental safeguards are enforced.

4.3.5 Infrastructure and Utilities

The project site is located within a notified industrial estate managed by Quaid-e-Azam Business Park Development Authority services, facilitated through the industrial estate framework of Punjab Industrial Estates Development & Management Company (PIEDMC)**.** The area is supported by well-established infrastructure linkages including:

- 32-m wide internal estate roads enabling heavy industrial freight and dispatch movement,
- Grid-connected power supply from Lahore Electric Supply Company (LESCO) ensuring reliability of operational electricity load,
- Natural gas provision planning administered by Sui Northern Gas Pipelines Limited (SNGPL) for current or future industrial gas connectivity,
- Park-level drainage and stormwater routing, and
- Telecom connectivity through fiber-enabled networks (local operators).

No major water bodies or household abstraction wells occur inside the plant boundary. Domestic and minor process wastewater routing is aligned to the estate wastewater network**,** conditional to in-plant treatment before discharge. No cultural heritage infrastructure exists inside or adjacent to the plot. The industrial park zoning confirms the area is compatible with surrounding land uses and contains no infrastructure-based restriction that could hinder project construction or operation.

4.3.6 Gender and Social Structure

The area follows a patriarchal social structure, with men typically engaged in external labor and women managing household duties.

- **Women's Participation**: Limited in formal employment. Some women are involved in livestock care, and home-based embroidery.
- **Decision-Making**: Largely male-dominated, especially regarding land and financial matters.
- **Social Cohesion**: The community is closely knit, with strong kinship ties and collective responses to social and religious events.

4.3.7 Cultural and Religious Sites

- **Mosques**: Present in all settlements; serve as important centers for religious and social gatherings.
- **Shrines**: Some small shrines to local saints (pirs) are present but located outside the project area.
- **Cultural Practices**: The local population celebrates traditional events such as Eid, Urs (saint commemorations), and harvest festivals.

No archaeological, historical, or religiously significant structures were identified within the site boundary during the environmental reconnaissance.

4.3.8 Community Perceptions

Informal consultations with local stakeholders indicate a generally neutral to positive attitude toward the project. Concerns raised include:

- Dust and noise impacts on nearby residents
- Safety measures around project boundary (during excavation)

Community members emphasized the need for:

- Employment for local labor
- Regular water sprinkling to reduce dust
- Fencing

4.4 Quality of Life Values

The quality-of-life profile for local communities reflects a rural industrial-transition environment characterized by improving access to livelihoods, local mobility, utilities, public services, and estate-based transport corridors. The project is socially acceptable among community stakeholders due to strong preferences for local hiring, skill development, inclusion of female technicians (10 → 60 by Year-5), technology transfer support, and reduced fossil fuel reliance through cleaner mobility manufacturing.

Nuisance stressors such as dust and noise are perceived as manageable and reversible due to the project being inside a designated industrial estate located away from dwellings. The plot contains no rare biological habitat, no protected forests, no archaeological receptors, and no physical resettlement requirements, confirming absence of any factors that could negatively influence community lifestyle or cultural identity.

Table 4.7: Quality of Life Indicators (QoLIs) screened during baseline consultations

Indicator	Community Context Status
Livelihoods and Local Employment	Expected major positive impact (increase in household income, jobs, skills)
Mobility and Road Access	Reliable estate road connectivity; moderate traffic increase is within industrial acceptance bounds
Noise Environment	Noisy receptors distant from dwellings; impact is manageable with daytime scheduling and PPE
Public Services (education/health)	Basic services accessible through nearby BHUs and public schools; major services accessed in district center
Cultural & Religious Identity	No direct project impact; no heritage or cultural disturbance expected
Environment, Air and Water	Pre-project baseline is clean; operational impacts negligible with mitigation

The project area shows functional connectivity to education, health, utilities, road access, drainage, and livelihood networks, and reflects good quality-of-life values without any prohibited or sensitive socioeconomic receptors that could hinder project compatibility or approval.

4.5 Lab reports of Environmental Analysis

To support the environmental baseline assessment of the proposed project 2 & 3 Wheeler & Battery Manufacturing Plant by M/s Jolta Electric (Private) Limited at QABP, Sheikhupura, comprehensive environmental sampling was carried out on September 19th, 2025. The sampling included key environmental parameters such as ambient air quality, groundwater quality, and ambient noise levels. This monitoring was conducted by a laboratory certified by the Punjab Environmental Protection Agency (Punjab EPA), in accordance with the procedures and standards outlined under the IEE/EIA Regulations, 2022.

All sampling and analytical procedures adhered strictly to the quality assurance protocols defined by the Punjab EPA. The monitoring and test results were subsequently validated by the Deputy Director (Laboratories), Lahore Division. The validated results represent a reliable benchmark of the pre-project environmental conditions in the study area.

The certified lab reports, including data sheets, analytical methods, and PEQS comparison tables, are enclosed in this report as Annexure-III.

4.6 Suitability of the site (not prohibited, environmentally sensitive, incompatible to surroundings and unsuitable)

The proposed site for M/s Jolta Electric (Private) Limited — situated at Plot No. 10-D, Quaid-e-Azam Business Park (QABP), Sheikhupura — was evaluated for its physical, ecological, social, and regulatory compatibility**.**

The site's attributes have been analyzed against criteria such as land use zoning**,** environmental sensitivity, and proximity to receptors**,** infrastructure availability, and risk of pollution or hazard**.**

4.6.1 Land Use Compatibility

The project site lies within the Quaid-e-Azam Business Park (QABP), a planned industrial estate established and managed by the Punjab Industrial Estates Development and Management Company (PIEDMC).

- QABP has been designated by the Government of Punjab for light to medium industrial activities, including manufacturing, assembly, engineering, and technology industries.
- The proposed electric 2 & 3 wheeler and battery manufacturing activities fall squarely within the permissible land use under the QABP master plan.
- Surrounding plots are allocated for industrial use, with no residential or ecologically sensitive areas within or near the estate boundary.

The site is fully compatible with the intended industrial activity.

4.6.2 Environmental Sensitivity

Environmental screening confirms that the project site and its 10 km surrounding area do not include or border any environmentally sensitive features, such as:

Table 4.7: Environmentally Sensitive Features

Environmental Feature	Presence / Distance from Site	Remarks
National Park / Wildlife Sanctuary	None within 10 km	Not applicable
Forest or Reserved Area	None	QABP is fully developed industrial land
River / Major Canal	Upper Chenab Canal (~5.8 km NW)	No direct hydrological connection
Archaeological / Heritage Site	None within 10 km	Hiran Minar located ~16 km away

Residential / Sensitive Receptors	None within 1.5 km	Nearest settlement is rural farmland
Floodplain or Waterlogged Zone	None	Site is elevated (~215 m AMSL) and graded
Fault Lines or Seismic Hazard Zone	None nearby	Falls in stable Seismic Zone 2B

The site is not environmentally sensitive and lies in a low-risk area in terms of ecology, hydrology, and geology.

4.6.3 Accessibility and Infrastructure

The site offers excellent accessibility and infrastructure support, as it is located along major transport and utility corridors within QABP.
Key features include:

- Direct access via PIEDMC's internal industrial roads connected to Sheikhupura–Lahore Road (N-5) and M-2 Motorway (approx. 4 km away).
- Availability of power supply (LESCO), natural gas (SNGPL), water supply, telecommunication, and wastewater disposal network provided by QABP.
- Well-developed stormwater drainage system and solid waste management services.

The site has *all necessary utilities and infrastructure* for industrial operations.

4.6.4 Socioeconomic Compatibility

The project area is surrounded by industrial and agricultural zones and is sparsely populated.
Key social compatibility indicators:

- No displacement or resettlement required (industrial land already acquired).
- Employment generation expected for local residents, including technical and semi-skilled labor.
- No cultural or religious sites within the immediate vicinity.

Local communities expressed positive perceptions during consultations, viewing the project as a source of economic growth and skill development.

4.6.5 Legal and Regulatory Compliance

The proposed site complies with all relevant legal and administrative frameworks:

- Land ownership legally transferred through PIEDMC industrial allotment;
- Located in an approved industrial estate, thereby not requiring agricultural land conversion;
- Will obtain Environmental Approval (NOC) from Punjab-EPA prior to construction;
- No violation of the Punjab Environmental Protection Act, 1997 (Amended 2012) or land-use restrictions.

4.6.6 Overall Site Suitability Evaluation

Based on the multidisciplinary assessment, the site was evaluated against key environmental siting criteria.

Table 4.8: Site Suitability Evaluation

Siting Criterion	Assessment	Remarks
Land Use Zoning	Suitable	Industrially designated by PIEDMC
Environmental Sensitivity	Not sensitive	No protected or ecologically fragile area
Surrounding Land Use	Compatible	Industrial plots, no residential proximity
Accessibility	Excellent	Adjacent to national highway and motorway
Infrastructure Availability	Complete	Utilities available within QABP
Hydrological Stability	Stable	Outside floodplain, proper drainage
Geological Stability	Stable	Alluvial plain, Zone 2B seismic area
Socioeconomic Setting	Favorable	Local employment and technology benefits
Regulatory Compliance	Fully Compliant	Meets Punjab EPA and PIEDMC requirements

CHAPTER 5: IMPACT ASSESSMENT

5.1 Methodologies for Impact Identification

For systematic identification of environmental and social impacts, multiple established EIA methodologies were applied, ensuring comprehensive coverage and regulatory compatibility. A Checklist Method was used to screen potential impacts across air, water, soil, noise, ecology, occupational health, and socioeconomics, following templates similar to those adopted by the Punjab Environmental Protection Agency. An Interaction Matrix (Leopold-type) was developed to evaluate cause-effect relationships between project activities and environmental receptors, enabling impact ranking based on significance using industry-standard parameters. The Checklists and Matrices were cross-verified for consistency and assigned impact intensity ratings to guide mitigation planning. A Network Method was applied to map primary, secondary, and cumulative impact pathways, illustrating linkages between waste generation, emissions, resource use, and ecological or human receptors. Spatial assessment was further strengthened using GIS-based overlays, combining elevation, drainage, and land-use layers prepared in accordance with the industrial planning framework of Punjab Industrial Estates Development & Management Company. A GIS Expert System was utilized through computer-assisted analysis to validate land and environmental constraints, while overlay mapping was used to confirm receptor proximity and industrial compatibility. Impact prediction and screening were also supported using computer-based expert system models consistent with tools such as the ArcGIS and other spatial analysis systems. Together, these combined methodologies ensured that all potential environmental, social, and industrial risks associated with the proposed facility were identified, categorized, and evaluated.

5.2 Characteristics of Impacts

The identified impacts were evaluated based on their nature, magnitude, spatial extent, timing, duration, reversibility, and associated risk levels to determine overall environmental and social significance. The nature of impacts includes direct effects from assembly operations, welding emissions, paint booth exhaust, and battery material handling; secondary impacts linked to energy consumption, wastewater effluent, solid scrap generation, and noise from production lines; and cumulative effects associated with supply-chain logistics and transport movement. The magnitude of impacts is expected to range from low to moderate for most environmental parameters, given the enclosed production system, flat terrain, and availability of estate-level utilities, while beneficial impacts such as employment generation and fossil-fuel substitution are rated as highly positive at national and regional scales. The extent and location of potential stressors — including gaseous emissions, noise, and wastewater discharge — will remain confined within the industrial plot boundary, with no sensitive receptors within immediate adjacency, confirming low off-site exposure risk. The timing of impacts distinguishes short-term impacts during construction (mainly dust, noise, and soil compaction) and long-term operational impacts (emissions, waste, utilities demand), all of which will be regulated and monitored under PEQS compliance. The duration of physical disturbances is temporary (3–10 months) for construction activities, while operational emissions and industrial activities will continue through the facility's life cycle. The reversibility rating confirms that impacts such as dust generation, noise, and soil disturbance are reversible through restoration measures, wastewater impacts are treatable and manageable via an ETP prior to discharge into the industrial wastewater network,

while land-use change is non-reversible but pre-approved under industrial zoning. The risk level is evaluated as low for ecological and social receptors, moderate for occupational health without controls, but low with HSE systems and engineering controls, and very low for groundwater contamination due to absence of direct process discharge to soil and the depth to water table (~27–37 m). No high-risk or irreversible impacts of unacceptable significance were identified.

The following impact identification checklist was used during the baseline impact screening, following industrial EIA practice accepted by the Environmental Protection Department Punjab. The checklist covers likely environmental and social receptors influenced by manufacturing, assembly, painting, material handling, utilities consumption, and related operations within the influence area of the proposed facility.

Table 5.1: Impact Identification Checklist (Industrial 2 & 3 Wheeler & Battery Facility)

Environmental / Social Aspect	**Potential Impact Consideration**	**Receptor Affected**	**Likely Impact?**
Ambient Air	Dust/Particulate emissions, welding fumes, paint booth exhaust (VOC)	Local air environment, on-site workforce	Yes
Groundwater	Potential contamination from accidental chemical or oil spills	Subsurface water reserves	Low probability / No direct discharge
Surface Water/Drainage	Runoff during construction, sediment transport	Ravi-Chenab Doab drainage network	Yes (short-term)
Noise Environment	Machinery noise, testing activities, transport movement	On-site workforce, industrial acoustic environment	Yes
Soil	Compaction and disturbance during construction; contamination via spills	Project plot soil	Yes (short-term)
Flora/Vegetation	Loss of minor grasses/shrubs in plot corridor	Ruderal vegetation only	Minimal / No sensitive flora
Fauna	Disturbance from noise & activity	Common adapted fauna (birds, small mammals)	Low probability
Solid Waste	Scrap metal, packaging waste, damaged parts, general refuse	Industrial waste stream	Yes
Liquid Effluents	Sanitary wastewater, minor process wash water, cooling drainage	Industrial wastewater network managed by Punjab Industrial Estates Development & Management Company	Yes
Hazardous Waste	Used batteries, e-waste, oils, contaminated absorbents	HSE-managed hazardous stream	Yes
Energy Use	Increased electricity demand (manufacturing lines, HVAC)	Power infrastructure via Lahore Electric Supply Company	Yes

Gender & Social Inclusion	Workforce composition and inclusive employment	Local communities, national EV sector labor	Positive impact
Traffic & Access	Increased truck/parts logistics movement	Industrial access routes including M-2 Motorway linkage network	Yes
Fire/Industrial Safety	Battery storage and charging risks	On-site workforce / infrastructure	Yes (manageable with controls)

A simple interaction matrix was developed to evaluate **cause → receptor → significance** relationships. The matrix approach is comparable to common industrial EIA matrices recognized under Pak-EPA practice, and spatial planning conformity verified within the Quaid-e-Azam Business Park industrial framework.

Table 5.2: Sample: Impact Assessment Matrix (Simple Interaction / Significance Screening)

Project Activity	**Air Environment**	**Water Resources**	**Soil/Plot Surface**	**Ecology**	**Socio-economic**	**Noise Levels**	**Overall Impact Significance**
Site clearance & earth works	●●○ (Medium, short-term dust)	○○○ (No direct impact)	●●○ (Medium compaction/ disturbance)	●○○ (Low)	●●● (High positive jobs via contracts)	●●○ (Medium, temporary)	**Medium (reversible)**
Welding & frame fabrication	●●○ (Localized fumes, manageable)	○○○ (No process discharge)	○○○	●○○	●●● (Skill-based jobs – positive)	●●○ (Moderate industrial noise)	**Low–Medium (reversible, localized)**
Paint booth operations	●●○ (Controlled VOC via filters)	○○○	○○○	●○○	●●● (Local supply chain – positive)	●○○	**Medium (controlled, reversible)**
Battery pack assembly	●○○ (Minimal with ventilation)	○○○	○●○ (Low–Medium spill risk without controls)	●○○	●●● (Technology & jobs – positive)	●●○	**Low (manageable, localized, reversible)**
Battery charging & balancing	○●○	○○○	○○● (Low contamination risk)	●○○	●●○ (Economic supply benefits)	●●○	**Low (managed via HSE systems)**
Storage of chemical/oil inventory	○○○	○●○ (Low if accidental spill)	●●○ (Medium without controls; low with containment)	●○○	●○○	○○○	**Low (with spill control measures)**
HVAC & machinery operation	○●○	○○○	○○○	●○○	●●○ (Employment & industry	●●○ (Industrial noise to workers	**Low to workers / negligible off-site**

					growth positive)	only)	
Vehicle testing (motors, load, electrical)	○●○	○○○	○○○	●○○	●○○	●●○ (Short bursts, industrial zone)	**Low–Medium (short-term, reversible)**
Dispatch logistics	●○○	○○○	○○○	●○○	●●● (Dealership ecosystem – strong positive)	●●○ (Day-peak, industrial)	**Low–Medium (localized to industrial routes)**

The checklist and matrix screening confirm that most environmental stressors will be short-term, localized, reversible, and manageable through standard industrial mitigation and HSE controls, while socioeconomic impacts are strongly positive due to job creation, income stability, and fossil-fuel substitution through local EV and battery manufacturing.

Chapter 6: Screening of Potential Environmental Impacts and Mitigation Measures

This chapter provides a systematic assessment of potential environmental impacts resulting from the proposed 2 & 3 Wheeler & Battery Manufacturing Plant by M/s Jolta Electric (Private) Limited at QABP, Sheikhupura. The screening is carried out in accordance with the Pakistan Environmental Protection Act, 1997, and the Punjab EPA IEE/EIA Regulations, 2022. The analysis is structured around key phases of the project lifecycle and is aimed at identifying environmental risks and proposing corresponding mitigation or enhancement measures.

6.1 Impacts during Project Location

The project site is located at Plot No. 10-D in Quaid-e-Azam Business Park Sheikhupura within a pre-approved industrial estate developed and managed by the Punjab Industrial Estates Development & Management Company. The site lies outside any prohibited land-use zones and does not intersect environmentally sensitive receptors such as forests, wildlife sanctuaries, rivers, or residential communities. Minor impacts at the location stage may include dust from existing infrastructure development within the industrial park and incremental pressure on estate utilities; however, these impacts are not project-induced and remain within permissible limits. Mitigation at the siting stage therefore focuses on ensuring continued zoning conformity, preserving designated green corridors, and maintaining proper drainage connection through the existing stormwater network of the River Ravi basin gradient. The project location is thus considered suitable for industrial EV and battery manufacturing, with no incompatible surrounding land uses, and no impacts requiring land rehabilitation beyond routine landscaping.

6.2 Impacts during Project Design

At the design stage, environmental screening ensured compatibility of plant components, internal layouts, chemical storage, ventilation, and effluent routing, adopting guidance comparable to commonly referenced industrial assembly designs under the Punjab Environmental Quality Standards. Potential design-related stressors include paint booth VOC exhaust, welding fume ventilation requirements, sanitary effluents, battery charging safety, stormwater flow, noise exposure to workers, and scrap material management. These impacts are anticipated and reversible if appropriately controlled. Design-integrated mitigation includes enclosed production halls, airtight paint booths with carbon-assisted filtration, local exhaust ventilation for welding bays, spill containment for oil and chemicals, fire-rated battery storage zones, anti-static assembly surfaces, separate waste segregation points, wastewater conveyance to an on-site effluent treatment system, acoustic insulation for high-decibel machinery units, and energy-efficient electrical design. Environmental controls (ETP, filters, and containment, ventilation, and HSE features) are included in the approved building and engineering templates required by AutoCAD-based layouts prior to execution.

Table 6.1: Impact Screening Matrix – Environmental Aspects, Impacts & Mitigation

Environmental Aspect / Source	Potential Impact	Impact Nature	Magnitude	Extent / Location	Mitigation / Control Measure
Site preparation & earth works	Dust, soil disturbance, landscape	Direct / Short-term	Medium	Project plot boundary and internal roads	Water sprinkling, soil leveling, covered material transport,

	alteration			in the industrial estate of Punjab Industrial Estates Development & Management Company	reuse of topsoil for landscaping
Welding and frame fabrication	Localized welding fumes, particulate matter exposure	Direct / Reversible	Low–Medium	Confined to fabrication halls within the allocated industrial plot inside Quaid-e-Azam Business Park	Local exhaust ventilation, fume extractors, worker PPE, welding bay filtration, equipment maintenance
Paint booth & surface coating	VOC emissions, solvent vapors, overspray deposition	Direct / Long-term	Medium (without controls), Low (with controls)	Confined to paint booth exhaust stacks inside industrial plot	Enclosed negative-pressure paint booths, activated-carbon VOC filters, periodic stack testing, prohibition of open painting
Battery assembly & storage ($LiFePO_4$)	Risk of chemical exposure, thermal runaway (safety risk), solid battery scrap	Indirect / Localized / Manageable	Low	Battery assembly and storage zone within the industrial halls	Anti-static flooring, controlled temperature, fire-rated storage, training, fire suppression system, no soil discharge, recycling of damaged cells by certified vendors
Battery charging, balancing & testing	Heat, electrical hazards, potential acid-free electrolyte leakage	Direct / Reversible	Low	Testing bays inside industrial area	Dedicated charging zone, smoke/heat detection, electrical safety breakers, insulated wiring, emergency shutdown systems
Wastewater generation	Groundwater and surface drainage contamination if discharged untreated	Indirect / Long-term	Low	No natural surface water intersected; treated discharge routed only via ETP to the industrial wastewater network within QABP leading toward	Install on-site Effluent Treatment Plant (ETP), neutralization, filtration, controlled industrial discharge after treatment

				the flow gradient of River Ravi	
Solid waste from operations	Land and visual pollution, landfill burden	Direct / Long-term	Medium	Generated on-site in industrial plot	Waste segregation, recycling of metal/plastic/cartons through QABP contractor, record keeping, no open dumping
E-waste / used oils / absorbents	Soil and groundwater impact if unmanaged	Indirect / Manageable	Low	HSE-managed waste storage zone on-site	Bunded storage, spill kits, hazardous waste sold/disposed through EPA-approved vendors
Operational machinery noise	Worker health disturbance, minor off-site industrial noise	Direct / Long-term	Low to workers, negligible off-site	Inside industrial halls and QC testing ground on-site	Acoustic insulation, silencers on equipment, mandatory hearing PPE, periodic noise monitoring
Emergency backup generator	Air emission pulses during outages	Indirect / Occasional	Very low	Backup generator pad on-site	Use only for emergency, regular tuning, low-sulfur diesel, chimney height as per guidelines
Stormwater runoff	Sediment transport or oil traces in runoff	Short-term & seasonal	Very low	Estate storm drains within QABP	Rooftop harvesting, sediment traps, oil-water separator on drains
Vegetation & open land	Loss of minor ruderal grasses	Direct / Reversible	Negligible	Barren/vacant zones on-site and estate periphery	Compensatory greenbelt development with native species
Employment & community impact	Improved livelihoods, skill progression, EV adoption benefits	Beneficial / Long-term	High positive	Local economic zone and national EV market	Prioritize local hiring, reduce foreign dependency over time, structured training, community liaison

Assessment Outcome: All screened environmental stressor impacts are localized, reversible, low-to-medium in magnitude, and manageable through embedded mitigation and estate-level controls, while socioeconomic impacts remain strongly beneficial.

6.3 Impacts during Construction Phase

Construction activities (foundations, structures, internal roads, utilities, and equipment installation) may generate temporary and localized impacts, primarily dust, noise, soil disturbance, wastewater from worker facilities, and construction debris. These are short-term in duration (estimated 6–10 months), fully reversible, and restricted within the project boundary.

Mitigation measures during construction will include water sprinkling to suppress dust, covered transport of construction materials, installation of noise-controlled equipment and scheduling of high-noise activities during daytime, reuse of excavated topsoil for landscaping, proper bunding of fuel storage and refueling zones, prohibition of open burning, deployment of personal protective equipment (PPE) for workers, provision of proper sanitation facilities, safe storage of battery components in designated laydown sheds, segregation of construction waste (metal, concrete, wood, plastics), recycling of high-value scrap where feasible, and disposal of residual debris through industrial waste contractors approved by QABP estate management. Pre-commissioning inspection of drainage lines and effluent treatment units will be ensured before trial operations.

6.4 Impacts during Operational Phase

The operational phase involves mechanical assembly, welding, paint booth exhaust, battery pack fabrication, electronic integration, charging, testing, storage, warehousing, and dispatch to market. Screened stressors include VOC and particulate emissions, wastewater effluent, solid scrap, battery waste, occupational noise, fire risk, and electricity demand. Air emissions, wastewater, and noise are moderate if uncontrolled, but negligible to low once mitigation is applied, as processes are enclosed and discharged to treatment or filtered exhaust systems. Operational mitigation will include:

- Paint booth VOC control via activated-carbon filters and negative-pressure booths;
- Welding fume capture with localized exhaust ventilators;
- Treated process and sanitary effluent discharge only after neutralization, filtration, and balancing through an on-site Effluent Treatment Plant (ETP) designed as per PEQS discharge limits;
- 100% segregation and recycling of non-hazardous solid waste (carton, metal, plastics);
- Safe handling of hazardous wastes including damaged batteries, used lubricants, and contaminated absorbents following an approved Hazardous Waste Management Plan;
- Noise exposure control for workers using acoustic insulation, equipment maintenance, silencers, and hearing PPE (earmuffs/earplugs);
- Backup generator emissions minimized via periodic maintenance and only emergency use;
- Material storage for oils and chemicals on bunded and paved pads with spill kits; and
- Annual environmental monitoring and EMP compliance reporting to Punjab-EPA.

Table 6.2: Environmental Aspects, Impacts and Mitigation Matrix (During Construction and Operational Phase)

Environmental Aspect	Potential Impact (Construction Phase)	Mitigation Measures (Construction Phase)	Potential Impact (Operational Phase)	Mitigation Measures (Operational Phase)
Air Quality	Dust from earthworks, vehicle	Regular water spraying, covering of loose materials,	Localized welding fumes and VOCs from paint booth	Enclosed paint booths with carbon-based VOC

	movement, material handling and generator use	limiting vehicle speed, dust masks for workers, avoiding open burning, immediate debris removal	exhaust	filtration, fume extraction systems at welding bays, maintaining negative pressure in paint halls, periodic stack testing, routine maintenance, and worker PPE
Noise Levels	Noise from construction equipment, piling, hammering, and heavy vehicle movement	Restrict noisy activity to daytime, periodic equipment maintenance, use of low-noise machinery, acoustic barriers if needed, mandatory use of earplugs/earmuffs, awareness training	Occupational noise from EV/battery assembly lines, motor testing bays, compressors, and standby generator	Acoustic insulation for high-noise units, silencers on compressors, preventive maintenance, hearing protection PPE for workers, noise monitoring as per EMP
Soil / Land Surface	Soil compaction, excavation disturbance, accidental oil/fuel/chemical spills	Minimize disturbed footprints, loosen and re-grade compacted surfaces, reuse excavated soil, provide bunded fuel storage, place spill trays under generators/service areas, maintain spill kits, dispose contaminated absorbents safely	Soil contamination risk from oils, battery rejects, or poor waste handling	Dedicated bunded hazardous material storage, paved chemical/oil areas, strict spill response protocol, temporary storage of battery rejects on impermeable floors, recycling through certified vendors, no ground dumping
Water Resources	Construction wastewater from worker facilities and sediment-laden storm runoff	Portable toilets/septic system, controlled drainage, sediment traps on drains, keeping chemicals away from drainage lines, no wastewater discharge to open soil, record water use	Sanitary wastewater and minor process wash/cooling drainage	On-site Effluent Treatment Plant (neutralization + filtration + balancing) before discharge to the centralized wastewater system of the industrial estate managed by Quaid-e-Azam Business Park, water recycling where possible, routine groundwater monitoring, no direct release
Solid Waste	Construction debris (metal, concrete, wood, cartons), workforce refuse	Waste segregation, metal/wood recycling, material reuse, contract disposal through industrial park	Scrap metal, packaging, battery rejects, electronic waste, used oils/absorbents	100% waste segregation, recycling agreements, secure temporary

		waste handlers, prohibition of open dumping, site cleanliness monitoring		hazardous waste storage, safe disposal via EPA-approved contractors, labeling + inventory record, management through HSE system, training, no open disposal
Batteries / Chemical Handling	Temporary storage of lithium cells, oils, paints, lubricants, risk of exposure or spillage	Designated covered storage, anti-static handling surfaces, fire extinguishers in laydown zone, trained personnel supervision	Battery assembly, charging, rejects handling, safety risks (thermal/electrical)	Anti-static flooring, smoke/heat detection, electrical safety breakers, emergency shutdown system, fire-rated battery storage, gradual staff localization, recycling of damaged cells by certified suppliers
Energy Consumption	Power use for welding, lighting, cranes, generators	Use of energy-efficient equipment where possible, turn-off policy for idle loads	Continuous electricity demand for machining, painting, battery assembly, HVAC, lighting	Energy-efficient motors, LED lighting, VFD drives, power-saving policy, future integration of **solar auxiliary load support**, metered monitoring
Ecology / Vegetation	Loss of minor grasses/shrubs in industrial plot (barren/vacant)	Compensatory greenbelt plantation after construction, maintaining estate green corridors	No sensitive habitats, minor bird/insect interactions	Environmental enhancement via native tree greenbelt, pollinator-friendly plants to improve micro-biodiversity, maintenance of greenery
Community & Employment	Temporary increased truck movement, influx of workers, possible minor nuisance	Traffic scheduling, availability of hired male/female labor, complaints registry, community liaison cell, HSE awareness	Technology-driven employment growth, inclusion of local labor, foreign experts (decreasing trend)	Priority to local hiring, structured training, grievance mechanism, liaison with estate management of Punjab Industrial Estates Development & Management Company, reduce foreign dependency from 12 → 3 over 5 years

During the construction phase, impacts are expected to be short-term, localized, reversible, and low-to-medium in magnitude, dominated mainly by dust, noise, soil disturbance, workers' effluent, and construction debris. These will be controlled through water sprinkling, covered storage, spill containment, waste segregation, and occupational PPE, and all disturbed surfaces will be rehabilitated via re-grading and compensatory greenbelt plantation.

During the operational phase, screened impacts include controlled air emissions from welding and paint booths, sanitary and process wastewater, occupational noise, and industrial scrap streams. Since operations take place within a designated industrial park, and all emissions/effluents will be treated, filtered, and monitored or routed to the estate's centralized systems following the regional slope toward the River Ravi basin gradient, off-site environmental risk remains negligible, while occupational risks are low once HSE controls are applied.

6.5 Potential Environmental Enhancement Measures

To improve environmental conditions beyond mitigation, the project integrates environmental enhancement measures as part of its sustainability strategy, aligned with Pakistan's low-carbon industrial and clean mobility roadmap supported by the Ministry of Climate Change Pakistan. These include development of a dense greenbelt (minimum 33 feet width along boundary) using native, dust-tolerant tree species, irrigation of green areas using treated ETP water**,** installation of solar photovoltaic (PV) system for auxiliary load support (~250–300 kW planned in later phase)**,** rainwater harvesting from rooftop catchments**,** oil-water separators on storm drains, use of energy-efficient motors and LED systems to reduce electricity footprint, biodiversity support through bird perching and pollinator-friendly boundary plantation, and worker environmental awareness training. The industrial estate greenery will supplement corridor plantation of QABP.

CHAPTER 7: ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM (EMMP)

7.1 Introduction

The Environmental Management and Monitoring Program (EMMP) outlines the framework for implementing mitigation measures identified during the Environmental Impact Assessment (EIA) process. The EMMP ensures that all environmental commitments made in this report are effectively carried out during the design, construction and operation phases of the proposed project.

The EMMP is prepared in compliance with the Pakistan Environmental Protection Act, 1997, the Punjab Environmental Protection (IEE/EIA) Regulations, 2022, and the National Environmental Quality Standards (NEQS).

7.2 Description of Proposed Mitigation Actions

Mitigation actions have been built into the project planning following the compliance framework of the Environmental Protection Department Punjab. Air quality stressors during construction and operations will be controlled by water sprinkling, covered transport, and booth-level VOC and fume extraction systems. Soil protection will use impermeable floors, bunded pads, and spill trays with rapid response kits. Wastewater streams (sanitary and minor process wash) will be routed to an on-site Effluent Treatment Plant (ETP) for neutralization and filtration before discharge into the pre-approved centralized wastewater network of the industrial estate managed by the park authority. Noise exposure to the workforce will be reduced using time-restricted daytime construction, preventive maintenance, acoustic insulation, and hearing PPE. Solid and hazardous wastes (scrap metal, packaging, battery rejects, used oils, contaminated absorbents, e-waste) will be segregated at source, stored temporarily on impermeable surfaces, labeled in HSE storage rooms, and recycled or disposed via EPA-approved contractors. Fire and battery safety risks will be managed through fire-rated storage, smoke/heat detectors, emergency shutdown systems, and technical training, ensuring impacts remain localized and low once controlled. The project also embeds gender-inclusive hiring and skill localization, minimizing long-term social risks while strengthening local 2 & 3 Wheeler and batter supply chains.

7.3 Schedule for Implementation and Environmental Budget

Table 7.1: Schedule for mitigation implementation.

Mitigation Category	Implementation Stage / Timeline
Dust & construction air controls	Months 1–10 (daily, during civil works)
Welding fume ventilation setup	Months 8–14 (machinery installation overlap)
Paint booth VOC filtration system	Months 12–16 (before commissioning)
Effluent Treatment Plant (ETP) installation	Months 12–16 (must be complete before trial production)
Noise insulation & silencers	Months 12–18 (before full operation)
Waste segregation & HSE storage rooms	Months 10–16 (before workforce mobilization peak)
Worker HSE & environmental training	Months 16–20 (pre-operation + continuous)
Greenbelt plantation & soil restoration	Months 18–24 (post-construction → maintained throughout life

	cycle)
Groundwater & noise monitoring	From Month 20 onward, annual and bi-annual as per EMP

7.3.1 Environmental Budget

A dedicated environmental management budget of PKR 22 million has been allocated within the overall project investment managed through the industrial estate framework of the Punjab Industrial Estates Development & Management Company. The breakup of the estimated environmental budget is as follows:

Table 7.2: Environmental budget

Component	Budget (PKR Million)
Air quality controls (dust + VOC filters + extractors)	5
Effluent Treatment Plant setup & contingencies	10
Noise control (acoustic insulation + silencers + PPE)	2
Hazardous waste storage room setup	1
Solid waste segregation & recycling arrangements	1
Greenbelt development and irrigation system	1
Environmental & HSE training programs	1
Monitoring & regulatory reporting (5-year plan)	1
Total Environmental Budget	**22 Million PKR**

Monitoring and EMP compliance sampling will be financed from this allocated environmental budget, with further incremental budgeting during plant expansion phases if required.

7.4 Environmental Management Team – Roles and Responsibilities

A dedicated Environmental and HSE Management Team will be established to ensure compliance with environmental obligations, monitoring requirements, and mitigation commitments throughout the project life cycle, in coordination with the regulatory oversight of the Punjab Environmental Protection Agency. The team will combine environmental management, safety supervision, monitoring coordination, and regulatory reporting functions, ensuring efficient implementation of the Environmental Management and Monitoring Program.

The core team will consist of the following positions and responsibilities:

Table 7.3: Roles and responsibilities of the management

Name / Position	Primary Role	Key Responsibilities
Project Director	Overall environmental compliance oversight	Strategic coordination, approval of EMP budget, and institutional liaison
Plant Manager	Execution of environmental safeguards	Daily enforcement of environmental and safety protocols within industrial operations
HSE Manager	Head of Environment, Health & Safety division	Supervision of mitigation implementation, HSE policy enforcement, and safety systems coordination
Environmental Monitoring Officer	Field sampling and data compliance lead	Air, water, and noise monitoring coordination, instrument calibration, and analytical supervision
Effluent Treatment Plant (ETP) Supervisor	Wastewater process controls	Management of the plant-level effluent neutralization and filtration processes prior to

		discharge
Waste Management Coordinator	Solid & hazardous waste compliance	Segregation, contractor coordination, safe storage, transport, and recycling/disposal tracking
Electrical Maintenance Lead	Electrical safety and energy controls	Supervision of insulated wiring, safety breakers, emergency shutdown systems, and energy safety
Administration & HR Head	Workforce inclusion and internal grievance lead	Local hiring preference, gender inclusion monitoring, and maintaining complaints registry during mobilization
Industrial Safety Trainer	Skill and safety capacity building	Training for spill response, battery handling, noise safety, PPE, and general HSE awareness

7.4.1 Team Functions and Compliance Commitments

The Environmental Management Team will ensure:

- Implementation of all mitigation actions during construction and operations;
- Compliance with Punjab Environmental Quality Standards (PEQS) for emissions, effluents, noise, and hazardous waste handling;
- Proper functioning of environmental control infrastructure including ETP, ventilation, noise insulation, spill kits, firefighting, and waste segregation;
- Annual and bi-annual environmental monitoring, data reporting, and internal compliance audits;
- Maintenance of greenbelt and landscaping restoration areas;
- Worker environmental, health and safety training, drills, and awareness programs;
- Grievance redressal and community-level complaints tracking during workforce mobilization and logistics movement.

7.5 Proposed Monitoring Program to Assess Performance of EMP

To evaluate the effectiveness and performance of the Environmental Management Plan (EMP), an Environmental Monitoring Program (EMoP) will be implemented, monitored, and periodically reported to the Punjab Environmental Protection Agency. The program is designed to assess EMP compliance**,** monitor residual impacts**,** verify mitigation performance**,** and track key environmental quality indicators during the construction and operational lifespan of the project.6.6 Environmental Monitoring Plan

Monitoring will be conducted at defined intervals to ensure compliance with NEQS and project-specific standards.

Table 7.4: Monitoring Components, Methods and Frequency

Monitoring Aspect	Parameters to be Monitored	Monitoring Method / Tool	Frequency	Performance Indicator (EMP Output Link)
Ambient Air Quality	$PM_{2.5}$, PM_{10}, VOCs, CO, NO_x, SO_2, O_3	High-volume samplers, gas/VOC analyzers, carbon-filter efficiency checks, stack sampling for paint booths	Bi-annual during operation, monthly during peak construction	PEQS compliance, filter & fume extraction efficiency ≥90%, no visible dust plumes
Noise Monitoring	Day & night Leq	Integrating sound level	Construction:	Plot boundary noise <75

	dB(A) at plot boundary & within halls	meter, equipment noise dampening inspection	Monthly; Operation: Quarterly	dB(A) day / <65 dB(A) night, occupational exposure PPE in place
Water Quality (Groundwater)	pH, TDS, hardness, chlorides, sulphates, iron, heavy metals (As, Pb, Cd)	Grab sampling and lab analysis	Construction: Once; Operation: Annual	No contamination trend relative to baseline; abstraction sustainable
Wastewater / ETP Output	pH, BOD, COD, TSS, oil & grease	ETP inlet/outlet sampling, OWS inspection	Operation: Quarterly; Construction: Once before commissioning	ETP discharge parameters within PEQS, OWS functional, no un-treated discharge
Soil Quality	Heavy metals, hydrocarbons if spill occurs	Composite soil sampling if accidental spill occurs	Only in case of spills; Post-rehabilitation once in construction	No contamination, rehabilitated soil reused in greenbelt
Waste Management	Records of solid & hazardous waste, recycling %, contractor disposal slips	Visual inspection and documentation audit	Construction: Monthly; Operation: Quarterly	100% segregated waste, recycling ≥75%, disposal fully documented
Plantation / Greenbelt	Survival rate of trees & shrubs	Physical count, photographic record, irrigation inspection	Quarterly	Plantation survival ≥85% after 1 year, treated water irrigation ongoing
Occupational HSE	PPE compliance, fire, spill, battery handling safety	Drill, inspection, training attendance, sensor system inspection	Monthly (both phases), drills quarterly	100% staff trained, sensors operational, emergency systems responsive

7.5.1 EMP Performance Evaluation Mechanism

The EMP performance will be quantitatively and qualitatively evaluated through:

- PEQS compliance comparison for air, noise, water, and wastewater;
- Inspection-based verification of installed control infrastructure (VOC filters, fume extractors, OWS/OWS, ETP, acoustic insulation);
- Trend analysis of groundwater results to detect any deviation from baseline;
- Waste recycling and safe disposal tracking using contractor documentation and manifest records;
- HSE training and drill response evaluation, ensuring corrective actions are implemented; and
- Greenbelt survival percentage tracking, ensuring ecological enhancement commitments are achieved.

A corrective action plan will be triggered if:

- Any pollutant parameter exceeds PEQS limits, or shows upward trend ≥20% from baseline;
- Filters or ventilation systems show efficiency <90%;
- ETP outlet deviates from PEQS sampling results; or

- Plantation survival drops below 75%.

7.5.2 Monitoring Documentation and Reporting Protocol

All monitoring data will be:

1. Analyzed by an EPA-approved laboratory;
2. Compiled into monitoring reports signed by the Environmental Monitoring Officer and HSE Manager;
3. Submitted to Punjab-EPA as part of the annual environmental compliance report; and
4. Maintained in an internal environmental register for at least 5 years.

7.5.3 Environmental Monitoring Budget (Allocated from EMP Budget)

Monitoring program financing will be covered from the previously committed PKR 3 Million Environmental Budget**,** with an estimated PKR 1.5 Million reserved for monitoring for first 5 years:

Table 7.5: *Environmental Monitoring Budget*

Monitoring Component	Estimated Cost (PKR Million)
Air Quality Sampling & Stack Testing	0.5
Noise Monitoring Instrumentation & Surveys	0.5
Groundwater & Wastewater (ETP/OWS) Analysis	0.5
Waste Documentation & Audits	0.5
Greenbelt Monitoring & Reporting	0.5
HSE Drills & Training Evaluation	0.5
Total Reserved Monitoring Budget	**3.0**

This monitoring allotment ensures performance verification, EMP effectiveness tracking, and regulatory reporting continuity without financial gaps.

The proposed monitoring program is adequate, measurable, and linked directly with EMP outputs**,** ensuring that the project remains within environmental compliance thresholds**,** maintains effective mitigation system performance**,** and fulfills environmental enhancement commitments**.** Through periodic sampling, inspections, and documentation audits, the EMP will function as a living environmental control system**,** continuously evaluated and improved where required.

7.6 Proposed EMP Reporting and Reviewing Procedures

A structured reporting and review mechanism will be implemented to ensure that the Environmental Management Plan (EMP) remains effective, updated, and compliant throughout project execution and facility operation. The EMP reporting procedure will follow a tier-based internal and external communication system, comparable to industrial environmental reporting formats recognized by the environmental regulatory framework of Punjab. All monitoring outputs, inspection findings, incident logs, waste manifests, and compliance comparisons will be documented in a centralized environmental register managed by the HSE Department of the proponent company.

7.6.1 EMP Reporting Procedures (Internal Reporting Flow)

- Daily Logs: On-site supervisors including the ETP Supervisor, Fabrication & Welding Bay In-charge, and Battery Assembly Line Leads will maintain daily operational logs (emissions control uptime, safety checks, ETP dosing, waste segregation compliance, drainage inspection, and noise PPE deployment).
- Monthly Reports: The Environmental Monitoring Officer (EMO) will compile monthly construction-phase and quarterly operational-phase summaries, covering analytical results, mitigation system performance, water use, waste generation, training attendance, and plot-boundary conditions.
- Incident Reporting: Any spill, fire, sensor alarm, or waste non-compliance occurrence will be escalated within 24 hours to the HSE Manager, followed by a Root Cause Analysis (RCA) and corrective action issuance.
- Annual Compliance Report: A comprehensive EMP compliance report will be developed annually and endorsed by the Project Director and Plant Manager, and maintained for regulatory submission.

7.6.2 EMP External Reporting Procedures

The project will coordinate EMP reporting with the estate-level administrative authority, environmental monitoring bodies, and utility routing departments. Reports containing analytical results, mitigation effectiveness, discharge compliance, waste manifests, alarms, and environmental enhancement performance will be submitted annually to the Punjab-EPA as part of the mandatory EIA approval obligations. Additional review-driven communication may also occur during project expansion, audits, or third-party credential verification stages.

7.6.3 EMP Review and Revision Procedures

To maintain EMP relevance, the following review procedures will be adopted:

1. Internal EMP Review: Twice a year, the HSE Manager and Environmental Monitoring Officer will conduct a formal internal EMP review to evaluate monitoring trends, audit observations, mitigation efficiency, discharge performance, sensors uptime, waste records, grievances, and plantation survival.
2. Trigger-Based Revision: EMP will be revised immediately if (a) any parameter exceeds PEQS/NEQS limits, (b) pollution control efficiency remains below 90% for more than 10% of uptime, (c) new environmental receptors emerge during estate development, or (d) major process modifications occur (battery line extension, paint capacity expansion, generator scale change, ETP up-gradation).
3. Five-Year Strategic Revision: A full EMP strategic revision will be conducted after 5 years to localize foreign technical roles, update production magnitude, enhance resource-efficiency controls, and integrate renewable-energy adoption commitments.

7.6.4 EMP Auditing Timeline Linked with Review

Review Type	Schedule	Responsible Departments
Internal construction phase EMP audit	Monthly	EMO + Plant Manager
HSE + Mitigation review	Bi-annual	HSE Manager + EMO

Operational compliance evaluation	Quarterly	EMO + ETP Supervisor
Annual EMP effectiveness review	Once per year	Project Director + HSE Manager
Strategic EMP revision	After 5 years	HSE Department + Plant Management

7.6.5 Review Documentation and Validation

All EMP reviews will include:

- Comparative tables against baseline benchmarks;
- Efficiency inspection sheets for filters, ventilation, and ETP;
- Incident logs and corrective action closures;
- Waste handover slips and recycling percentages;
- HSE training documentary evidence; and
- Signed review minutes archived in both soft and hard form for 5+ years.

7.6.6 EMP Budget for Reviews and Updates

EMP reviewing and reporting activities are covered under the dedicated Environmental Budget of PKR 22 Million, with PKR 1.2 – 1.5 Million per year reserved for:

- EMP documentation,
- internal/external submission logistics,
- mitigation review workshops, and
- Trigger-based updates.

The proposed EMP reporting and review procedures adopt a measurable and adaptive framework that ensures:

✓ compliance with industrial environmental standards,

✓ uptime and efficiency verification of pollution control systems,

✓ rapid escalation and corrective response to incidents, and

✓ strategic periodic revisions that reflect the project's technology-transfer objectives with reduced foreign dependency.

The reporting system will function as a continual improvement cycle**,** updated as and when required, and validated through documented reviews, audits, and regulatory submissions.

7.7 Training Needs for EMP and Monitoring Plan Implementation

To ensure effective implementation of the Environmental Management Plan (EMP) and associated monitoring obligations, a structured capacity-building and workforce training program will be deployed under the governance model of the project proponent, in coordination with industrial estate support services from the Punjab Industrial Estates Development & Management Company. Training is essential to localize technical capabilities, maintain mitigation infrastructure, ensure health and safety, and generate regulatory-compliant monitoring outputs for submission to environmental authorities.

7.7.1 Core Training Requirements by Position

Key project positions will receive dedicated environmental and safety skill development, based on international standards and industrial EIA practices accepted under Punjab's regulatory expectations, similar to formats vetted through institutions like the Pakistan Environmental Protection Agency.

Position	Training Focus
Project Director	EMP endorsement procedures, compliance decision-making, institutional liaison
Plant Manager	Implementation of mitigation controls, resource efficiency enforcement, monitoring oversight
HSE Manager	HSE & EMP supervision, spill-response systems, noise, fire and chemical storage safeguards
Environmental Monitoring Officer	Sampling protocols, calibration, PEQS/NEQS compliance comparison, report compilation
Effluent Treatment Plant Supervisor	Wastewater dosing, ETP performance evaluation, discharge compliance practices
Waste Management Coordinator	Industrial and hazardous waste handling, manifests, segregation and contractor credential tracking

7.7.2 Thematic Training Modules

Training will be divided into construction-phase and operation-phase requirements, covering environmental controls, monitoring protocols, safety systems, and reporting.

A. Construction Phase Training Needs

Prior to and during construction, all workers and supervisors will receive:

- Dust suppression and air protection training (importance of water sprinkling, covered material handling, no open burning);
- Fuel, oil and chemical spill prevention and response (spill tray use, absorbent kit deployment, immediate escalation);
- Noise management protocols (daytime scheduling for noisy work, hearing PPE usage);
- Construction waste segregation practices (separate bins for metal, concrete, wood, cartons, plastics, and safe contractor handover);
- General HSE awareness training for contractors and workforce (PPE compliance, emergency contacts display, first aid access, fire extinguisher use).

Timeline:

- Initial induction: Prior to site mobilization
- Refresher sessions: Every month during active construction (approx. 6–10 months)

Performance Link: 100% trained workforce during site development; documented attendance maintained.

B. Operational Phase (Manufacturing Facility) Training Needs

During factory operations, technical staff will receive:

- Welding fume extraction system handling and maintenance;
- Paint booth emission control and VOC filter maintenance;
- ETP operation and effluent compliance protocols;
- Lithium-based battery handling, reject storage and thermal/electrical fire safety;
- Industrial waste segregation, hazardous storage labeling and manifesting;
- Stormwater management, sediment traps, and oil-water separator inspection;
- Use of hearing PPE for occupational noise exposure;
- Incident escalation and EMP corrective action cycle compliance.

Timeline:

- Pre-commissioning intensive training: Month 16–20 (before trial production)
- Permanent staff refreshers: Quarterly
- Emergency drills & safety simulations: Twice a year

Performance Link:

- Pollution control uptime ≥90%, effluent within PEQS, groundwater remains at baseline trend, waste manifests 100% complete, no untrained personnel in critical zones.

7.7.3 Training Delivery Mechanism

Training will be delivered using:

- Induction and refresher lectures
- Practical hands-on sessions
- Emergency response drills
- On-site signage and SOP awareness reinforcement
- Technology transfer workshops led by foreign collaborators in early years

7.7.4 Documentation and Compliance

All training activities will be:

1. Recorded in hard and digital formats
2. Signed by trainers and HSE department
3. Archived for minimum 5 years
4. Made available for EPA submission, EMP review, and third-party audits

7.7.5 Training Budget Allocation

Workforce and EMP/Monitoring training will be financed from the approved environmental budget already allocated in Chapter 7, with PKR 0.5 Million per year earmarked for:

- Environmental and safety training sessions,
- Development of Standard Operating Procedures (SOPs),
- Emergency response drills,
- Public display of environmental signboards,
- Training documentation and trainers' fees.

No untrained staff will be engaged in environmental mitigation or monitoring-related activities, ensuring EMP effectiveness as a verifiable operational system**.**

CHAPTER 8: STAKEHOLDERS CONSULTATION

Stakeholder consultation was conducted to identify community perceptions, obtain local knowledge, evaluate concerns, and integrate recommendations into environmental and social safeguards for the proposed 2 & 3 Wheeler and battery manufacturing facility. The process was undertaken in line with the consultation spirit of the Punjab Environmental Protection Act 1997, ensuring participatory, transparent, and gender-inclusive engagement. The consultations primarily covered local communities, industrial estate authorities, relevant government departments, transport users, and workforce representatives within the 10-km influence zone.

8.1 Proponent's Environment Management Team

The project proponent will establish a formal Environment and HSE Management Team to oversee environmental compliance, mitigation deployment, monitoring coordination, stakeholder communication, and EMP review for the EV and battery manufacturing facility. The team will operate in close coordination with the regulatory authority of Punjab and industrial estate services from the Environmental Protection Department Punjab. The structure of the team is position-based**,** ensuring continuity of responsibilities irrespective of changes in individual staff members.

Table 8.1: Composition, Roles, and Responsibilities

Team Position	Reporting Level	Roles and Responsibilities
Project Director	Executive oversight	Overall environmental approval, EMP endorsement, allocation of environmental budget, high-level regulatory and institutional coordination
Plant Manager	Operational lead	Execution of environmental controls inside the industrial facility, ensuring compliance of production units, and supporting EMP audits
HSE Manager	Department head	Lead environmental management, supervise mitigation actions (air, water, waste, noise, safety), conduct internal environmental audits, incident escalation, and EMP effectiveness reporting
Environmental Monitoring Officer (EMO)	Monitoring lead	Coordinate all environmental sampling, instrument calibration, lab liaison, ensure analytical compliance with standards, maintain environmental database, prepare EMP monitoring comparison tables, and support external submission packages
ETP Supervisor	Wastewater controls	On-site effluent treatment administration, dosing logs, inlet/outlet sampling support, ensure treated effluent complies before discharge to QABP wastewater network
Waste Management Coordinator	Waste compliance	Industrial and hazardous waste segregation, storage, labeling, manifest tracking, contractor handover documentation, recycling/disposal supervision, maintain disposal records
Electrical & Utilities Lead	Energy/Hazard controls	Ensure electrical safety systems, energy metering, insulated wiring, emergency shutdown protocols, support resource efficiency tracking under EMP
HR–Administration Head	Social compliance	Ensure gender inclusion trend, implement local-hiring preference, maintain grievance registry, internal stakeholder coordination, and communication support during audits

8.1.1 Key Team Functions

The Environment Management Team will ensure the following core functions:

- Implementation of EMP mitigation controls in construction and operation,
- Compliance comparison against standards and baseline benchmarks,
- Monitoring coordination with EPA-approved labs and internal inspections,
- Incident reporting and corrective action issuance (≤24 hours),
- Maintenance of environmental registers and data archiving (≥5 years),
- Bi-annual EMP performance review and 5-year strategic EMP revision, particularly for technology localization and enhancement integration,
- Coordination with industrial estate management for wastewater routing, drainage, firefighting support, and contractor approvals,
- Awareness, training, and drill supervision for occupational health and environmental protection.

8.1.2 Responsibility Rating

Responsibility Category	Status by Proponent
Site is industrially permissible	✓ Suitable (pre-approved industrial plot)
Sensitive ecological receptors	✗ None within 10 km zone
Wastewater discharge	✓ Only after ETP treatment to estate network
Air emission control design	✓ Enclosed halls + booth/vent filters
Noise exposure controls	✓ Daytime-only noisy works + hearing PPE
Hazardous waste handling	✓ Bunded storage + certified recycling/disposal
Social inclusion & grievances	✓ Local hiring + female inclusion trend + registry

The Environment Management Team proposed by the proponent demonstrates full institutional control, regulatory alignment, industrial compatibility, and measurable EMP performance linkage**,** ensuring that environmental and social safeguards will be continuously enforced, monitored, reported, and reviewed throughout the plant life cycle. The structure assures effective mitigation, monitoring transparency, corrective responsiveness, and progressive skill localization**,** allowing sustainable industrial development and compliance continuity.

8.2 The responsible authority

During stakeholder consultations, the environmental regulatory authority was formally recognized as one of the key institutional stakeholders associated with the project. The department responsible for verifying environmental compliance, reviewing the EIA report, issuing environmental approval, defining monitoring requirements, and enforcing environmental quality standards in the project influence area is the Punjab Environmental Protection Agency. This authority ensures that industrial developments proposed within designated estates undergo impact assessment, adopt adequate mitigation, and remain compliant with the Punjab Environmental Protection Act 1997 (Amended 2012) and Punjab Environmental Quality Standards (PEQS) throughout all project phases. Its role as a consultation stakeholder also includes providing regulatory guidance, ensuring monitoring conditions are measurable, and validating that the site does not fall under prohibited or environmentally incompatible zones.

Coordination for wastewater routing, internal road access, drainage planning, and contractor-based waste disposal within the industrial park is facilitated at the estate level by authorities managing Quaid-e-Azam Business Park. However, the final environmental decision-making, impact acceptance thresholds, monitoring directions, and enforcement jurisdiction remain with the Punjab Environmental Protection Agency. Stakeholder records confirm that regulatory participation was acknowledged, no objections were raised regarding site incompatibility, and EMP performance indicators were structured to meet the Agency's monitoring and reporting expectations.

8.3 Other Departments and Agencies (Institutional Stakeholders)

In addition to the environmental regulator, several government departments and institutions were identified and consulted as part of the institutional stakeholder framework due to their direct or supportive relevance in industrial operations, licensing, utilities provisioning, safety compliance, workforce development, and technology collaboration for the proposed EV and battery manufacturing facility. Administrative and industrial estate planning conformity, plot utilities, drainage connectivity, and waste contractor supervision in the Park are supported by the Punjab Industrial Estates Development & Management Company. Electricity load and infrastructure reliability are facilitated through the regional grid services of the Lahore Electric Supply Company. Industrial gas demand and future plant connectivity are administered through the pipeline network planning and safety obligations of the Sui Northern Gas Pipelines Limited. Worker safety systems, fire code alignment, and emergency responsiveness fall under industrial safety guidance comparable to formats practiced by the Rescue 1122 Punjab, while industrial manufacturing workforce, demographic statistics, and employment benchmarking are maintained by the Pakistan Bureau of Statistics. At the policy alignment level, the national EV transition objectives referenced during stakeholder discussions are guided by the federal climate and clean-mobility roadmap of the Ministry of Climate Change Pakistan. Technical collaboration, early-year technology transfer, and capacity building for battery pack and motor system localization were acknowledged through stakeholder discussions aligned with practices comparable to global industrial technology-transfer models used by manufacturing proponents. Vocational and technical workforce development support is accessible through institutions such as the Technical Education and Vocational Training Authority Punjab, ensuring future localization of skills and reduced foreign dependency. Institutional stakeholders confirmed that the plot lies in an allowable industrial zone, adequate environmental mitigation controls will be installed before commissioning, temporary impacts remain localized, occupational HSE risks are manageable, wastewater will not be discharged without treatment, and waste manifests and monitoring indicators shall be documented for regulatory review cycles.

Table 8.2: Institutional Stakeholder Roles in Project Relevance

Department / Agency	Stakeholder Role in Project Context
PIEDMC	Industrial estate planning, drainage, utilities, contractor supervision
LESCO	Electricity supply reliability, load metering
SNGPL	Industrial gas connectivity and safety obligation
Rescue 1122 Punjab	Emergency response stakeholder reference for safety planning

Pakistan Bureau of Statistics	Census reference for socioeconomic benchmarking
Technical Education & Vocational Training Authority Punjab	Vocational skilled labor development support
Ministry of Climate Change Pakistan	Policy alignment for clean mobility and decarbonization
TEVTA Punjab	Technical/vocational skill development and training integration

These departments and agencies were acknowledged as institutional stakeholders based on industrial relevance, regulatory oversight, utilities support, vocational skill development, emergency response planning, and policy alignment for sustainable clean mobility manufacturing proposed by the project proponent.

8.4 Environmental practitioners and experts

For scientific credibility, impact validation, and development of mitigation and monitoring frameworks, qualified environmental practitioners and technical experts were identified and consulted as part of the technical stakeholder group. Baseline environmental monitoring, laboratory analysis, and reporting conformity were carried out by an EPA-Approved Environmental Laboratory operating under provincial regulatory certification, following reference methods comparable to those of the United States Environmental Protection Agency. Expert consultations on industrial air emissions, VOC control design for paint booths, occupational noise exposure evaluation, hazardous waste manifesting, lithium-ion battery safety, fire risk controls, effluent treatment design, and EMP-performance linkage were guided through environmental engineers, HSE specialists, and monitoring practitioners retained by the proponent, reflecting industrial compliance expectations similar to guidance models acknowledged by the Pakistan Environmental Assessment Association. Site environmental screening confirmed that the plot does not fall under any prohibited or ecologically sensitive landscape categories. Technical stakeholders reviewed preliminary environmental data gathered on September 12 and 19, 2025**,** verified sampling conformity to PEQS/NEQS benchmarks, validated industrial zoning compatibility, confirmed absence of rare ecological receptors during the biological baseline survey, and structured the monitoring Key Performance Indicators (KPIs) for EMP performance evaluation. Practitioners emphasized that dust and noise impacts will be short-term and reversible during construction, all effluent must pass through the on-site treatment system prior to industrial discharge**,** hazardous wastes must be stored on impermeable surfaces with manifests maintained, VOCs shall be filtered at booth level, boundary noise must remain within industrial thresholds, hearing PPE must be enforced for the workforce, and all environmental registers shall be archived for EMP review cycles and Punjab-EPA submission packages**.** This stakeholder group also recommended environmental enhancement planning including native greenbelt design**,** irrigation using treated water from the plant ETP, and future solar auxiliary load integration for cleaner factory footprint**,** which have now been formally embedded in the project EMP design and monitoring structure**.**

8.5 Affected and Wider Community (Public Stakeholders)

The nearest communities in the study area consist of rural villages and farm households located outside the industrial estate but within the project's broader 10-km socio-economic influence zone. The project does not require physical or economic resettlement and lies on a legally

allotted industrial plot, therefore the community engagement focus remains on information sharing and integration of local concerns into the mitigation and monitoring framework. Field-based public consultations were conducted at the nearby village Bhurban Kalaan, situated approximately 1.3 km northeast of the project boundary, to obtain on-ground insights on local livelihoods, environmental perception, noise and dust concerns, employment expectations, health awareness, and transport movement patterns. The geographical coordinates of the consulted area were recorded as Bhurban Kalaan.

Public consultation sessions were carried out in September 2025, in alignment with the stakeholder consultation requirements of the Punjab environmental governance framework. Participants included local elders, farmers, transport users, small business owners, youth, and women representatives. The community was informed regarding the nature of the project, expected construction and operational activities, associated short-term environmental stressors, embedded pollution control design, and long-term socio-economic benefits.

Community feedback confirmed strong support for the project, especially due to anticipated employment opportunities, local skill development, reduced reliance on fossil-fuel vehicles, and a cleaner mobility ecosystem. Concerns raised were mainly related to temporary dust generation, construction-phase noise restriction to daytime, traffic scheduling during dispatch, avoidance of open waste burning, battery reject recycling assurance, and transparent grievance handling. These suggestions have now been incorporated into the Environmental Management Plan (EMP) and Monitoring Plan. Women participants specifically welcomed increased female workforce inclusion and emphasized opportunities for technical roles, which will be supported by structured training and local hiring prioritization.

No objection was raised regarding the project location, site compatibility, or cultural heritage disturbance. The consulted community confirmed the area has previously been open agricultural land but is now transitioning into planned industrial and service infrastructure zones, and acknowledged that impacts discussed will be localized, reversible, and manageable with controls.

Figure 8.1: Public consultation near the Quaid e Azam Industrial Estate, Sheikhupura


GPS Map Camera Lite
P3JC+PC, Bamban Kalan, Pakistan
Latitude
31.73298735°
Longitude
74.07072752°
Local 11:15:46 AM
GMT 06:15:46 AM
Altitude 209 meters
Friday, 12.09.2025


GPS Map Camera Lite
P3JC+PC, Bamban Kalan, Pakistan
Latitude
31.7330042°
Longitude
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GMT 06:15:09 AM
Altitude 209 meters
Friday, 12.09.2025


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Latitude
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Altitude 209 meters
Friday, 12.09.2025


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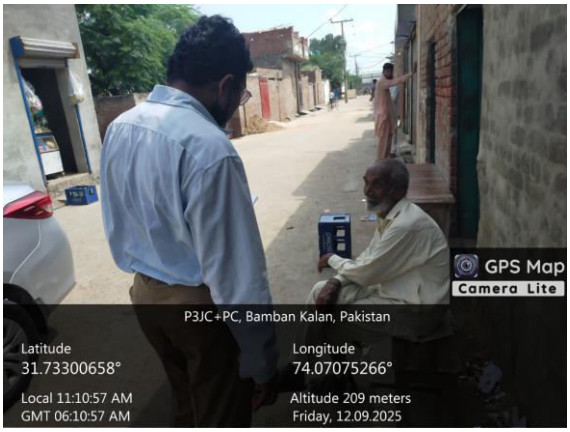
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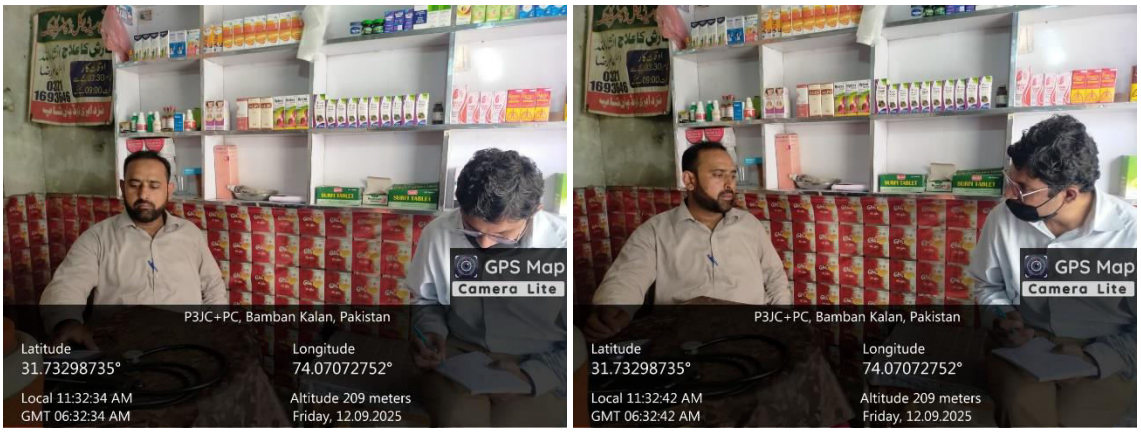


Table 8.3: Concerns and written feedback by the Local Community

Sr No	Name	Occupation	Remarks/concerned Issues
1.	Irfan	Local	• +ve/Employment • Positive development for economic growth
2.	Karamat Ullah	Shopkeeper	• +ve/Employment • Extension of Government Welfare schemes • Education & Health facilities need more improvement in the area
3.	Waqas	Local	• +ve/Employment • Industrial Estate is positive aspect to the nearby community. Locals should be given priority for job for skilled and un-skilled labour.
4.	Imran	Local	• +ve/Employment • Dust emissions should be controlled • Movement of vehicles should be moderate
5.	Aslam	Shop keeper	• There is a need for Quality of Life values is essential in the area
6.	Nouman	Farmer	• +ve/Employment • Air pollution during winter season is a problem that needs more attention and implementation from the concerned agency.
7.	Waqas	Local resident	• Potable Water availability in the area shall be improved • +ve/Employment

8.	Mr. Ali Imran	Dy. Director (Environment) Field Sheikhupura District	• Waste management should be done properly • An authorized waste contractor should be hired and log book shall be available with updated records for all activities

The public and affected community confirms that the proposed project is socially acceptable, environmentally progressive, and economically beneficial**,** provided EMP controls, sanitation planning, waste handling, noise and dust mitigation, and local hiring preference are implemented as committed.

Chapter 9: Conclusion and Recommendations

9.1 Conclusion

The proposed project of establishing an Electric 2 & 3 Wheeler and $LiFePO_4$ battery manufacturing plant is a strategically significant and environmentally progressive industrial initiative for Pakistan's clean-mobility transition. The proponent, Jolta Electric (Private) Limited, intends to develop the facility on a designated industrial plot within the planned estate of Punjab Industrial Estates Development & Management Company. The baseline survey conducted on September 12, 2025, and environmental monitoring carried out on September 19, 2025, through an EPA-approved environmental laboratory, confirm that the existing air quality, groundwater characteristics, noise levels, soil stability, and ecological environment are within acceptable limits and show no signs of contamination or prohibited ecological sensitivity prior to project inception. Screening and assessment indicate that construction-phase impacts will be short-term, localized, and reversible, while operational-phase impacts are low to moderate in magnitude if controls fail, but negligible to low when mitigation systems and HSE controls are deployed and maintained. No natural water bodies, protected forests, sensitive ecosystems, archaeological sites, or residential receptors exist within immediate adjacency, indicating the site is environmentally suitable and legally compatible for the proposed industrial activity. The project will generate substantial socio-economic benefits including increased livelihoods, technological localization, skill development, gender-inclusive employment, fossil-fuel displacement, and industrial innovation while remaining compliant with environmental protection and monitoring obligations.

9.2 Key Findings

- The site is approved for industrial development, not prohibited, not ecologically sensitive, and compatible with surrounding land uses.
- Baseline environmental parameters (air, groundwater, noise, soil) are compliant with PEQS/NEQS limits.
- Impacts during:
    - Construction: Dust, noise, soil disturbance, debris — all reversible and manageable.
    - Operation: Emissions from paint booths and welding, wastewater, industrial scrap, battery cell rejects, occupational noise — all manageable through ETP, ventilation systems, and HSE controls.
- No stakeholder identified any fatal flaw or incompatibility in project siting.
- Foreign experts (12 → 3 over 5 years) will ensure technology transfer, with decreasing reliance as local skills progress.
- Estimated 10–15% temporary labor addition at peak production remains manageable under permanent HSE supervision.
- Environmental enhancement (native greenbelt + future solar auxiliary load + water recycling) presents high sustainability opportunity.

9.3 Recommendations

To ensure environmental compliance and enhance sustainability, the following recommendations are made:

i. Air Environment

- Maintain enclosed welding bays and negative-pressure paint booths
- Replace VOC filters at efficiency <90%
- Conduct bi-annual stack and ambient air sampling

ii. Water and Effluent

- Install and fully commission the Effluent Treatment Plant (ETP) before trial production
- Dose neutralizing agents precisely and maintain weekly logs
- Reuse treated ETP water for plantation irrigation
- Conduct annual groundwater trend sampling

iii. Soil and Chemicals

- Implement strict spill-response SOPs
- Maintain paved and bunded chemical/oil storage pads
- Store rejects and hazardous wastes only on impermeable surfaces

iv. Noise and Occupational Safety

- Restrict remaining noisy works to daytime
- Conduct quarterly occupational noise surveys
- Enforce 100% hearing PPE compliance
- Install silencers on compressors when noise >85 dB(A) in halls

v. Waste and Battery Reject Stream

- Maintain 100% waste segregation
- Recycle battery rejects via certified licensed vendors
- Maintain contractor disposal and recycling slips in register

vi. Training and Team Continuity

- Continue quarterly environmental and HSE refresher training
- Update EMP immediately if process or battery line magnitude changes

vii. Environmental Enhancement

- Maintain minimum 33-ft greenbelt width around boundary
- Install rooftop rainwater harvesting system

- Integrate future solar auxiliary load support when grid-load permits
- Install sediment traps and oil-water separators on drains

9.4 Institutional and Monitoring Compliance Recommendation

It is strongly recommended that all EMP and monitoring reports be:

- Signed and endorsed by senior proponent HSE and plant leadership
- Archived and submitted annually to the Punjab-EPA
- Reviewed bi-annually for performance improvement and updated if needed

The proposed project is environmentally, technically, socially, and legally feasible for development, provided that the committed mitigation systems and EMP monitoring program are installed, enforced, monitored, reported, and reviewed as per regulatory requirements. No fatal environmental or cultural flaws exist that may hinder project approval or sustainable operations.

List of ANNEXURES

Sr. #	Annexure	Annexure No.
1.	Google Earth Location Map of the project	i.
2.	Approved Layout Plan of the project	ii.
3.	Validated Lab reports of environmental analyses	iii.
4.	Glossary of Items	iv.
5.	Checklist for Impact Assessments	v.
6.	Sources of data and a full list of all reference material used	vi.
7.	Approvals from other concerned departments	vii.
8.	References	viii.

Annexure-I

Google Earth Location Map of the Project Area

Imagery ©2025 Airbus, CNES / Airbus, Maxar Technologies, Map data ©2025 200 m

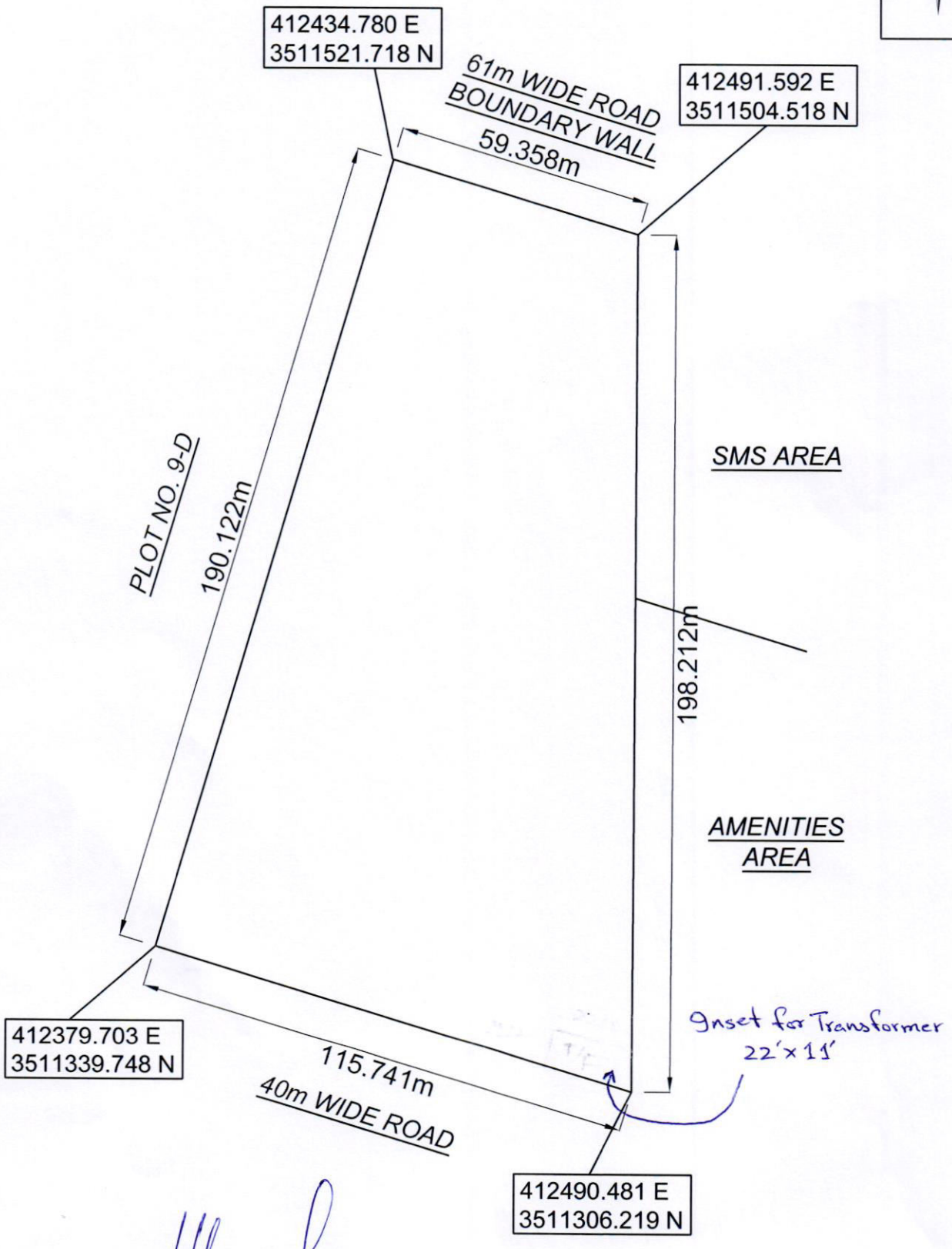
Annexure-II

Approved Layout Plan of the project

QUAID-E-AZAM BUSINESS PARK (QABP)

LAYOUT PLAN

PLOT NO.	AREA IN ACRE	AREA IN Sqm.	AREA IN Sft.
10-D	4.977	16644.826	179164.904



QUAID-E-AZAM BUSINESS PARK (QABP)	DRAWN BY:	CHECKED BY: 17/10/25	APPROVED BY:	PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY (ENGINEERING DEPARTMENT)

Annexure-III

Validated Lab reports of environmental analyses

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore

EPA

Validation for Monitoring / Sampling of Stack Emission, Noise, Ambient air, Vehicular emissions

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Cautions Related to scope, use & legal foundation of Validation

1. The Validation is quality control check under Regulation 91(d) for sampling & monitoring.
2. The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate.
3. The Scope of quality check of validation does not cover quality check of results declared with Report.
4. "The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. while the report is not valid for Court cases, EPO, compliance reporting for operational Phase approvals, punitive actions such as Smog prevention & control Rules, 2023, complaint cases, etc". The same shall be exhibit at top of Report during its issuance under Regulation 12.
5. The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory.
6. The EPA officer as well as certified Laboratory should also comply directions issued by authority vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.

Nature Of Sample	Stack Emissions ✗	Ambient Air ✓	Vehicular Emission ✗	Ambient Noise ✓
Description of monitored source / Site	Plot No 10-D Dwaid-e-Azam Bussiness park (SE2) Sheikhupura Punjab			
Name and category of Unit	Jolta Electric (Pvt) Ltd			
Standard Method	Accordind To US EPA			
Equipment, Model,	Testo 350 Horiba Teledyn			
Field Tested Parameters ,	CO2, NOX, SO2	**Lab Tested Parameters (Not Validated)**	Compiled Result and Report	

Industrial Gaseous Emissions			
Values of tested Field Parameters: CO .....mg/nM3, NOx ...mg/nM3 , excess air (%age):			
(i) 5 min Ramp-Up phase (ii) flow rate & EC Temp. measured during calibration & testing (iii) Data recorded with 15 min interval (iv) complied all QA/QC checks	Yes	NO	NA
Stack Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17			
(i) Sample train is complete (ii) Leak Test Performed (iii) data sheet filled (iv) "K" & "Y" calculated (v) QA/QC complied (vi) suitability of filter ensured	Yes	No	NA
Stack SOx sampling as per Method 8 (Thorin Indicator Method)			
(i)Absorbent solution available (ii) Flow rate as per method (iii) sampling as per Method	Yes	No	NA
Ambient Air Quality Monitoring by Automatic Monitors for CO, O3, SO2, NOx, PM2.5 & PM10			
Zero/span check is performed (ii) CE of NOx 96% - 104.1% , Compliance of Critical Criteria (iii) Compliance of operational Criteria (iv) Comply PEQS measuring technique	Yes	No	NA
Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler			
(i) The flow rate of sampler 1.1m3/min, (ii) Calibration performed	Yes	No	NA
Vehicular Emissions & Noise Measurement			
Vehicle emissions and noise measurement performed as per method	Yes	No	NA

Remarks:

Muhammad Ahmad Akram
Research Officer
EPA (Labs) Lahore

Dated 19-9-25

SOLUTION ENVIRONMENTAL ANALYTICAL LABORATORY LAHORE

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore

EPA
دارہ تحفظ ماحول حکومت پنجاب

Validation for Sampling of Wastewater & Drinking Water / Ground water

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Nature Of Sample	Waste water		Drinking Water / Ground water ✓	
Description of Sample source /Site			Tap water	
Name and category of Project /Unit	Jolta Electric (Pvt) Ltd			
Standard Method used for Sampling	Accordind To U.S EPA			
Field Tested Parameters ,	Field Tested parameter	PH ,Tem, Cl	**Lab Tested Parameters (Not validated)**	Compiled Result and Report

AMBIENT AIR MONITORING REPORT

Client Name: Jolta Electric (P^t.) Limited

Address: Plot No. 10-D Quide-e-Azam Business Park (SEZ), Sheikhupura, Punjab.

Monitoring Point: Near Main Gate

Starting Date: 19-09-2025

Reporting Date: 25-09-2025

Monitoring By: SEAL

Reference No.: SEAL/Lab/2025/AA/001

Results:

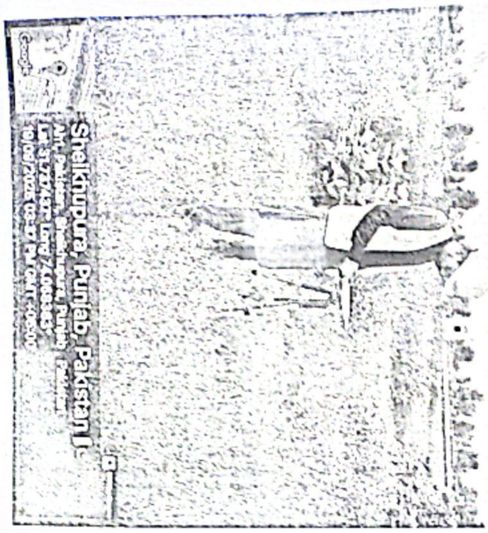
Sr. No.	Parameter	Method	Unit	Results	PEQS
1	Particulate Matter (PM_{10})	40 CFR Part 50, App J (US-EPA)	$\mu g/m^3$	133.62	150
2	Particulate Matter ($PM_{2.5}$)	40 CFR Part 50, App J (US-EPA)	$\mu g/m^3$	31.14	35
3	Carbon monoxide (CO)	40 CFR Part 50, App. C (US-EPA)	mg/m^3	2.67	5
4	Oxides of Nitrogen as (NO & NO_2)	40 CFR Part 50, App F (US-EPA)	$\mu g/m^3$	48.55	120
5	Sulphur dioxide (SO_2)	*EQSA-0197-114 (US-EPA)	$\mu g/m^3$	52.82	120

PEQS: Punjab Environmental Quality Standards

Note:

- Quality was assured through self-calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.

ANALYZED BY	REVIEWED BY	APPROVED BY
		FOR
Lab Analyst	Assistant Lab Manager	Lab Manager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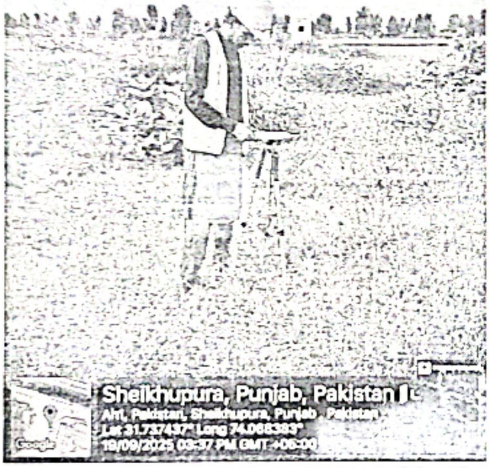
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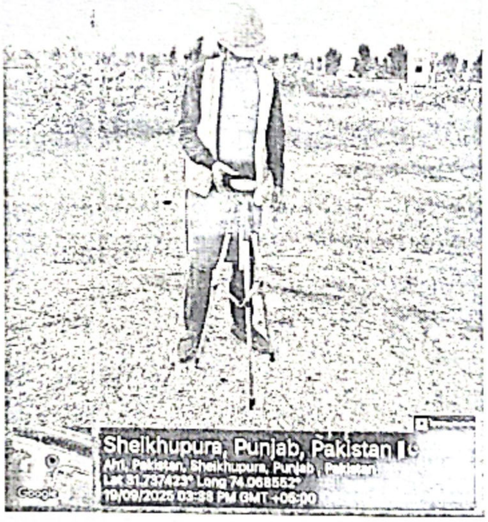
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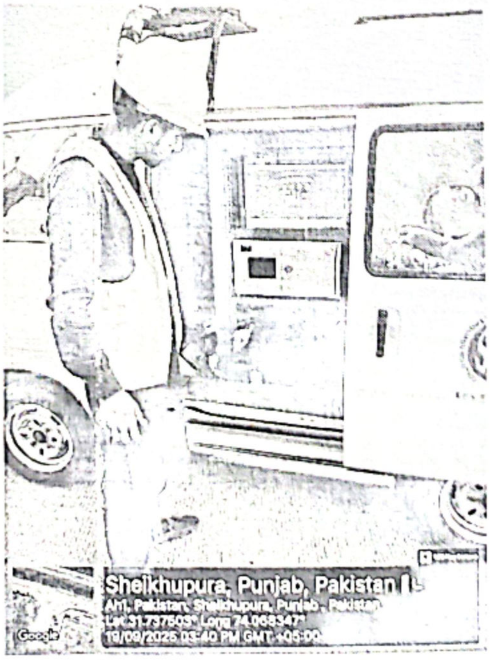
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Ah1, Pakistan, Sheikhupura, Punjab , Pakistan
Lat 31.737503° Long 74.068347°
19/09/2025 03:41 PM GMT +05:00

NOISE LEVEL MONITORING REPORT

Client Name:	Jolta Electric (Pvt.) Limited	**Address:**	Plot No. 10-D Quide-e-Azam Business Park (SEZ), Sheikhupura, Punjab.
Monitoring Date:	19-09-2025	**Instrument Used:**	Digital Sound Level Meter T.M 102
Reporting Date:	25-09-2025		
Monitoring By:	SEAL	**Reference No:**	SEAL/Lab/2025/NM/001

Sr. No.	Location	Average dB(A) Leq
1.	North Boundary of Site	62.8
2.	South Boundary of Site	64.2
3.	East Boundary of Site	68.4
4.	West Boundary of Site	67.1
5.	Centre of Site	65.3
PEQS (Industrial Area Day Time)		**75 dB (A) Leq**

PEQS (Punjab Environmental Quality Standards)

Note:

- The average noise levels describe the overall ambient noise levels of the proposed site.
- Selected measurement units were dB (A) Leq otherwise stated.
- Quality was assured through self-ca ibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report in not valid for any nego iations.

ANALYZED BY	REVIEWED BY	APPROVED BY
		For
Lab Analyst	Assistant Lab Manager	Lab Manager


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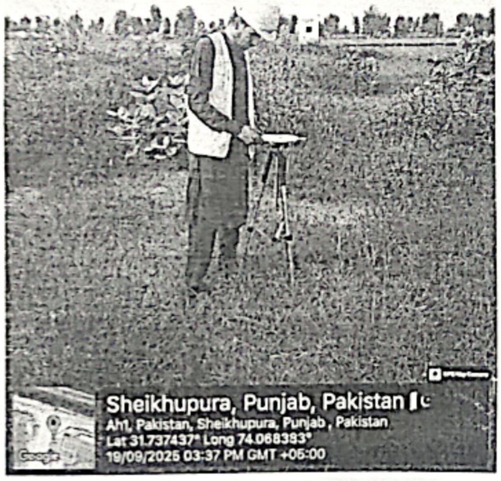
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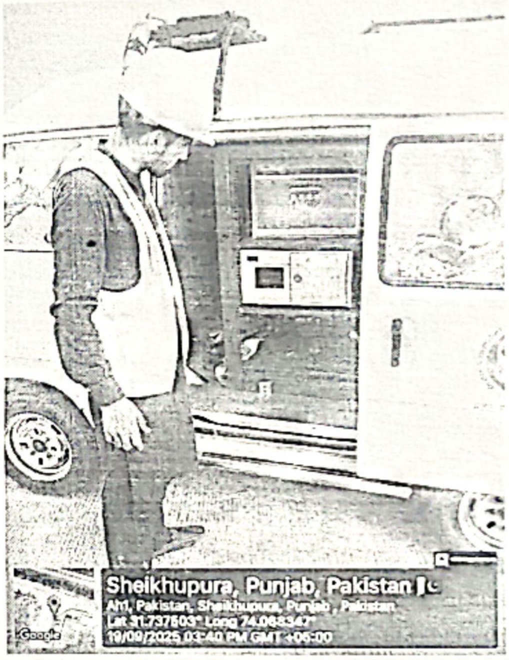
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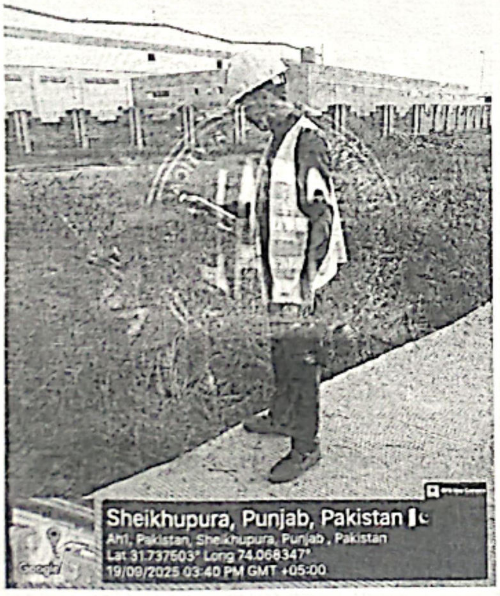
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19/09/2025 03:41 PM GMT +05:00

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

GROUND WATER ANALYSIS REPORT

Client Name:	Jolta Electric (Pvt.) Limited	**Address:**	Plot No. 10-D Quide-e-Azam Business Park (SEZ), Sheikhupura, Punjab.
Sampling Point:	Tap	**Nature of Sample:**	Ground Water
Sampling Date:	19-09-2025	**Date of Completion:**	25-09-2025
		Temp. & Humidity:	23-30 C^0 & 50-70 %
Sampling By:	SEAL	**Reference No.:**	SEAL/Lab/2025/GW/001

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H^+ B	--	7.36	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	784	1000
3	Chloride	4500- APHA Cl^- B	mg/l	60.50	250
4	Fluoride	APHA 4500-F^- D	mg/l	0.03	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Unobject.	Unobject.
6	Odour	APHA 2120 B	Object. /unobj.	Unobject.	Unobject.
7	Colour	APHA 2120 B	TCU	0.12	15
8	Nitrate (as NO_3^-)	APHA 4500-NO^{3-} E	mg/l	0.4	50
9	Nitrite (as NO_2^-)	APHA 4500-NO^{2-} B	mg/l	0.003	3
10	Lead	APHA-Pb B	mg/l	BDL	0.05
11	Total Hardness as $CaCO_3$	APHA 2340 C	mg/l	92.76	500
12	Turbidity	APHA 2130 B	NTU	1.0	5
13	Zinc	APHA 3500-Zn B	mg/l	0.0	5
14	Aluminum	APHA 3111 D	mg/l	0.03	0.2
15	Chromium	APHA 3500-Cr B	mg/l	0.0	0.050
16	Cadmium	APHA 3500-Cd D	mg/l	0.0	0.01
17	Copper	APHA 3500-Cu C	mg/l	0.0	2
18	Boron	APHA 4500-B C	mg/l	0.046	0.300
19	Barium	APHA 3111 B	mg/l	0.067	0.700

HEAD OFFICE: Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. **PHONES:** +92-42-35922295-96, **FAX:** +92-42-35922296
EMAIL: info@seal.com.pk / nihalasghar@gmail.com / hr@seal.com.pk

KARACHI OFFICE: Office No, M06-07 In Fort Sultan Opp, Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan.
PHONES: +92-300-9768799 **EMAIL:** karachi@seal.com.pk

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

Client Name: Jolta Electric (Pvt.) Limited **Address:** Plot No. 10-D Quide-e-Azam Business Park (SEZ), Sheikhupura, Punjab.

Sampling Point: Tap
Sampling Date: 19-09-2025
Sampling By: SEAL
Nature of Sample: Ground Water
Date of Completion: 25-09-2025
Temp. & Humidity: 23-30 C^0 & 50-70 %
Reference No.: SEAL/Lab/2025/GW/001

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
20	Antimony	APHA 3114 C	mg/l	0.0	0.020
21	Arsenic	APHA 3114 C	mg/l	0.0010	0.050
22	Cyanide	APHA 4500-CN^- D	mg/l	0.002	0.05
23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.0	0.020
25	Residual Chlorine	APHA 4500-Cl_2	mg/l	0.25	0.2 – 0.5
26	Total Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
27	Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
28	E. coli	APHA 9222 C	Number/100ml	0	0/100 ml

PEQS = Punjab Environmental Quality Standards
BDL = Below Detection Limit
APHA = American Public Health Association

Note:

- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client.
- Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over samples (if so available) shall be retained for 10 days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiation

ANALYZED BY	REVIEWED BY	APPROVED BY
		For
Lab Analyst	Assistant Lab Manager	Lab Manager

HEAD OFFICE: Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. **PHONES:** +92-42-35922295-96, **FAX:** +92-42-35922296
EMAIL: info@seal.com.pk / nihalasghar@gmail.com / hr@seal.com.pk

KARACHI OFFICE: Office No, M06-07 In Fort Sultan Opp, Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan.
PHONES: +92-300-9768799 **EMAIL:** karachi@seal.com.pk

Annexure-IV

Glossary of Items

Glossary of Items

Term	Definition
EIA	Environmental Impact Assessment — a systematic process to identify, predict, evaluate, and mitigate environmental impacts of a proposed project under environmental law.
EIA-NOC / Environmental Approval	A formal clearance issued by the provincial environmental regulator permitting a project to proceed subject to compliance with approved conditions and mitigation commitments.
EMP	Environmental Management Plan — a project-specific plan outlining mitigation measures, monitoring, institutional arrangements, and reporting mechanisms for impact control.
PEQS / NEQS	Environmental Quality Standards that define maximum permissible limits for emissions, effluent discharge, and ambient noise to safeguard environment and human health.
Baseline Survey	The collection of pre-project environmental data on physical, biological, and social conditions against which future project-induced changes are compared.
Impact Screening	The initial stage of EIA analysis used to determine likely environmental and social impacts and their significance using checklists and interaction matrices.
Mitigation Measures	Engineering, administrative, procedural, and ecological controls applied to avoid, reduce, reverse, or offset project impacts.
ETP	Effluent Treatment Plant — an on-site treatment system designed to neutralize, balance, filter, and condition wastewater before reuse or discharge to industrial wastewater networks.
OWS	Oil-Water Separator — a drainage treatment component used to remove oil, grease, or hydrocarbon traces from stormwater or workshop runoff.
VOCs	Volatile Organic Compounds — chemical vapors typically associated with industrial paints and solvents that must be filtered before atmospheric release.
$LiFePO_4$ Battery	Lithium Iron Phosphate (Li-ion) battery chemistry that is relatively safer and more thermally stable than other lithium-ion chemistries, and used in electric mobility and energy storage.
Lithium-Ion Phosphate ($LiFePO_4$)	A recyclable, cobalt-free, long-life lithium battery technology manufactured or assembled at industrial EV battery facilities, requiring safe reject handling.
Electric 2-Wheeler	Battery-powered electric motorcycles and scooters designed to replace gasoline mobility in personal commuting with zero tailpipe emissions.
Electric 3-Wheeler	Battery-powered electric rickshaws and commercial transport units used for local deliveries and last-mile transportation in urban environments.
Raw Material Inventory	All input materials including battery cells, metals, lubricants, solvents, plastics, and packaging stock used for manufacturing, many of which require bunded or impermeable storage.
HSE Department	Environment, Health & Safety management unit of the proponent responsible for mitigation enforcement, worker safety training, monitoring coordination, incident escalation, and EPA reporting.
Thermal Runaway	A failure mode of lithium batteries involving uncontrolled heat release that is managed through smoke/heat sensors, insulated storage, fire suppression, and emergency shutdown systems.

Spill Kit / Absorbents	Emergency response materials (absorbent pads, neutralizers, containment trays) used to capture accidental fuel or chemical spills before soil or drainage contamination.
Greenbelt / Buffer Plantation	Landscaped boundary corridor developed using pollution-tolerant native trees and shrubs to control dust, moderate noise, improve aesthetics, and enhance micro-biodiversity.
Compressor Silencer	A noise-dampening attachment or inbuilt acoustic system fitted to air compressors to reduce high-decibel industrial noise for occupational safety.
Grid Load Metering	Recording and monitoring of electricity draw through sanctioned utility infrastructure to ensure industrial power reliability and sustainability.
Industrial Waste Contractor	Licensed third-party waste handlers responsible for transport, recycling, and disposal of non-hazardous construction and operational waste as per industrial estate policy.
Hazardous Waste Manifest	A formal record or slip documenting storage, quantity, transporter handover, recycler/vendor details, and disposal pathway for hazardous wastes including battery rejects and oils.
Technology Transfer	The process during initial operational years where foreign technical experts train local staff, after which dependency on foreign experts is reduced progressively.
Ravi–Chenab Doab	The hydrological interfluvial tract forming the drainage and aquifer influence area of central Punjab alluvial plains, regionally recharged by canal seepage and rainfall.
Plot Boundary Rehabilitation	Restoration of disturbed soils and vacant footprints through leveling, de-compaction, cleaning, and plantation after construction is complete.
Project Proponent	The company initiating the proposed EV and battery manufacturing facility, responsible for EMP implementation, monitoring, reporting, training, and environmental enhancements.
Industrial Estate	A planned zoning area allotted for manufacturing industries by PIEDMC providing roads, drainage, utilities, and waste contractor facilitation.
Sheikhupura District	The administrative region hosting the project site in Punjab characterized by alluvial plains, monsoonal gradient drainage, semi-arid subtropical climate, and moderate seismic risk.

Annexure-V

Checklist for Impact Assessment

Impact Aspect	Assessment Question	Potential Impact	Impact Type	Significance (Low/Med/High)	Mitigation Required (Yes/No)	Residual Impact after Mitigation
Project Siting	Is the site located in a designated industrial zone?	Land use conflict	Off-Site	Low	No	Negligible
	Are sensitive ecological or residential receptors located within close vicinity?	Nuisance risk	Off-Site	Low	Yes	Low
	Is resettlement of communities required?	Social disturbance	Off-Site	None	No	None
Soil & Land	Will construction disturb topsoil or land stability?	Soil erosion/compaction	On-Site	Low	Yes	Negligible
	Are chemical or fuel spill risks present?	Soil contamination	On-Site	Medium	Yes	Low
Air Environment — Construction	Will heavy machinery generate dust (PM_{10}/$PM_{2.5}$)?	Air deterioration	Off-Site	Medium	Yes	Low
	Is site water-sprinkling proposed?	Dust reduction	Enhancement	Low	Yes	Negligible
Air Emissions — Operations	Do paint booths emit VOCs from solvents?	VOC emission	On-Site	Medium	Yes	Low
	Are VOC filters installed and maintained?	VOC capture improvement	Enhancement	Low	Yes	Negligible
Water Environment	Will wastewater be generated from sanitary or production areas?	Effluent generation	On-Site	Medium	Yes	Low
	Is wastewater discharged after treatment through ETP?	Water protection	Off-Site	Low	Yes	Negligible
	Will groundwater be monitored for contamination trends?	Groundwater protection	Off-Site	Low	Yes	None

Noise Levels — Construction	Will machinery generate high noise during construction?	Noise propagation	Off-Site	Medium	Yes	Low
	Are noisy works scheduled for daytime only?	Noise reduction	Enhancement	Low	Yes	None
Noise Levels — Operation	Will plant operations exceed 85 dB(A) in halls?	Occupational noise	On-Site	Medium	Yes	Low
	Are workers provided and trained on hearing PPE?	Workforce safety support	Enhancement	Low	Yes	Negligible
Solid Waste — Construction	Will construction generate debris, steel, scrap, and packaging waste?	Waste generation	On-Site	Low	Yes	Low
	Is waste disposed through licensed collectors, without burning?	Pollution avoidance	Off-Site	Low	Yes	Negligible
Hazardous Waste — Operation	Will used oils, battery rejects, or e-waste be generated?	Hazardous waste generation	On-Site	Medium	Yes	Low
	Is a hazardous waste manifest maintained and vendor handover documented?	Waste compliance	Off-Site	Low	Yes	Negligible
	Are battery rejects stored on impermeable surfaces pending recycling?	Battery reject storage risk	On-Site	Medium	Yes	Low
Fire and Safety	Will battery charging areas have thermal or electrical risk?	Thermal runaway / fire risk	On-Site	Medium	Yes	Low
	Are sensors, alarms, ventilation, emergency shutdown, and	Fire risk control	Off-Site	Low	Yes	Negligible

	firefighting provisions installed?					
Socioeconomic	Will the project create long-term employment for local communities?	Livelihood improvement	Off-Site	High	Yes	Positive Major residual benefits
	Does the workforce plan include increasing female employees?	Social inclusion	Off-Site	High	Yes	Long-term positive enhancement
Green Belt / Ecology Enhancement	Will boundary plantation be developed after construction?	Biodiversity improvement	Off-Site	Low	Yes	Improved ecological value
	Will treated water be reused for irrigation of greenbelt?	Resource enhancement	On-Site	Low	Yes	Positive
Grid & Power Sustainability	Are power utilities metered and grid-connected to avoid recurring diesel-only emissions?	Emissions and OPEX reduction	Off-Site	Low	Yes	Long-term reduction in emissions

Annexure-VI

Sources of data and a full list of all reference material used

Annexure-VI: Sources of Data and List of Reference Material

A.1 Sources of Data

The data used in this EIA study were collected from authenticated primary and secondary sources. Primary baseline information was obtained through field surveys and environmental monitoring in September 2025, including ambient air quality sampling, groundwater grab sampling, and 24-hour noise measurements, analyzed by an EPA-approved laboratory. Secondary environmental data were compiled from provincial zoning archives, census records, hydrological and geological literature, and industrial safety guidance. All datasets and reference templates conform to legal and regulatory requirements for industrial projects in Punjab and Pakistan.

A.2 Key Reference Material Used

- Punjab Environmental Protection Act 1997 (Amended 2012)
- Punjab Environmental Quality Standards (2016)
- National Environmental Quality Standards
- IEE/EIA Regulations 2022
- Building Code of Pakistan — Seismic Provisions 2007
- 2017 Population & Housing Census, Pakistan Bureau of Statistics
- QABP Master Plan and Industrial Zoning Allotment Archives
- Upper Chenab Canal (UCC) and Lower Bari Doab Canal (LBDC) recharge literature
- Hazardous Waste Rules under PEPA
- Industrial Safety and HSE guidance formats
- WHO Drinking Water Guidelines
- ISO 1996 Acoustic Monitoring Standards

A.3 Dataset Categories Utilized

Field Baseline Survey	Physical, biological, and socioeconomic conditions within 10 km
EPA-Approved Laboratory Monitoring	Air, groundwater chemistry, and noise analytical results
District Demographics	Population, literacy and employment benchmarks
Industrial Estate Publications	Zoning conformity and utilities acknowledgement

Hydrological Literature	Aquifer flow and canal recharge baseline
Soil & Geology Screening	Alluvial texture and compaction suitability
Seismic Setting	Seismic Zone 2B structural risk screening
HSE & Safety Guidance	Battery, fire, spill, and hearing PPE guidance
Policy Alignment	Low-carbon and clean mobility roadmap relevance

A.4 Organizations and Departments Acknowledged

Organization/Department	Role
Punjab Environmental Protection Agency	Environmental approval and compliance oversight
Punjab Industrial Estates Development & Management Company	Industrial zoning, utilities and drainage management
Pakistan Bureau of Statistics	Census-based socioeconomic baseline provider

A.5 Compliance Statement

This EIA report has used verified legal, environmental, hydrological, geological, safety, and socioeconomic references. All monitoring data, mitigation models, and management templates are based on approved industrial EIA practice for reversible and manageable impacts.

Annexure-VII

Approvals from other concerned departments

PIEDMC/QABP/0270/2218
November 14, 2025

M/s. Jolta Electric (Pvt.) Ltd.
Through its CEO, Mohammad Amjad
House No. 21, Street 25, Sector F-6/2, Islamabad.

CONDITIONAL POSSESSION OF INDUSTRIAL PLOT NUMBER 10-D QUAID-E-AZAM BUSINESS PARK (QABP), SHEIKHUPURA.

Dear Sir,

Please contact with the Project Director of Quaid-e-Azam Business Park in connection with the possession of the **Plot No. 10-D** measuring **4.97** Acres situated at Quaid-e-Azam Business Park, Sheikhupura. Layout plan is enclosed as **Annexure-A.**

This Conditional Possession Letter is issued on the conditions mentioned in the Agreement for Conditional Possession of Plot enclosed as **Annexure-B.**

Muhammad Umair Khan
Company Secretary

A copy is forwarded to **Project Director,** Quaid-e-Azam Business Park with the request to please hand over the possession of **Plot No. 10-D** to its Allottee **M/s. Jolta Electric (Pvt.) Ltd.** The attached possession slip may please be returned to Marketing Department after doing the needful.

Note.
Please do not proceed with excavation of boundary wall without prior demarcation by QABP Site Staff. Any damage done to the utilities due to your negligence will be borne by you and follow PIEDMC approved front boundary wall design.

X927059

E-STAMP

0085-31959878

PB-LHR-A16952BAED97C926

Non-Judicial

Rs 3,000/-

Description	: AGREEMENT OR MEMORANDUM OF AN AGREEMENT - 5(ccc)
First Party	: Punjab Industrial Estates Development Management Company [1000000000000]
Second Party	: Jolta Electric Private Limited [1000000000000]
Agent	: RAHEEL [35202-4777951-5]
Stamp Duty Paid by	: Jolta Electric Private Limited [1000000000000]
Issue Date	: 12-Sep-2025, 10:55:20 AM
Paid Through Challan	: 2025FFCD09980BD7
Amount in Words	: Three Thousand Rupees Only

Please Write Below This Line

AGREEMENT FOR CONDITIONAL POSSESSION OF PLOT

14

This Agreement for Conditional Possession of plot (the "**Agreement**") is made at Lahore on this __ of November, 2025

BETWEEN

PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY (PIEDMC) through its Company Secretary, hereinafter referred to as the **VENDOR** (which expression shall unless excluded by or repugnant to the context be deemed to include its successors, executors, administrators, representatives and assignees) of the one part;

AND

M/s. Jolta Electric (Pvt.) Ltd through its CEO **Dr. Muhammad Amjad S/o Sardar Muhammad** holding CNIC No. **61101-1949970-1** hereinafter referred to as the **VENDEE** (which expression shall unless excluded or repugnant to the context be deemed to include his/her/its/their heirs, successors, executors, administrators, representatives and assignees) of the other part.

WHEREAS the Vendor represents that it is the lawful owner in possession of Industrial Plot no. **10-D** measuring **4.970** Acres in **Quaid-e-Azam Business Park, (QABP)** and agrees to give conditional possession thereof, to Vendee and the Vendee agrees to take conditional possession of **10-D** measuring **4.970** Acres situated at **Quaid-e-Azam Business Park, Sheikhupura** (hereinafter referred to as the **Plot**) free from all encumbrances, attachments, charges and other claims subject to the terms and conditions hereunder contained.

AND WHEREAS the Vendee has already paid to the Vendor sum of **Rs. 74,550,000/- (Seventy-Four Million Five Hundred Fifty Thousand Rupees Only)** and deposited with Vendor post-dated cheques for payment of the balance due amount of the purchase money amounting to **Rs. 173,950,000/- (One Hundred Seventy-Three Million Nine Hundred Fifty Thousand Rupees Only)** as per following installment schedule:

a) Dated 11-12-2025 Rs. 74,550,000/-
b) Dated 11-04-2026 Rs. 19,880,000/-
c) Dated 11-08-2026 Rs. 19,880,000/-
d) Dated 11-12-2026 Rs. 19,880,000/-
e) Dated 11-04-2027 Rs. 19,880,000/-
f) Dated 11-04-2027 Rs. 19,880,000/-

Jolta Electric (Pvt) Ltd. JOLTA ELECTRIC (Pvt) Ltd.

The Vendee hereby undertakes that:

1. Vendee will abide by all rules and regulations of Special Economic Zone Act 2012, Special Economic Zone Rules 2013 and SEZ Zone Enterprise Admission and Sale, Lease and Sub-Lease of Plot Regulations, 2021.
2. Vendee shall commence construction on the Plot within **6** months of SEZ Zone Enterprise Approval Notification dated ***11th August 2025*** and the project shall be completed within **24** months of the said notification i.e. till ***10th August 2027*** unless extended by the respective Special Economic Zone Committee as per clause (52) sub clause (3) of SEZ Rules 2013.
3. Vendee shall ensure that the post-dated cheques are credited to the accounts of the Vendor whenever they are presented by Vendor on or after the due date as mentioned on the post-dated cheque.
4. Vendee understands that PIEDMC shall impose collection charges, penalty charges, interest charges (@KIBOR+4%) for any returned cheque.
5. Vendee understands that PIEDMC reserves the right to also take, inter alia, legal action in case any post-dated cheque is bounced/dishonored.
6. Vendee understands that if it is found that there is any change (increase or decrease) in the area of the Plot, the price of the Plot will be adjusted accordingly as per the rate on which Plot was purchased.
7. All terms & conditions mentioned in the Zone Enterprise Entry Application approval letter and Provisional Allotment Letter shall remain binding.
8. Vendee shall not re-sell/ rent and/ or transfer in anyway whatsoever, Plot(s) or any portion thereof, or rights therein, to any party without execution of final Sale Deed.
9. Vendee understands that the Sale Deed shall be executed only after the project is completed and it has performed business operations for at least six months.
10. Vendee shall not use the Plot or any part thereof or the buildings and superstructure raised thereon or plant or machinery or other equipment installed thereon for any purpose other than those approved in the Zone Enterprise Entry Application;
11. Vendee shall not create any encumbrance on the Plot without written approval of the PIEDMC;
12. Vendee shall adhere to the construction schedule (**Annex-I**) and if the construction is not started as per schedule date, the possession letter shall be considered as withdrawn.
13. Vendee has familiarized himself with the 'Electrical Connection Policy' and 'Gas Connection Policy' of the Vendor and shall pay all costs/ fees as per the policies.
14. Vendee understands that the vendor will not be able to offer any relief or concessionary tariff/benefit to the vendee and that vendee shall have to claim those benefits separately from the concerned authority.
15. Failure to commence construction or completion of the project within above said time lines shall result in, in addition to any other penalty for which the Vendee may be liable, the cancellation of the Plot(s) against a cancellation charge of **5%** of the amount submitted by the Vendee. Upon cancellation any structure will become property of PIEDMC.
16. The construction of the building shall be strictly in accordance with the following specifications -
    a) PIEDMC's Building Regulations.
    b) Pakistan Building Code
    c) Pakistan Standards Institute's specifications
    d) Punjab Provincial Building Specifications
17. The Vendee shall strictly abide by the Building Bye-Laws, and those enacted by the Vendor from time to time. In case of violation of Building Bye-Laws, the Vendor shall have right to impose penalty/charge keeping in view, the nature of violation. The Vendor shall also have a right to direct Vendee to rectify any such violation within a specified time period.
18. The Vendee shall follow Pakistan Environmental Protection Act 1997/National Environment Quality Standards, Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents, for preservation and conservation of environment in the Industrial Estate and disposal of waste/effluents. If the Vendee is found, violating the said laws during or after construction of building, the Vendor shall have right to impose fine/penalty as applicable and direct the Vendee to rectify such violation within a specified period. In case Vendee fails to rectify the violation, the Vendor may order any appropriate measure including but not limited to sealing of premises to stop any such violation.

Jolta Electric (Pvt) Ltd. JOLTA ELECTRIC (Pvt) Ltd.

Company Secretary

19. The Vendee shall use the Plot solely for the purpose(s) specified in the Application. In order to change nature of business, the Vendee shall obtain prior Approval as per prescribed rules and regulations of Special Economic Zone.

20. The Vendee shall pay Annual Recurring Expenses (ARE)/Monthly Recurring Expenses (MRE) to the Vendor for which the Vendor shall issue receipt to the Vendee. The AREs/MREs shall be paid by the Vendee at the rates and in the mode and manner as may be stipulated by the Vendor from time to time for maintenance of Industrial Estate.

IN WITNESS WHEREOF, the Parties have set and subscribed their respective hands on this 14 of November, 2025 at Lahore in presence of witnesses.

VENDOR

Punjab Industrial Estates Development and Management Co. (Govt of Punjab) Company Secretary

VENDEE

Jolta Electric (Pvt) Ltd JOLTA ELECTRIC (Pvt) Ltd

WITNESS

Name: Ghulam Sarwar Shah
Designation: DM (Law)
CNIC No: 36502-1393727-3

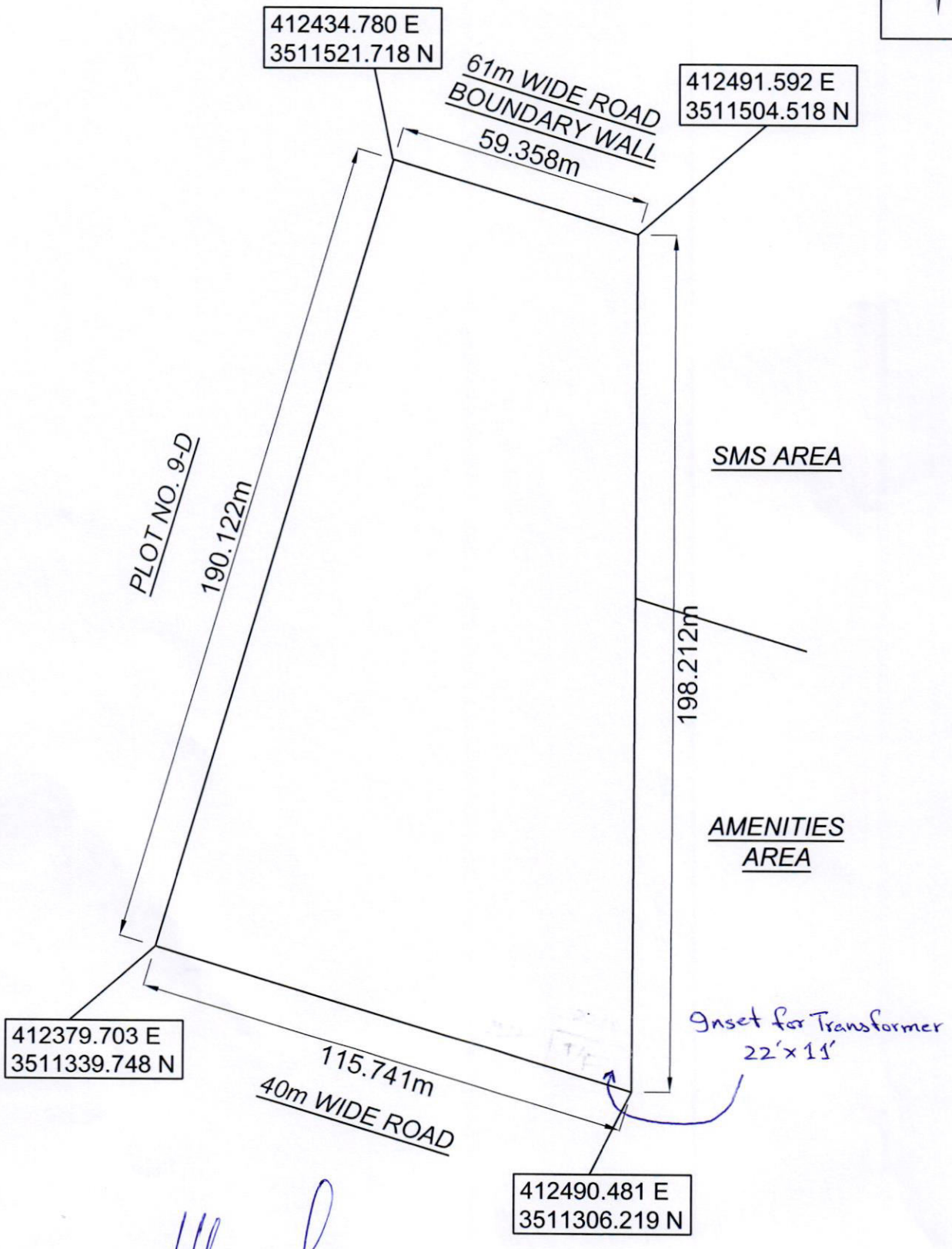
WITNESS

Name: Muhammad Juraid Riaz
Designation: Manager Accounts
CNIC No: 34102-0569182-7

QUAID-E-AZAM BUSINESS PARK (QABP)

LAYOUT PLAN

PLOT NO.	AREA IN ACRE	AREA IN Sqm.	AREA IN Sft.
10-D	4.977	16644.826	179164.904



QUAID-E-AZAM BUSINESS PARK (QABP)	DRAWN BY:	CHECKED BY: 17/10/25	APPROVED BY:	PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY (ENGINEERING DEPARTMENT)

Annexure-VIII

References

References

1. Government of Punjab — Environmental governance and PEQS enforcement jurisdiction.
2. Punjab Environmental Protection Act 1997 (Amended 2012).
3. IEE/EIA Regulations 2022 notified under federal environmental governance.
4. PEQS (Punjab Environmental Quality Standards, 2016).
5. NEQS (National Environmental Quality Standards).
6. Industrial Master Plan, zoning allotment and infrastructure framework for Quaid-e-Azam Business Park.
7. 2017 Population and Housing Census — demographic and employment benchmarking (Pakistan Bureau of Statistics).
8. Doab hydrology and aquifer succession literature for alluvial Punjab.
9. Effluent treatment, Oil-Water Separator (OWS) and spill containment industrial best practices.
10. Occupational noise exposure assessment protocols and ISO 1996 acoustic monitoring standards.
11. WHO Drinking Water Quality Guidelines.
12. Global analytical reference methods comparable to USEPA air and water sampling procedures.
13. Hazardous waste management approaches recognized under industrial waste manifesting, storage and vendor credential tracking.