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CONSTRUCTION OF LPG STORAGE AND FILLING PLANT BY M/S SAZ GAS PVT. LTD. LOCATED AT MOUZA RAJA JANG, TEHSIL & DISTRICT KASUR

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Prepared by

Head Office : Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman, Lahore, Pakistan.

Tell Head Office : +92 42 35960091

Office : Street No. 9, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

Head Office Email: inenvconsultants@yahoo.com;
Tell Peshawar Office : +92 91 5202323, **Web:** www.iec-consultants.com

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EXECUTIVE SUMMARY

The need for an LPG (Liquefied Petroleum Gas) storage plant arises from the increasing demand for clean and efficient energy sources. LPG, known for its versatility and relatively low environmental impact, serves as a crucial energy solution for residential, commercial, and industrial sectors worldwide. As an easily transportable and storable fuel, LPG offers a reliable energy source for cooking, heating, and powering various applications. Establishing an LPG storage plant is essential to ensure a consistent and secure supply of this energy source to meet the growing demands of diverse industries, households, and businesses, while simultaneously reducing environmental emissions and promoting sustainable energy usage.

The proposed project for the commissioning of its objective and construction requires fulfilling the legal requirements of the Punjab Environmental Protection Act (amended act 2012), Section 12, for which this Environmental Impact Assessment (EIA) report is being submitted.

i- TITLE AND LOCATION OF PROJECT:

Construction of LPG Storage and Filling Plant by M/s SAZ GAS Pvt. Ltd.

Location: Mouza Raja Jang, Tehsil & District Kasur

PROJECT PROPONENT

Proponent: Waseem Ahmad

Address: Makan Number 1, Street Number 2, Muhala Ravi Colony, Main Band Road, Lahore

Proponent: Shuja Hussain
Address: 5-Golfers Lane, Theater, Bedian Road, Lahore

NAME OF ORGANIZATION PREPARING REPORT:

Integrated Environment Consultants
Head Office : Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman, Lahore, Pakistan.

Tell Head Office : +92 42 35960091
Office : Street No. 9, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

Head Office Email: inenvconsultants@yahoo.com;
Tell Peshawar Office : +92 91 5202323, **Web:** www.iec-consultants.com

ii- BRIEF OUTLINE OF PROJECT

The proposed project aims the construction of LPG Storage and Filling Plant by M/S SAZ GAS Pvt. Limited. Two storage tanks capable of collectively storing a total of 100 metric tons (2x50) of LPG are proposed to be constructed. The total area of the project is 19 kanal and 12 Marla. The proposed location for its construction is Khewat No. 211/249, Khatooni No. 1565, Khasra No. 65,66,67,68, Mouza Raja Jang, Tehsil & District Kasur.

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The electricity supply is the usual 500 kVA supply from local electricity board that is WAPDA. In order to meet the emergency as well as critical power requirements during WAPDA shut down the project also have a supportive facility for standby power generation. The water requirements of the facility will be fulfilled by the Municipal supply, to be backed up by bore well, for all the construction and operational activities

iv. PROJECT IMPACTS AND RECOMMENDATIONS FOR THEIR MITIGATION

Impact assessment is crucial for project initiation as it enables the identification and comprehension of a project's potential positive and negative effects. Understanding these impacts aids in tailoring the project to maximize benefits and minimize risks. Impact assessment assists in recognizing environmental, social and economic challenges and risks and gives the directions to develop strategies that mitigate these risks and adjust the plan accordingly.

Table E-1Possible Impacts and their Mitigation Measures

Possible Impact	Impact Magnitude	Proposed Mitigation Measures
CONSTRUCTION PHASE		
Dust emissions likely to occur during the excavation of the top soil. Vehicular Emission from the heavy machinery used.	Minor/Short Term	• Water Sprinkling on construction areas when necessary. • Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Cleaning of all paved access roads, parking areas and staging areas at construction sites. • Provision of PPEs to workers
Water Quality Degradation.	Minor/Short Term	• Use of impermeable sheets to avoid contamination of the groundwater/surface water • Proper disposal of waste material on dumping sites

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Possible Impact	Impact Magnitude	Proposed Mitigation Measures
Construction waste will be produced from construction activities	Minor/Short Term	• Conduct separate collection of construction and domestic waste to promote recycling and re-use. • Proper disposal of waste to the authorized sites. The area to be leveled and contoured after disposing excess material. • No waste or debris will be thrown in the nearest canal water or other water bodies.
Noise pollution due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles	Minor/Short Term	• Install portable barriers to shield compressors and other small stationary equipment where necessary. • Proper maintenance of vehicles and construction equipment. • Minimize/avoid unnecessary use of drills and other noisy machinery • The personal protective equipment (PPE) will be provided to the construction workers and its usage will be made mandatory.
Workers Health & Safety	Minor/Long Term	• Provide training regarding proper handling and use of chemicals/ paints • Install fire extinguishers at fire handling places • Continuous monitoring be carried out to ensure that contractor is following safe working procedures and practices.
OPERATION PHASE		
Air Impact Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during	Moderate/Long Term	• Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and leakage or faulty valves. • PEQs for air emissions will be strictly followed to avoid excess air pollution

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Possible Impact	Impact Magnitude	Proposed Mitigation Measures
transfer, storage, and handling operations.		
Impact on Noise LPG storage plants can generate noise from equipment such as compressors, pumps, and generators. The transportation of LPG can also generate noise.	Minor/Short Tern	• LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.
Fire and Workers Safety LPG is highly flammable and explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards.	Moderate/Long Term	• Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents.

v. **Environmental Monitoring Plan**

The implementation of a monitoring plan within an EIA is crucial for several reasons. It serves as a fundamental tool to track and evaluate the actual environmental effects of a proposed project against the predicted impacts outlined in the EIA report. By establishing a monitoring plan, it becomes possible to assess the accuracy of the initial predictions, ensuring compliance with environmental regulations and standards. This ongoing assessment aids in identifying any unforeseen or adverse impacts, enabling timely corrective measures or adjustments to the project to mitigate or prevent environmental harm, fostering sustainable development and ensuring the project's alignment with environmental conservation objectives throughout its lifecycle.

Table E-2 Environmental Monitoring

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
A. Construction phase				

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Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
1.	**Noise**	Construction vehicle/ machinery/ generators/welding work	Noise meter	Construction vehicles / machinery / generators will be checked regularly for noise level by the contractor during construction phase.
2.	**Air Emissions**	Construction vehicle/ machinery/ generators	Ambient particulate matter monitoring.	Construction vehicles / machinery / generators will be checked regularly for smoke emissions by the contractor during construction phase.
B. Operation phase				
1.	**Air Emissions**	Filling of Storage Tanks	Amount of Volatile Organic Compounds (VOC's) and Hydrocarbons	Will be carried out on quarterly basis
2.	Wastewater monitoring	Wastewater discharging points	Detection of residual hydrocarbons and Particulate Matter	Will be carried out on quarterly basis.
3.	LPG leakages	Storage tanks	Pressure tests	Will be carried out on monthly basis.

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1 INTRODUCTION

Natural gas scarcity is prevalent in Pakistan, constituting its primary energy shortfall. Moreover, the increase in population and urbanization have led to notable transition towards for Liquefied Petroleum Gas (LPG) for cooking, heating and industrial purposes. The government's initiative, including subsidies and the promotion of LPG as cleaner fuel have also contributed to its increasing demand. LPG serves as eco-friendly alternative in comparison to traditional fuels such as coal and kerosene. Its convenience, and efficiency have made it a popular choice across urban and rural areas. The increasing demand for LPG in Pakistan is a positive development, as it will help to reduce the country's reliance on imported energy and improve air quality.

The proposed project for the construction of LPG Storage and Filling Plant is located at Khewat No. 211/249, Khatooni No. 1565, Khasra No. 65,66,67,68, Mouza Raja Jang, Tehsil & District Kasur. The project's objective is to construct two storage tanks capable of collectively storing a total of 100 metric tons (2x50) of LPG.

The proposed project aims to fulfill its objectives through construction and operation necessitating compliance with the legal regulations specified in Punjab Environmental Protection Act 2012, Section 12. In accordance with these requirements, this Environmental Impact Assessment (EIA) is being submitted.

1.1 PURPOSE OF THE REPORT

As per the Punjab Environmental Protection Act (PEPA), Section 12, which covers Initial Environmental Examination and Environment Impact Assessment, no project proponent is allowed to initiate construction or operations without filing the necessary documentation with the designated Government Agency under the Provincial Environmental Agencies. If the project is anticipated to cause adverse environmental effects, it necessitates an environmental impact assessment. Subsequently, approval must be obtained from the Government Agency. This requirement set forth by the Government of Punjab mandates the preparation of this Environmental Impact Assessment (EIA) Report to secure Environmental Approval (EA) from the Environmental Protection Agency (EPA), Government of Punjab, Lahore.

This report provides comprehensive information and data on the environmental, economic, and social impacts of the project, enabling its assessment and justification that the project will comply with the requirements of environmentally sustainable practices during both installation and operation stages, as required by the Punjab Environmental Protection Act, 2012, the Punjab Environment Quality Standards, and the rules and regulations thereof.

1.2 IDENTIFICATION OF PROJECT AND PROPONENT

The proposed project is the Construction of LPG Storage and Filling Plant in District Kasur, Punjab.

Proponent detail as following:

Proponent: Waseem Ahmad

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SAZ GAS PVT LIMITED

Address: Makan Number 1, Street Number 2, Muhala Ravi Colony, Main Band Road, Lahore

Proponent: Shuja Hussain

Address: 5-Golfers Lane, Theater, Bedian Road, Lahore

1.3 DETAILS OF CONSULTANTS

Integrated Environment Consultants

Head Office : Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman, Lahore, Pakistan.

Tell Head Office : +92 42 35960091

Office : Street No. 9, Main Canal Road, Abshaar Colony Warsak Road, Peshawar, Pakistan

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1.4 BRIEF DESCRIPTION OF NATURE SIZE AND LOCATION OF PROJECT:

The proposed project aims the construction of LPG Storage and Filling Plant by M/S SAZ GAS Pvt. Limited. Two storage tanks capable of collectively storing a total of 100 metric tons (2x50) of LPG are proposed to be constructed. The total area of the project is 19 kanal and 12 Marla.

The proposed location for its construction is Khewat No. 211/249, Khatoni No. 1565, Khasra No. 65,66,67,68, Mouza Raja Jang, Tehsil & District Kasur.

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

The proponent has assigned the task of preparing EIA report to M/S Integrated Environment Consultants, Lahore. The EIA study of the proposed project has been conducted according to Environmental Assessment Procedures, 1997, Review of IEE and EIA Regulation 2022 as prescribed by the Federal Environmental Protection Agency (Pak EPA), Government of Pakistan. The study team of M/S Integrated Environment Consultants which completed the EIA report consists of following expert

Table 1 MEMBERS COMPLETED EIA PROCESS

Name	Qualification	Status in Project
Mr. Ahtasham Raza	M.Phil (Env. Sciences) GC University, Lahore	Project Incharge
Mr. Adnan Sharif	BS (Env. Sciences)	Team Leader

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Mr. Mehmood Amjad	BS (Hons) Environmental Sciences NFC.IET. Multan	Monitoring In charge
Nabia Farrukh Sohail	MS Environmental Sciences NUST, Islamabad	Environmentalist

*Only the main roles of the team members are given. However, their role was not restricted to these, rather it also includes many other studies in their respective fields in the context of this EIA study

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2 SCREENING OF THE PROJECT

Based on the Punjab Environmental Protection Act 2012 and the Review of IEE & EIA Regulations, 2022 for filing, reviewing, and approving environmental assessments, the present project is classified under Schedule II class A (5). Following list shows the projects included in Class A.

A. Energy

1. Hydroelectric power generation over 50MW.
2. Transmission lines more than 132 kV and grid stations.
3. Nuclear power plant.
4. Petroleum refineries.
5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage.
6. Renewable energy projects (including wind and solar) more than 100 MW.

LPG storage and filling facilities necessitate an EIA due to their significant scale, potential environmental risks, and complexity of operations. The EIA is required because of the considerable environmental impacts these plants may have, the extensive regulations, and the need for a comprehensive assessment involving public participation, considering potential risks, mitigation term measures, and long-term consequences.

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3 SCOPING OF THE PROJECT

The scoping process outlines the essential concerns and impacts requiring detailed investigation. It establishes the spatial and temporal limits, crucial concerns raised during consultations, and significant impacting factors impacting the project.

3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Considering spatial and temporal boundaries in environmental assessments is vital to comprehensively evaluate the impact of a project. Spatial boundaries define the area affected, aiding in recognizing the extent of impact on ecosystems and nearby communities. Temporal boundaries assess short and long-term effects, enabling an understanding of how impacts evolve over time and helping in planning mitigation measures and long-term sustainability strategies. This approach ensures accurate, detailed assessments and effective addressing of potential environmental consequences related to the project. The proposed project is located at Mouza Raja Jang, Tehsil & District Kasur of Punjab.



Figure 1 Boundaries of the Project Area

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The EIA for the proposed project incorporated a two-stage consultation process, primarily focused on one-on-one meetings. In the initial stage, the consultation was specifically directed towards engaging local government authorities, affected individuals, and local communities. The primary goal of this stage was to evaluation both the short-term and long-term impacts that might result from the new development proposed for the project in its early stages. The intent was to gather insights and perspectives from key stakeholders in the immediate vicinity to better understand potential environmental, social, and economic implications of the project.

The second stage of consultations, as indicated, will be conducted through a more extensive process of public participation if deemed necessary. This broader involvement will allow for a wider outreach to the

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public, enabling a more comprehensive engagement to gather additional feedback, concerns, and insights from a larger cross-section of the community. This will ensure a more inclusive approach, providing an opportunity for a wider range of stakeholders to contribute their perspectives, concerns, and suggestions, which can be valuable in shaping and refining the EIA for the proposed project.

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

At an LPG storage and filing plant, the determination of significant impacts involves assessing environmental risks, safety and health concerns for workers, community impact, infrastructure and property damage, emergency response planning, regulatory compliance, and the adequacy of preventive measures. Understanding and addressing these factors are essential to ensure safe operations, mitigate risks, and protect the environment, workers, communities, and infrastructure from potential hazards associated with LPG handling.

3.4 DEVELOPMENT OF AN ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) in an EIA is crucial as it outlines strategies to mitigate environmental impacts, ensures regulatory compliance, guides project operations, promotes sustainability, reduces risks, assures stakeholders, and allows for ongoing improvement and adaptation to address environmental concerns throughout the project's lifecycle.

These key parts of EMP include a clear description of the project, an outline of potential environmental impacts and risks, specific mitigation measures tailored to address these impacts, a comprehensive monitoring and reporting system to track environmental indicators, protocols for emergency response and contingency planning, details on stakeholder engagement and communication strategies, and a framework for ongoing review and updates to ensure the plan's adaptability and effectiveness over the course of the project. Together, these components form a comprehensive EMP designed to guide environmental practices, minimize adverse impacts, and maintain compliance with regulations and best practices in environmental management.

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4 ALTERNATIVES OF THE PROJECT

The alternatives for the proposed project and their relative potential impacts on the environment were considered to evaluate the best project option. The following alternatives were considered for the project.

Project Alternatives

- No project option/worst scenario option.
- Site Alternative
- Technology Alternative

4.1 NO PROJECT OPTION / WORST SCENARIO OPTION

Analysis

❖ **Strengths and Opportunities**

If the project is not taken up at all then all the funds, efforts and inconvenience will be saved and these will become available for diversion to other projects of the proponent. No more land will be required and no disturbance will be caused to people through project construction process. Further the recurring cost of the maintenance of the project along with enhanced operational cost will be saved. No disturbance will be caused to any physical, biological and social part of the environment. The people benefiting out of a status quo will continue benefiting.

❖ **Weaknesses and Threats**

The absence of LPG distribution in a particular area poses several drawbacks. It limits the energy choices, potentially leading to reliance on traditional and less efficient fuel sources, which can result in increased expenses, environmental degradation, and health concerns due to indoor pollution on higher carbon emissions. Without the convenience and efficiency of LPG, residents may face challenges in food preparation and heating. Moreover, the lack of LPG distribution can impede economic growth by affecting local businesses and industries reliant on consistent and affordable energy sources. Safety concerns might arise if individuals resort to less safe or unregulated energy sources.

Conclusion

The "No project option" reveals that the absence of LPG distribution impacts affordability, convenience, health, the environment, and economic development in the area. Therefore, this option is not recommended.

4.2 LOCATION ALTERNATIVES

4.2.1 Construction on Government Land

The project proposal includes the option of building the LPG storage tank on Government-owned land. The feasibility study has indicated that the government land is available and suitable for the construction of the

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storage facility. The preliminary assessments and believes this location meets the technical requirement for the safe storage of LPG. However, it involves additional bureaucratic procedures for obtaining permits and approvals from the government. The additional costs associated with leasing or using government land including fees, and rent could impact project's financial viability. Moreover, the Government regulations and polices might impose limitations on the scope of development or impose specific conditions on the usage of the land, which could restrict the project's design or expansion plans.

4.2.2 Construction on Proponent's Land

The proponent's land has been carefully chosen due to its proximity to existing infrastructure and logistical convenience. The site has already undergone through assessments and it is deemed suitable in terms of safety, environmental impact, and compliance with regulations. The proponent's land is already owned, eliminating the need for additional land acquisition and streamlining the construction process. This option provides more control and flexibility to the proponent over the project's development and operation. Additionally, it aligns with the proponent's strategic goals and minimizes potential delays associated with the utilizing government land, making it the preferred choice for the project.

Conclusion

The construction of LPG on proponent's land was preferred because it provides more control and flexibility to the proponent over the project's development and operation.

4.3 TECHNOLOGY ALTERNATIVE

LPG Storage tank design as per ASME (American Society of Mechanical Engineers) and API (American Petroleum Institute) standards both provide robust frameworks for ensuring safety, reliability, and efficiency. However, specific distinctions exist between the two in terms of design criteria, and construction processes.

Design as per ASME Standards

ASME guidelines are comprehensive approach to pressure vessel design. They incorporate strict requirements for material selection, fabrication, inspection, and testing, ensuring a high standard of safety and quality. ASME standards also emphasize rigorous quality control, offering a more extensive and detailed framework for pressure vessel construction.

Design as per API Standards

API standards also offer well-defined regulations for the design and construction of LPG storage tanks. However, API standards might be more industry-specific, focusing on certain operational aspects and applications.

Conclusion

Conclusively, the design of LPG storage tanks under ASME guidelines is often considered superior due to its wider acceptance, global recognition, and stringent quality control measures. ASME Section VIII Division 1 provides a more comprehensive and detailed approach, covering a broader spectrum of design and

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construction considerations. Its rigorous guidelines for material selection, fabrication, inspection, and testing contribute to a higher level of reliability and safety in LPG storage tank design compared to API standards. Therefore, ASME standards are generally regarded as a more preferred choice for ensuring the safety and quality of LPG storage tank designs.

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5 DESCRIPTION OF THE PROJECT

5.1 OBJECTIVE OF THE PROJECT

The prime objective of the project is to construct LPG storage tank for ensuring a proper containment of the gas while facilitating its reliable distribution for various industrial, commercial and domestic purposes. These storage tanks serve as a critical infrastructure component, ensuring a continuous and stable supply chain for the efficient utilization of LPG, ultimately supporting economic activities and meeting energy across various sectors. The careful construction and maintenance of these storage facilities are essential to guarantee the safe storage and distribution of LPG, meeting energy demands while prioritizing safety and operational integrity.

5.2 LOCATION AND SITE LAYOUT OF THE PROJECT

The Location of the proposed project is shown in Figure 2.

5.3 LAND USE ON THE SITE

The selected land for the construction of the project is an expansive and currently undeveloped open space. The open land offers an opportunity for flexible and strategic planning, allowing for thoughtful consideration in designing and shaping the upcoming project.

5.4 ROAD ACCESS

The project site is situated adjacent to "Gathian Wali Metal Road".

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Figure 2 Location of the SAZ GAS (Pvt.) Limited

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5.5 VEGETATION FEATURES OF THE SITE

The land earmarked for the project stands devoid of any significant vegetation, eliminating the need for cutting down or uprooting trees. Its barren expanse presents a unique advantage, sparing any ecological impact typically associated with land development. This absence of substantial vegetation not only streamlines the construction process but also mitigates the environmental footprint of the project. With no trees or major vegetation to clear, the project can progress without disturbing the natural ecosystem, allowing for a more environmentally friendly and efficient development process.

5.6 COST AND MAGNITUDE OF OPERATION

The total cost of the project is PKR 40,000,000. The time period for the completion of the project is proposed as 6 months.

5.7 SCHEDULE OF IMPLEMENTATION

The outlined project implementation schedule is intended to be followed, contingent upon smooth execution as per the plan and the absence of significant obstacles. The implementation stages of the project activity include:

1st Stage

The stage –1 comprises the onsite contouring studies and soil investigations and the finalization of storage plant designs.

2nd Stage

The stage –2 comprises the following task:

- Digging the ground to lay foundation and starting to build or put together the structure.
- Building support structures and foundation work.
- Beginning construction, electrical and mechanical tasks.
- Establishing essential infrastructure.
- Fitting of instrumentation

3rd Stage

The stage –3 comprises the following task

- Commercial building civil structure erection completion.
- Completion of the basic infrastructures water supply system, electricity supply etc.

4th Stage

The last stage will be the commencement of regular use of the storage plant.

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5.8 DESCRIPTION OF THE PROJECT

The proposed project aims the construction of LPG Storage and Filling Plant. Two storage tanks capable of collectively storing a total of 100 metric tons (2x50) of LPG are proposed to be constructed. The daily filling capacity of the plant will be 5MT. The LPG storage tanks are designed as per the standards of ASME (American Society of Mechanical Engineers) as shown in the figure below.



Figure 3 Storage tank Design

The total area of the project is 19 kanal and 12 Marla. The proposed location for its construction is Khewat No. 211/249, Khatooni No. 1565, Khasra No. 65,66,67,68, Mouza Raja Jang, Tehsil & District Kasur.

5.8.1 Land Acquisition

Since the proponent owns the project site, there is no necessity for any land acquisition process to be initiated. The absence of land acquisition requirements minimizes the risks related to potential conflicts, delays, or disruptions arising from disputes over land ownership. This scenario ensures a more seamless initiation and execution of the project, allowing resources and efforts to be focused on the project's core objectives and development activities.

5.9 RESTORATION AND REHABILITATION PLAN

To restore and rehabilitation the project site, a recommendation for tree plantation has been proposed. This strategic initiative aims to rejuvenate and enhance the site's ecological balance following the completion of the project. Tree plantation offers a means to restore the natural environment, promote biodiversity, mitigate potential environmental impacts, and contribute to the overall sustainability of the site. By introducing tree plantation, the project area can experience ecological restoration, afforestation, and the development of a more environmentally friendly landscape, aligning with the commitment to environmental stewardship and sustainability.

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6 DESCRIPTION OF THE ENVIRONMENT

6.1 GENERAL

This section covers a comprehensive description of the project area, including environmental attributes which are expected to be affected by the project, as well as, those which are not expected to be directly affected by the construction and operation of the project. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. A site visit was conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters. Further, consultations were held with the general public and stakeholders of the project area in order to seek the public opinion on the implementation of the proposed project.

6.2 PHYSICAL ENVIRONMENT

6.2.1 Topography

District Kasur, Pakistan, is a topographically diverse region, with a landscape that ranges from flat plains to gently undulating hills. The General height of the area is approximately 201 meters above the Mean Sea Level (MSL). The district is located in the Punjab province, which is known for its fertile agricultural land. The Indus River flows through the district, and its alluvial deposits have contributed to the richness of the soil.

The district is predominantly flat, with a slight elevation gradient from northeast to southwest. The eastern and western edges of the district are characterized by the floodplains of the Sutlej and Ravi rivers, respectively. The central portion of the district is a gently undulating plateau. This plateau is known as the Majha region, and it is known for its fertile agricultural land. The Majha region is also home to a number of small lakes and ponds.

The topography of District Kasur has a significant impact on the region's climate and economy. The flat plains of the district are ideal for agriculture, and the region is a major producer of wheat, rice, sugarcane, and vegetables. The Indus River provides a vital source of irrigation water for the district's farms. Overall, the topography of District Kasur is diverse and complex. The district's flat plains, gently undulating hills, and low hills all contribute to its unique landscape and its vibrant economy.

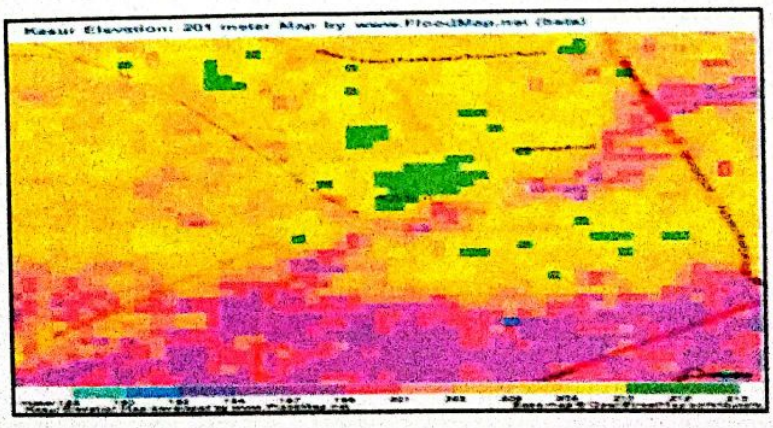


Figure 4 Topography of District Kasur

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6.2.2 Geology

District Kasur in Punjab, Pakistan is located between approximately 31.1157° North latitude and 74.4462° East longitude. Kasur is bordered by Sheikhupura to the north, Nankana Sahib to the west, Lahore to the east, and India to the south.

6.2.3 Soils

District Kasur in Pakistan has a variety of soil types, including alluvial, silty, sandy, and clayey soils. Alluvial soils are the most common and fertile, suitable for a range of crops. Silty soils have a fine texture and good moisture retention, making them ideal for cultivating wheat, sugarcane, and vegetables. Sandy soils have larger particles and good drainage but lower fertility, requiring proper irrigation and soil amendments for efficient cultivation. Clayey soils are present in limited areas, retaining moisture and suitable for specific crops but requiring proper management to avoid waterlogging. Kasur's diverse soil types provide a strong agricultural base, enabling the cultivation of a variety of crops suited to the local soil conditions.

6.2.4 Climate and Meteorology

District Kasur in Pakistan experiences a four-season climate, with distinct characteristics for each season. Summer (April to June) is hot and dry, with temperatures reaching above 40 °C (104 degrees Fahrenheit). Hot winds, known as "loo," can sometimes make the heat even more oppressive.

Monsoon season (July to September) brings relief from the heat, with moderate to heavy rainfall. Humidity levels increase during this time, and the agricultural lands are replenished. Autumn (October and November) is characterized by moderate temperatures and decreasing humidity. This period marks the transition from monsoon to winter.

Winter (December to February) is cool and can occasionally be chilly, with temperatures dropping as low as 5 °C (41 degrees Fahrenheit) at night. The days are usually mild and pleasant. Spring (March) brings a gradual rise in temperatures, marking the start of the growing season. The weather becomes mild and pleasant, making it an ideal time for agricultural activities.

Precipitation primarily occurs during the monsoon season, providing essential water for agriculture in the predominantly agrarian landscape of District Kasur. The Indus River and an intricate network of canals also provide irrigation water for the region's crops. District Kasur's climate is favorable for cultivating a variety of crops, including wheat, rice, sugarcane, and vegetables. The region's agriculture sector is a vital part of the local economy, and the climate plays a crucial role in its success.

In addition to its impact on agriculture, the climate of District Kasur also influences the region's culture and lifestyle. For example, the hot and dry summers encourage people to spend more time indoors, while the cooler winters and mild spring weather are ideal for outdoor activities. Overall, the climate of District Kasur is diverse and complex, with each season playing a unique role in shaping the region's landscape, economy, and culture.

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Table 2Temperature, Precipitation and Relative Humidity of District Kasur

Month	Mean Temperature °C		Precipitation (millimeters)	Relative Humidity (%)
	Maximum	Minimum		
January	19.7	5.0	33.8	66.2
February	21.6	7.7	50.0	60.2
March	26.6	12.5	60.5	53.8
April	33.0	17.7	36.5	41.9
May	38.1	22.0	31.8	32.5
June	40.5	25.8	51.9	37.2
July	35.7	25.8	23.3	62.3
August	34.4	25.3	22.2	70.8
September	35.0	23.0	77.7	65.5
October	33.1	16.6	12.2	55.6
November	27.6	9.9	9.9	62.9
December	21.5	5.7	30.4	68.9
Annual Mean	**30.6**	**16.4**	**36.6**	**56.4**

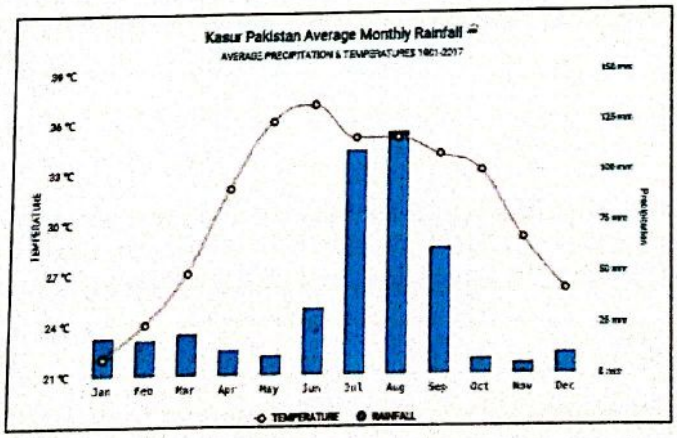


Figure 5 Average Monthly Temperature and Precipitation in District Kasur

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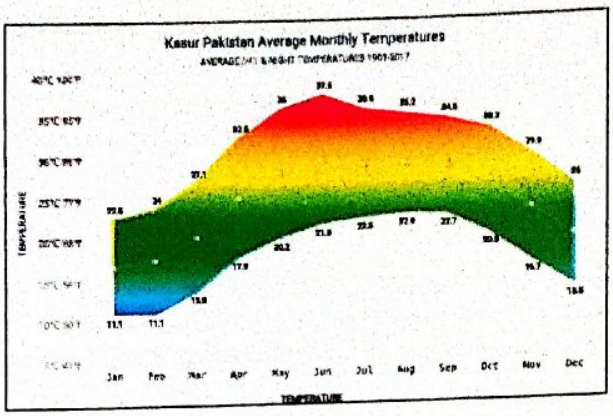


Figure 6 Average Monthly Temperature in District Kasur

6.2.5 SURFACE AND GROUND WATER

District Kasur in Pakistan has a variety of surface and groundwater resources.

6.2.5.1 Surface water resources

The Indus River is the main surface water resource in District Kasur. It flows through the central part of the district and provides water for irrigation, drinking, and industrial use. Other surface water resources include the Ravi River, the Sutlej River, and a number of canals and irrigation channels.

6.2.5.2 Groundwater resources

District Kasur has a large aquifer system that contains a significant amount of groundwater. The aquifer is recharged by rainfall and seepage from the Indus River and its tributaries. Groundwater is used for irrigation, drinking, and industrial use.

6.2.5.3 Water quality

The quality of surface and groundwater in District Kasur varies depending on the location and the source of pollution. In general, the quality of surface water is moderate. The quality of groundwater is generally better than surface water, but it can be contaminated by agricultural chemicals, arsenic, and other pollutants.

6.3 SEISMOLOGY

Kasur is located in a seismically active region of Pakistan. The city is situated on the Indian Plate, which is constantly colliding with the Eurasian Plate. This collision causes tectonic stress to build up, which can be released in the form of earthquakes.

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Kasur has experienced a number of earthquakes over the centuries. In 1905, a magnitude 7.5 earthquake struck the city, causing widespread damage and loss of life. The seismic hazard in Kasur is considered to be high. The city is located in Seismic Zone IV, which is the second highest seismic zone in Pakistan. This means that Kasur is at a high risk of experiencing a major earthquake.

6.4 FLOODING

District Kasur in Pakistan is frequently impacted by flooding, particularly during the monsoon season. The district is located on the floodplain of the Indus River, which is prone to overflowing during heavy rainfall. Additionally, the district's low-lying topography makes it vulnerable to flash floods.

6.5 ECOLOGICAL RESOURCES

6.5.1 Flora

- Acacia trees are common in Kasur, Pakistan, and are well-adapted to the arid climate. They provide shade and greenery, and their leaves are used as fodder for livestock. The wood of the acacia tree is also used to make furniture and other items.
- Kasur is known for its fruit cultivation, particularly citrus fruits such as oranges and kinnow, as well as mango orchards. Other fruits grown in the region include apples, pears, peaches, and plums. The fruit orchards provide a livelihood for many farmers in Kasur and also contribute to the region's economy.



Acacia Trees | Mango Trees | Orange Trees

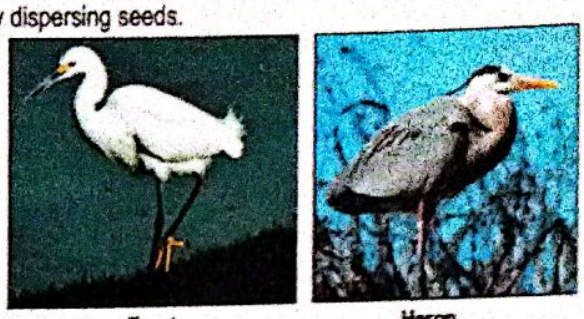
Figure 7 Flora of District Kasur

6.5.2 Fauna

- Some common waterfowl found in the region include ducks, geese, and swans. Egrets, herons, and other wading birds are also commonly seen in these areas. Other birds found in Kasur include doves, pigeons, parrots, and owls.
- Domestic animals in Kasur include cattle, buffalo, and poultry. Cattle and buffalo are important for milk and meat production, while poultry is raised for eggs and meat. Other domestic animals found in the region include goats, sheep, and horses.

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- Some small mammals found in Kasur include squirrels, rabbits, and rodents. These animals are often found in rural and semi-urban areas. They play an important role in the ecosystem by helping to control pests and by dispersing seeds.



Egret Heron

Figure 8 Fauna of District Kasur

6.5.3 Endangered Species

The endangered plant in Pakistan is the Elm i.e., Ulmus wallichiana which is not found here. No endangered species exist in the project area.

6.6 SOCIO-ECONOMIC ENVIRONMENT

6.6.1 History

Kasur is a historic city in the Punjab province of Pakistan, renowned for its rich cultural heritage, significant historical sites, and its association with the legendary poet and philosopher, Baba Bulleh Shah. District Kasur is believed to have been founded by the Pashtun prince Kamal-ud-Din in the 11th century. Over the centuries, Kasur has witnessed the rise and fall of different rulers and dynasties, including the Delhi Sultanate, the Mughals, and the Sikhs.

During the Mughal era, Kasur became an integral part of the Mughal Empire, serving as a strategic military outpost and a flourishing trade center. Its location at the crossroads of important trade routes made it a bustling hub of commerce and cultural exchange. In the 18th century, Kasur came under Sikh rule, and during this period, the city witnessed the birth of the legendary Punjabi Sufi poet, Baba Bulleh Shah. His poetry and philosophy, which transcended religious and cultural boundaries, have had a profound impact on Punjabi culture and literature. After the partition of India in 1947, Kasur became part of Pakistan. Today, the city is a vibrant and diverse metropolis, recognized for its cultural significance, agricultural prominence, and its commitment to preserving its historical and cultural heritage.

Kasur is home to a number of notable historical sites, including the Shrine of Baba Bulleh Shah, the Kasur Fort, the Ganda Singh Wala Border, the Shrine of Baba Kamal Chishti, and the Changa Manga Forest Park. The city is also known for its traditional crafts, such as wood carving, pottery, and carpet weaving.

Kasur is a city with a rich and diverse history, culture, and heritage. It is a place where visitors can learn about the past, experience the present, and glimpse the future. Kasur is known for its syncretic culture, which reflects the city's rich and diverse history. The city is home to people of various faiths and ethnicities, who

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live together in harmony. Kasur is a major center of Punjabi literature and music. The city is home to a number of renowned poets, writers, and musicians.

Kasur is a popular tourist destination, attracting visitors from all over Pakistan and the world. The city's historical sites, cultural attractions, and natural beauty make it a must-visit destination for travelers interested in learning about Pakistan's rich history and culture. Kasur is a city that is steeped in history, culture, and heritage. It is a place where the past and present coexist, and where tradition and modernity blend together seamlessly.

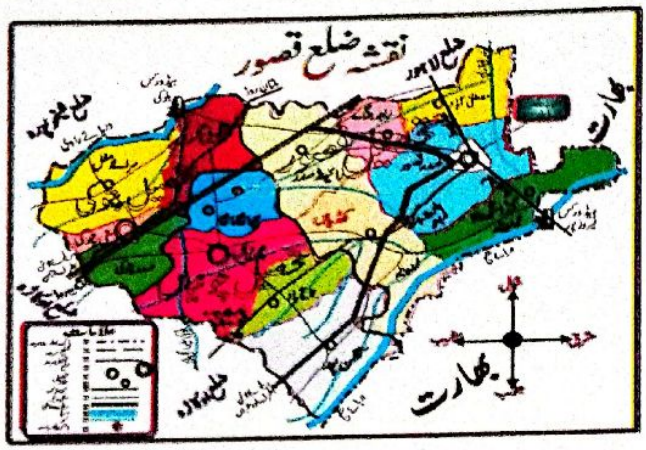


Figure 9 Map of District Kasur

6.6.2 Political Set up

The local government system in District Kasur is based on a three-tier structure: District Council, Tehsil Municipal Administration (TMA), and Union Councils (UCs). The District Council is the highest tier of local government and is responsible for overall development and planning in the district. The TMAs are responsible for municipal services in their respective tehsils, while the UCs are responsible for local affairs and development projects at the grassroots level.

6.6.3 Agricultural and Industrial Activities

6.6.3.1 Agricultural Activities

The agricultural landscape of Kasur includes various crops such as wheat, rice, sugarcane, and vegetables. Wheat is the most important crop grown in the region, followed by rice. Sugarcane is also a major crop, and Kasur is known for its production of high-quality sugar. Vegetables such as tomatoes, onions, potatoes, and brinjal are also grown in Kasur. There are various fruit farms in the vicinity of the project area.

6.6.3.2 Industrial Activities

Kasur is home to a number of textile mills, food processing plants, and chemical plants. The textile mills produce cotton and woolen fabrics, which are exported to countries all over the world. The food processing

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plants produce a variety of food products, such as canned fruits, juices, and snacks. The chemical plants produce a variety of chemicals, such as fertilizers and pesticides.

6.7 QUALITY OF LIFE VALUES

6.7.1 Demographic Survey

According to the 2017 census, the population of Kasur district was reported as 3,454,881. Out of which, 1,788,617 were males and 1,666,044 were female. 2,564,101 were rural and 890,780 urbans.

6.7.2 Cultural and social status

The people are conservative in their life style. They practice their traditional social and cultural and moral values strictly in all walks of life.

6.7.3 Religion

Muslims are the predominant religious community, accounting for 96.48% of the population, while Christians are 3.47%.

6.7.4 Literacy Rate

As per 2017 survey, the literacy rate was 60.77% in the district Kasur.

6.7.5 Ethnic Structure

About 32% population of the district is Rajput. The next numerous tribe is Arain consisting about 30% of population, Jats are about 10% and Dogars 4% while Ansari, Sheikh and Pathans are in lesser percentage and are mostly settled in towns.

6.7.6 Languages

According to the 2017 census, 89.86% of the population's first language was Punjabi, while 1.80% spoke Urdu as their first language. The remaining 7.80% of the population recorded their first language as "Other."

6.7.7 Institutions

Kasur District is home to a number of educational institutes, both public and private. The most prominent are Gulberg College of Education, School of Nursing, DHQ Hospital, Govt Islamia College Kasur, Govt College for Women. The schools and colleges found near the project site are Govt. Girls Primary School, Dar-e-Arqam School.

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Figure 10 Govt. Hanifan Begum Degree College for Women Kasur

6.7.8 Transportation

Kasur is a well-connected district, with a variety of transportation options available to residents and visitors. Kasur is also served by the Pakistan Railways network. The district has a number of railway stations, which provide passenger and freight services to major cities in Pakistan. Project Site is located approximately 55 kilometers from the Lahore International Airport, which provides domestic and international flights. Within the district, the most common modes of local transportation include rickshaws, auto-rickshaws, and buses.

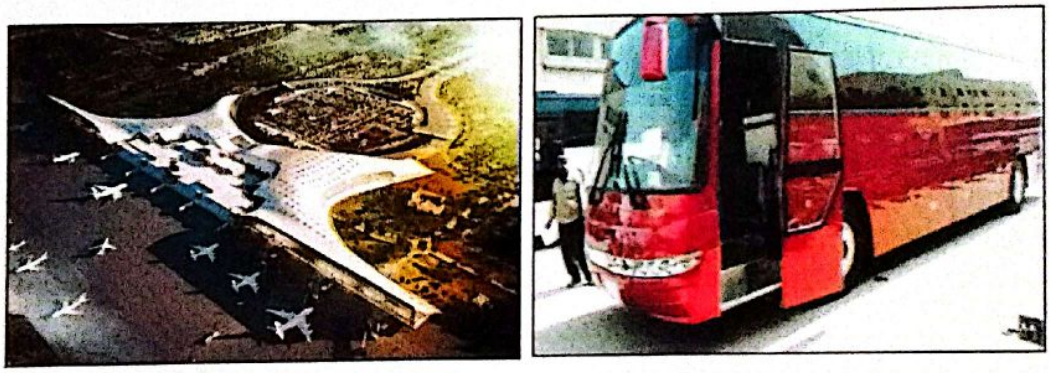


Figure 11 Transportation in District Kasur

6.7.9 Health Facilities

Health facilities are very few in district Kasur, Bhatti Hospital, Wali Hospital, and Ahmad Medical Complex etc. are the most prominent one. Few medical facilities are available near project site such as Alshifa Hospital, and THQ hospital.

6.7.10 Recreational Areas

District Kasur lacks organized recreational facilities. The only recreational activity that the people and youth of the area enjoy is Mela, a village fair. Open and level fields in the villages are usually used as playgrounds for various games, especially cricket. Other games include Kabaddi, a local sport, and indigenous-style wrestling. Urs, the death anniversary of the famous Saint Bulleh Shah in Kasur city, is celebrated with

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religious and cultural enthusiasm throughout the area. This Urs plays a vital role in satisfying the recreational and spiritual needs of the masses in the study area.



Figure 12 Shrine of Baba Bulleh Shah

6.8 ENVIRONMENTAL MONITORING DATA

6.8.1 Water Quality

The groundwater quality of the project site was assessed through comprehensive analysis determining various parameters and their observed values. These findings were subsequently compared against Punjab Environmental Quality Standards (PEQs) to evaluate the quality of groundwater. The analysis involved measuring several parameters such as color, taste, pH, turbidity, Electrical Conductivity (EC), Total Suspended Solids (TDS), heavy metals and total coliforms. By aligning the observed values with the PEQs, the assessment provided a clear understanding of the groundwater quality at the project site. The study concludes that the groundwater in the vicinity of the project exhibits good quality.

Table 3 Groundwater Quality of the Project Site

Sr. No.	Parameter	Unit	Observed Value	PEQs
1.	Color	–	Colorless	–
2.	Taste	–	Tasteless	–
3.	pH	–	7.7	6.5-8.5
4.	EC	mg/L	1302.06	<1400
5.	Turbidity	NTU	2	5.0
6.	Coliforms	Number/100	50	0.0
7.	TDS	mg/L	934	<1000

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8.	Arsenic	mg/L	N.D	<0.05
9.	Zinc	mg/L	0.75	5
10.	Chloride	mg/L	30	250

6.8.2 Air Quality

The evaluation of the project's air quality involved measuring the levels of nitrogen oxides (NOx), oxides of sulphur (SOx), and particulate matter. These measurements were then compared against the PEQs for an accurate assessment of air quality at the site. The air quality in the vicinity of the project is deemed to be of good quality due to reported lower levels of oxides of nitrogen (NOx), oxides of sulphur (SOx), and particulate matter. This observation indicates favorable atmospheric conditions around the project area.

Table 4 Concentrations of nitrogen oxides (NOx), oxides of sulphur (SOx), and particulate matter

Reference Point	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Main Road	49.9	32.4	0.37
North Side of the Project	35.4	35.0	0.12
South Side of the Project	38.4	53.6	0.42
East Side of the Project	27.4	42.5	0.18
PEQS Limiting Values	**120.0**	**80.0**	**10.00**

6.9 SITE SUITABILITY

After thorough monitoring and analysis of the baseline data gathered from the project site, it has been deduced that the location is highly conducive and well-suited for the construction of an LPG storage plant. The comprehensive assessment considered various factors such as geological stability, environmental impact, proximity to infrastructure, and adherence to safety regulations. The site's characteristics, including its geological stability and favorable environmental conditions, align harmoniously with the stringent requirements for establishing an LPG storage facility. Moreover, the location's accessibility to transportation networks and adherence to safety protocols further support the conclusion that this site is optimal for the safe and efficient operation of an LPG storage plant.

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7 SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

7.1 GENERAL

Impact assessment is crucial for project initiation as it enables the identification and comprehension of a project's potential positive and negative effects. Understanding these impacts aids in tailoring the project to maximize benefits and minimize risks. Impact assessment assists in recognizing environmental, social and economic challenges and risks and gives the directions to develop strategies that mitigate these risks and adjust the plan accordingly.

7.2 PROJECT AREA OF INFLUENCE

Before commencing the environmental analysis of the project, its essential to define the specific area of influence. While the primary construction activities will be contained within predetermined boundaries, there are certain aspects where construction-related tasks may extend beyond these confines. These include

- Establishment of construction camps and erection of material grinding plants on temporarily acquired land
- Borrowing soil material from temporarily acquired land
- Quarrying aggregate material; and Construction of haul tracks for transportation of construction material, etc.

Environmental impacts have been identified within the Project Area of Influence; which lies within 0.5 km boundary of the proposed commercial building. Therefore, the identification of Project impacts and recommendations of mitigation measures will be limited within this area.

7.3 METHODOLOGY FOR IMPACT ASSESSMENT

A comprehensive risk assessment was conducted using both qualitative and quantitative analysis methods to evaluate the potential impacts associated with the design, construction, and operational phase of the LPG storage plant. The probability, severity, and consequences of the impacts were analyzed.

7.4 PROJECT DESIGN RELATED ENVIRONMENTAL PROBLEMS

The design of the storage plant was meticulously developed in adherence to standard operating procedures (SOPs) ensuring safety, efficiency, and compliance with industry benchmarks. Additionally, a tree plantation initiative has been incorporated to enhance project's aesthetics and environmental sustainability. This strategic inclusion of tree plantation not only aims to improve the visual appeal of the site but also aligns with ecological objectives, contributing positively to the environment surrounding the storage plant.

7.5 IMPACTS DURING CONSTRUCTION PHASE

The detailed risk Matrix of Construction phase is shown in the table.

Table 5 Screening of Possible impacts during Construction Phase

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Potential Impacts	Likelihood (Certain, Likely, Unlikely, Rare)	Consequences (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
Soil Erosion	Likely	Minor	Low
Land Contamination	Likely	Minor	Low
Soil Contamination	Likely	Minor	Low
Solid Waste	Likely	Minor	Low
Contractor Camp	Likely	Minor	Low
Ground Water	Likely	Minor	Low
Dust	Likely	Moderate	Low
Noise	Likely	Minor	Low

7.5.1 Land Contamination

The construction machinery, including cranes, trucks, loaders/dumpers, and batching plants, used during the construction period can release or spill lubricants, oil, chemicals, and toxic materials, contaminating the land. Paints used in the construction phase can also pose threats to both the environment and human health.

Mitigation Measures

Land contamination will be controlled by the following measures:

- Vehicles and other equipment will be maintained only in designated areas with concrete slabs.
- Prevent the release of contaminated effluent into the environment.
- Direct machinery wash and other potentially contaminated effluents will be drain to a mud pit.
- Proper Handling and storage of fuels, oils, and other hazardous substances according to standard safety practices, such as using secondary containment will be ensured.
- Fuel tanks will be properly labeled and have impervious linings and dykes.
- Leakages during fuel and oil transfer operations will be prevented.
- Checking of fuel, oil, and chemical storage daily for leaks will be ensured.

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- Shovels, plastic bags, sandbags, and absorbent materials will be available near fuel and oil storage areas.
- Vehicles will be properly maintained to avoid spills.
- Maintain a leak/spill record for each vehicle.
- Control of soil contaminated by moderate spills or leaks (up to 200 liters) using shovels, sand, and mud.

7.5.2 Soil Erosion

Soil erosion may occur in the construction area due to improper runoff management from equipment washing yards and inadequate construction management practices. This impact is considered negative of minor magnitude.

Mitigation Measures

Soil erosion will be controlled by using good engineering practices especially both at construction site and peripheral area. Following measures should be taken to avoid soil erosion due to runoff water:

- Ensuring that surface run-off controls are implemented and maintained so as to minimize erosion.
- Main drainage courses within the proposed project development site will be lined to avoid erosion.
- Plantation of indigenous grass which will flourish under project site conditions. This should be done for low road embankments.

7.5.3 Soil Contamination

Soil contamination during the construction phase can occur from waste generated from construction camps, such as garbage, putrescible waste, rubbish, and residues; discarded construction materials, such as wires, plastics, cut pieces of pipes, pieces of empty fuel and lubricant tins, and cardboard packing materials; and paint, varnishes, and other hazardous chemicals and toxic materials used in construction activities. This impact is considered negative of minor magnitude.

Mitigation Measures

- Oil, paint, and other chemical leakages will be controlled by storing these substances in special containers. Keep these containers away from unauthorized people and only allow authorized personnel to access them.
- Store other chemicals in adequate and appropriate places, depending on the type of material.
- Place safety equipment, such as fire extinguishers, near these storage areas, along with signs warning of danger and fire.
- Provide workers with Material Safety Data Sheets (MSDS) for each chemical, and take care when handling and storing these chemicals.
- Develop and implement a proper solid waste management plan to avoid waste problems.
- Collect solid waste by placing solid waste collection containers at various locations. Provide separate arrangements for organic and inorganic waste, and make workers aware of the solid waste management system in place at the site.

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7.5.4 Impacts of Dust Emissions

Construction activities require machinery and equipment's such as transport vehicles, cranes, excavators, trucks for material excavation, dump/haul truck, etc. This machinery will generate air emissions that contain particulate matter (PM), smoke, dust, Carbon Monoxide (CO), and Oxides of Nitrogen ($N0_2$).

Mitigation Measures

- Vehicular emissions of NOx, oxides of sulfur, PM, and CO will be controlled by tuning and maintaining vehicles in good working condition.
- Dust emissions will be controlled by regularly sprinkling water and covering trucks carrying earth, sand, aggregate, and other materials.
- Tuning of all equipment, generators, and vehicles used during the construction phase of the LPG storage plant.
- Ensuring that concrete mixers meet the requirements of zero emissions.
- Minimizing dust emissions due to vehicular traffic by reducing speed, minimizing traffic through good traffic management, and sprinkling water when required.
- Minimizing dust emissions at construction sites by implementing best management practices.

7.5.5 Impact of Noise

Construction activities may increase noise levels at active construction sites. Noise impact on construction workers/ laborers may be avoided in case of loud noise by provision of adequate. Protective Equipment's (PPEs) like ear muffs, ear plugs, etc. This impact is considered negative of moderate magnitude.

Mitigation Measures

Following measures should be adopted to minimize the noise levels;

- Noise barriers (paneled fencing) will be installed where possible to keep the noise levels within permissible limits.
- While replacing equipment, quieter alternatives will be purchased. New equipment may introduce a noise problem; therefore, a noise assessment will be carried out while installing new piece of equipment.
- Contractor obligation will be to use appropriate and fit machinery.
- Noise analysis will be done every month during construction phase.

7.5.6 Impact of Solid Waste and Sewerage Generation

The contractor camp is expected to generate waste. Improper disposal of this waste can lead to both land and water contamination. To address this, storage and collection system will be provided. This impact is considered minor but negative.

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Mitigation Measures

- Solid waste will be collected and segregated.
- Material suitable for recycling will be stored separately and will be handed to vendor.
- It will be ensured that the dumping area having construction waste will be leveled properly after disposal of waste material.

7.5.7 Impacts on Flora

The construction of LPG storage plant on open land is underway, yet a tree plantation plan is proposed. It aims to offset the environmental impact of construction by introducing trees, enhancing the ecological balance, and contributing to a greener environment. This initiative not only aligns with conservation efforts but also endeavors to mitigate the ecological footprint of the project, promoting sustainability and environmental responsibility in all over operational framework of the LPG storage plant.

7.6 IMPACTS DURING OPERATIONAL PHASE

The detailed risk Matrix of operational phase is shown in the table.

Table 6 Screening of possible impacts during operational phase

Potential Impacts	Likelihood (Certain, Likely, Unlikely, Rare)	Consequences (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
Air Quality	Likely	Moderate	Medium
Noise	Likely	Minor	Low
Water Quality	Likely	Moderate	Medium
Soil Quality	Likely	Moderate	Medium
Safety Hazard	Likely	Moderate	Medium

Air pollution

LPG storage plants can emit a variety of air pollutants into the atmosphere. Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during transfer, storage, and handling operations. These emissions can also occur due to leaks, pressure relied, or equipment malfunctions. These pollutants can contribute to smog and ground-level ozone formation, which can cause respiratory problems and other health problems. The impact is considered as negative having a moderate effect.

Mitigation Measures

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Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and rectify any leakage or faulty valves helps prevent emissions from fugitive sources. PEQs for air emissions will be strictly followed to avoid excess air pollution.

Water pollution

Accidental leaks during transportation, handling, or storage of LPG can contaminate nearby water sources. When not properly contained, these leakages can seep into the ground and potentially reach nearby water bodies, causing water pollution. LPG is a flammable liquid, and it can also dissolve in water and contaminate groundwater. Operational activities at an LPG storage plant may produce treatment or discharge of this wastewater into water bodies without adequate management can lead to water pollution.

Mitigation Measures

LPG storage plants will reduce water pollution by preventing leaks. This will be done by installing leak detection systems and by using double-walled tanks. PEQs for wastewater discharges will be strictly followed to avoid water pollution.

Soil contamination

LPG leaks, and improper disposal of waste can also contaminate soil.

Mitigation Measures

LPG storage plants will reduce soil contamination by preventing leaks.

Noise pollution

LPG storage plants can generate noise from equipment such as compressors, pumps, and generators. The transportation of LPG can also generate noise. This noise can be disruptive to nearby communities.

Mitigation Measures

LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.

Safety Hazard

LPG is highly flammable and explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards, endangering workers and nearby population. LPG leakage can displace oxygen in the air, leading to an oxygen-deficient atmosphere. Workers handling LPG are at a risk of exposure to hydrocarbons, which can cause skin irritation, respiratory issues, or more severe health problems upon prolonged or high-level exposure.

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Malfunctioning equipment or over-pressurization of tanks can also pose risks of sudden release or ruptures, leading to physical injuries or exposure to hazardous material. Transportation of LPG to and from the storage point involves risks associated with vehicular accidents and spillage.

Mitigation Measures

- Comprehensive training to the employees on safe handling procedures, emergency response protocols, and the use of personal protective equipment (PPE) to minimize risks will be ensured.
- Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents.
- Emergency response plan will be implemented to effectively manage and contain leaks or other potential accidents to minimize their impact on worker safety and nearby communities.
- Safety equipment such as gas detectors, flame arrestors, and personal protective gear to reduce exposure risks.

7.7 POTENTIAL ENVIRONMENTAL ENHANCEMENT PROCEDURES

To minimize these environmental impacts, LPG storage plants can implement a variety of enhancement measures, including:

- Water sprayers can be used to suppress LPG vapors in the event of a leak.
- Leak detection and repair programs can help to identify and repair LPG leaks early on, before they cause significant environmental damage.
- Double-walled tanks can provide a secondary layer of protection in the event of a leak from the primary tank.
- Storm water management plans can help to prevent LPG leakages from contaminating storm water runoff.
- Trees plantation can help to absorb pollutants from the air and water.
- Energy-efficient equipment can help to reduce greenhouse gas emissions.
- Electricity will be used from LESCO; however, available stand by generator will also be used whenever there is casual power shut down. In the first place the generator is to be housed in double built containment/ housing, therefore, its noise will be curtailed well within the limits of the Punjab Environmental Quality Standards (PEQS).
- Adequate firefighting system will be maintained at all times and the required quantity of water will always be kept in storage.
- Rainwater disposal will be done through the adequate system.
- Sewage will be discharged to the main sewerage system; after its treatment through a septic tank and also getting the permission from the competent authority.

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8 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

An environmental management and monitoring program involves the systematic approach to controlling, mitigating, and assessing the impacts of human activities on the environment. The aim is to protect, preserve, and enhance environmental quality while ensuring sustainable use of resources.

8.1 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The objectives of an Environmental Management Plan (EMP) generally revolve around the following key goals:

- The safeguard and conserve natural resources, habitat, and ecosystems. This involves preserving biodiversity, protecting endangered species, and maintaining the overall health of the environment.
- To minimize or eliminate pollution by managing emissions, waste, and other harmful byproducts generated by human activities. This involves adopting cleaner technologies, waste reduction, and recycling initiatives.
- To ensure the responsible and sustainable use of natural resources such as water, land, energy, and minerals. This involves strategies to conserve resources, reduce consumption, and promote renewable and alternative sources of energy.
- To adhere to environmental laws, regulations, and standards set by relevant authorities, ensuring that activities and operations are conducted in accordance with legal requirements.
- To identify potential environmental risks and develop strategies to mitigate these risks. This includes planning for emergencies and establishing protocols to respond to environmental incidents.
- To constantly assess and improve environmental performance through regular monitoring, evaluation, and adjustment of management strategies. This ensure that environmental goals are being met and that new challenges are addressed effectively.
- To involve and educate community, stakeholders, and employees in environmental initiative, fostering a culture of environmental responsibility and awareness.
- The manage environmental concerns in a manner that is cost-effective and integrate sustainability.

These objectives from the backbone of an Environmental Management Plan, guiding strategies and actions to ensure environmental sustainability and responsibility in all the phases of a project.

8.2 INSTITUTIONAL CAPACITY

Project Proponent will be responsible for Monitoring and Evaluation, but Environment consultant (of the proponent) will responsible to monitor EMP implementation in the field and reporting to the Project Proponent. The Project Proponent will integrate monitoring reports in the main monthly reports of the project. The Environment Specialist of Supervision Consultant will carry out a final evaluation at the end of the Project. In addition, for external monitoring, proponent is to engage an independent agency (an NGO, an academic institute or an individual consultant) to conduct 3rd party validation of EMP implementation. District Office of the EPA at district will monitor the overall activity at the site.

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8.3 SCHEDULE FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

The implementation stages of the project activity include

1st Stage

The stage –1 comprises the onsite contowing studies and soil investigations and the finalization of the project designs.

2nd Stage

The stage –2 comprises the following task.

1) Laying of foundations excavation and commencement of erection work.
2) Shoring and piling
3) Start of civil, electrical and mechanical work.
4) Development of basic infrastructure.
5) Fitting of instrumentation.

3rd Stage

The stage –3 comprises the following task:

1) Commercial building civil structure erection completion.
2) Completion of the basic infrastructures water supply system, electricity supply etc.

4th Stage

The last stage will be the commencement of regular use.

8.4 SCOPE OF ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides mitigation and management measures for the following phases of the project.

8.4.1 Construction Phase

This section of EMP provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required within the construction phase are specified. These specifications will form part of the contract documentation and therefore, the contractor will be required to comply with the specifications to the satisfaction of the project Manager and Environmental Control Officer, in terms of the construction contract.

8.4.2 Operation and Mitigation Phase

This section of EMP provides management principles for the operation and maintenance phase of the project. Environmental actions, procedure and responsibilities are required from proponent within the operation and maintenance phase are satisfied.

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8.5 MITIGATION PLAN FOR CONSTRUCTION AND OPERATION PHASE

Table 7 Environmental Management Plan (EMP) for Constructional Phase

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
		Constructional Phase		
1	**Air quality** Dust and particulate matter resulting from construction activities. Use of heavy machinery will produce dust emissions	Water sprinkling on regular basis will be ensured to limit pollution from dust and particulate matter. Proper maintenance and management of all the construction machinery and vehicles. Tree plantation will be done to reduce air pollution.	During construction phase	Proponent and Contractor
2	**Water quality** Run-off water from construction area. Inappropriate storage of constructional waste can cause leakages contaminating ground water.	Use of impermeable sheets to avoid contamination of the groundwater/surface water. Proper disposal of waste material on dumping sites.	During construction phase	Proponent and Contractor
3	**Waste Generation** Construction waste will be produced from construction activities Domestic waste from workers camp	Conduct separate collection of construction and domestic waste to promote recycling and re-use. Proper disposal of waste to the authorized sites. The area to be leveled and contoured after disposing excess material.	During construction phase	Proponent and Contractor

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		No waste or debris will be thrown in the nearest canal water or other water bodies.		
4	**Noise** Noise caused by construction machinery and vehicles used for mobilization of construction equipment and workers.	The contractor will strictly follow the PEQS Proper maintenance of vehicles and construction equipment. Minimize/avoid unnecessary use of drills and other noisy machinery Unloading of constructional material will be done during day time. The personal protective equipment (PPE) will be provided to the construction workers and its usage will be made mandatory	During construction phase	Proponent and Contractor
5	**Soil Quality**	Chemical leakages will be controlled by storing these substances in special containers. Proper waste management will be ensured.	During construction phase	Proponent and Contractor
6	**Materials Management**	Stockpiles shall not exceed a particulate height. Stockpiles maybe exposed to windy conditions or heavy rain, so they will be properly covered with plastic sheets. Stockpiles may further be protected by the construction of low brick walls around their bases.	During construction phase	Proponent and Contractor
7	**Workers Health & Safety**	Personal protective equipment will be provided to the workers. Provision of first aid box at work site to deal with emergency situation.	During Construction Phase	Proponent

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		Safety training to the workers. Adequate safety signs on site will be ensured. Provide training regarding proper handling and use of chemicals/ paints Install fire extinguishers at fire handling places. Inspection that lifting devices, such as cranes, are appropriate for expected loads. Stagnant water at the project site will be prohibited to avoid the dengue larva production. Continuous monitoring will be carried out to ensure that contractor is following safe working procedures and practices.		
8	**Clearance of site from extra material and construction equipment**	Regular removal of extra materials from the site to avoid congestion at work place. Construction waste will be collected and disposed of separately from other waste. Careful handling of waste will be ensured.	During Construction phase	Proponent and Contractor

Table 8 Environmental Management Plan (EMP) for Operational Phase

Sr. No.	Project Component/ Impact	Mitigation/ Preventive Action	Responsibility	
			Implementation	Monitoring
	Operational Phase			

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1	**Air Impact** Fugitive emissions such as volatile organic compounds (VOCs), and carbon monoxide (CO) can be released during transfer, storage, and handling operations.	Frequent inspections, maintenance, and testing of storage tanks will be ensured to identify and leakage or faulty valves. PEQs for air emissions will be strictly followed to avoid excess air pollution.	During Operational Phase	Proponent
2	**Impact on Noise** LPG storage plants can generate noise from equipment such as compressors, pumps, and generators. The transportation of LPG can also generate noise.	LPG storage plants will reduce noise pollution by installing mufflers on equipment and by building sound barriers around the plant.	During Operational Phase	Proponent
3	**Soil Contamination** LPG leaks, and improper disposal of waste can also contaminate soil.	LPG storage plants will reduce soil contamination by preventing leaks.	During Operational Phase	Proponent
4	**Water Quality** Accidental leaks during transportation, handling, or storage of LPG can contaminate nearby water sources. LPG is a flammable liquid, and it can also dissolve in water and contaminate groundwater.	LPG storage plants will reduce water pollution by preventing leaks. This will be done by installing leak detection systems and by using double-walled tanks. PEQs for wastewater discharges will be strictly followed to avoid water pollution.	During Operational Phase	Proponent

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5	**Fire and Workers Safety** LPG is highly flammable and explosive. Leakages, improper handling, or accidental release of LPG can lead to fire or explosion hazards. LPG leakage can displace oxygen in the air, leading to an oxygen-deficient atmosphere. Workers handling LPG are at a risk of exposure to hydrocarbons, which can cause skin irritation, respiratory issues, or more severe health problems upon prolonged or high-level exposure. Malfunctioning equipment or over-pressurization of tanks can also pose risks of sudden release or ruptures, leading to physical injuries or exposure to hazardous material. Transportation of LPG to and from the storage point involves risks associated with vehicular accidents and spillage.	Comprehensive training to the employees on safe handling procedures, emergency response protocols, and the use of personal protective equipment (PPE) to minimize risks will be ensured. Routine maintenance, inspections, and testing of equipment to ensure proper functioning and detect potential issues early on to prevent accidents. Emergency response plan will be implemented to effectively manage and contain leaks, or other potential accidents to minimize their impact on worker safety and nearby communities. Safety equipment such as gas detectors, flame arrestors, and personal protective gear to reduce exposure risks.	During Operational Phase	Proponent

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8.6 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

The project proponent bears the responsibility for overseeing all the project activities. To cater to the varying requirements during operational phase, the proponent will hire personnel specifically dedicated to environmental management at the project site. This step is crucial to ensure the effective implementation and operations of the Environmental Management Plan (EMP).

Assigning the responsibilities to designated individuals is paramount to uphold accountability in the event of any oversight or mishap. Each appointed person will have specific duties outlined within the EMP. These responsibilities will be tailored to their roles, ensuring they are accountable for the successful execution of environmental protocols and procedures.

By delineating and assigning these responsibilities to individuals, the project proponent establishes a framework where each person understands their role and obligation within the broader context of environmental management. This structuring allows for a more efficient response to any environmental issue. This approach aims to create a clear chain of accountability, ensuring that the implementation of EMP is conducted diligently and that there are identifiable points of contact for any concerns or queries related to environmental management during the project's operational phase.

8.7 ENVIRONMENTAL MONITORING PROGRAM

An Environmental Monitoring Program (EMP) is a structured system designed to consistently observe, assess, and record the environmental conditions and impacts associated with the construction of LPG storage plant. It involves systematic data collection related to air quality, water quality, soil conditions, and biodiversity. This collected data is analyzed to detect any deviations from the PPEQs.

It also involves impact assessments, communication of findings to stakeholder, and adaptive management – making necessary adjustments to mitigate environmental risks and issues. The program's goal is to ensure sustainable environmental practices, minimize adverse impacts, and maintain compliance with set standards, contributing to better environmental management and long-term sustainability.

The objectives of the Environmental Monitoring Plan are given below;

- Detecting environmental changes to prevent and minimize potential negative impacts on the environment.
- Ensuring compliance with environmental laws, permits, and regulations by regular monitoring and reporting environmental parameters. This helps in meeting legal requirements and avoiding penalties or sanction.
- Assessing and managing potential risks to the environment caused by human activities. This involves evaluating the impact of these risks and implementing strategies to mitigate or manage them effectively.
- Monitoring and managing the use of natural resources such as water, air, soil, and biodiversity. The goal is to conserve these resources and maintain ecological balance.

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- Assessing the impact of specific actions, projects, or processes on the environment to understand their consequences and make informed decisions regarding future actions.
- Using collected data to improve environmental performance, refine strategies, and adapt measures to achieve better outcomes over time.
- Establishing protocols and responses for emergencies or unexpected environmental incidents, ensuring a rapid and effective reaction to minimize damage.

Table 9 Monitoring Parameters

Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
A. Construction phase				
1.	**Noise**	Construction vehicle/ machinery/ generators/welding work	Noise meter	Construction vehicles / machinery / generators will be checked regularly for noise level by the contractor during construction phase.
2.	**Air Emissions**	Construction vehicle/ machinery/ generators	Ambient particulate matter monitoring.	Construction vehicles / machinery / generators will be checked regularly for smoke emissions by the contractor during construction phase.
B. Operation phase				
1.	**Air Emissions**	Filling of Storage Tanks	Amount of Volatile Organic Compounds (VOC's) and Hydrocarbons	Will be carried out on quarterly basis
2.	Wastewater monitoring	Wastewater discharging points	Detection of residual hydrocarbons and Particulate Matter	Will be carried out on quarterly basis.

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Sr. No	Monitoring parameters	Monitoring location	Monitoring mechanism	Remarks
3.	LPG leakages	Storage tanks	Pressure tests	Will be carried out on monthly basis.

8.8 ENVIRONMENTAL BUDGET

An environmental budget is a crucial aspect for the construction of LPG storage tank, as it delineates the financial allocation specifically designated for environmental management, sustainability, and mitigation potential ecological impacts. Before the commencement of the project, a detailed environmental budget was carefully formulated and allocated to ensure the responsible management of environmental aspects throughout the project's lifecycle.

The environmental budget outlined a comprehensive plan detailing financial resources for various environmentally significant aspects of the project. It encompassed expenses associated with the implementation of sustainability measures, compliance with environmental regulations, and the execution of eco-friendly initiatives. Moreover, the budget accounted for costs related to environmental impact assessments, monitoring systems, and routine environmental audits to ensure adherence to established standards and regulations.

Table 10 Environmental Budget

Environmental Component	Amount PKR	Details	Remarks
A. Environmental Management Cost			
Fire and Health & Safety Measures	400,000	The workers are required to provide the PPEs for work site safety precaution and to avoid any safety hazard.	Amount to be included in the Project Budget.
B. Environmental Monitoring Cost			
(i) Air, Water and Noise Monitoring	200,000	Monitoring will be performed as per EPA Standards	Amount to be Included in Project Budget

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C. Tree Plantation Tree Plantations of Endemic /Local Species	400,000	Landscaping around the project site.	Required for implementationof true spirit of EMP
Total Environmental Management and Monitoring Cost in PKR (A+B+C)	**1,000,000**	Summing up A,B, C	Amount to be included in the Project Budget.

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9 TREE PLANTATION PLAN

In an era marked by growing environmental consciousness and pressing need to address climate change, the act of tree planting stands as an indispensable and powerful tool for the protection of the planet's future. With a firm commitment to biodiversity, sustainability, and ecological restoration, this plans tells us the systematic approach to select, plant and sustain trees at the project site. Through tree plantation plan we can circumvent the impacts of deforestation, improve air and water quality, enhance local ecosystems, and contribute to the global struggles to reduce climate change. Tree plantation plan is a testament to our dedication to a healthier and greener future, where trees are serving as a beacons of hope, life, and resilience.

9.1 OBJECTIVES OF TREE PLANTATION

The following objectives of tree plantation helps to clarify its basic purpose.

- Trees in urban areas provide shade and heat reduce heat, mitigation the urban heat island heat.
- Trees store carbon in their biomass, helping and reduce the atmospheric carbon dioxide levels.
- Trees contribute to visual appeal of urban and rural landscapes, making areas more attractive.
- Trees yield valuable resource such as timber, fruits, nuts, and medicinal plants.
- Trees plantations create employment opportunities for the people living in the vicinity of the project area.
- Trees act as a natural air filters by trapping airborne pollutants and particulate matter.
- Trees release oxygen during photosynthesis, improving air quality.
- Trees help maintain healthy watersheds, reducing the risk of floods and ensuring a consistent water supply.
- Trees help prevent soil erosion by anchoring soil with roots.
- Trees planted strategically can safeguard against landslides and protect roads and buildings.
- Trees absorb carbon dioxide and release oxygen, helping reduce greenhouse gas level and circumvent climate change.
- Trees can efficiently serve as windbreaks.

9.2 BENEFITS OF TREE PLANTATION

- A well-executed tree plantation plan offers numerous advantages, covering all the environmental, economic and soil aspects. Some of the key benefits of tree plantation are enlisted below;
- Plants absorb carbon dioxide (CO_2) from the atmosphere and store this carbon in the biomass helping to circumvent climate change by reducing greenhouse gas emissions.
- Roots of the trees help to stabilize soil and prevent soil erosion.
- Trees act as a natural air filter, by trapping particulate matter which leads to healthier living environments.
- Trees can provide habitat and food residues to birds contributing to local biodiversity.

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- Trees act as a natural buffer that helps to control and purify water entering into the streams and rivers reducing the risks for the contamination of water.
- Well-maintained tree plantation enhances the visual appeal of the landscapes, making area more attractive.
- Tree roots can improve soil quality by increasing its organic matter content and nutrient availability.
- Tree plantation contnbute to climate resilience by moderating temperature extremes, reducing the risk of heatwaves, and providing shelter from extreme weather events.
- Trees can help to enhance the mental and physical well-being of the people living around the project area.
- A well-designed tree plantation plan serves as a long-term investment in the environment and the future, as they continue to provide benefits for generations to come.

9.3 TREE CUTTING

The project is designed without any tree cutting, thereby emphasizing a commitment to preserving existing green spaces and natural habitats. Instead, a proactive approach centered on environmental enhancement and sustainability is proposed through a tree plantation initiative. This initiative aims to further enrich the local environment by introducing new trees in designated areas. The tree plantation is a proactive step towards nurturing and expanding greenery, bolstering ecological balance, and contributing positively to local ecosystem.

The proposed tree plantation initiative forms an integral part of the project's green strategy, seeking to mitigate environmental impact and foster sustainability. By adding new trees, it not only compensates for any potential loss of greenery but also serves as a deliberate action to amplify the overall environmental quality of the project area. The selection of tree species and their placement is carefully considered to ensure alignment with the local ecosystem and promote biodiversity.

9.4 AREA ENHANCEMENT PLAN

Tree plantation plan of the area has been prepared keeping in view the project area and length. The plan is based on best possible estimations and can be modified accordingly at the execution stage.

9.5 TREES RECOMMENDED

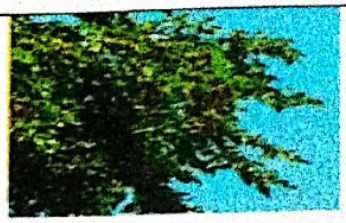
Tree species are recommended for the plantation are the indigenous species of District Kasur.

Table 11Trees to be planted

Sr. No.	Local Name	Scientific Name	Picture

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1.	Beri	*Zizyphus jajaba*	
2.	Toot	*Morus marlaccae*	
3.	Sharin	*Albizzia lebbek*	
4.	Kikar	*Acacia arbica*	
5.	Shisham	*Dalbergia sissoo*	

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6.	Phulai	*Acacia modesta*	

9.6 COST OF TREE PLANTATION

The cost for the plantation and maintenance of trees at the project site is estimated as 4 Lakh PKR. The budget has been calculated for the procurement of manure, continued supply of water throughout the year. The proponent will make a proper record of the current number and conditions of the planted trees.

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FIRE SAFETY PLAN

A fire safety plan is a structured and comprehensive document that details procedures, protocols, and strategies aimed at preventing, preparing for, and responding to fire emergencies at the project site. This essential plan outlines preventive measures, emergency procedures, evacuation protocols, fire detection and suppression systems, training requirements and communication strategies. It assigns specific roles and responsibilities to individuals and provides clear instructions for evacuations, ensuring occupants, or employees understand what to do in case of a fire. Regular reviews and updates to the plan maintain its relevance, ensuring compliance with fire safety regulations and fostering a safe and prepared environment in the event of a fire emergency.

9.7 OBJECTIVES OF A FIRE SAFETY PLAN

Following objectives collectively aim to create a safe and prepared environment in the face of a fire emergency, ensuring the protection of lives, property, and assets.

- The primary goal is to prevent fires from occurring by implementing measures that reduce fire hazards, ensuring that all the safety systems, equipment, and protocols are up to standard, and that fire risks are minimized.
- Protecting the lives and well-being of occupants and employees by ensuring a quick and safe evacuation during a fire emergency. This involves establishing and regularly practicing efficient evacuation routes and procedures.
- Minimizing damage to property and assets by having effective fire detection and suppression systems in place. This includes regular maintenance of fire safety equipment such as fire alarms, sprinkler systems, and fire extinguishers.
- Outlining procedures to respond effectively and efficiently in the event of a fire. This involves establishing clear roles and responsibilities for personnel during a fire emergency.
- Ensuring compliance with local fire safety regulations and standards.
- Conducting regular training sessions, and fire drills to educate occupants and employees about fire safety procedures, evacuation routes, and the use of fire equipment.
- Regularly reviewing and updating the fire safety plan to incorporate any necessary changes in equipment, procedures, or regulations. This ensures the plan remains current and effective.

9.8 FIRE SAFETY SYMBOLS

In a LPG storage and filling plant, hazard identification symbols play a crucial role in communicating potential hazards identification symbols play a crucial role in communicating potential dangers to employees, emergency responders, and the public. These symbols, often standardized, convey carious hazard associated with the storage and handling of LPG. Some common symbols and their meanings in such a facility include:

9.8.1 Flammable Symbol

It indicates the flammability of LPG. It warns about the potential for fire explosion.

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Figure 13 Symbol for Flammable Material

9.8.2 Gas Cylinder Symbol

It highlights the presence of compressed gas cylinder, signifying the potential pressure and hazards associated with gas containment.



Figure 14 Symbol for Gas Cylinder

9.8.3 Toxic Symbol

It warns about the toxicity of certain chemicals or gases, emphasizing the need for caution and proper handling to avoid health and hazard.



Figure 15 Symbol for Toxic Material

9.8.4 Explosive Symbol

It indicates the potential for an explosion due to certain conditions or elements present in the LPG plant.



Figure 16 Symbol for Explosive Material

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9.8.5 Electrical Hazard Symbol

It warns about electrical hazards present in the facility, highlighting the risk of electrical shock or short circuits.



Figure 17 Symbol for Electrical Hazard

9.8.6 PPE (Personal Protective Equipment) Symbol

It emphasizes the necessity of wearing appropriate personal protective equipment while working in the facility.



Figure 18 Symbols of PPEs

9.8.7 Environmental Hazard Symbol

It signifies potential hazards to the environment, like contamination or pollution risks from LPG leaks.



Figure 19 Environmental Hazard Symbol

These symbols are commonly used in combination with written warnings, color codes, and other safety measures to ensure a comprehensive and easily understandable identification system for the hazards present in an LPG storage plant. It's crucial for all personnel to be familiar with these symbols and their meanings to ensure a safe working environment.

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9.9 FIRE SAFETY MEASURES

Fire safety measures prevent fires and explosions, safeguard personnel, protect property and equipment, ensure compliance with regulations, maintain emergency preparedness, and mitigate environmental risks associated with potential fire incidents. Following safety measures are proposed at project site.

Table 12Fire Safety Measures at the LPG Storage Plant

Sr. No.	Descriptions	Quantity (No.)
01	Emergency Shut off Value	2
02	Fire Hydrant	4
03	Fire Monitor	4
04	Fire Water PUMP 500 GPM	1
05	Showering PUMP 500 GPM	1
06	Jockey PUMP	1
07	Manual Sprinkler	125
08	Auto Sprinkler	25
09	Fire Extinguisher DCP 09 Kg.	8
10	Totally Mounted 50 kg DCP Fire extinguisher	03
11	Fire Extinguisher CO_2 5 kg	03
12	Manual Hooter	01
13	Earth Pits	10
14	Sand Bucket Stand	04
15	Fire Alarm	01

9.9.1 FIRE EXTINGUISHERS

Fire extinguishers are necessary in LPG storage areas due to high flammability of LPG. They provide a means to quickly suppress small fires, prevent their escalation, comply with safety regulations, and protect lives, and the environment. These extinguishers ensure emergency preparedness and the rapid containment of fires, offering immediate response and safety for individuals working in or around LPG storage areas.

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Carbon Dioxide Fire Extinguishers

Carbon dioxide (CO_2) fire extinguishers play a vital role in LPG storage and filling plants due to their effectiveness in combating LPG fires, leaving no residues and being non-corrosive, which is crucial for sensitive equipment. They swiftly suppress fires by displacing oxygen, prevent their spread in potentially hazardous environments. Additionally, CO_2 extinguishers are safe for use on electrical fires and ensure compliance with safety regulations in areas where flammable gases like LPG are handled. Their rapid action not only safeguards worker safety by providing a quick means to address fires but also protects equipment and facilities in these high-risk settings. Three CO_2 fire extinguishers of 5 kg are proposed to be placed in the plant.



Figure 20 CO_2 Fire Extinguisher

Dry Chemical Powder Fire Extinguishers

Dry Chemical Powder (DCP) fire extinguishers are crucial in LPG storage and filling plants due to their versatility in combating different types of fires, including those involving flammable gases like LPG. These extinguishers work by interrupting the chemical reaction of the fire, making them effective for a wide range of fire classes, such as Class B (flammable liquids) and Class C (electrical fires). In LPG storage facilities, where various fire risks exist, DCP extinguishers serve as a reliable choice for their ability to quickly suppress fires, prevent their spread, and safeguard the environment, equipment, and personnel. Their adaptability, quick response, and effectiveness against various fire types make them an essential safety measure, ensuring preparedness for diverse fire emergencies in LPG-related settings. Eight DCP fire extinguishers having the capacity of 09 kg each are proposed to be placed on the plant.

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Figure 21 DCP Fire Extinguisher

9.9.2 Fire Hydrants

Fire Hydrants at LPG storage plants provide immediate access to water for firefighting in emergencies, supporting fire suppression efforts, ensuring site safety by cooling structures, and complying with safety regulations. Although water might not directly extinguish LPG fires, hydrants serve as a crucial resource for firefighting equipment and overall emergency preparedness. Four fire hydrants are proposed to be placed at the project site.

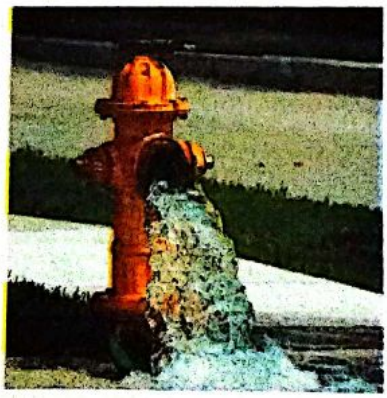


Figure 22 Fire Hydrant

9.9.3 Fire Alarm

Fire alarms are crucial in LPG storage plants for early fire detection, timely warnings, evacuation, facilitation, prevention of fire escalation, and compliance with safety regulations. They play a vital role in ensuring the safety of personnel and protecting the facility and its surroundings. Fire alarm is supposed to be installed at the storage plant.

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Figure 23 Fire Alarm

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10 OCCUPATIONAL HEALTH AND SAFETY PLAN

The occupational health and safety program will work to ensure that the workplace is safe and healthy by addressing the risks and hazards present there, outlining the processes and responsibilities for preventing, eliminating, and minimizing the effects of those risks and hazards, identifying the emergency management plans for the workplace or workplaces, and defining the methods for consulting with, training, and informing employees at various workplaces.

10.1 OBJECTIVES OF OCCUPATIONAL HEALTH AND SAFETY

The objectives of Health and Safety plan at LPG storage are given below

- Protect the health and safety of employees, contractors, visitors, and the surrounding community. This includes preventing injuries, illnesses, and fatalities caused by LPG releases, explosions, fires, and other hazards.
- Minimize the environmental impact of LPG storage and handling. This includes preventing releases of LPG to the air, water, and soil.
- Comply with all applicable health, safety, and environmental regulations.

10.2 SCOPE OF OCCUPATIONAL HEALTH AND SAFETY PLAN

Following scope of occupational health and safety will be followed;

- Assessment and identification of potential hazards specific to the LPG storage and filling operations, including risks associated with handling, storage, transportation, and potential exposure to LPG will be ensured.
- Detailed guidelines on the use, maintenance, and adequacy of personal protective equipment required for various tasks, such as flame-resistant clothing, safety goggles, gloves, respirators, and other specialized gear will be provided.
- Comprehensive training programs for workers, ensuring they are well-informed about the risks involved in working with LPG, handling emergency situations, and the correct usage of safety equipment will be ensured.
- Detailed protocols and procedures for handling emergencies such as gas leaks, fires, and other incidents, including evacuation plans, communication strategies, and coordination with emergency services.
- Compliance with relevant occupational health and safety regulations and conducting regular audits to review and update safety protocols based on changing circumstances or regulations.
- Implementation of the regular maintenance schedules and inspections of equipment, machinery, and facilities to ensure safe working conditions and prevent potential hazards.
- Involving workers in safety decisions, creating a culture of safety awareness, and encouraging reporting of safety concerns or incidents will be implemented.

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10.3 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is an important part of any health and safety plan at an LPG storage plant. PPE can help to protect employees from a variety of hazards, including:

- PPE can help to protect employees from exposure to LPG vapors, which can be harmful to the respiratory system and can cause burns.
- PPE can help to protect employees from flying debris and from the heat and flames associated with an explosion.
- PPE can help to protect employees from burns and from exposure to smoke and toxic gases.
- PPE can also help to protect employees from other hazards, such as slips, trips, and falls.

10.3.1 PPE Required for LPG Storage and Filling Plant

PPE is crucial in LPG storage and filling plants to ensure the safety of workers and minimize the risk of accidents. The necessary PPE for such environments typically includes:

1. **Safety Goggles/Face Shields:** Protect the eyes and face from potential splashes or contact with LPG, chemicals, or other hazardous materials during filling or maintenance operations.
2. **Chemical-Resistant Gloves:** Shield hands from direct contact with LPG, chemicals, or corrosive substances used in the process to prevent skin irritation or burns.
3. **Flame-Resistant Clothing:** Clothing made of fire-resistant materials is essential to protect against potential fire hazards. This includes flame-retardant coveralls or other specialized clothing designed to resist ignition.
4. **Safety Shoes/Boots:** Non-slip, closed-toe footwear is important to protect the feet from spills, slips, or potential impact hazards.
5. **Respiratory Protection:** In some cases, respiratory masks or respirators may be required to safeguard against inhalation of fumes, vapors, or airborne contaminants in the LPG storage or filling environment.
6. **Hard Hats:** Essential for protecting the head from falling objects, particularly during maintenance or handling tasks where there is a risk of items falling from above.
7. **Ear Protection:** If the operations involve loud machinery or equipment, ear protection in the form of earplugs or earmuffs can prevent damage to hearing.
8. **Safety Harnesses:** In instances where workers are operating at elevated heights or working in confined spaces, safety harnesses can prevent falls and ensure worker safety.

The specific PPE required in an LPG storage and filling plant might vary based on the site's procedures, potential hazards, and regulatory requirements. Employees working in these areas should be trained in

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the correct usage of PPE and adhere to safety protocols to mitigate risks associated with handling LPG and ensure a safe working environment.



Figure 24 Personal Protective Equipment

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11 STAKEHOLDER'S CONSULTATION

Stakeholder consultation is a way to involve both the primary and secondary stakeholders in making decisions about the project. This helps address their concerns, improve how the project is planned, and make sure it is seen as a legitimate effort. When stakeholder consultation is done fairly and inclusively, it can make the project more sustainable. Getting input from the local community, including their knowledge and values, can greatly improve the quality of decision-making on social and environmental matters, So, we conducted stakeholder consultations in the project area, not only because it is legally required in EIA process in Punjab province, but also to make the project better by considering social and environmental aspects.

11.1 OBJECTIVES OF STAKEHOLDERS CONSULTATION

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

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

This study was conducted with the main goal of understanding how the project would affect the local population through public consultation. The specific objectives of this assessment are

- Improve people's understanding of the project, what it aims to achieve, and its likely effects.
- Identify and address the concerns of all individuals and groups in the project area who are interested and affected.
- Create a way to find and solve problems before finalizing plans, which can prevent expensive delays and reduce the risk of public anger and resentment.
- Promote transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.

11.2 PROPONENT ENVIRONMENT MANAGEMENT TEAM

All possible impacts and mitigation measures related to the project were discussed with the proponent and management. They assured to take all suggested mitigation measures to control any discrepancy arising from the project and to make the environment friendly.

11.3 THE RESPONSIBLE AUTHORITY

The Proponent shall be the responsible authority to take all measures before starting the project and during operation.

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11.3.1 Other departments and agencies

The impact analysis is detailed with the management, local community, educational institutes, health institutes, hospitals, and NGOs. All issues were discussed related to the implementation of the project. Scoping sessions, focused group discussions, and wayside consultations were held with the relevant stakeholders in the area.

11.4 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

Our team of integrated environmental consultants conducted a visit to the project site. They engaged in discussions with project stakeholders and conducted with residents from nearby villages and beyond to assess the project's socio-economic impacts. The people in the area come from various professions, including those employed in various fields, business owners, doctors, some living abroad, military personnel, and educators. Women were also consulted to gather their perspectives on how the project could improve the area. While some women openly shared their thoughts, many felt hesitant due to the area's social norms, making them uncomfortable with speaking or being photographed. Overall, the local community provided massive information about the project and expressed positive views regarding its potential for development.

11.5 AFFECTED AND WIDER COMMUNITY

There is no affected community present in the area of the proposed project. The proponent has consulted with the inhabitants of different villages. The remarks of people are positive regarding the project.

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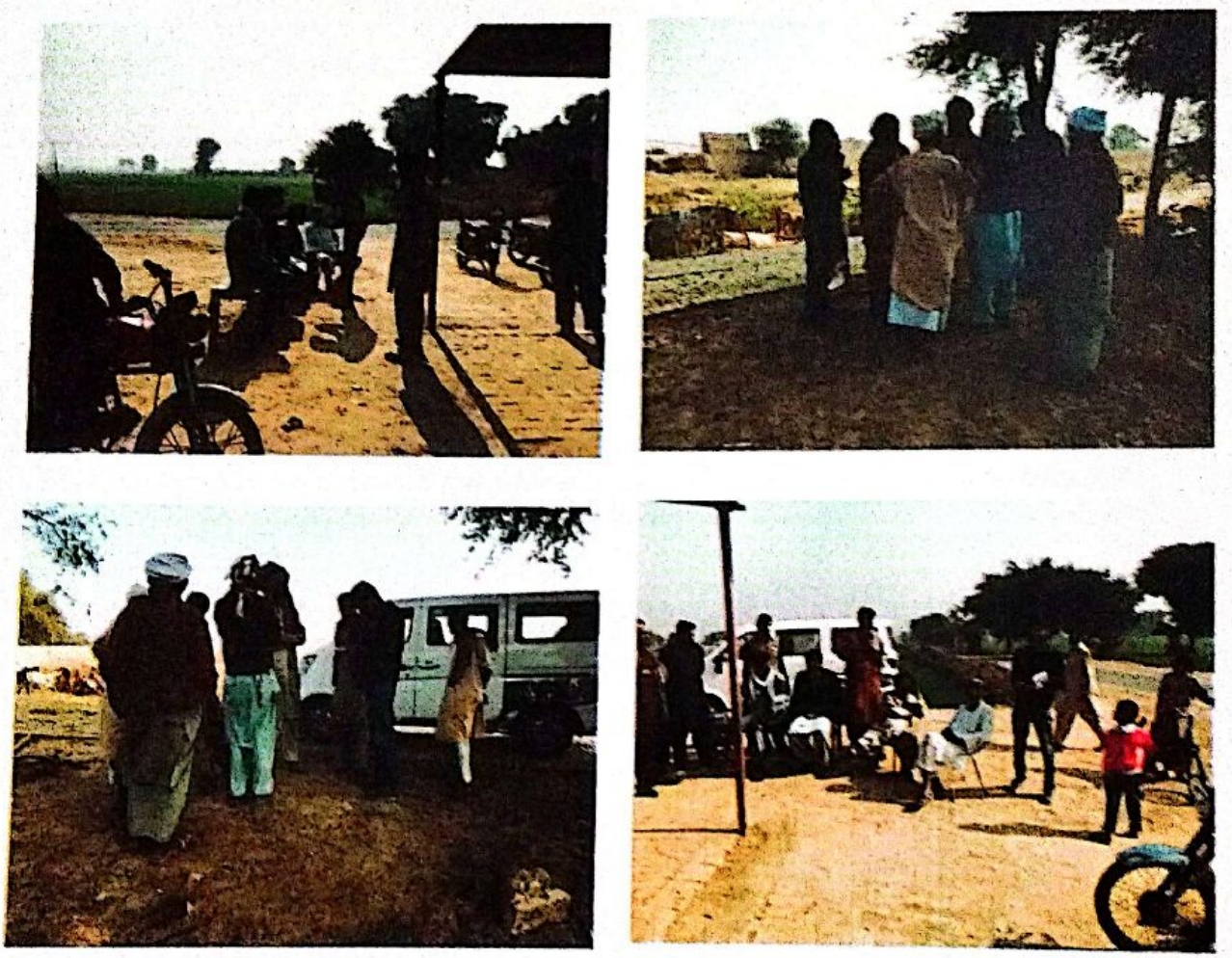


Figure 25 Pictorial View of Public Consultation

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12 GRIEVANCE REDRESS MECHANISM

A Grievance Redress Mechanism is a structured system established to address and resolve complaints, concerns, or issues raised by individuals or entities regarding their experiences or interactions. This mechanism typically involves clear channels for lodging complaints, whether through written communication, online platforms, or dedicated grievance officers. Once a grievance is registered, the mechanism ensures a systematic and fair investigation of the matter, taking into account all relevant information and perspectives. Timely resolution and effective communication with the aggrieved party are essential components, helping to restore trust and rectify any perceived injustices. An efficient Grievance Redress Mechanism not only safeguards the rights and interests of individuals but also contributes to organizational transparency, accountability, and continuous improvement in service delivery.

12.1 COMPONENTS OF GRM

GRM typically involves several basic steps to address and resolve complaints or grievances effectively. While specific procedures may vary depending on the organization or context, the following are common steps in a basic GRM:

- Individuals submit their grievances through designated channels, which may include online platforms, written communication, or direct contact with a grievance officer.
- The received grievance is formally registered in the system, assigning a unique identifier. This step ensures proper tracking and documentation of each complaint.
- A preliminary assessment is conducted to determine the nature and severity of the grievance. This step helps in categorizing grievances and prioritizing them based on urgency.
- A thorough investigation is carried out to gather relevant information and facts related to the grievance. This may involve interviews, document reviews, or other means of inquiry.
- Clear and timely communication is maintained with the aggrieved party throughout the process. Regular updates and feedback are provided to keep them informed about the progress of the investigation.
- Once the investigation is complete, appropriate measures are taken to address the grievance. This may involve corrective actions, policy changes, compensation, or other forms of redress, depending on the nature of the complaint.
- The resolution is communicated to the aggrieved party, and feedback is sought to ensure their satisfaction. Follow-up may be conducted to confirm that the resolution has been implemented and to monitor any lingering concerns.
- The entire process, from grievance registration to resolution, is documented for record-keeping and reporting purposes. This documentation aids in analyzing trends, identifying systemic issues, and improving the overall grievance-handling process.

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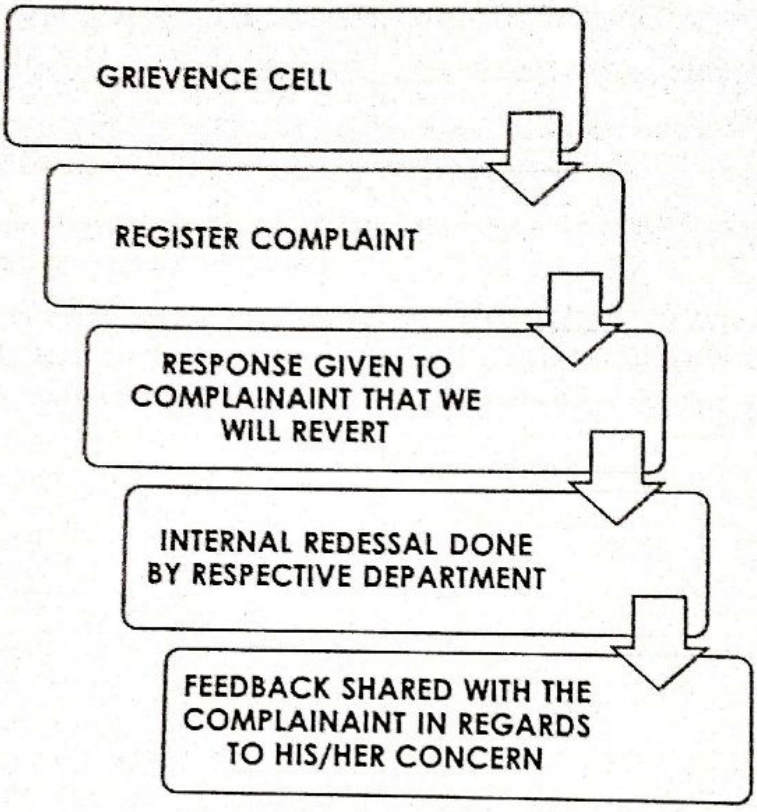


Figure 26 Grievance Redress Mechanism

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CONCLUSION AND RECOMMENDATION

Based on the study conducted for EIA of the project, the following recommendations are made:

- Plantation as far as permissible and within the scope of the project to be carried out.
- Sustainable development approach through conservation of natural environment is followed.
- Environmental aspects of the project should be well taken care through implementation of the Environmental Management Plan as recommended in this report.
- The project management may adopt "cleaner and greener environment" as its motto and this will make the project more environment friendly.

On the basis of the findings of the EIA, it is concluded that the project will not pose any adverse impact on the local population and the environment. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the construction and operation of this project.

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Glossary

Air quality	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
Area	Area is the quantity that expresses the extent of a two-dimensional figure or shape, or planar lamina, in the plane.
Compensation	Includes cash payment, deferred payment, a bond, an insurance policy, stipend, payment in kind, rendition of services, grant of privileges and disturbance money, entitlement to special treatment by government and semi government entities, grant of alternative land, grant of import licenses and business, trade and commercial facilities in addition to the rehabilitation and resettlement of an affected person.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Coordinates contaminate	Each of a group of numbers used to indicate the position of a point, line, or plane to make impure, pollute
Disclosure	The action of making new or secret information known
Disruption	Disturbance or problems which interrupt an event, activity, or process.
Environmental Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Evaluation	The making of a judgment about the amount, number, or value of something; assessment.
Geology	A science that studies rocks, layers of soil, etc., in order to learn about the history of the earth and its life
Ground water	Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers.

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Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
Impact	Effect on someone or something
Land acquisition	The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the ownership and possession of that agency, for public purpose in return for compensation.
Mitigation	The action of reducing the severity, seriousness, or painfulness of something
Occupational health	Maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs
Parking	A parking garage is a building, or an area under a building, where cars can be parked.
Project area	The area specified by the funding and/or implementing agency according to the official gazette notification and includes the areas within the administrative limits of the federal or a provincial government.
Proponent	A person who advocates a theory, proposal, or course of action.
Rehabilitation	Include all compensatory measures to re-establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.
Resettlement	Means all measures taken to mitigate any and all adverse impacts, resulting due to execution of a project on the livelihood of the project affected persons, their property, and includes compensation, relocation and rehabilitation.
Scope	The extent of the area or subject matter that something deals with or to which it is relevant
Social Environment	It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.
Stakeholders	Include affected persons and communities, proponents, private and public businesses, NGOS, host communities and EPA.

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Topography	Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.

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List of Abbreviation

PEPA	Punjab Environmental Protection Act
EPA	Environmental Protection Agency
EIA	Environmental Impact Assessment
IEE	Initial Environmental Examination
LPG	Liquefied Petroleum Gas
EMP	Environmental Management Plan
ASME	American Society of Mechanical Engineers
API	American Petroleum Institute
PPE	Personal Protective Equipment
NGO	Non-Governmental Organizations
UNCED	United Nations Conference on the Environment and Development
DCP	Dry Chemical Powder
PEQs	Punjab Environmental Quality Standards
VOCs	Volatile Organic Compounds
CO	Carbon Monoxide
CO_2	Carbon Dioxide
LESCO	Lahore Electric Supply Company
EC	Electrical Conductivity
TDS	Total Dissolved Solid
UC	Union Council
EA	Environmental Approval

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REFERENCES

Listed below are some of the documents, reports and other references consulted during the preparation of this report:

1. Information and data provided by project proponents;
2. Project Pre-Feasibility Study Report;
3. Technical Design Data related to the project.
4. Information gathered through discussions with the project related persons of the project proponent;
5. Information collected from the Technical documents of various suppliers of machinery/equipment.
6. Punjab Environment Quality Standards for Ambient Air August 2016;
7. Punjab Environment Quality Standards Noise Levels August 2016;
8. Punjab Environment Quality Standards for Drinking Water August 2016:
9. Pakistan Environmental Protection Act, 1997;
10. The Punjab Environmental Protection (Amendment) Act 2012 covers aspects related to:

    - The protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development;
    - Establishing complete regulatory and monitoring bodies, policies, rules, regulations and national environmental quality standards; and
    - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC) and responsible bodies i.e. Punjab Environmental Protection Agency (Punjab EPA) at Provincial level.

i. Environment related Laws in Pakistan and the Province of Punjab;
ii. Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review and Approval of Environmental Assessment, 2022;
iii. Google earth, maps.
iv. Guidelines for Public Consultations - These guidelines cover:
    - Consultation, involvement and participation of Stakeholders
    - Techniques for public consultation (principles, levels of involvements, tools, building trust)
    - Effective public consultation (planning, stages of EIA
    - where consultation is appropriate)
    - Consensus building and dispute resolution.

1. workplace safety and health act 2011
2. Land Acquisition Act (LAA) of 1894
3. The forest Act 1927
4. Pakistan Penal Code, 1860
5. Provincial Wildlife Act, 1974
6. Drugs Act 1976

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TERM OF REFERENCES

1. The Consultant is required to carry out an Environment Assessment Study of the Project as required under section 12 of Pakistan Environmental Protection Act 1997/ Punjab Environmental Protection Act 2012.

2. The Study should be comprehensive and should cover all aspects which are envisaged under the relevant national and provincial's laws & regulations including but not limited to:

- Identification and recommendation for suitable solution/treatment/mitigation measures of emissions and effluents such as waste water and sludge etc. in accordance with Punjab Environmental Quality Standards (PEQS).

- Identification and recommendation for suitable solution/treatment/mitigation measures of solvents, oils (tar), hazardous waste, organic compounds, steam, flue gases, particulate matter and chemical compounds harmful for the environment and other substances leading to air, noise, water and soil pollution in accordance with PEQS.

The Study should be acceptable to the relevant national and/or provincial authorities (relevant authorities) in Punjab

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