ENVIRONMENTAL IMPACT ASSESSMENT

(EIA)

of

Nutraceutical Manufacturing Unit

by

PHARMA PAK
PHARMACEUTICALS (PVT.) LIMITED

at

Plot # 537-A, Sundar Industrial Estate, Lahore

Prepared By

ALTEC ENGINEERS

186-N, Model Town, Lahore, Pakistan
Phone: +92-300-9106342
Email: altec.engineers@gmail.com

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EXECUTIVE SUMMARY

This is the report of Environmental Impact Assessment of Establishment of Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited.

Title of the Project:	Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited
Location of Project:	Plot # 537-A, Sundar Industrial Estate Lahore. Coordinates (Degrees) 31°17'26.73"N, 74° 9'50.81"E Coordinates (Decimal) 31.29075833 N, 74.16411389 E
Proponent:	Pharma Pak Pharmaceuticals (Pvt.) Limited Mailing Address: 603-F-II, Johar Town, Lahore Phone: +92-333-6701898 Email: macrainshc@gmail.com
Consultant:	Altec Engineers 471-A, Block-B, Faisal Town, Lahore Phone: +92-300-9106342 Email: altec.engineers@gmail.com

Brief Outline of the Proposal

This document presents the findings of environmental impact assessment of construction and operations of nutraceuticals manufacturing unit of Pharma Pak Pharmaceuticals (Pvt.) Limited carried out by Altec Engineers.

Nutraceutical has been defined in many ways. One of them defines nutraceutical as a food, or parts of a food, that provide medical or health benefits, including the prevention and treatment of disease. The nutraceutical is usually isolated and concentrated form of food. Because of side effects of pharmaceuticals, there is an increasing trend towards the use of nutraceuticals and are preferred to pharmaceuticals. The demand of nutraceuticals remains present in the society because of health needs of the people. In the past, Pakistan used to import nutraceuticals as such from foreign countries. However, gradually local industrialists have jumped in to manufacture maximum portion of this demanded product locally. The proponent Pharma Pak Pharmaceuticals (Pvt.) Limited is also one of such industrialists and proposes to establish a Nutraceuticals Manufacturing Unit at their owned Plot No. 537-A at Sundar Industrial Estate, Lahore. The manufacturing unit shall be production facility for manufacturing of tablets, sachet, syrup and capsules. The production capacity shall be 200,000-300,000 units/month. The project cost shall be PKR 113.32 Million.

Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft. The project shall involve construction of a double story RCC building. One of these two buildings shall be divided into different sections for production of different nutraceutical products such as tablets and oral liquid. The structure shall also include other associated structures. Guard room and kitchen shall be other parts of the project.

According to Section-12 of PEPA 1997 (Amendment 2012), “No proponent of a project shall commence construction or operation unless he has filed with the Provisional Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provisional Agency approval in respect thereof.” According to Punjab Environmental Protection (Review of IEE and EIA) Regulations-2022, the project falls under Schedule-II, therefore requires an EIA. In that context, Environmental Impact Assessment has been carried out and is being presented in the form of this EIA Report.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts. This encompasses all the phases of the project.

Brief detail of the project is as follows:

The Project Area

The proposed project has been planned to be constructed at Sundar Industrial Estate. Sundar Industrial Estate (SIE) is located at approximately 45 Km from Lahore along Sundar-Raiwind Road. PIEDMC has acquired land from Government of the Punjab and thereon industrial estate has been established. The purpose of this estate is to promote industrialization in Punjab. SIE comprises 1750 acres of land made in 2007 with objective to develop an industrial estate where issues of industrialists are handled and problems solved through ‘One Window’ operation.

Knowledge on the baseline environmental conditions was obtained by collecting and reviewing the available secondary data of the project area. The review process was also helpful in establishing the scope and methodology for collection of field data inside the project area. The EIA team comprising of environmentalists, chemists, civil engineers collected area specific primary data as well.

Facilities

Sunder Industrial Estate, Lahore is the second largest estate of the province of Punjab. A large number of various industries are located here. SIE has infrastructure comparable to any modern international industrial estate. It is a purpose built industrial estate for encouraging industrial development in the province. Sundar Industrial Estate bears so many facilities which qualify it as an ideal option for the proponent.

After analyzing the needs of entrepreneurs, SIE has provided reinforced concrete road network, underground sewerage system, estate managed underground electricity distribution system, walled industrial estate with limited entry/exit points, high pressure gas pipelines, potable water, telecommunications system, fully equipped fire station (industrial safety unit), computerized weigh station, information signs, technical training facilities, estate-owned security arrangements, emergency medical services (social security), masaajid and petrol stations. SIE also ensured environmental compliance by developing and implementing environmental procedures, occupational health, safety, environmental awareness, solid waste management and combined effluent treatment plant. This new project shall avail all of these facilities to achieve their goals towards sustainable development in all of its activities.

Availability of Utilities

Main source of electricity. shall be from WAPDA through Sundar Industrial Estate's own dedicated Grid station. For adequate water supply, Sundar Industrial Estate has installed overhead water tanks fed with tube wells, through which water for all purposes shall be supplied to the project area. Sui gas is also available as needed by any industry.

The summarized outline of the report has been described below:

Chapter-1: Introduction

In this chapter, an introduction to this report has been given. A little detail about project has been provided. Project background, purpose of the report, specific objectives of this EIA, identification of the project, details of proponent and consultant, project nature, size and location, extent and scope of study, EIA study team, study methodology, scoping, temporal boundaries of environmental assessment, spatial boundaries of environmental assessment, important issues raised during public consultation have been described.

Chapter-2: Description of the Project

This chapter describes the specifications of the proposed project i.e. screening, objective of the project, alternatives including project alternative, economic alternatives, construction design alternatives, technology alternatives, site alternatives, site selection criteria, environmental alternatives, location and site layout of the project, land use on the site, road access, vegetation features of the site, cost and magnitude of operation, schedule of implementation, description of pre-construction phase, construction phase and operation phase of the of the project, restoration and rehabilitation plans and government approvals required for the project.

Chapter-3: Description of the Environment

This chapter describes the existing environmental conditions around the proposed project area. Information that has been collected from different sources including public, literature, reports of other studies conducted in this

area, knowledge with the proponent and the concerned government departments and the first-hand surveys and field measurements has been presented in this chapter. This encompasses all the important aspects of local environment; such as physical, ecological and socio-economic resources. Environmental testing has also been carried out through an EPA-Punjab certified environmental laboratory in the presence of representative of EPA-Punjab to know about quality of ambient air, ground water and noise.

Chapter-4: Screening of Potential Environmental Impacts and Mitigation Measures

This chapter identifies the characteristic potential impacts due to the implementation of project on the physical, ecological and social environment of project area. This chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. Impact assessment methodology, characteristics of impacts associated with project location, project design, construction phase, operation phase on the environment have been described in this chapter. Potential Environmental Enhancement Measures have also been described. The summary of potential environmental impacts of the project, mitigation measures to be taken and proposed monitoring are summarized below:

Chapter-5: Environmental Management Plan and Monitoring Program

This chapter presents the implementation mechanism in the form of an Environmental Management Plan (EMP) for dealing with the potential environmental impacts identified during EIA and reported in Chapter 4 of this document. This EMP addresses the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project activities.

In this chapter, objectives of EMP, components of EMP, institutional capacity/roles & responsibilities of environmental management team, reporting and reviewing procedures, training needs and schedule, training syllabus contents, equipment maintenance schedule, communication and documentation, environmental management budget and schedule of implementation of EMP have been described.

Environmental monitoring and management have been proposed to be carried out in all stages of the project namely; pre-construction, construction and operational phases. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring by a third party will further support operations in environmentally sustainable fashion.

Potential Impact	Magnitude of Impact	Mitigation Measures
CONSTRUCTION PHASE		
Solid Waste Solid waste shall be generated in the form of excavation waste, broken bricks, wasted concrete material etc.	Major/Long term	All types of waste shall be kept segregated. The waste shall never be piled and shall be managed regularly. The construction waste shall be disposed off through construction waste contractors. The recyclable part of the waste shall be sold to recyclers.
Air Pollution Particulate matter may arise due to localized excavation in soil for foundation purpose, leveling of ground and also due to movement of off-road or on-road automobiles. Transport of construction materials such as sand, aggregate etc. may also cause particulate pollution. Off-road or on-road automobiles may also cause exhaust pollution.	Minor/Short lived	Construction contractor shall be asked to ensure using only well-conditioned and tuned automobiles and equipment. Sprinkling of water on the exposed surfaces. Covering of all trucks loaded with sand, soil and other such loose construction materials. Regular sweeping of roads and parking areas to avoid deposition of dirt. Use of appropriate masks by workers to prevent entry of metal dust in their breathing system.
Water Quality Water shall be needed for making concrete mix, masonry work and all such construction purposes.	Minor/Short Lived	Water consumption shall be kept at minimum. Extra run off will mostly percolate to ground water table thus recharging it. Leakage and wastage shall be prevented.

This shall also be needed for curing of the structures. Sewerage from temporary dormitory of construction staff.		Any wastewater shall be channelized to the drainage system of estate from where this shall be treated by centralized effluent treatment plant of SIE before disposal to nearby drain.
Noise Pollution Operation of construction machinery and equipment may be a source of noise. Movement of off-road or on-road automobiles.	Minor/Short Lived	Maintain all the machinery and automobiles. Lubricate all moving parts of the machinery. Use of ear plugs by workers to prevent entry of noise in their ear.
Traffic Flow There shall be a little increase in the traffic of the area because of movement of transport carrying construction materials.	Minor/Short Lived	The construction material shall be transported during off-peak hours.
Occupational Health & Safety Work at height. Ergonomic issues due to loading and off loading of construction materials e.g. Cement sacks etc. During hot season, workers may have to suffer from heat stress. Electrical safety	Minor	Work at height should be performed under supervision of HSE Officer who shall issue work at height permit after taking all appropriate measures. Construction materials should be distributed into small packs during loading and off loading. During hot season, jobs of the workers may be changed during peak hot hours. The work timing may be changed to prevent heat stress. Electric earthing shall be done to prevent electric shock to workers.

		Safety shoes shall be worn by the workers while performing jobs related with electric equipment. Construction workers shall be provided with adequate awareness and training about HSE aspects of the project. They shall also be provided with suitable Personal Protective Equipment. Emergency preparedness and response plan shall be prepared and adhered to.
Ecology The birds may get scared due to noisy operations. The patch of land is already barren. There is no vegetation on it which is likely to be impacted.	Minor/Temporary	The noise of the equipment shall be kept under control to prevent disturbance to fauna especially birds. The construction staff shall be guided not to interfere with the habitat of local biota.
Socioeconomic Disturbance to local population Jobs for the locals	Minor/Temporary	The construction staff shall be guided to respect the local cultural and moral values and behave well. Locals shall be preferred for job so far as possible according to their competence.
OPERATIONAL PHASE		
Solid Waste The production process shall be material efficient. Solid waste may be generated in the form of	Major/Long term	All kinds of wastes shall be kept in segregated and color coded bins. The municipal waste shall be stored in bins provided by SIE

packing of raw material such as plastic containers and wrappers. This may also include packing of finished products such as PVC, aluminum foil, cardboard, glass. Due to workers, municipal waste shall also be generated.		and shall be managed by SIE. The operational waste shall be managed through EPA-Punjab certified outsourced contractor. It has been proposed to sell all of the solid waste to junk handlers for reuse and recycling as may be appropriate.
Air Pollution All of the processes shall be either wet (e.g. oral liquid making) or these shall be in closed system (such as tablets manufacturing). Therefore there are no air pollutants from production process. The raw materials shall be already in grinded form. These shall only be mixed at the unit.	Minor/Long term	Better ventilation system. All exposed surfaces shall be either paved or grassed to prevent particulate pollution. Workers may be provided with masks to prevent entry of particulate pollutants into their breathing system.
Water Pollution RO treated water shall be used for production processes. The machines shall be cleaned with water after every batch. This may use a small amount of water. Sewerage shall also be the waste water.	Minor/Long term	Waste water shall be monitored according to the raw materials used in manufacturing process. If the results indicate presence of such effluents which are outside domain of treatment by SIE CETP then it shall be locally treated. Otherwise, all wastewater shall flow to composite effluent treatment plant of Sundar Industrial Estate for treatment before ultimate disposal. To ensure water conservation, the reject water from RO Plant shall be used for meeting all the non-productive needs of the unit such as irrigating lawns, washing, cleaning, toilets etc.

		Water wastage shall be prevented. Sewerage shall be channelized to the drainage system of estate from where this shall be treated by centralized effluent treatment plant of SIE before disposal to nearby drain.
Noise Noise may be generated by mixing machines and tablet bristles machines.	Minor/Long term	The noise of these machines shall not be higher than PEQS. Better maintenance and lubrication of all the machinery may keep the noise under control. Regular monitoring of noise shall be carried out every year to check the efficacy of controls. Enclosure/confinement of the machinery shall also decrease the noise levels. Employees shall be provided with ear plugs to prevent entry of noise into ear.
Occupational Health & Safety The mixing section may pose occupational health concern due to handling of raw materials. Fire safety management. Ergonomics shall be one of the major	Minor/Long term	The raw materials shall not be harmful. The workers shall be provided with all of the required personal protective equipment to prevent any harm. Automation shall be ensured as far as possible. Load to be lifted by the labor staff shall be distributed in small packs of raw materials.

occupational health and safety concern as workers usually need to posture themselves for performing various operations. Manual material handling		Sharing of weights by multiple employees, Levers shall be used to lift and carry heavy raw materials and products. Adequate arrangements for illumination, temperature and ventilation shall be made. Heat ventilation and air conditioning shall be ensured. Training about OHS aspects may also assist in managing the risk. Electrical earthing shall be done to prevent from electrical hazards. Fire extinguishers, fire hydrants, smoke detectors, electric earthing and sand buckets shall be installed.
Ecology The patch of land is already barren. There is no vegetation on it which is likely to be impacted. Therefore, there shall be no impact on biota due to operations.	Minor	The noise of the equipment shall be kept under control to prevent disturbance to fauna especially the birds. The operation staff shall be guided not to interfere with the habitat of local biota. The proponent as part of condition by PIEDMC, shall plant 2000 trees.
Socioeconomic Disturbance to local population	Minor/Temporary	The operational staff shall be guided to respect the local cultural and moral values and behave well. Locals shall be preferred for job so far as possible according

Jobs for the locals		to their competence.
Traffic Flow There shall be a little increase in the traffic of the area because of movement of raw materials and finished goods.	Minor	The transport shall be scheduled such that it may not cause traffic blockage.

Proposed Monitoring

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed:

Environmental Aspect	Parameters	Concerned Location	Frequency
Construction Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Project Site	06 Months
Ground Water	All parameters as described in PEQS	Water Connection at site	06 Months
Noise	Industrial Noise	Project Site	06 Months
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily
Operational Phase			
Ambient Air	PM	Production rooms	Annually
Waste Water	pH, temperature, COD, TSS, TDS	End of pipe effluent	Annually
Noise	Industrial Noise	Production rooms	Annually
Solid Waste	Generation Rate according to type of waste	Solid Waste Bin	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Whole unit	Daily

Chapter-6: Stakeholders Consultation

This chapter includes the output of consultations carried out with the stakeholders including people of the project area. These include local residents who also carry out different businesses such as shop keepers, farmers. Some of these include employees of Sundar Industrial Estate. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Mitigation measures proposed for addressing the stakeholder's concerns have been described.

Chapter-7: Conclusion and Recommendations

This chapter recommends for issuance of environmental approval by EPA-Punjab. Construction and operations of this Nutraceuticals Manufacturing Unit will be under strict environmental management controls while sticking to the requirements of the Punjab Environmental Quality Standards (PEQS) and Punjab Environmental Protection Act 1997 (Amendment 2012). Therefore, project at the proposed site will have no adverse effects on any segment of the environment or on people of the area.

Conclusion

It is concluded that the project is a need as part of establishment of industries in the country. The project will accelerate socio-economic development and create job opportunities. The site has been examined with respect to the Pakistan Environmental Protection Agency guidelines and found to be in line with the criteria developed.

On the basis of the overall impact assessment, this has been concluded that environmental impacts during its construction and operational phases can be prevented with the mitigation measures included in this EIA report.

CHAPTER-1

INTRODUCTION

1. INTRODUCTION

1.1 Project Background

The proponent M/s Pharma Pak Pharmaceuticals (Pvt.) Limited proposes to exploit the demand of nutraceuticals by establishing a nutraceuticals manufacturing unit at their owned Plot No. 537-A at Sundar Industrial Estate, Lahore. The manufacturing unit shall be production facility for manufacturing of tablets, capsules, drops, sachet and oral liquid.

Nutraceutical has been defined in many ways. One of them defines nutraceutical as a food, or parts of a food, that provide medical or health benefits, including the prevention and treatment of disease. The nutraceutical is usually isolated and concentrated form of food. Because of side effects of pharmaceuticals, there is an increasing trend towards the use of nutraceuticals and are preferred to pharmaceuticals.

The project building structure shall be RCC. Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft. The structure shall be double story building divided into different sections for production of different products in the form of tablets and oral liquids.

1.2 Purpose of the Report

Section-12 of the Punjab Environmental Protection Act, 1997 (Amended 2012) requires that for any development project to be commenced in Punjab, it is mandatory to obtain Environmental Approval from EPA-Punjab by filing an Initial Environmental Examination or Environmental Impact Assessment, as defined in Punjab Environmental Protection (Review of IEE and EIA) Regulations, 2022 or recommended by EPA-Punjab. This involves impact assessment of such development on the environment. Section-12 reads as follows:

“No proponent of a project shall commence construction or operation unless he has filed with the Provisional Agency an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provisional Agency approval in respect thereof.”

According to Review of IEE and EIA regulations-2022, this proposed project of the “Establishment of Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited” at Plot# 537-A Sundar Industrial Estate, Lahore does not clearly fall under any category of both of the schedules. However, since the production processes and machinery shall be similar to those for pharmaceutical manufacturing though the environmental impacts shall be different and the pharmaceutical manufacturing falls under Schedule-II which requires the proponent to submit an Environmental Impact Assessment (EIA) of the project. Therefore, Environmental Impact Assessment has been carried out to study various environmental impacts and devise relevant mitigation measures and is being presented in the form of this

EIA Report. The EIA report is being submitted to the Environmental Protection Agency (EPA)-Punjab.

The purpose of this EIA report is to support an application for environmental approval from the EPA-Punjab. This is in compliance with many other national and international environmental laws besides PEPA 1997 (Amended 2012) for obtaining Environmental Approval (EA) before commencement of the project.

The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997. Both primary and secondary data has been used to carry out the study. This EIA Report highlights environmental aspects of the project both during construction and its regular operation. It also provides necessary measures to be adopted to mitigate any adverse environmental impacts. It also gives information used to help decision makers i.e., EPA-Punjab, for issuing the Environmental Approval.

The proponent of the project is environmentally responsible. Therefore, considering environmental obligations in addition to technical feasibility requirements, the proponent has proceeded for environmental feasibility of the construction and operation phase of the project.

The scope of the EIA study includes environmental assessment of the project including collection of data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts.

1.3 Specific Objectives of this EIA

The EIA study is aimed at promoting environmentally sustainable developmental activities. The specific objectives of this EIA include:

- Collection and scrutiny of data related to physical, biological, and socio-economic environment of the project area before commencement of the project in order to prepare baseline environmental profile
- Identification of environmental aspects of the proposed project area
- Identification, prediction and evaluation of likely environmental impacts of the proposed project
- Quantitative evaluation of the significance of the impacts
- Assess public perceptions and ensure the participation of all stakeholders in decision making
- Evaluation of public participation/consultation and identification of vulnerable groups present in the area
- Propose mitigation measures to keep the impact of the project activities within permissible limits i.e., PEQS
- Preparation of an Environmental Management and Monitoring Plan.
- To assist the proponent in receiving the environmental approval from the agency by fulfilling requirement of EPA-Punjab for EIA.
- To work closely with the project engineers to ensure that the project

design includes environmental consideration

1.4 Identification of Project

The proponent M/s Pharma Pak Pharmaceuticals (Pvt.) Limited proposes to exploit the demand of nutraceuticals including tablets and oral liquid by establishing nutraceuticals manufacturing unit" at Plot# 537-A, Sundar Industrial Estate, Lahore. Title of the proposed Project is "Establishment of Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited" at Plot# 537-A, Sundar Industrial Estate, Lahore."

The project will involve construction of a double story RCC building divided into different sections for production. Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft. Total cost of the project shall be PKR 113.32 million.

1.5 Details of Proponent

Pharma Pak Pharmaceuticals (Pvt.) Limited
Project Location: Plot No. 537-A, Sundar Industrial Estate, Lahore
Mailing Address: 603-F-II, Johar Town, Lahore
Phone: +92-333-6701898
Email: macrainshc@gmail.com

1.6 Details of Consultant

Altec Engineers
471-A, Block-B, Faisal Town, Lahore
Phone: +92-300-9106342
Email: altec.engineers@gmail.com

M/s Altec Engineers are Consulting Engineers, Architects, Turnkey Civil and Pre-Engineered Building Project Development Professionals. They have specialties in industrial, commercial and residential buildings; water and sewage treatment plants, bridges (steel and RCC), roads, public health, housing societies and rotary parking. They are registered with DHA, PHA, LDA, WASA, Bahria Town, Lahore Parking Company, Sundar Industrial Estate, Quaid-E-Azam Industrial Estate and other industrial estates under PIEDMC.

1.7 Project Nature, Size and Location

The proponent Pharma Pak Pharmaceuticals (Pvt.) Limited proposes to establish a Nutraceuticals Manufacturing Unit at their owned Plot No. 537-A at Sundar Industrial Estate, Lahore (Coordinates 31°17'26.73"N, 74° 9'50.81"E). Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft. The project shall involve construction of a double story RCC building. Additionally, there shall be office block, guard room, kitchen and mess area. The operations will involve manufacturing of various kinds of nutraceuticals.

Sundar Industrial Estate (SIE) comprises 1700 acres of land, made in 2007 with objective to develop an industrial estate where issues of industrialists are handled and problems solved through 'One Window' operation. SIE is located at approximately 45 Km from Lahore along Sundar-Raiwind Road. The purpose of this estate is to promote industrialization in Punjab. SIE has infrastructure comparable to any modern international industrial estate. After analyzing the needs of entrepreneurs, SIE has ensured availability of reinforced concrete road network, underground sewerage system, estate managed underground electricity distribution system, walled industrial estate with limited entry/exit points, high pressure gas pipelines, potable water, composite effluent treatment plant, telecommunications system, fully equipped fire station (industrial safety unit), computerized weigh station, information signs, technical training facilities, solid waste collection system, estate-owned security arrangements, hospital/emergency medical services (social security), masaajid and petrol stations.

1.8 Extent and Scope of Study

The approach adopted for carrying out the EIA study includes review of the available secondary data, collection of primary data, analysis of collected data, establishing environmental baseline of the project related to physical, ecological & social aspects of the environment. Information relating to the physical, technical and environmental parameters is collected from the proponent and other agencies. Local inhabitants were interviewed in detail to understand the socio-economic, culture and customs of the area. An extensive literature review was also carried out in this step.

The impacts of the project activities on the physical, ecological and socio-economical resources in the immediate surroundings of the project area during pre-construction, construction and operational phases of the project have been assessed and where applicable mitigation measures have been proposed. Environmental management plan has been prepared for all of the phases so that the impacts can be kept within permissible limits.

1.9 Persons Performing the EIA Study

The proponent has received consultancy services from M/s Altec Engineers for carrying out environmental study and preparation of this final EIA report. The members of team who carried out EIA study are shown in Annexure-IV. Only main role of the members has been described as they mostly performed multiple tasks related with this EIA study.

1.10 Study Methodology

This Environmental Impact Assessment (EIA) has been carried out to prepare this report according to "Guidelines for the preparation and review of Environmental Reports, October 1997," approved by the Government of Pakistan. The following steps have been followed for carrying out the EIA study of the proposed project:

1.10.1 Scoping

In this step, the limits of the study have been defined. The nature of proposal and its project area has been considered for defining the limits of the study. In order to avoid wastage of resources on unnecessary investigations, the aspects of physical, biological and socioeconomic aspects have been identified. Being located in a well-defined industrial estate, the study of most of the aspects was already covered during EIA of Sundar Industrial Estate. The outcomes of that study have been used as secondary data for the purpose of this report according to context of this project.

1.10.1.1 Temporal Boundaries of Environmental Assessment

Temporal boundaries of construction phase of project have been elaborated through Table 2.2. The temporal boundaries for the environmental effects, assessment of traditional land and resource use are defined through following phases. Phase wise time schedule of the project has been elaborated in Table 2.1:

1.10.1.1.1 Preliminary Phase

During this phase, after land acquisition, contouring studies, soil investigations are carried out. Then project designs are finalized. This phase is currently under process. Land has been acquired. Drawings of project design are being submitted to office of SIE along with receipt of application for Environmental approval as this is pre-requisite by BOM-SIE.

1.10.1.1.2 Start-up Phase

After getting approval from Board of Management of Sundar Industrial Estate, the project construction from ground breaking shall be started. Land shall be excavated for installing foundations. Subsequently proper civil, mechanical and electrical work shall be carried out. Basic infrastructure shall be established.

1.10.1.1.3 Wrap-up Phase

The project construction activities shall be finalized. Finishing activities shall be carried out. This shall be followed by establishment of basic infrastructures such as water supply system, electrical supply etc.

1.10.1.1.4 Commissioning Phase

After completion of all construction and other related activities, the project shall be handed over to proponent/client for desired use.

1.10.1.1.5 Operation Phase

The operation begins when raw material is received and converted to final product. In this case, active and inactive ingredients shall be dispensed and packed.

1.10.1.2 Spatial Boundaries of Environmental Assessment

The construction phase shall have potential to cause impacts mostly within boundaries of Sundar Industrial Estate and even within few feet away from the project plot. The spatial boundaries of the operation phase of the project shall not be having any impact outside the boundaries of Sundar Industrial Estate. Still the study has been composed of area outside of Sundar Industrial Estate especially adjoining small villages within radius of about 5 Kilometers of the boundaries of Sundar Industrial Estate.

1.10.2 Data Collection

It involves the collection of primary as well as secondary data in order to prepare the baseline profile of the project area. Various departments have been visited to collect relevant data. These include Board of management of Sundar Industrial Estate, Geological Survey of Pakistan, Pakistan Meteorological Department and many others. The data regarding construction and operations of the project has been obtained through literature review, consultation with civil and structural engineers, architects and also from the proponent. The sources of literature review included web published data as well as various books. Teachers from College of Earth & Environmental Sciences, University of the Punjab, Lahore have also been consulted.

1.10.2.1 Important Issues Raised during Public Consultation

Detailed group discussion was carried out with various classes of people living in the surrounding areas. These were held in the open space available in the village. During the discussion, the relevant responses, opinions were recorded. They were asked about the information of the project. Their perception and expectations (both positive and negative) about the project were asked.

1.10.2.2 Interview

Local residents were interviewed. A semi-structured interview was used as a tool for data collection. Personal observations were also included in the methodology in order to collect relevant information about village and people of the community. They were asked about the project and their stakes relevant to it.

1.10.2.3 Primary Data

Quantitative data for baseline of ambient air, ground water and noise has been obtained through real-time monitoring of their samples by EPA-Punjab certified environmental laboratory in the presence of EPA-Punjab authorized officials.

1.10.2.4 Secondary Data

Secondary data was also used to collect important information regarding village, the people and the project. For this purpose, data provided by the

project proponent and published data from other relevant sources were used. The previous reports prepared by other environmental consultants have also been consulted. Data published by Pakistan Bureau of Statistics have also been used.

1.10.3 Determination of Significant Impacts

The environmental items from Aldo Leopold matrix have been selected for assessing the impacts of the project on the environmental resources during pre-construction, construction and operational phases of the project qualitatively. This assessment was based on professional judgment.

1.10.4 Mitigations Proposed

A range of cost-effective mitigation measures keeping in view of best available environmental options and best available techniques not entailing to environmental cost, have been proposed where applicable. All the approaches have been considered in order to meet Punjab Environmental quality standards.

1.10.5 Environmental Management Plan

Environmental management plan has been prepared to manage the environmental impacts of the project during construction and operation phase of the project to ensure that impacts of the project remain within permissible limits of Punjab Environmental Quality standards.

In EMP, roles and responsibilities have been defined. Required resources have been defined and their cost have been assessed and defined.

CHAPTER-2

DESCRIPTION OF THE PROJECT

2. DESCRIPTION OF THE PROJECT

This chapter describes the specifications of the proposed project i.e. type and category of the project, project objectives, project alternatives and reasons for their rejection, project location, project site layout, land use on the site and surroundings, topographic and vegetation features of the site, cost and magnitude of the project, activities involved in construction and operation, processes and materials involved in project, project implementation schedule, details of restoration and rehabilitation plans at the end of project life and government approvals.

2.1 Screening

The proposed project involves construction of the Nutraceuticals Manufacturing Unit. Punjab Environmental Protection (Review of IEE and EIA) Regulations 2022 classify the projects under two schedules called Schedule-I and Schedule-II. Regulation 3 thereof reads that a proponent of a project falling in any category specified in Schedule I shall file an IEE with the Provincial Agency, and the provisions of section 12 shall apply to such project whereas Regulation 4 reads that a proponent of a project falling in any category specified in Schedule II shall file an EIA with the Provincial Agency, and the provisions of section 12 shall apply to such project.

The sector of nutraceuticals manufacturing has not been clearly categorized in any schedule of these regulations. However, the manufacturing processes and machinery of the nutraceuticals manufacturing are similar to those of the pharmaceutical manufacturing though its environmental impacts are not exactly similar to those of a pharmaceutical manufacturing unit. According to the contents of Punjab Environmental Protection (Review of IEE and EIA) Regulations 2022, the pharmaceutical manufacturing units fall under category of Chemical manufacturing projects mentioned in Schedule II, (B)(2). Therefore, the proposed project requires an Environmental Impact Assessment (EIA) in order to get Environmental Approval from Environmental Protection Agency-Punjab, Lahore.

2.2 Objective of the Project

The proponent Pharma Pak Pharmaceuticals (Pvt.) Limited proposes to establish a Nutraceuticals Manufacturing Unit at their owned Plot No. 537-A at Sundar Industrial Estate, Lahore. The word “Nutraceutical” is actually the combination of two words: nutrient and pharmaceutical. A nutraceutical basically comes from the idea that certain foods have medicinal properties that can be used to get health benefits. Due to side effects of pharmaceuticals, there is a rising trend towards use of nutraceuticals for treatment of diseases of the public.

The trend towards nutraceutical dietary supplements has originated from the notion that diet strongly affects health. Research suggests that our modern diet has moved progressively further away from natural ingredients towards processed and treated artificial substances with limited nutritional goodness.

The benefits of nutraceuticals to the consumer are obvious. They combine a regular, comprehensive vitamin and mineral supplement with food that is designed to appeal to modern taste. Scientists also believe that they provide health-giving qualities and may be used to prevent many diseases and ailments.

Herbal nutraceuticals have received commendable interests worldwide due to the potential nutrition and therapeutic effects. You can achieve so many benefits from nutraceuticals to improve your health, aid in certain health conditions, delay aging, and possibly increase expectancy of your life. You can even support the functioning as well as the structure of your body.

According to some recent studies, nutraceuticals have shown good results against several pathological complications including diabetes and cardiovascular conditions. Therefore, such products are often considered health-promoting sources.

Nutraceuticals can be one, or a combination of, any of the Vitamins, minerals and other dietary supplements in the form of pills or capsules; food extracts with medical benefits; active ingredients extracted from foods or beverages in normal use (for example a manipulated, patented and bottled form of broccoli, cabbage, grapes or mushrooms) or natural substances that are not traditional food such as colloidal silver, hypericin or insenocides. A more recent development has been the increased popularity of the phytochemical, which uses the nutritional plant source of the supplement, such as genistein from soybeans or bioflavonoids, which are found in garlic, citrus fruit and berries.

Business analysts suggest that this sector will be the biggest growing market in the food and drink industry in the near future. As consumer demand multiplies for these products and this lucrative business breeds competition, the methods that are used to filter, concentrate and process the compounds become increasingly important.

Overall demand and local supply gap that prevails in the market remains largely unmet which also provides opportunities for entering in to this business. All of these reasons have motivated the proponent to opt for this nature of business. This project is an economic activity which shall not only generate revenue for the owner but also create jobs for the people. Local people of the area shall be preferred for jobs regarding the project.

2.3 Alternatives

2.3.1 Project Alternatives

One of the alternatives may be not to establish this project. In that case, the available alternatives may be to import all nutraceuticals and sell them as traders. This is not a viable alternative because of the high demand and less profit margin. Since the labour is expensive in most of the foreign countries, the nutraceuticals shall have to be purchased at expensive rates. Moreover it shall create comparatively less jobs. Therefore the option of manufacturing of these nutraceuticals locally has more benefits. Government also encourages

the industrial development so that exports of Pakistan may be increased and imports may be decreased.

2.3.2 Economic Alternative

One of the alternatives which was considered was to manufacture pharmaceuticals instead of nutraceuticals. With passage of time, pharmaceuticals have found to impart negative impacts on human health. Researchers have found nutraceuticals to be more effective as these increase immunity against diseases by fulfilling the deficiency of required substances in the body. Therefore, this was decided to manufacture nutraceuticals.

2.3.3 Construction Design Alternatives

The alternatives to the kind of structure of building which can be considered include double T roof supported by RCC pillars and beams. The other option may be PEB steel shed. The operations of the proposed unit require separate rooms for each kind of product. Other supportive departments such as raw material store, packing and finished goods store require having separate rooms. Such separations can only be made with RCC building structure and not with PEB or double T structures. Therefore RCC has been chosen for building structure. Its benefits have been further elaborated as follows:

2.3.3.1 Benefits of Reinforced Concrete (RCC)

(i)Concrete is basically alkaline in nature, (the principal component being Calcium hydroxide) and this prevents rusting of the steel reinforcement used;
(ii) The bond or ‘grip’ between the steel and concrete is established easily;
(iii) The coefficient of thermal expansion of concrete is almost identical with that of steel. This prevents the risk of cracking due to expansion at different rates.
(iv) It is durable and resistant to fire and other climate changes.
(v) Easily available almost anywhere in the world.
(vi) It can be used in any part of the structure i.e., from foundation to the top roofing.
(vii) It is more economical compared to other materials.
(ix)It has a high compressive strength (due to concrete) and a high tensile strength (due to reinforcement).

2.3.4 Technology Alternatives and Selection Criteria

The technology and equipment proposed for manufacturing of nutraceuticals shall be updated and state of the art. The machines shall not be generating any air pollution. The process water shall be circulated again and again in the system to save raw materials. This shall also reduce water pollution load. Thus nutraceuticals manufacturing unit shall be environment friendly, energy efficient and material efficient as evident. The quality of environmental parameters shall be within Punjab environmental quality standards.

2.3.5 Site Alternatives

An alternative may be to construct the unit outside Sundar Industrial Estate. Reasons described below justify the selection of Sundar Industrial Estate as option for the proponent for establishment of the unit:

2.3.5.1 Site Selection Criteria

Sundar Industrial estate, Lahore is a purpose-built industrial estate providing most of the facilities needed by the industrialists. Therefore, the project at the present site is well justified. Economic viability, investment limitations, market volume, ensured availability of raw materials, availability of dependable energy source, availability of project basic support systems and environmental management are the main considerations upon which capacity of the manufacturing unit has been determined. All these factors were taken into consideration while selecting site for the project. These have been summarized below:

i) Raw material

Raw material needed for construction is readily available in the required quantity throughout the year. Raw material needed for operation shall be in the form of active and inactive substances. The raw materials shall be purchased from local manufacturers, purchased from traders who import from other countries and also directly imported.

ii) Basic Infrastructure

The project site is linked with the other parts of the country through a network of roads and rail. This shall facilitate fast, convenient and cost-effective movement of the construction materials during construction phases and shall also provide convenience during operational phase of the project.

iii) Availability of water

Water required for project construction is plentifully available at the project site. For operations, water shall be needed for manufacturing of nutraceutical products. This shall also be needed for drinking, cooking and sanitation purposes. This amount of water can be met with ground water supply from Sundar Industrial Estate.

iv) Environment

The surrounding environmental conditions are congenial for the project. Both the construction as well as operation phases will not adversely affect the environment. All of the aspects will be kept strictly within the limits defined under Punjab Environmental Quality Standards (PEQS) and the project shall comply with Punjab Environmental Protection Act 1997 (Amendment 2012).

v) Utilities

All utilities such as electricity, gas, water, telecommunication including telephone and internet are conveniently available at the project site. There is an industrial safety unit with very good facilities for all emergencies.

vi) Labor

Labor is easily and at cheaper cost available in the project area.

vii) Site Availability

The proponent purchased Plot No. 537-A, Sundar Industrial Estate Lahore (SIE). Total area of the plot is 21802.02 Square ft. The site is fully owned by the proponent. This is under the administration of Sundar Industrial Estate and is available for industrial use. Government of the Punjab has established Sundar Industrial Estate to facilitate industrial development. Therefore, the site is available for this project.

viii) Site Access

The Plot No. 537-A is situated inside Sundar Industrial Estate Lahore (SIE) and is accessible from Gate No. 01 and 02 of SIE. The Sundar Industrial Estate is accessible through Sundar-Raiwind Road.

ix) Energy availability

The power source during construction and operation will be from Water and Power Development Authority (WAPDA) through Sundar Industrial Estate. Sundar Industrial Estate has its own grid station. Usually, the supply of electricity is continuous without any load shedding.

Of all the alternatives examined on basis of above required criteria, the present option merited on all others for project. Accordingly, the present site was selected and purchased.

2.3.6 Environmental Alternatives

The proponent could drain waste water from washing of machines directly. However, the proponent has opted for circulating and subsequent treatment of waste water.

Separate drainage lines shall be installed for storm water and sewerage. Thus, waste water load on drainage system shall be reduced. This saved water can be used directly for irrigation of green belt or it can be used for washing purpose after minimal treatment.

2.4 Location and Site Layout of the Project

The proposed site for the construction of project is located at Plot # 537-A, Sundar Industrial Estate, Lahore. The Google Earth coordinates are

31°17'26.73"N, 74° 9'50.81"E. The project plot is surrounded by main road at its north, at east, south and west with industrial plots. The map showing location of project area, Google map and site layout is annexed as Annexure-VI.

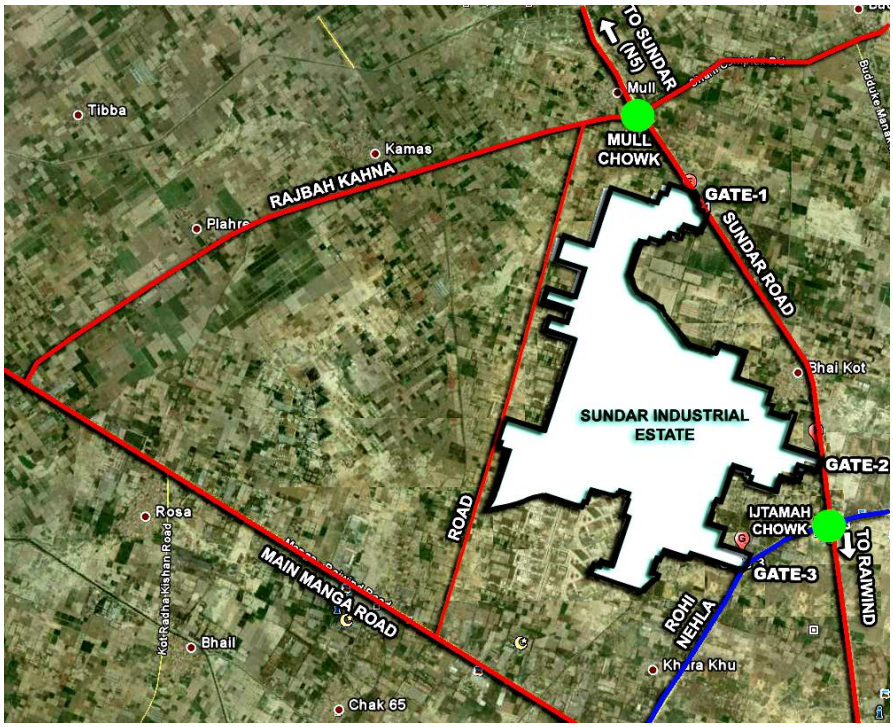


Figure 2.1: Location of Sundar Industrial Estate

2.5 Land Use on the Site

The project site is located within the premises of Sundar Industrial Estate. All the area of Sundar Industrial Estate is purpose built for industrial use by Government of the Punjab. Supporting documents are attached as Annexure-IX. Even the commercial use of the area is discouraged. Sundar Industrial Estate is surrounded by residential and commercial areas including Small Industrial Estate, Mull, Sultanke, Bhaikot, Islampura, Warra Sidhu Wala and Fazaia Housing Scheme. No agricultural activity has been observed at the project site. However, some agricultural patches can be found outside of the Sundar Industrial Estate.

2.6 Road Access

The Plot No. 537-A is situated inside Sundar Industrial Estate Lahore (SIE) and is accessible from all three gates of Sundar Industrial Estate. This is just near Gate No. 01. All roads inside Sundar Industrial Estate are made of RCC. The Sundar Industrial Estate is accessible through Sundar-Raiwind Road which is a part of National Highway Karachi-Lahore-Peshawar Road N5.

2.7 Vegetation Features of the Site

Land is clear and there are no significant plants or vegetation present on site. Only spontaneous wild growth is present which is not of ecological importance. Sundar Industrial Estate has been developed on an infertile/barren patch of the land. Different vegetation species that are found in the vicinity of project area includes the big trees, middle size trees, ground covers, shrubs, bushes, seasonal plants and climbers including Kandiari, Akash Bel, Peeli Booti, Datura and Dahlia etc. Green belt developed by management of Sundar Industrial Estate contains a large variety of flora including fruit trees, ornamental plants, grass etc.

2.8 Cost and Magnitude of Operation

The estimated capital cost of the project shall be PKR 113.32 Million comprising construction cost (81.18 million), land cost (2.14 millions) and machinery cost (30 millions). Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft.

The project shall involve RCC construction of production rooms, office block, guard room and kitchen. The operations shall constitute nutraceuticals manufacturing. The production capacity shall be 200,000-300,000 units/month.

2.9 Schedule of Implementation

The estimated period required for the implementation of project is 14 months. The implementation schedule is given in Table 2.1. The exact dates for each of the phases cannot be mentioned because of ambiguity about dates of issuance of various approvals. The construction schedule has been separately elaborated in Table 2.2. This schedule also serves to describe the temporal boundaries of the construction phase of the project.

Table 2.1: Implementation Schedule

Project Phases	Details	Expected Completion
Preliminary Phase	The land for project is acquired.	Already Acquired
Start-up Phase	Start-up of construction.	Immediately after getting submission approval.
Wrap-up Phase	Completion of Construction Phase	12 Months
Commissioning	Commissioning	01 Month
Operation phase	Start up	01 Month

2.10 Description of the Project

Complete project layout is attached as Annexure-VI. It shall comprise construction work of a double story RCC building.

2.10.1 Pre-Construction Phase

The following activities will form part of the pre-construction stage:

- Conducting necessary feasibility studies including the cost benefit analysis and the expected internal rate of return.
- Preparation of the project documents, layout/master plan, architectural & engineering designs and the cost estimates.
- Conducting investigative studies such as geo-technical studies, environmental impact assessment, and economic feasibility studies.
- Obtaining registrations, approvals, and NOCs from different departments of the Government for business purpose.
- Selecting the appropriate and the best suited machinery and equipment for fast track implementation of the project and completion of construction within the scheduled timeframe.
- Signing the contracts for construction, procurements, installations, and implementation of the project facilities.

2.10.2 Construction Phase

Complete project layout is attached as Appendix-VI. The project shall be accomplished according to bye-laws of PIEDMC. For this purpose, approval for construction is being applied which is a pre-requisite for the project.

The project for manufacturing unit structure shall comprise construction work of single story RCC main building of production hall 145’-3”X76’-3”. The associated structures shall be 8’X10’ underground water tank, 8’X8’ overhead water tank, 12’X8’ septic tank and 21’-2.5”X9’-4.5” guard room. According to the requirement of PIEDMC bye-laws, 15’ wide passage shall be left all around the boundary of the plot in order to facilitate movement of emergency rescue vehicles. Separate drainage lines shall be laid for sewerage and storm water drainage. The main structure of RCC roof slabs of both floors shall be supported by framework of RCC pillars and beams and masonry walls. The project construction shall be completed in about 12 months. The project construction cost shall be PKR 81.18 Million.

Table 2.2: Brief Description of the Project

Parameter	Description
Proponent & Owner	Pharma Pak Pharmaceuticals (Pvt.) Limited
Main Operations	Nutraceuticals manufacturing
Operational Hours	8:00 AM to 5:00 PM (Monday to Saturday)
Plot Area	21802.02 Sq. ft
Project Covered Area	23194 Sq. ft.

Cost of the Project	PKR 113.32 Million
Production Capacity	200,000-300,000 units/month
Source of Raw Material	Local as well as imported through vendors.
Solid Waste Management	Only empty wrappers of raw materials. Empty cans/containers. Proposed to be sold to the approved contractor. Waste from packing of finished goods shall include PVC, Aluminum foil, cardboard, Glass. Estimated generation rate shall be 10-15 Kg/day. The solid waste management shall be outsourced to EPA-Punjab approved contractor.
Air pollution control	HVAC, Local Exhaust & General Ventilation. Exhaust fans. Provision of masks to workers.
Wastewater Management	The wastewater shall be washing of the machines. This shall be temporarily held in septic tank for settling of solid contents. Then treated by ETP and shall be allowed to flow to reach composite effluent treatment plant of Sundar Industrial Estate. Sewerage shall also be temporarily held in septic tank for settling of solid contents. Here waste water shall be treated before ultimate disposal.

2.10.2.1 Workforce Required

During construction phase of the project 12 persons will be required that will include masons and labors.

2.10.2.2 Water Supply and Water Balance

During construction phase of the project, ground water through water supply line of SIE will be used. 30% Water shall be used for masonry work. Concrete mix shall not be prepared on the site. Ready mix concrete shall be brought on the project site to be used for foundations and slabs. This shall need 60% water. 10% of the total needed water shall be consumed for sanitation purposes.

2.10.2.3 Power Supply

Electricity requirement during construction phase shall be 10 to 15 KW through temporary connection. The main source of power will be from SIE own grid station which is fed by LESCO-WAPDA.

Table 2.3: Temporal Boundaries of Construction Phase

		Month1	Month2	Month3	Month4	Month5	Month6	Month7	Month8	Month9	Month10	Month11	Month12
S#	**Construction Schedule**												
1	Excavation for foundation												
2	Pouring of lean concrete												
3	Pouring of foundation, columns upto plinth level												
4	Pouring of columns upto ground floor and roof ceiling level												
5	Pouring of ground and roof slabs and beams												
6	Plastering of ground, roof, walls, slabs, beams and columns												
7	Flooring of roof												
8	Finishing of building including paint, tile fixing, wood etc.												
Note: One cell equals 08 days													

2.10.3 Operation Phase

The nutraceutical product shall consist of small amounts of the ingredients which must be mixed accurately. The technology to be used in the process plant must be state-of-the art. Broadly speaking, a supplement can be differentiated as either a 'whole herb' or 'herbal extract'. Some people prefer to have ground up herbs as they believe that other, as yet undiscovered, active ingredients exist that are lost in the extraction process. The largest sector of the market however believes that extracts are the nutritionally beneficial ingredient. Because constituent quantities vary in the raw material itself, extract producers tend to standardize the strength of these active ingredients to produce a consistent product; the manufacturing process is therefore designed to achieve this.

2.10.3.1 Raw Materials

Materials include solid powders, semisolids, viscous inert liquids & organic liquids. Some of the raw materials shall be purchased from local market. Others shall be imported.

1) Pre-Extracted Vitamins
2) Pre-processed mineral supplements such as for Calcium, Iron and other essential elements needed for human body
3) RO treated potable water

2.10.3.2 Machinery Details

1) 01 Tablet Maker
2) 01 Tablet/Capsule Blister
3) 01 Tablet Coating Machine
4) 03 Capsule Fillers
5) 01 Syrup Machine
6) 01 Drops making machine
7) 01 Sachet Filler
8) 2000 LPH RO Plant

Table 2.4: List of Machinery

Sr.	Section	Machine	Capacity	Qty
1	Tablet	Ribbon mixer	200 Kg	1
2	Tablet	Paste Mfg Vessel	100 L	1
3	Tablet	Powder sifter	100 Kg/Hour	1
4	Tablet	Double cone mixer	200 Kg	1
5	Tablet	Wet granulator	200 Kg/Hour	1
6	Tablet	Tray Dryer	100 Kg	1
7	Tablet	Fluidized bed dryer	100 Kg	1
8	Tablet	Oscillating Granulator	200 Kg/Hour	1
9	Tablet	Compression machine ZP-37	125000/Hour	1
10	Tablet	Compression machine ZP-25	90,000/Hour	1

11	Tablet	Tablet coating machine	150 Kg	1
12	Tablet	Tablet coating pan	100 Kg	1
13	Tablet	Tablet coating pan	50 Kg	1
14	Tablet	Solution Mfg Vessel	100 L	1
15	Tablet	Tablet blister machine (Al/Al/PVC) 250 mm	250 mm	2
16	Tablet	Packing belt	15 feet	2

2.10.3.3 Manufacturing Process Description

The manufacturing of nutraceuticals is a complex process requiring clarification and concentration of the ingredients followed by drying processes downstream. At the nutraceuticals manufacturing unit of M/s Pharma Pak Pharmaceuticals (Pvt.) Limited, most of the ingredients of the recipe shall reach at the unit in refined form. These ingredients shall be combined as such according to the formulation decided by the pharmacist and shall be formed into tablets or oral liquid. Therefore nothing shall be wasted in case of manufacturing of tablets or oral liquid. Only a small amount of solid waste shall be generated. The manufacturing processes shall be as follows:

2.10.3.3.1 Tablet Manufacturing Process

2.10.3.3.1.1 Materials' Dispensing

- Weigh the required materials of the formula according to "material dispensing sheet".
- Shift these materials to production department following the approved SOPs.

2.10.3.3.1.2 Mixing & Granulation

- Sieve different powder materials through appropriate sieve size to get uniform particle size. Mix uniformly all of the sieved materials.
- Wet the above mixed mass (if required) with purified water & knead appropriately.
- Pass the wet mass through appropriate sieve to get wet granules.
- Dry the wet granules in by suitable method i.e.; either by tray dryer or by fluidized bed dryer.
- Sieve the dried mass through oscillating granulator to get uniformly sized dried granules.
- Lubricate the dried and sieved mass with the lubricants of the formula.

2.10.3.3.1.3 Compression

- Compress the mixed mass on the rotary tablet compression to get convert the mixed powder into tablets of uniform mass of specified shape & size.

2.10.3.3.1.4 Coating (Where required)

- Prepare the coating solution by dissolving different coating materials in appropriate solvent.
- Load the automatic coating machine with compressed tablets.
- Apply the appropriate coating solution on the revolving bed of tablet in coating machine.

2.10.3.3.1.5 Blistering

- Blister pack the final tablets (coated or uncoated) on tablet blister machine.
- Use Aluminum & PVC foils to pack the tablets in blister.

2.10.3.3.1.6 Packing

- Pack the blistered tablets in specified unit cartons according to defined pack size.
- Pack the unit cartons in master shippers.

2.10.3.3.1.7 Storage

- Store the finished packs of tablets in warehouse & dispatch to market on as and when required basis.

Raw Materials Weighing according to recipe
↓
Blending Process
↓
Compression
↓
Inspection
↓
Testing

Figure 2.2: Tablets Preparation Process Flow

2.10.3.3.1.8 Mass Balance Equation

Mass of the weighed material		=	a Kg
Mass of the mixed powder		=	b Kg
Mass of compressed tablets		=	c Kg
Mass of coated tablets		=	d Kg
Theoretical yield	X	=	a Kg
Practical yield	Y	=	(X-Wastage in b, c & d) Kg
%age yield	Z	=	(Y/X)*100

Note: No “Bye products” are formed in any of the processes.

Powder- Raw Material

↓

Grading & sieving Process (Machine–Vibro Sifter)

↓

Dry & Wet mixing with binder (Machine –High Shear Mixer OR Mass Mixer)
Starch Paste Preparation (Machine-Paste Making Kettle)

↓

Lumps Milling (Machine Multi mill / Cone Mill/Comminuting Mill / Oscillating Granulator)

↓

Wet Material Drying (Machine - Fluid Bed Drier OR Tray Dryer Oven)

↓

Forming Granules (Multi mill/Cone Mill/Comminuting Mill/Oscillating Granulator)

↓

Grading & sieving (Machine–Vibro Sifter)

↓

Lubrication of granules for free flowing (Blender Octagonal / Double & V Cone, Bin)

↓

Tablet Compression (Machine–Tablet Press & Die & Punch)

↓

Tablet De-Dusting (Machine–Vibro De-Duster)

↓

Powder dust extracting during tablet compression (Dust Extractor Unit)

↓

Film & Sugar Coating of tablets (Machine–Auto Coater or Conventional coating)

↓

Coating solution preparation (Machine–Stirrer & Colloid Mill)

↓

Inspection and packing

Figure 2.3: Tablet Manufacturing Process

2.10.3.3.2 Capsule Manufacturing Process

2.10.3.3.2.1 Materials' Dispensing

- Weigh the required materials of the formula according to "material dispensing sheet".
- Shift these materials to production department following the approved SOPs.

2.10.3.3.2.2 Mixing/Granulation

- Sieve different powder materials through appropriate sieve size to get uniform particle size.
- Mix uniformly all of the sieved materials.
- Wet the above mixed mass (if required) with purified water & knead appropriately.
- Pass the wet mass through appropriate sieve to get wet granules.
- Dry the wet granules in by suitable method i.e.; either by tray dryer or by fluidized bed dryer.
- Sieve the dried mass through oscillating granulator to get uniformly sized dried granules.
- Lubricate the dried and sieved mass with the lubricants of the formula.

Note:
-In majority of capsule manufacturing processes, first three steps are applied only.
-None of above steps is applicable on the "ready to fill" formulations

2.10.3.3.2.3 Encapsulation (Capsule Filling)

- Shift the mixed powder/ready-to-fill materials to the capsule filling machine.
- Load the machine's hopper with the powder & empty capsule shells separately.
- Fill the mixed powder/ready-to-fill materials in the empty capsule shells of appropriate size & color on the capsule filling machine.

2.10.3.3.2.4 Blistering

- Blister pack the filled capsules on tablet blister machine.
- Use Aluminum & PVC foils to pack the capsule in blister.

2.10.3.3.2.5 Packing

- Pack the blistered capsules in specified unit cartons according to defined pack size.
- Pack the unit cartons in master shippers.

2.10.3.3.2.6 Storage

- Store the finished packs of capsules in warehouse & dispatch to market on as and when required basis.

2.10.3.3.2.7 Mass Balance Equation

Mass of the weighed material	=	a Kg
Mass of the mixed powder	=	b Kg
Mass of filled capsules	=c Kg	= (b + weight of empty capsule shells)
Theoretical yield	X	= (a + weight of empty capsule shells) Kg
Practical yield	Y	= (X-Wastage) Kg
%age yield	Z	= (Y/X)*100

Note: No “Bye products” are formed in any of the processes.

Raw Materials Weighing according to recipe
↓
Blending Process
↓
Encapsulation
↓
Polishing
↓
Inspection
↓
Testing

Figure 2.4: Capsule Preparation Process Flow

2.10.3.3.3 Sachet Manufacturing Process

2.10.3.3.3.1 Materials’ dispensing

- Weigh the required materials of the formula according to “material dispensing sheet”.
- Shift these materials to production department following the approved SOPs.

2.10.3.3.3.2 Mixing/Granulation

- Sieve different powder materials through appropriate sieve size to get uniform particle size.
- Mix uniformly all of the sieved materials.
- Wet the above mixed mass (if required) with purified water & knead appropriately.
- Pass the wet mass through appropriate sieve to get wet granules.
- Dry the wet granules in by suitable method i.e.; either by tray dryer or by

fluidized bed dryer.
- Sieve the dried mass through oscillating granulator to get uniformly sized dried granules.
- Lubricate the dried and sieved mass with the lubricants of the formula.

Note:
-In majority of sachet manufacturing processes steps a, b and c are applied only.
-None of above steps is applicable on the “ready to fill” formulations

2.10.3.3.3.3 Sachet Filling

- Shift the mixed powder materials to the sachet filling machine.
- Load the machine’s hopper with the powder & mount the Aluminum foil roll on the machine.
- Fill the mixed powder materials in the aluminum sachet of appropriate size & color on the sachet filling machine.

2.10.3.3.3.4 Packing

- Pack the filled sachets in specified unit cartons according to defined pack size.
- Pack the unit cartons in master shippers.

2.10.3.3.3.5 Storage

- Store the finished packs of sachets in warehouse & dispatch to market on as and when required basis.

2.10.3.3.3.6 Mass Balance Equation

Mass of the weighed material		=	a Kg
Mass of the mixed powder		=	b Kg
Mass of filled sachets		=	c Kg = (b + weight of Aluminum foil)
Theoretical yield	X	=	(a + weight of Aluminum foil) Kg
Practical yield	Y	=	(X-Wastage) Kg
%age yield	Z	=	(Y/X)*100

Note: No “Bye products” are formed in any of the processes.

2.10.3.3.4 Dry Powder Injectable Manufacturing Process

All of the operations are to be carried in aseptic conditions following the approved SOPs. All of the materials to shift in sterile area must be subjected to appropriate sterilization processes prior to shifting.

2.10.3.3.4.1 Materials’ Dispensing

- Weigh the required materials of the formula according to “material dispensing sheet”.

- Shift the material aseptically to vial filling room following the approved SOPs.
-

2.10.3.3.4.2 Vial Washing

- Wash the glass vials on the vial washing machine.
- Apply the required cycles of sterile air, rinse with water for injection & dry sterile air
- Pass all of the vials through “siliconization process” on the machine.

2.10.3.3.4.3 Sterilization/De-Pyrogenation of Washed Vials

- Load the washed vials in the double door “dry heat sterilizer” & close the sterilizer tightly.
- Subject the loaded vials to temperature of 250^0C for 2 hours.
- Run “cooling cycle” in sterilizer to cool down the vials.

2.10.3.3.4.4 Vial Filling & Sealing

- Load the sterile powder in the hopper of filling machine
- Fill the vials with the powder in sterile environment.
- Plug the filled vials automatically on the filling machine
- Seal the filled vials automatically on the filling machine

2.10.3.3.4.5 Packing

- Label the filled vials.
- Pack the filled vials in specified unit cartons according to defined pack size.
- Pack the unit cartons in master shippers.

2.10.3.3.4.6 Storage

- Store the finished packs in warehouse & dispatch to market on as and when required basis.

2.10.3.3.4.7 Mass Balance Equation

Theoretical number of vials		=	a
Actual number of vials after filling		=	b
Practical yield	X	=	(b-Wastage) Kg
%age yield	Z	=	(X/a)*100

Note: No “Bye products” are formed in any of the processes.

Step:1 Sugar Grading & sieving Process (Machine – Vibro Sifter)

↓

Step:2 Sugar Transfer in the sugar melting vessel (Machine–Vacuum Transfer System)

↓

Step:3 Sugar Melting Process by Sugar and Demineralized water mixed and heated in sugar melting vessel so sugar is malted (Machine –Sugar Melting Vessel)

↓

Step:4 Melted Sugar to be filtered for removing impurity of solid particles and transfer the manufacturing vessel (M/c. Basket Filter and Transfer Pump)

↓

Step:5 Oral liquid manufacturing by adding drugs & ingredient in malted sugar and mixed by stirrer and high speed homogenizer with heating. Also the material re circulated in the vessel after that readiness of oral liquid it will be cooled by cooling system. (Machine –Oral liquid Manufacturing Vessel)

↓

Step:6 Cooled oral liquid will be transfer through inline homogenizer and filter press for homogenize mixing and filtered up to 5 microns size in storage tank. (Inline Homogenizer & Filter Press)

↓

Step:7 The oral liquid is storage in the storage vessel and when transfer to the filling machine that time mixed by stirrer. (Machine –Storage Tank)

↓

Step:8 Oral liquid transfer to float tank of filling machine by transfer Pump system (Machine – Tranfer Pump)

↓

Liquid oral liquid will be packed in bottle by filling & sealing & packing line machinery

↓

Step: 9 Automatic washing of all vessel and Tank by CIP system (Machine – CIP/WIP System)

Figure 2.5: Oral liquid Manufacturing Process

2.10.3.4 Water Requirement

3000 Liters per day of water will be required for the manufacturing processes. This requirement will be met from SIE ground water supply.RO Plant with capacity 500 Liters/Hour shall be installed for meeting the requirement of water for manufacturing purposes.

2.10.3.4.1 Water Balance Equation

3000 Liters of Water= 430 Liters in products+ 0 Liters in Bye product (No by-products) +2000 Liters in washing of machinery or packing+570 Liters for hygiene purpose in toilets (by employees)+0 Liters waste =Total 3000 liters balanced

Reject from RO plant shall be used for irrigation of lawns and also for general use washing purposes such as sanitation.

Total units of water input into RO Plant= 100
Output from RO Plant= 40
Rejected by RO= 60
Bifurcation of these rejected 60 units is:
40 for Washing of machinery
10 for irrigating lawns
10 for sanitation purposes in toilets etc.

2.10.3.5 Electricity Requirement

The estimated electricity required during operational phase of the project shall be 75000 units/month through a 400 KW connection. This will be met from SIE own grid station which is fed by LESCO-WAPDA. Electricity supply from SIE is usually continuous and without load shedding.

2.10.3.6 Man Power Involved in the Operation

30 persons shall be involved in the project operation. Administration shall involve CEO and General Manager. The staff shall be a mix of skilled and un-skilled manpower. These shall comprise Plant Manager, Shift Supervisor, Machine Operator, Technician/Electrician and Helper.

2.10.3.7 Operational Hours

The nutraceutical manufacturing unit shall remain operational 8 hours/day.

2.10.3.8 Restoration and Rehabilitation Plans

The project site is owned by proponent and does not possess any environmentally sensitive areas which may need rehabilitation. However, after completion of construction activities, all kinds of waste either recyclable or non-recyclable has been proposed to be managed according to procedure laid down in Bye-Laws of PIEDMC and in line with legal provisions of district government laws. The surroundings shall be cleared out of all kinds of debris from construction activities. The site is located inside Sundar Industrial Estate which already has been dedicated by government for establishment of such kinds of units as proposed by the proponent.

Once the useful life of nutraceuticals manufacturing unit and its components will be over, a comprehensive mechanical and civil structural overhaul will be carried out. The old parts and equipment will be sold in the market for reuse

and/or recycling. These shall be replaced with new and updated ones. Thus the life time of the unit shall be increased. In case of decommissioning of the unit, the civil structure shall be demolished under all required environmental controls. This will be done conforming to avoid any damage to environment or human health.

2.10.3.9 Government Approvals Required for the Project

Environmental Approval from the EPA-Punjab, Lahore is the major requirement to start work on the project. For seeking approval from Environmental Protection Agency-Punjab, this Environmental Impact Assessment Report is being submitted. Subject to this approval, permission from Board of Management of Sundar Industrial Estate shall be granted. SIE approval shall be governed by PIEDMC which is part of Government. The building layout has also been approved by Drug Regulatory Authority of Pakistan (DRAP). For operations, each product shall be separately approved by Drug Regulatory Authority of Pakistan (DRAP).

CHAPTER-3

DESCRIPTION OF THE ENVIRONMENT

3. DESCRIPTION OF THE ENVIRONMENT

3.1 General

This chapter describes the existing environmental baseline conditions in the proposed project area. An environmental baseline study is intended to establish a database against which potential project impacts can be predicted and managed later. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. For this purpose, only those environmental items from Aldo Leopold's master checklist of environmental items have been considered which pertain to this project. Mitigation measures have been proposed in next chapter according to these physical, biological and socio-economic aspects defined in environmental baseline. The described information has been collected from foot survey, public consultation, literature, previous studies about project area, knowledge with the proponent and the concerned government departments. A site visit was conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters. Real-time monitoring of samples of ambient air, noise and ground water has also been carried to know the baseline conditions.

3.2 Baseline Physical Environment

3.2.1 Topography

The topography of the project area is flat. The height of the area is 213 meters above the mean sea level (MSL). The area of Lahore is divided into two parts.

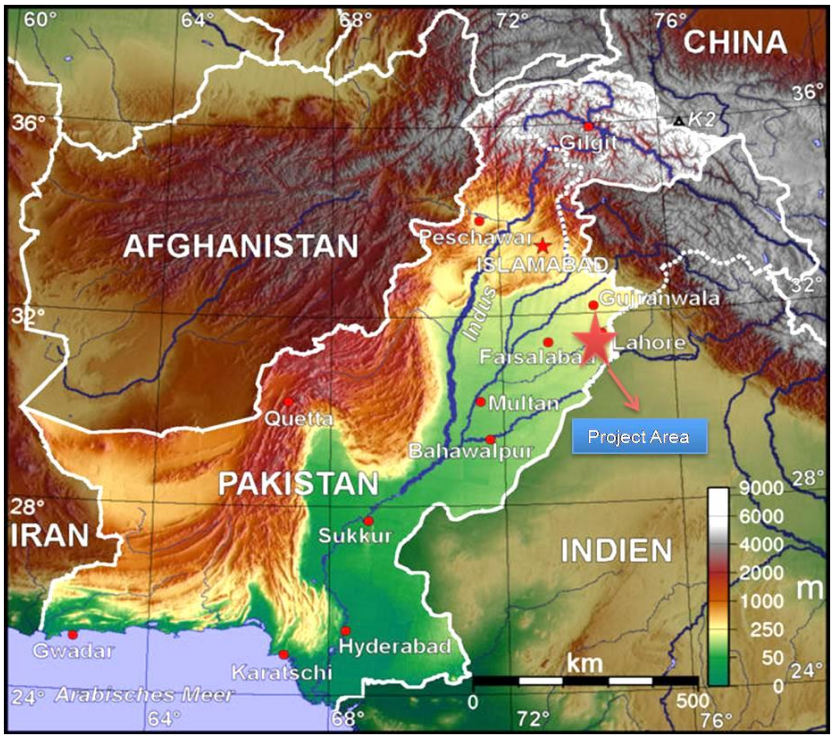


Figure 3.1: Topography of the Project Area

The low lying alluvial soil is along the Ravi River, and the Upland in the East. Upland is a plain slope from North-east to South-west. The low lands are generally inundated during the monsoon season by Ravi River, flowing in the west of district along its boundary with district Sheikhupura. The topography of the area is of Cover Flood Plain and scalloped interfluves composed of fertile alkaline soils. Figure 3.1 represents the topography of the area.

3.2.2 Regional Geological Conditions

The project is located at Sunder Industrial Estate, Sundar-Raiwind Road, Lahore which is a part of the Upper Indus plain. This plain is composed of major tributaries of Indus River–Jehlum, Chenab, Ravi, and Sutlaj. The soil deposits at the project area belong to the Chung Formation which shows the last glacial cycle. The clay, silt, and sand deposits are from late Pleistocene to Recent in age. Because of the withdrawal of the sea in late Tertiary time, shallow water and deltaic deposits were laid down. After that it became a huge flood plain in which debris from the different streams have mingled to load with huge thickness of alluvial material derived from the Himalaya. Though, there is no evidence of any glaciations in the area, the series of great climatic changes during the Pleistocene period had impact on the sedimentation in physiography of this region.

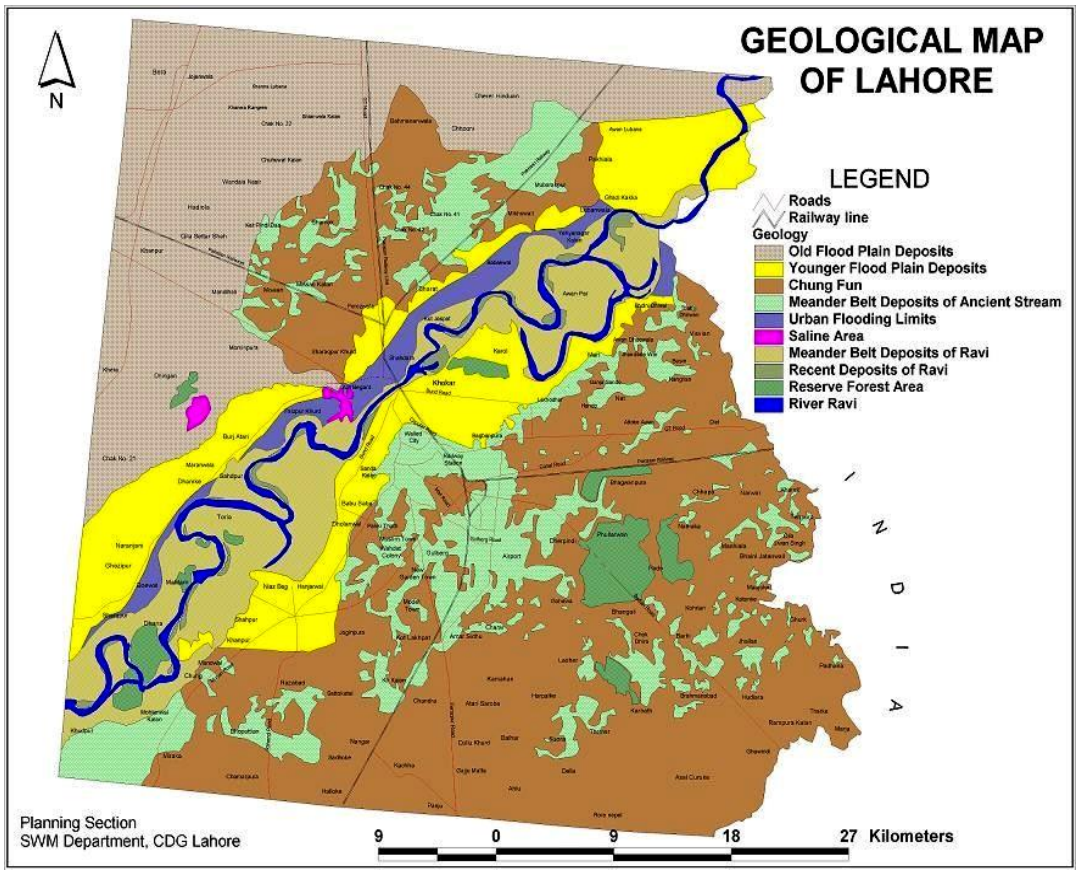


Figure 3.2: Geological Map of the Project Area

The presence of old channels of Ravi River indicates conformity of the stream oscillation to terrestrial rotation in the deflection of the streams. The abrupt migration shows excessive flooding due to which the earlier channels were choked with sediments and streams were forced to create new channels. These alluvial deposits comprise earthy brown to black silt, sand, and clay. The beds are largely hard, laminated, and sandy with inter-beds of clay and layers and lenses of sand. Project site is located in meander belt deposits. The project area does not have any valuable minerals. Although, scientific in depth, investigations haven't been carried out, yet the surveys conducted have failed to discover any minerals worth the name till to date. The economic minerals are kallar, kankar, sand, and clay.

Kallar is the grey powdery substance collected and taken out from the old village sites and other deserted abodes in the district. It is used for the manufacture of crude salt peter and also as manure for the top dressing of young cotton and tobacco plants (no longer in the line of extensive cultivation). With the passage of time the demand for Kallar diminished and its use as a trading commodity is on the decline. Kankar is used for metaling roads and its smaller particulars are burnt for lime. It is a kind of limestone gravel and is found, after being dug out at a depth varying from one to eight feet, in many parts of the district particularly the uplands.

3.2.3 Soil

The vegetation carried by these soils is influenced by moisture and aeration. The soil in the project area is cohesionless and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. Soil Map of the project area is given in Figure 3.3. The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients. Soil is rich in potential plant nutrients. Alluvium is soil or sediments deposited by the river or other running water. Alluvium is made up of variety of materials including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas where more particles are dropped are called alluvial or flood plains and the dropped particles are called alluvium.

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

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

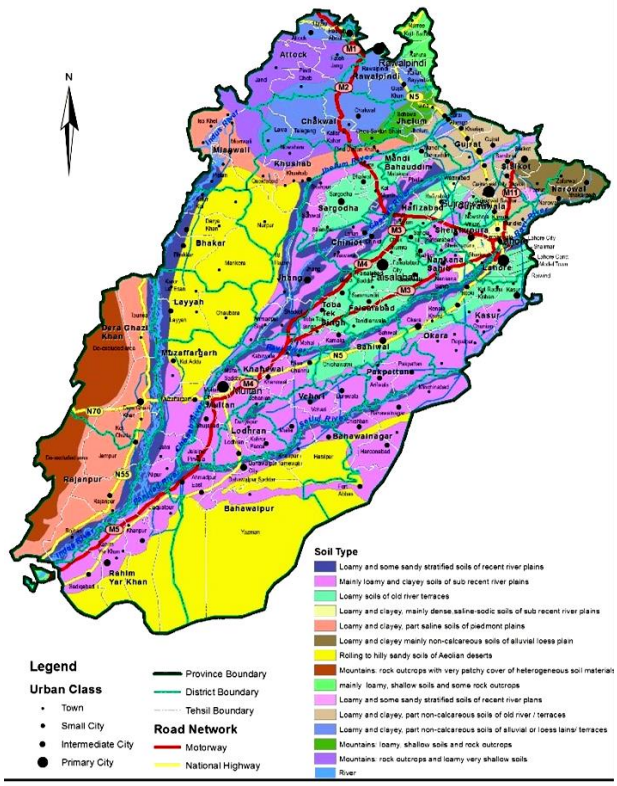


Figure 3.3: Soil map of the project area

3.2.4 Climate

The factors which influence the climatic conditions are air, humidity, precipitation, temperature and evaporation. Seasonal climatic conditions must be considered for the design and execution of project. These factors influence the construction of plant and other engineering structures. The project site, like other major parts of the province of Punjab, observes winter, summer, autumn and spring during yearly seasons. Overall effect of the climatic stresses can be determined from daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation. The project area has extreme climate, it has hot summers and cold winters.

The summer starts from April and lasts till September. May, June, and July are hottest months. The mean maximum and minimum temperature ranges from 40.4ºC and 27.3ºC respectively for these months.

The winter season lasts from November to March. December, January, and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8ºC to 5.9ºC in January. Temperatures in the project area vary from 5.9ºC to 40.4ºC.

The project area receives rain in all the seasons but monsoon rain is pronounced and constitutes a definite rainy season between the months of July and September. The monsoons are at their peak during June and July,

and during these two months there is more than half of the annual rainfall. October and November are the driest months.

Pressure winds during January move from North to South-East and during July they go along South-East to North. The project area does not have any previous records of flooding.

Table 3.1 summarizes month wise temperature, precipitation, and relative humidity.

Table 3.1: Annual Meteorological Data of Project Area during 2020 (Source: Pakistan Meteorological Department, Lahore)

Month	Monthly Total Rain (mm)	Mean Max. Temp °C	Mean Min. Temp °C	Mean Humidity		Mean Wind Speed (Knot)	
				0800 PST	1700 PST	0800 PST	1700 PST
Jan	66.9	16.1	5.5	87	60	1.9	4.5
Feb	15	22.5	8.8	80	43	1.6	5.8
Mar	85.2	24.7	13.1	77	50	4.1	5.4
Apr	34	32.2	19	62	33	4.5	7.1
May	35	37.4	23.1	51	30	8.0	10.1
Jun	60.2	37.8	26	62	43	8.7	9.0
Jul	174.5	36.4	26.7	73	55	7.9	10.3
Aug	368	34.6	26.5	79	66	6.5	6.0
Sep	131.8	36.1	26	75	50	1.6	5.0
Oct	0.0	33.8	537-A.1	70	33	0.1	3.5
Nov	27	24.9	10.7	80	44	1.3	2.7
Dec	16.8	19.1	6.6	90	60	1.0	2.2

3.2.5 Seismicity

The area falls in Low Hazard Seismic Zone with Seismic Factor Ground Acceleration of factor ≤0.03 showing Negligible Possible Damages. According to the building code of Pakistan, it is located in the seismic zone 2A of Pakistan. Zone 2A represents peak ground acceleration (PGA) from 0.08 to 0.16g.

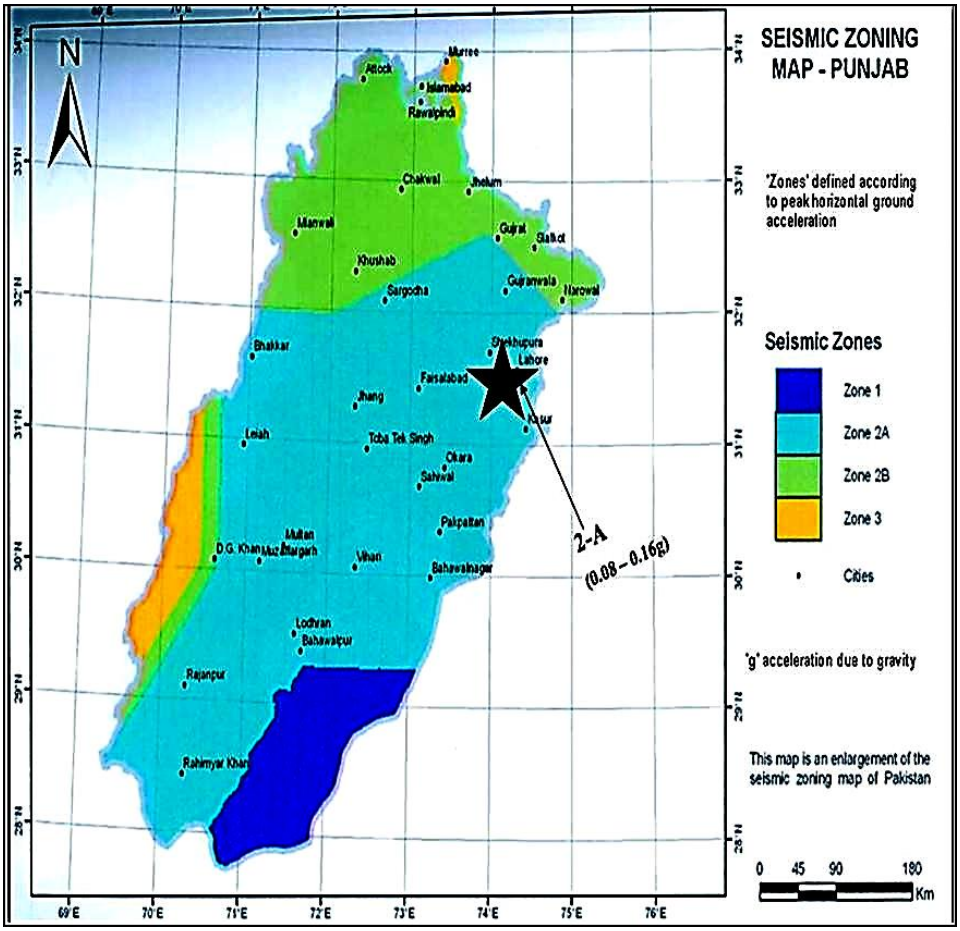


Figure 3.4: Seismic Zoning of Punjab

3.2.6 Water Resources

The study area forms the upper part of the Punjab plain, which is a part of Indo-Gangetic depression. The depression is of synclinal nature. Synclinal depression is a fore deep downward of the Himalayan foreland of variable depth, converted into flat plains by simple process of alluvial deposition. The aquifer underlying the study area comprises unconfined alluvium with a thickness of about 1050 feet as a part of regional ground water investigation.

The aquifer underlying the study area comprise unconfined alluvium with a thickness of about 1050 feet (rock has been encountered at depth 1050 ft. in the deepest test bore hole drilled near Thokar Niaz Baig in Punjab) as a part of regional groundwater investigation. Hydrological map showing that the Project Area falls in Bari Doab is shown in Figure 3.5.

It is part of larger inter alluvial Upper Bari Doab, which is bounded by the River Ravi in Northwest and the Sutlej River to the southeast. The Bari doab along with other Doabs like Rechna, and Chaj form the vast alluvial plain which is part of the Indus plain in the Punjab. The alluvium is derived from the erosion of mountain ranges in north. It has been deposited and reworked by

the large meandering rivers and tributaries of the Indus River and comprises a random distribution of fine to coarse sand with lenses of silty clay and clay of varying thickness and extensions. Borehole logs for tube wells shows that the lenses of less permeable material are neither thick nor continuous so, in spite of their heterogeneity, the alluvial sediments constitute an aquifer which on regional basis behaves as a single homogenous unconfined water body.

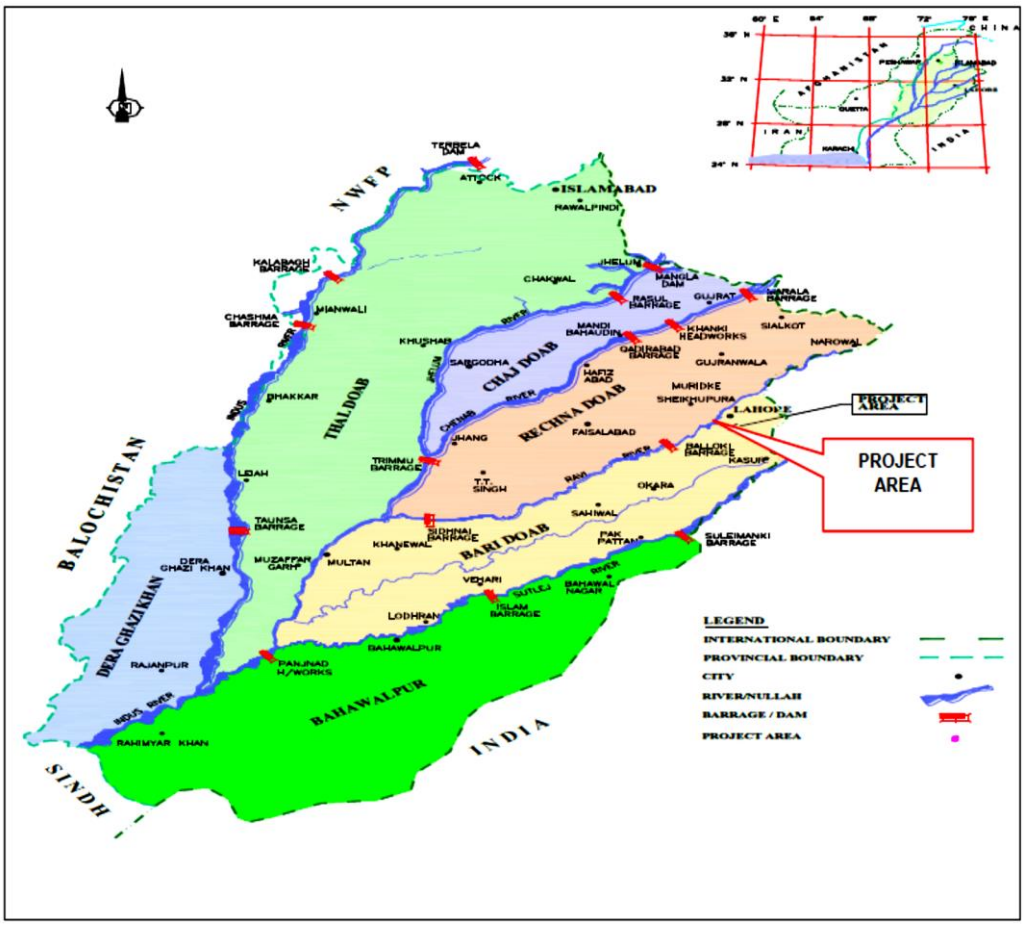


Figure 3.5: Hydrology of the project area

3.2.6.1 Ground Water

The regional groundwater flow in the area is from northeast, the Jammu and Kashmir foothills which are at higher elevation, towards the southwest along the general slope of the area.

The previous studies and behavior of existing shallow and deep tube wells in the area have shown that in spite of local variation, aquifer overall behaves as a single homogeneous water body and 73% of the total consists of sand. The water table in the study area ranges from 15ft (surrounding areas) to 100 ft. in the centre of city. This condition is during the monsoon season, when the water table is high and the annual fluctuation is reported not more than 10 feet.

Before the introduction of controlled irrigation system in Punjab, the water table was deep towards the centre of Doabs and was shallow along the rivers. After the introduction of controlled irrigation system in the region, water table started rising as a result of leakage/seepage from irrigation canals and infiltration from irrigation applications on crop fields. As a result, the area became water logged until about 1960 when a quasi equilibrium state was reached, controlled in part, by evapo-transpiration and drainage.

Groundwater flow to the area has partly been checked due to creation of a large deep bowl of around 130 ft. deep in Lahore City located in north east of the industrial state by the declining of water table. This has happened due to high groundwater abstraction for meeting the demand of public water supply for large population and for industries. Therefore, water table in the area is showing declining trend.

3.2.6.1.1 Recharge and Discharge of Groundwater

The main recharge source to the groundwater is from regional groundwater flow, from the piedmonts of Kashmir Mountain range located in northeast at a distance of around 150 km, and follows the general slope of the area that is northeast to southwest along the Ravi River with an average slope 1.22 ft/mile.

Recharge to the area is also supplemented by leakage from canal system, seepage from the irrigated fields and infiltration from rainfall. The regional groundwater flow is the dominant component of recharge and assures the sustainability of the quantity and quality of groundwater. The main sources of discharge in the area are the evapo-transpiration and groundwater abstraction by the industrial and irrigation tube-wells.

A number of industrial and irrigation tube-wells up to 4 cusec capacity are already operating in and around the project area. Lahore City has 400 WASA public water supply tube-wells with a capacity of 4 Cusec each at about 600 ft. depth. In addition to this, large numbers of industrial tube-wells in and around Lahore are being operated.

Specifically for Sundar Industrial Estate and its surrounding areas, the ground water is drawn with tube wells for drinking as well as irrigation purposes. Due to over draft caused by increased population density, the quality and quantity of ground water is degrading. Therefore, people are gradually switching to use of treated bottled water for drinking purposes.

For the project area, the ground water is the main source of water for meeting all kinds of requirements of units established in Sundar Industrial Estate. There is a well-planned uninterrupted water supply to all the units of SIE through overhead water tanks. The quality of this supplied water has been tested through EPA-Punjab certified environmental laboratory. According to the data, all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards. The results have been described in Table 3.2. Copy of Lab reports has been annexed under Annexure-VII.

Table 3.2: Result of Chemical Analysis Test Report (Ground Water)

S#	Parameters	Units	PEQS	Result
1	pH	--	6.5-8.5	7.54
2	TDS	mg/l	<1000	990
3	Bicarbonate	Mg/l	NGVS	634
4	Conductivity	µS/cm	NGVS	1547
5	Chloride	mg/l	<250	164
6	Hardness	mg/l	<500	150
7	Calcium	mg/l	NGVS	6
8	Magnesium	mg/l	NGVS	15
9	Turbidity	NTU	<5 NTU	0.6
10	Fluoride	mg/l	≤ 1.5	0.41
11	Iron	mg/l	0.3	0.03
12	Sodium	mg/l	NGVS	320
13	Potassium	mg/l	NGVS	1.1
14	Nitrate (NO_3)	mg/l	≤ 50	0.044
15	Nitrite (NO_2)	mg/l	≤ 3	BDL

Figure 3.6: One of the Overhead Water Tanks installed throughout SIE

3.2.6.2 Surface Water

River Ravi, which is the major natural surface water resource located in the northern part of the district, surrounds the project area. It has its origin in

India. India releases surplus water during heavy floods. Otherwise, this is fed with municipal wastewater, storm water and industrial wastewater. Drains of all of the Lahore district fall ultimately to River Ravi. Besides receiving huge amount of wastewater from Lahore city and other industrial discharges from different sources, it also receives Hudiara Drain, a natural drain which carries pollution loads from both Pakistan and India. Most wastewater discharge reaches to Ravi in the 60 Km stretch between Bulloki and Lahore. These wastewater discharges, along with reduction in available water in River Ravi for dilution, has greatly deteriorated the quality of river water. River Ravi runs merely as a sullage carrier near Lahore during low flow season.

Besides these major drains, there are 76 minor drains which finally fall in eight major drains namely Satto Kattle drain, Lakshimi Drain, Suk Neher Drain, Upper Chota Ravi Drain, Siddique Pura Drain and Shahdara Drain. Nowadays, all these drains collect wastewater from different areas of Lahore and finally fall into River Ravi.

Canal passing through Lahore has no diversion to the project area. There is no other surface water body near the projects area.

3.2.6.3 Flood Control

The project area although situated near to river Ravi. However, this area has never been flooded even when Ravi gets surplus water from upstream areas.

3.2.7 Ambient Air Quality

The main sources of air pollutants are gaseous emissions from the industries and traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e. Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. For assessing the current status of these air pollutants in the study area, these pollutants have been monitored through EPA-Punjab approved laboratory. Results have been described in Table 3.3. The monitoring reports of Environmental Testing Laboratory have been attached in Annexure-VII. All of the parameters are already within permissible limits of Punjab Environmental Quality Standards.

Table 3.3: Result of Chemical Analysis Test Report (Ambient Air)

S#	Parameters (µg/m^3)	PEQS	Results
1	Sulfur Dioxide (SO_2)	120 µg/m^3 (01 hr)	68 µg/m^3
2	Nitrogen Oxides (NO)	40 µg/m^3 (01 hr)	21 µg/m^3
3	Nitrogen Oxides (NO_2)	80 µg/m^3 (01 hr)	27 µg/m^3
4	Ozone (O_3)	130 µg/m^3 (01 hr)	63 µg/m^3
5	Suspended Particulate Matter	500 µg/m^3 (01 hr)	145 µg/m^3

	(SPM)		
6	Particulate Matter PM_{10}	150 µg/m^3 (01 hr)	108 µg/m^3
7	Particulate Matter $PM_{2.5}$	35 µg/m^3 (01 hr)	24 µg/m^3
8	Carbon Monoxide (CO)	5 mg/m^3 (01 hr)	0.4 mg/m^3

3.2.8 Noise

Area is in industrial as well as in commercial use. Current levels of sound have been monitored. Monitoring reports annexed in Annexure-VII. Results have been described in Table 3.4. The result shows that noise levels are already within PEQS.

Table 3.4: Noise Levels of project area

S#	Measurement Point	PEQS	Average dB(A)
1	East	75 dB (A)	62.8
2	West	75 dB (A)	61.9
3	North	75 dB (A)	63.4
4	South	75 dB (A)	60.5

3.2.9 Liquid Effluents

Various kinds of industries at Sundar Industrial Estate release various kinds of effluents. The Sundar Industrial Estate takes responsibility of management of some of the pollutants through its combined effluent treatment plant. Others have to be managed by the industrial unit itself.

3.2.10 Solid Waste

Each industry inside the estate is responsible for management of its process/industrial waste. For management of municipal solid waste, color coded plastic bins have been placed in front of every industrial unit. The waste in these containers is managed by Sundar Industrial Estate.

Generally, the solid waste management outside the estate is poor. This may be attributed partly to lack of awareness among people and partly to the poor management of authorities.

3.3 Baseline Ecological Environment

As climate of the area is semi-arid and subtropical, the vegetation of the area falls under scrub, dry, tropical thorn forest type as per phyto-geographical classification of the area.

3.3.1 Fauna

The project site is surrounded by urban and agricultural area. There is no wild life because of absence of conducive natural habitat.

Pigeon	Bank Myna
Parrot	Asian Koel
Indian Palm Squirrel	Small Indian Mongoose

Figure 3.7: Fauna of the project area

3.3.1.1 Aquatic Fauna

There are waste water bodies namely Rohi Drain, Butcher Khana Distributary and Nullah drain. In these drains, aquatic life such as fisheries cannot survive. However, these may host such animals who feed upon waste materials. Otherwise, there is no fresh water body and fauna present in the project area.

3.3.1.2 Mammals

Commonly found mammals in the area include porcupine, stray dogs, cats, house rats, wild rats and bats. However Small Indian Mongoose and Indian Palm Squirrel are also found in the area. Common domestic animals include buffalos, cows, goats, sheep, camels and donkeys, horses, cats, dogs and hare.

3.3.1.3 Reptiles

Lizards such as Spiny tailed lizard (Uromastyx hardwickii) and fingered toed lizard (Acanthodactylus cantoris) are found in the area. Goh (iguana) and snakes are also found.

3.3.1.4 Amphibians

The amphibians found in the area include common frog (Rana tigrina) and Indus valley toad.

3.3.1.5 Birds

Doves, quails, House sparrow (Passer domesticus), House crow (Corvus splendens) and Mynah (Acredotheres tristis) are commonly found in the area. Along with these some of other birds were also found such as Nightingale (Pycnontus cafer), Bank Myna (Acridotheres ginginianus), Parrot (Psittacula krameri), Pigeon (Columba livia), Common Koel (Eudynamys scolopacea) and Hoopoe (Upupa epops).

3.3.1.6 Critical Habitats

No wild life sanctuary or game reserve (critical habitats), exists near the project area or the study area and therefore it can be stated that, this project does not affect any critical habitat as no critical habitat is located close to the project area.

3.3.2 Forestry

The project area lies in the agricultural zone. No forest is found in area.

3.3.3 Flora

The vegetative resources around the location of the project are typical of the plains and include Kikar (Acacia arbica), Shisham (Dalbergia sissoo), Pipal (Ficus religious), Mulberry (Mourus alba), Aam (Mangiferra indica), Siris (Albizzia lebbek), Jamolan (Engenia jambolana), Amaltas (Cassia fistula) and Saffaida trees. They are the most useful and provide hard wood for construction, agriculture implement manufacture and for a variety of many other purposes like furniture manufacturing. These trees are not present on the project site.

Management of Sundar Industrial Estate has grown extensive green belt throughout the estate. These are mostly ornamental plants which include flowering plants, a large variety of trees and shrubs.

Bottle Brush	Cassia fistula
Dalbergia sissoo	Ficus religiosa
Hibiscus rosa	Rose

Figure 3.8: Flora of the project area

Wild grasses and horny shrubs are also found mostly as wild growth on especially small patches of land which is out of use. The flowering plants include Sun flower, Rose, Motiya (Jasminum sambac), Shoe flower (Hibiscus rosa). The trees include Alstonia, Arjun, Gul-e-Nishtar, Neem, Ashoke, Kanair, Sukh Chayn, Bottle brush.

3.3.4 Endangered Species

There are no endangered species of plants or animals in the project area.

3.3.5 Agriculture

The surrounding area of the project is predominated with agricultural use. The wheat, rice, maize, berseem, brassica (Sarson), legumes and pulses and animal fodder are among the major crops grown on the agricultural land surrounding the project area.

3.4 Baseline Socioeconomic Environment

Socioeconomic baseline has been developed for the project through a review of secondary data as well as primary data collected using checklists and discussion with locals (residents, farmers, shopkeepers, students, pedestrians, drivers) in the project area. Social survey was conducted to assess the present socio-economic and socio-cultural conditions of local population of the project area. The availability of basic amenities of life to community living in the project area is indicator of its socio-economic condition. Secondary data used include census report and previous research carried out in the area.

3.4.1 Population and Communities

The project site is situated in agricultural and industrial zone and the nearest community is present at a distance of about 0.5 Km. According to census of 2017, the population of Raiwind is 8,55,626. The average annual growth rate according to 2017 Census is 3%. The surrounding villages of Sundar Industrial Estate are Mul, Sultanke, Kamas, Bhai Kot, Nahla Village, Wara Siddhu Wala, Wara Jhanda Singh Village, Chaju Wala, Kot Jahan, Islampura and Manak. All these villages are nearest from the project site. Basic needs of life like electricity, potable water, natural gas and basic infrastructure like roads and drainage system are present in these villages.

3.4.2 Political and Administrative Set-up

Raiwind has recently been granted the status of Tehsil. According to new system of local government, it has Tehsil Municipal Administration. Under TMA, lower tiers of local government such as union councils function. Sundar is part of Raiwind Tehsil. Sundar Industrial Estate has been established inside the area of Sundar Village therefore the name is Sundar Industrial Estate. Sundar Industrial Estate is managed by a Board of Management. At upper

tier, this is managed by Punjab Industrial Estate Development and Management Company PIEDMC.

3.4.3 Industries

The project site is located in Sundar Industrial Estate Lahore. Large number of industries is present in the vicinity of the project site. Industrial sectors that have been established at SIE are Pharmaceuticals, Food Processing, Engineering, Textile/Garments, Carpet, Paper & Board, Plastics, Electronics, Chemicals, Paints, Steel, Auto parts, Wood products, Warehouse etc.

The important brands which have established their units here so far include Pepsi Cola International (Pvt.) Limited, Shan Foods, Masood Homeopathic, Asian food, Pakistan Oxygen Limited formerly Linde Pakistan Limited, Gourmet Beverage, Kansai Paints, Mayfair, Tapal Tea, Master foam, Ihsan Pakistan Spinning industry, Din textile, SVA Ruba and Millat equipment.

3.4.4 Infrastructure

The SIE is a purpose-built industrial estate. Therefore, it provides all essential facilities to all of the investors of the estate in order to encourage further industrial development. All the bigger villages are connected through roads to Lahore, the district head quarter of the area. Natural Gas and electricity are also available.

3.4.4.1 Potable Water Supply

Inside Sundar Industrial Estate, consistent and adequate ground water supply has been made available through overhead water storage tanks. These tanks are fed with ground water draft through tube wells. To surroundings of Sundar Industrial Estate, water supply is either through bore hole or through water supply system by the governmental establishments.

3.4.4.2 Sanitation and Drainage

PIEDMC has issued Industrial Building Regulations containing section for sanitation and drainage. The details have been attached in Annexure-IX. Every unit has established septic tank which disposes-off industrial as well as wastewater of the unit to wastewater system of SIE. SIE has established composite effluent treatment plant which treats water before ultimate disposal. However, sewerage system in the surrounding villages of SIE is very poor. This is old ‘Naali’ system ultimately reaching Hudiara drain. We can also find stagnant rain water during rainy season along Sundar-Raiwind Road. Same condition can be found in the nearby villages.

3.4.5 Land Use Planning

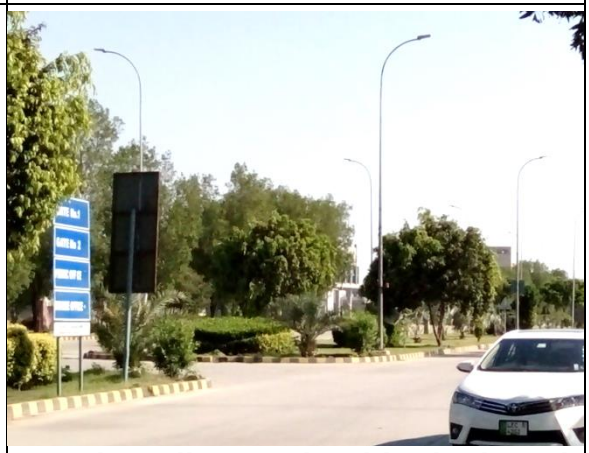
Under the present Government system, the District Government is responsible for all land use planning according to the provincial laws. The land occupied by Sundar Industrial Estate has been dedicated for industrial use

only. Even the commercial use of the land occupied by Sundar Industrial Estate is discouraged. The relevant documents have been attached in Annexure-IX. The estate has plots of various sizes with ownership rights.

3 Lane Road in SIE

Green Belt

Separate Lane for Motorcycles



Good Quality Roads with Signboard

Industrial Safety Unit for Emergency Response

Figure 3.9: Glimpses of Development at SIE

3.4.6 Power Sources and Transmission

WAPDA is the source of all electricity in SIE. SIE has its own separate dedicated grid station. Transmission of power to industrial units of SIE from this grid station is through underground electric transmission lines.

Electric supply is also available to all of the surrounding areas including Islam pura, Mull, Wara Sidhhu Wala, Bhai Kot etc. The electric supply to these areas is through overhead transmission lines.

3.4.7 Agricultural Development

Local residents earn their livelihoods from agriculture and livestock. However, with time, the areas are getting urbanized and converted into residential societies. The major crops include wheat, rice, fodder plants and some vegetables.

3.4.8 Quality of Life Values

3.4.8.1 Main Occupations

Survey of the project area reveals that agriculture is the main source of income for people of the area. Majority of the people around the project site belongs to poor section of the society. They are farmers, workers in different industries; some people have their own shops. A very small group belongs to affluent portion of the society including industrialists, bankers, politicians, educationists, medical professionals, businessmen and real estate business owners.

3.4.8.2 Family Life

The elders themselves strictly follow the old traditions in every walk of life while living in the affluent society. Their children are trying to follow the life style of the affluent society. In spite of all the modernized lifestyle, virtually elders are responsible to make decisions and their decisions are valued by the family members.

Print and electronic media are influencing almost all walks of life of the people. There is a lot of awareness about education. Rich or poor all families are trying hard to get their children educated. Mostly joint family system prevails. Most of the families are quite coherent. There is a rising trend in the society to change their old traditional socioeconomic pattern of life.

3.4.8.3 Religion

Predominant religion of the area is Islam with some percentage of Christian community. Wahabi sect can be found dominant compared with other sects. This is because of annual processions of Tableeghi Ijtimaa which have long been organized in the Raiwind area. People from all over the world attend this Ijtimaa. Locals also attend this Ijtimaa.

3.4.8.4 Housing

Most of the people have built pacca houses. Recent development in housing sector has also influenced Raiwind area. We can find mushroom growth of a large number of housing societies in the area. The prominent ones include different phases of Fazaaia Housing Scheme, Bahria Orchard, Lake City, LDA Housing Society, Defense Housing Authority Phase XI, Alkabeer Town, Motorway city etc. These housing societies have upgraded the living standards of people of the area. However, we can also find migrants from other parts of the city and country coming to reside in the area of locals. This migration has both positive and negative impacts on the life of the local people.

3.4.8.5 Transportation

3.4.8.5.1 Roads

There is a reasonable network of roads connected by small roads in the area. Most of the villages are connected with each other through these roads. Southern package of Lahore Ring Road is linked with Sundar-Raiwind Road. Public transport is available in the form of vans, buses and railways. Due to SIE, we can find goods transport sector flourishing in the area which is evidenced by movement and stationing of goods transport trucks along Raiwind Road linked to SIE. Inside SIE, there are RCC arterial roads which conveniently connect all parts of the estate. The condition of streets inside the surrounding villages is not that much good. These are paved either with bricks or with RCC. These have been found in much damaged condition. Due to poor sewerage system, the water becomes stagnant during rainy season causing inaccessibility to these villages from main road.

3.4.8.5.2 Railways

Raiwind Railway station is located at a distance of 8 Km from the project area which connects it to other parts of the country for movement of public, raw materials and finished goods.

3.4.8.5.3 Airport

Allama Iqbal International Airport, Lahore is situated at 47 Km from SIE.

3.4.8.6 Public Health

Sanitation facilities are very poor. Old naali system still exists. These overflow even in case of light rain. These cause muddy bumps on the roads. Drinking water supply is through bore hole pumps. WASA supply is present only in few areas surrounding the project site.

Only small scale dispensaries are available at some villages of the area. Shareef Medical Complex is the major health facility present at about 5 Km from the project area. There is no hospital in public sector.

3.4.8.7 Education

Mostly people are illiterate. They used to earn their livelihood as farmers. However, with passage of time, literacy rate is rising up. Sharif Educational City is located at a distance of only 05 Km. Superior University present at a distance of about 27 Km, COMSATS Institute of Information Technology and Lahore campus of University of Faisalabad is situated is near Bhubtian Chowk. Small schools are present in the nearby villages mostly up to middle level. The nearest college is Government College of Technology; Government Degree College for Boys Raiwind and Lahore Pharmaceutical College. For government owned educational institutions, students have to go to Raiwind or Lahore. Recently a TEVTA approved Technical Training Institute has been established with an objective to train local people and to meet the needs of industrial units of SIE. Most of the programs from Government College of Technology, Raiwind Road have been shifted in this institute.

3.4.8.8 Recreational Resources

Lahore safari is a recreational park present at a distance of about 15 Km from the project site. It houses many wild and domestic animals in captivity. Notable ones are lions, peacock, wild birds and mammals. Additionally, people are establishing some other sources of recreation such as private swimming pools etc.

3.4.8.9 Aesthetic and Cultural Values

Because of limited income, most of the common people live marginalized status of life. They had completely rural standards of living. Gradually the people are getting urbanized. However, old traditional and simple life typical of the Punjab villages is the prevailing cultural and aesthetic characteristic of life style of majority of the people. Old people prefer to live conservative life style. Decades old culture and customs in every walks life are dominant. General attitude to visitors is quite welcoming.

3.4.8.10 Language

Punjabi is the main language. Many dialects of Punjabi can be found in practice.

3.4.8.11 Ethnicity

The main castes and groups of Lahore district are Arain, Kashmiri, Jutt, Rajput, Malik, Pathan, Mughal, Sheikh, Komboh, and Gujjar.

3.4.8.12 Role of Women

Women of the area are mostly illiterate. However, they do assist their male family members in all of their activities. We can find women milking the cattle, managing the livestock, working at crop fields, selling the fruits and such other activities to support earning livelihood.

3.4.8.13 Archeological and Historical Treasures

We can hardly find any archeological sites in the project area.

3.5 Lab Reports of Environmental Analysis

For assessing the current status of baseline quality of environmental parameters including ground water supplied by SIE, ambient air and noise in the study area have been monitored through Punjab-EPA approved laboratory in the presence of Punjab-EPA officials. The monitoring reports of Environmental Testing Laboratory containing the results have been annexed in Appendix-VII.

According to the data, all the parameters of water are within ranges as provided by Punjab Environmental Quality Standards.

The main sources of air pollutants are gaseous emissions from the industries and traffic on road. Environmental Protection Department of Punjab has issued Punjab Environmental Quality Standards for criteria pollutants, i.e., Particulate Matter, Ozone, Oxides of Nitrogen, Sulphur Dioxide and Carbon Monoxide. Results have been described in Table 3.3. According to the data, all the parameters of air are within ranges as provided by Punjab Environmental Quality Standards. These may be subsequently monitored for knowing impact of project construction and operational activity on the value of these pollutants.

Area is in industrial as well as in commercial use. Current levels of sound have been monitored. Results have been described in Table 3.4. The result shows that Noise levels are already within PEQS.

3.6 Suitability of the Site

The proposed site for the construction of project is located at Plot # 537-A, Sundar Industrial Estate, Lahore. The Google Earth coordinates are 31°17'26.73"N, 74° 9'50.81"E. The project plot is surrounded by main road at its north, at east, south and west with industrial plots. The purpose of Sundar Industrial Estate is to promote industrialization in Punjab. All the area of Sundar Industrial Estate is dedicated for industrial use by Government of the Punjab. Supporting documents are attached as Annexure-IX. Even the commercial use of the area is discouraged. Sundar Industrial Estate has been purpose built for establishment of such kinds of units as proposed by the proponent. Sundar Industrial Estate is surrounded by residential and commercial areas including Small Industrial Estate, Mull, Sultanke, Bhaikot, Islampura, Warra Sidhu Wala and Fazaia Housing Scheme. No agricultural activity has been observed at the project site. However, some agricultural patches can be found outside of the Sundar Industrial Estate. The project site is owned by proponent and does not possess any environmentally sensitive areas. These facts support suitability of the site for this project.

CHAPTER-4

SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 General

This chapter identifies the potential impacts due to the implementation of project on the physical, ecological and social environment of project area. The chapter also identifies measures that will help mitigate the project's adverse environmental effects and enhance positive impacts. This shows the environmental responsibility on the part of the proponent.

The proponent is submitting an undertaking on stamp paper with EPA-Punjab that she shall ensure that the project shall be executed throughout all of its phases strictly in compliance with all applicable legal and regulatory obligations regarding environment. Therefore, we can say that the project activities shall not have significant negative environmental impact on any aspect of the environment.

4.2 Impact Assessment Methodology

Following methods have been used for impact assessment:

4.2.1 Checklists

The environmental aspects of the project during all stages namely pre-construction, construction and operation have been selected from Aldo Leopold's master list of environmental items which is widely used world over for this purpose. The extent of qualitative and quantitative impacts has been described and mitigation measures have been proposed to keep them within permissible limits.

The systematic strategy developed to provide an assessment of the potential impacts on the environment of the project area included:

- Considering general guidelines
- Surveying, environmental baseline monitoring and stakeholders' consultations to identify potential environmental impacts
- Situational analysis to know magnitude and significance of impacts
- Proposing best available and cost-effective mitigation measures for environmental management

4.2.2 Thinking through Stages of the Project

The project stages have been defined as pre-construction, construction and operation phase. The actions and likely impacts of each stage of the project have been described on the basis of professional judgment. Environmental monitoring of selected parameters shall also be carried out. The best available techniques not entailing to environmental costs and best practicable options have been recommended to mitigate the negative impacts.

4.3 Impacts Associated with Project Location

The project envisages the construction of nutraceuticals manufacturing Unit at Plot# 537-A, Sundar Industrial Estate, Lahore. The site location is already a clear land situated at Sundar Industrial Estate, Lahore which is purpose built for industrial purpose. Government of the Punjab has dedicated this location for industrial use. Therefore, it supports establishment of such kinds of projects in the estate.

This project site has other establishments of almost similar size in its immediate surroundings. The establishment of this nutraceuticals manufacturing unit is not expected to cause any significant negative impact in the location of the project because all the environmental aspects shall be kept under strict controls with the help of stringent mitigation measures incorporated in PIEDMC Industrial & Commercial Buildings Regulations.

4.4 Impacts Associated with Project Design

Design stage is the most important stage where environmental consideration can comfortably be incorporated without any financial and environmental damages. Subsequent modifications in order to bring the project in compliance with legal requirements after the initiation of the project often causes wastage of valuable natural and financial resources.

Total area of the plot is 21802.02 Square ft. Total covered area of the plot shall be 23194 Square ft. The proposal is to design a double story RCC building, underground water tank, above ground water tank, septic tank and guard room. The RCC slabs shall be supported by RCC pillars, beams and masonry walls. The civil work will be excavation for foundations, erection of pillars and beams. This shall be followed by installation of RCC slabs and masonry walls shall be made subsequently. Localized drilling shall be done to excavate for foundations. The localized drilling shall keep the impact of construction within limits.

The project has been designed to adhere to all standard technical as well as environmental requirements in order to avoid impacts on environment. The design of the project shall be implemented only after approval by PIEDMC.

Besides technical details according to its industrial and commercial building regulations, PIEDMC shall review whether environmental aspects of the project have been given due consideration. PIEDMC Industrial and Commercial Building Regulations themselves contain environmental provisions (attached herewith under Annexure-IX). After giving due consideration to environmental aspects of the design, the submission drawings shall be approved by PIEDMC. The construction contractors will be selected from among contractors who have significant experience in similar construction developments. These contractors shall have competence to care about environmental aspects of the project.

4.5 Characteristics of Impacts Associated with Construction Phase and their Mitigation Measures

The project shall be established inside Sundar Industrial estate. All the steps of construction shall be performed according to PIEDMC Industrial and Commercial Building Regulations which already contain environmental provisions. Therefore, the impact of construction shall be controlled.

4.5.1 Noise and Vibration

During construction activities, continuous, intermittent and instant noise and vibration may be caused by the operation of earth moving and excavation equipment, welding plant, cutting operations, concrete mixers, cranes and lifters for the transportation of equipment, materials and people. Loading and off-loading of materials and equipment shall also be a source of noise.

4.5.1.1 Duration

On the whole, the duration of the noise shall be temporary. The construction activities shall be performed only during day light hours.

4.5.1.2 Extent & Location

The noise and vibration shall remain restricted within 40-50 ft. of the project plot and within boundaries of Sundar Industrial Estate.

4.5.1.3 Reversibility

As soon as the construction phase is complete, the noise and vibration due to construction activities shall cease to exist.

4.5.1.4 Likelihood (Risk)

The noise levels shall be mostly within acceptable limits. Only construction staff shall be at risk. If they adopt following mitigation measures, their risk shall be managed. Residential areas are very far away from the project site. Thus, these shall not be impacted due to noise and vibration.

Mitigation Measures

- Activities with the greatest potential to generate noise to be planned during periods of the day that will result in least disturbance.
- Such equipment shall be used which has been designed by default with noise control elements.
- Using noise control devices, such as temporary noise barriers and exhaust muffling devices for combustion engines.
- Proper lubrication and maintenance of all construction equipment shall prevent unwanted sounds leading to noise.
- Operation of noise producing machinery shall be kept limited.
- Ear plugs shall be provided to workers during construction.

4.5.2 Impact on Soil

Initially the soil shall be disintegrated to a little extent due to excavation for foundation pillars. Soil disintegration may also be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may result in sedimentation of surface drainage networks.

4.5.2.1 Duration

After construction phase, the soil particles shall settle down and get consolidated. Therefore, the duration shall be temporary.

4.5.2.2 Extent & Location

The excavation for foundation pillars shall cause only local disintegration of soil. The soil disintegration shall be within the project plot and within boundaries of Sundar Industrial Estate.

4.5.2.3 Reversibility

The land of project plot shall be covered with the established project. Bare soil shall be vegetated. Deep soil shall not be disturbed as such except holes for filling foundation pillars with concrete.

4.5.2.4 Likelihood (Risk)

The disintegrated soil shall be immediately replaced with some filling material such as concrete and replacement soil. Therefore, there is no likelihood of any risk.

Mitigation Measures

- Excavation shall be done for foundation with the help of vertical drilling thus restricting its area of impact only to the specified points of the site
- Compacting the surfaces properly
- Preventing the movement of soil particles into the water lines
- Vegetating exposed areas after construction promptly

4.5.3 Impact on Air Quality

Initially construction activities may generate emission of dust caused by a combination of on-site excavation, ground leveling, filling, movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from combustion engines of earth moving equipment on-site.

Use of uncovered vehicles for transportation of building materials such as gravel, sand and cement as well as their storage on the construction site can lead to inadvertent dispersal of materials during heavy rains or high winds

during dry periods. This may have a little negative impact on the surroundings the form of particulate matter (PM). The principal air pollutants may be particulate matter (PM), CO_2, CO, NO_X, SO_X, and to a little extent VOC's.

4.5.3.1 Duration

Temporary. At the end of construction phase, the above stated sources of air pollution shall cease to exist.

4.5.3.2 Extent & Location

The air pollution shall spread only upto radius of about 50 feet from the boundaries of project plot. However, if precautions not taken, movement of material carrying vehicles can cause dispersion of particulate matter in the surrounding areas.

4.5.3.3 Reversibility

At the end of construction phase, the above stated sources of air pollution shall cease to exist. Therefore there shall not be any air pollution due to above mentioned sources after completion of construction phase. Thus environment shall get reversed.

4.5.3.4 Likelihood (Risk)

The air pollution shall comprise particulate matter as major component. This may lead to cough and problem in comfortable breathing if precautions not taken.

Mitigation Measures

- Restricting the excavation only to the specified points with the help of drilling excavator
- Covering the stockpiles of construction materials and/or watering where possible
- Minimizing dust from open area sources, including storage piles by installing enclosures.
- Covering all haul-trucks carrying earth, sand, aggregate and other materials with tarpaulin to help contain construction materials being transported within the body of each carrier.
- All contracted vehicles shall be ensured to remain tuned and maintained so that unburnt hydrocarbons may not be released into the environment in the form of VOC's beyond permissible limits.
- Use of such construction equipment and vehicles which uses environment friendly fuels shall be preferred
- Daily sweeping of all the surroundings where possible.
- Good housekeeping should be observed at the site generally.
- Provision of PPE's to workers to prevent entry of air pollutants in their breathing system.

4.5.4 Solid Waste

Solid waste expected to be generated from construction activities may include broken bricks, left over of sand and cement, excess fill materials, concrete waste, sanitary wares, electricity wires, wooden cuttings, scrap metals, cement packaging, empty cartons/containers, glass waste etc. Municipal solid waste will also be generated due to worker's activities. Overall, the solid waste shall be combination of biodegradable and non-biodegradable kinds.

4.5.4.1 Duration

Temporary. At the end of construction phase, the above stated sources of solid waste shall cease to exist.

4.5.4.2 Extent & Location

The sources of solid waste shall be restricted to the project plot. It shall not be causing any impact on the surrounding areas. The recyclables shall be sold to junk handlers usually found within Sundar Industrial Estate.

4.5.4.3 Reversibility

At the end of construction phase, the above stated sources of solid waste shall cease to exist after completion of construction phase. Thus environment shall get reversed.

4.5.4.4 Likelihood (Risk)

The solid waste shall not cause any harm to the environment. However, this shall depend on the maintenance of rate of removal of solid waste according to the generation rate.

Mitigation Measures

- PIEDMC bye-laws contain provisions for solid waste management. These shall be followed (attached herewith under Annexure-IX).
- Waste management hierarchy of reduce, reuse and recycle shall be ensured for all of the construction activities.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- Recyclable and non-recyclable waste will be segregated, stored separately at source.
- Segregated recyclable waste will be sold to contractors in recycling market and the non-recyclable construction debris waste will be sold to contractors who usually dump the construction waste debris in pits.
- Solid waste shall be kept covered especially during rainy season.
- No on-site burning of wastes will be allowed at any time.
- All employees shall be trained regarding proper waste management
- Collection schedule of waste will be according to the rate of generation

- Management of municipal solid waste shall also be according to solid waste management hierarchy of reduce, reuse and recycle. It will be properly disposed-off to prevent the chances of its attraction by scavengers. On the site, the color coded bins for collection of municipal solid waste shall be available. Waste from these containers shall be managed by Sundar Industrial Estate.

4.5.5 Impact on Water Resources

There are no surface water resources which are expected to be impacted by the project activities. The construction activity shall use water for making concrete mix for making slabs, beams, pillars, foundations and pavement of the floors. For this purpose, ready mix concrete shall be used. Therefore, water shall not be collected from the site for their preparation. There shall be a little additional load on ground water resources supplied by Sundar Industrial Estate through overhead water tanks. The water from this source shall also be used for sanitation purposes.

Construction activities may cause the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. This wastewater shall be channelized to join sewerage system of Sundar Industrial Estate.

4.5.5.1 Duration

At the end of construction phase, the need for above stated extraction of water shall cease to exist.

4.5.5.2 Extent & Location

The local water table shall be impacted. The project plot shall get meet its need of water from nearest water tank which is situated at 663 feet distance from project plot. This water tank gets water from ground through tube well right beneath it within Sundar Industrial Estate.

4.5.5.3 Reversibility

The quantity water extracted out for use during construction phase shall not be recovered to the aquifer. The quality of water shall be changed. Therefore the impact shall be permanent. However, water run off in case of rain shall recharge the ground water table.

4.5.5.4 Likelihood (Risk)

Although the impact shall be permanent yet there is no risk of extensive depletion of water due to this project construction.

Mitigation Measures

- All kinds of wastewater shall be segregated.

- PIEDMC bye-laws (attached herewith under Annexure-IX) contain provisions for water and waste water management. These shall be followed.
- Water usage shall be kept as minimum as possible.
- Water reuse and recycling shall be ensured where possible.
- Storm water shall be drained separately to join storm water drainage system of SIE and its mixing with solid waste and other wastewater shall be prevented so far as possible.
- Storm water can be allowed to percolate through exposed soil to recharge water table.
- Efforts shall be made to prevent entry of solid waste into the water.
- Adequate portable or permanent sanitation facilities serving all construction workers shall be provided.
- Sewage from construction camps should be disposed of by development of on-site sanitation systems i.e. septic tanks.
- The contractors shall be instructed to ensure that their machinery and equipment is properly tuned and serviced and there is no leakage or spillage of oil or oily products from the construction equipment and machinery which may pollute ground water.

4.5.6 Impact on Ecological Environment

The construction activity will be carried out in the proposed site which is situated within already established industrial estate and does not have significant flora and fauna. Therefore, no adverse impact on fauna and flora is anticipated due to the proposed activity. There will be no cutting of any trees. There will be removal of grass and weeds from the location of proposed plant site. Temporarily the green belt can receive particulate pollution due to construction activity if preventive measures not taken.

4.5.6.1 Duration

Temporarily the green belt can receive particulate pollution due to construction activity if preventive measures not taken. At the end of construction phase, the sources of particulate pollution from this project shall cease to exist.

4.5.6.2 Extent & Location

The birds and some other animals (mostly rodents) shall feel noise and vibration and may migrate in immediate local surroundings of few feet from project plot within Sundar Industrial Estate.

4.5.6.3 Reversibility

After construction phase, green belt shall get restored to previous state. They may get washed with rain naturally or these may be washed with water sprinkling. Thus the impact during construction shall be reversible.

4.5.6.4 Likelihood (Risk)

There is no risk of loss of or damage to any biodiversity due to this project construction.

Mitigation Measures

- The construction activities should be performed in such a manner that it does not impact vegetation of green belt of the project area.
- Tree plantation shall be carried out after construction to improve the ecological condition.

4.5.7 Impact on Socio-economic Conditions

The project area is part of already established industrial estate. The implementation of the proposed project will not involve dislocation or involuntary resettlement of people. Positive impact is anticipated in terms of employment opportunity as many skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during construction phase. Construction activities, particularly movement of haul trucks and machinery may affect the workers as well as the residents.

4.5.7.1 Duration

The mason, labor and other skilled and unskilled workers shall get temporary employment during construction activity. At the end of construction phase, their jobs will be terminated.

4.5.7.2 Extent & Location

The construction staff may be from immediate surrounding locality or it may be hired from outside.

4.5.7.3 Reversibility

After construction phase, the staff shall lose their jobs from this project. They may get jobs at some other projects. Thus the impact during construction shall be reversible.

4.5.7.4 Likelihood (Risk)

There is only risk of loss of jobs after this project construction.

Mitigation Measures

- This should be ensured that local people be preferred for all kinds of jobs during construction phase.
- The contractor will select specific timings for heavy machinery operation so as to cause least disturbance to the adjoining community by considering their peak movement hours.

4.5.8 Occupational Health and Safety

Work at height shall be involved which needs safety management. Moving machinery shall also have potential of injuries to the workers. Plus, there may also be electric hazards.

Handling of construction materials usually causes skin problems. Due to interaction of people from different backgrounds and health conditions, allergies may be caused if precautions not taken.

Due to only day time construction activity, there are less chances of night fatigue.

During hot season of the summer, there may be chances of heat stress.

4.5.8.1 Duration

The construction activity will be performed only 08 hours a day and additional time for lunch break. The risk of injury shall exist only when performing certain hazardous activity.

4.5.8.2 Extent & Location

The impact shall be restricted within site of the project plot.

4.5.8.3 Reversibility

After construction phase, the occupational health and safety impacts due to construction activity shall cease to exist. Thus the impact during construction shall be reversible.

4.5.8.4 Likelihood (Risk)

There are risks of injuries from work at height, electrical hazards, musculoskeletal disorders due this project construction.

Mitigation Measures

- Adequate scaffolding and shuttering should be established and used for all kinds of construction activities.
- Work at height should be performed only after permit to work by HSE staff who shall issue such permit to work at height after taking all appropriate measures.
- Work site layout shall be designed to minimize the need for manual transfer of heavy loads.
- Electrical cords should be located in common areas and marked corridors.
- Safety signage should be adequately displayed
- Clean drinking water availability should be ensured for use by all construction staff.

- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases should be hired. Screening test may be performed at the time of hiring
- Emergency response plan should be made, communicated to all and maintained during all of the construction activities
- First aid facility should be readily available for the workers at the site.
- Good house-keeping should be practiced prevent the events of slips, trips and fall.
- Mandatory personal protective equipment like harness, masks, gloves and helmets should be strictly used by the labor according to their assignments at the work site.
- Smoking should be avoided to prevent any fire incident
- Fire and any other emergency shall be managed with the help of emergency services provided by Industrial Safety Unit of Sundar Industrial Estate.
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- During hot season, outdoor work timing may be changed. Only indoor construction activities may be performed during sunny part of the day. In case of inevitable circumstances, workers should be given adequate breaks.
- Workers should be given mineralized fluids during hot season to balance electrolytes in their body.

4.5.9 Traffic Flow

The project plot is situated within Sundar Industrial Estate. The transportation of construction materials through Lahore-Sundar-Raiwind Road shall temporarily cause increased load on the road which already remains congested due to goods transport vehicles.

4.5.9.1 Duration

The congestion shall be of temporary duration only during construction phase of the project.

4.5.9.2 Extent & Location

The impact shall be restricted along Lahore-Sundar-Raiwind Road.

4.5.9.3 Reversibility

Traffic flow shall get smooth after movement of construction materials vehicles. Thus, the impact shall be reversible.

4.5.9.4 Likelihood (Risk)

There is risk of injuries from probable road accidents.

Mitigation Measures

- Transportation of construction materials shall be scheduled during off-peak hours so far as possible.
- Vehicle operators should be instructed to maintain low speed to prevent any accidents.

4.6 Characteristics of Impacts Associated with Operation Phase and their Mitigation Measures

4.6.1 Air Emissions

There are no direct sources of air emissions associated with operations of this nutraceuticals manufacturing unit. The machinery shall have fume hoods with them to release any traces. The ingredients shall be mixed and put onto the machines for making tablets and oral liquid. The mixing of ingredients shall be carried out in closed containers of the machinery and subsequently tablets shall be made and oral liquid bottles shall be filled mechanically without human hands. The employees shall only control the computerized system of machines making and packing of tablets and oral liquid.

4.6.1.1 Duration

The probable impacts (if any) shall be permanent throughout operation phase.

4.6.1.2 Extent & Location

The impact shall be restricted within production rooms.

4.6.1.3 Reversibility

The liberation of particulate matter shall stop when tablet manufacturing process stops. The particulate matter may get settle down naturally due to flocculation. Thus, the impact shall be reversible.

4.6.1.4 Likelihood (Risk)

There are risks of respiratory problems because of particulate pollution.

Mitigation Measures

- Dispensing of formulations shall be performed under the fume hood. If any hazardous emissions, these shall be managed according to composition and safety data sheet of relevant substance.
- The mixing of ingredients shall be carried out in closed containers of the machinery and subsequently tablets, dry powder shall be made and capsules and sachet shall be filled mechanically without human hands. Thus there shall be no dispersion of ingredients in the surrounding air.

- Restricting the operation of vehicles outside of the covered areas so that the uncontrollable exhaust emissions may get diluted in the open air.
- Heat ventilation and air conditioning system shall be installed to prevent any indoor air pollution.
- Vegetation/plantation of fruit trees has been proposed to create a pleasing environment at the unit which shall also improve air quality.
- Workers shall be provided with masks to prevent entry of particulates into their breathing system.

4.6.2 Wastewater

Estimated 3000 Liters per day of water will be required for the manufacturing processes. This requirement will be met from SIE ground water supply. RO Plant with capacity 500 Liters/Hour shall be installed for meeting the requirement of water for manufacturing purposes. Groundwater from supply of SIE shall be treated with reverse osmosis (RO) based treatment plant and shall be used for meeting needs of the production processes.

The machines for manufacturing the pharmaceuticals shall be washed periodically. This washing shall contain the ingredients. Therefore the solution resulting from washing shall be circulated again into the system in order to recover its valuable contents to be used in production process.

The sewerage shall be generated from toilets. Occasional washing of the floors may also generate wastewater. Such waste water is not part of regular operations and may not have very hazardous composition.

Water Balance Equation shall be as follows:

3000 Liters of Water= 430 Liters in products+ 0 Liters in Bye product (No by-products) +2000 Liters in washing of machinery or packing+570 Liters for hygiene purpose in toilets (by employees)+0 Liters waste =Total 3000 liters balanced

Total units of water input into RO Plant= 100
Output from RO Plant= 40
Rejected by RO= 60
Bifurcation of these rejected 60 units is:
40 for Washing of machinery
10 for irrigating lawns
10 for sanitation purposes in toilets etc.

4.6.2.1 Duration

Water shall be permanently needed during life of the project. Water for hygiene purpose shall also be permanently needed throughout operation phase of the project.

4.6.2.2 Extent & Location

The impact shall be on the local ground water resources within radius of about 1 Km from project plot.

4.6.2.3 Reversibility

Water treatment shall assist in conservation of water. Grey water shall be used for irrigation of vegetated area of the plot. Thus, it shall contribute in recharging of the water table.

4.6.2.4 Likelihood (Risk)

There are risks of water depletion if careful steps not taken for water conservation.

Mitigation Measures

- The water from washing shall be circulated again and again in the system to recover its contained materials. Thus pollution load of the water shall also be reduced to a very large extent.
- RO reject water shall be stored and used for washing purpose and meeting needs of the unit other than production processes. Thus it shall not be wasted as such.
- The water from RO reject and floor washing shall be channelized to irrigate the lawns which have been proposed to be established on a very large area of the plot wherein a variety of fruit trees and flowering plants shall be planted.
- As part of compliance with PIEDMC bye laws for industrial establishments, the drainage lines for sewerage and storm water shall be kept separate at the unit. Thus there shall be no mixing of both kinds of water.
- Screening of solid contents of water at source shall be ensured in order to decrease pollution load of effluent water.
- As part of compliance with PIEDMC bye laws for industrial establishments, a septic tank shall be established. The wastewater after storage in septic tank may join drainage system of Sundar Industrial Estate and may be treated through Composite Effluent Treatment plant of Sundar Industrial Estate before ultimate disposal to nearby drain. If the wastewater shall be containing some kinds of pollutants which are outside the domain of treatment by Composite Effluent Treatment plant of Sundar Industrial Estate, then it shall be treated at the unit first to keep ultimate values of parameters of effluents within PEQS.
- Periodic cleaning of lines shall be carried out.
- Better piping design shall be ensured to facilitate draining of the lines.

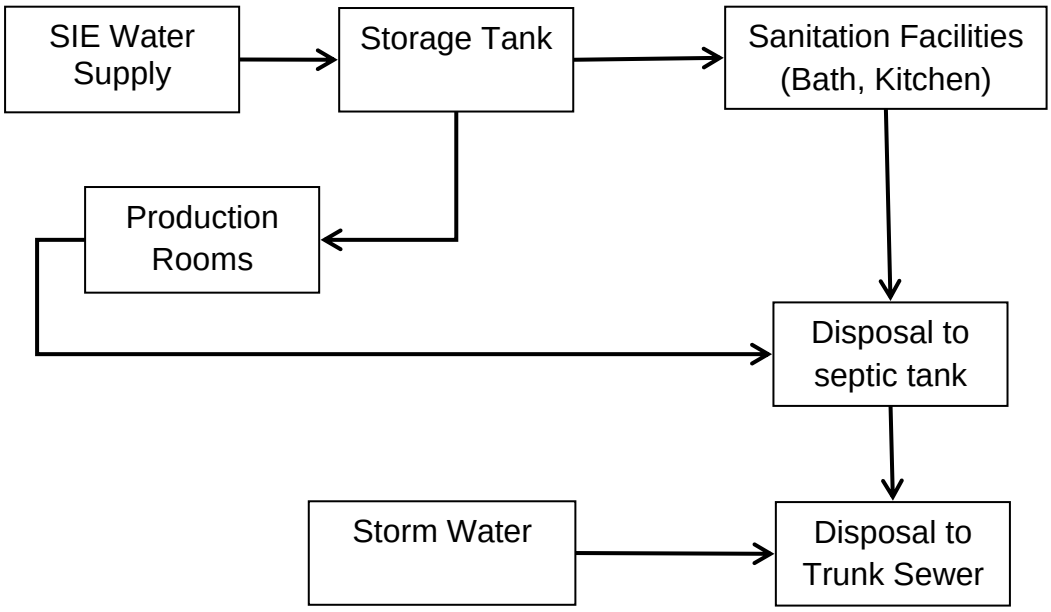


Figure 4.1: Water Flow Diagram

4.6.3 Noise

The sources of occupational noise shall be due to the operations of production process machines and packing machines. This noise shall not be significant and remain well below Punjab Environmental Quality Standards.

4.6.3.1 Duration

The intermittent noise shall be of temporary duration whereas continuous noise shall be existent throughout the project operation phase of the project.

4.6.3.2 Extent & Location

The impact of noise and vibration shall be within production rooms thus having potential to impact workers.

4.6.3.3 Reversibility

The potential damage caused to human ear may be either reversible or irreversible depending upon intensity of instantaneous noise.

4.6.3.4 Likelihood (Risk)

This noise shall not be significant and remain well below Punjab Environmental Quality Standards. Following precautions shall further reduce the risk caused by noise and vibration. Otherwise normal efficiency of the workers may be reduced also causing psychological stress.

Mitigation Measures

- Machines shall have built-in containment and isolation to reduce noise.
- Guarding of the moving parts also shall reduce the noise.
- Machinery shall be arranged in the separated rooms which shall produces minimum noise and generated noise shall be absorbed by the surrounding structures instead of reflecting it.
- Regular maintenance of equipment including lubricating moving parts, tightening loose parts and replacing worn out components should be conducted regularly to further reduce the noise generation.
- Equipment will be regularly inspected for good working condition.
- Plantation of trees along perimeter of the building shall reduce impact of noise from outside sources reasonably.
- Due to automation, workers shall be usually away from the sources of noise.
- Workers shall be provided with ear plugs.

4.6.4 Solid Waste

The manufacturing process of nutraceuticals shall relatively be a material efficient process. The ingredients of the recipe shall be used as such to make final product. Empty sacks/bags, plastic containers and wrappers of raw material and discarded packaging of finished goods may be source of solid waste. The solid waste from packing of finished products shall include PVC, aluminum foil, cardboard, glass. The volume/mass of this solid waste shall vary depending upon the type and quantity of the raw materials to be used. Some of the raw materials shall be received in drums/containers. Others shall be received in wrappers, sacks or bags. The generation rate shall be 10-15 Kg/day. According to present proposal the proposed raw materials to be used or the products produced shall not generate any hazardous solid waste.

Besides this operational waste arising out of manufacturing processes, municipal solid waste shall also be generated due to various activities of employees.

4.6.4.1 Duration

Municipal waste shall be generated on daily basis. The operational solid waste shall be generated on daily basis yet it shall be segregated at source and managed according to following mitigation measures.

4.6.4.2 Extent & Location

The impact of both municipal and operational solid waste shall be within Sundar Industrial Estate.

4.6.4.3 Reversibility

Following measures shall assist in reduction of generation rate of solid waste. Thus reversing the circumstances.

4.6.4.4 Likelihood (Risk)

If solid waste not collected timely, there shall be nuisance. Plus, there may be occupation of space by solid waste. Piling of solid waste may cause development of microorganisms and rodents.

Mitigation Measures

- Solid waste shall be managed through outsourced contractor approved by EPA-Punjab.
- The packing of raw materials shall form scrap and shall be sold in the market.
- Waste management hierarchy of reduce, reuse and recycle shall be ensured for all of the operations.
- A comprehensive solid waste management plan will be devised and adhered to collect, segregate and dispose solid waste.
- Recyclable and non-recyclable waste will be segregated and stored at source.
- Any misprinted packing shall be returned back to the printing press where it shall be reused or recycled as appropriate.
- Recyclable and non-recyclable waste will be segregated and stored at source. Segregated waste will be sold to outsourced waste managers who shall be responsible to manage all kinds of the solid waste in an environment friendly manner. Recyclables shall be sold to recycling industry by these waste managers.
- No on-site burning of wastes will be allowed at any time.
- As part of compliance with PIEDMC bye-laws for industrial establishments, SIE has developed waste management system for daily generated municipal waste by providing color coded waste bins outside every plot. This waste shall be collected and managed by SIE.
- Training of all employees regarding proper waste management
- Collection schedule of waste will be according to the rate of generation.

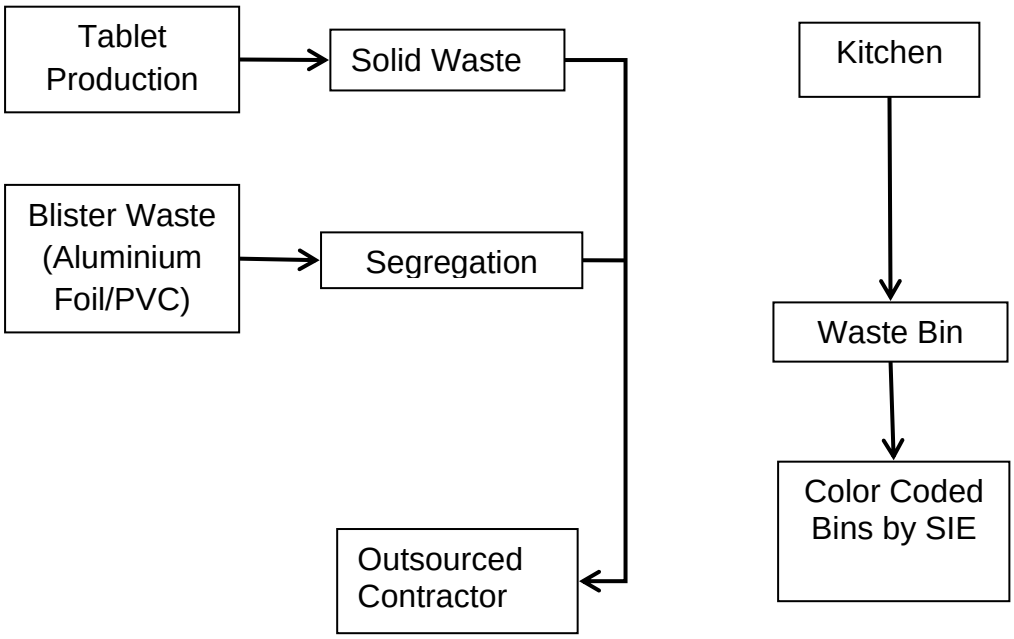


Figure 4.2: Solid Waste Management Plan

4.6.5 Impact on Flora and Fauna

The nutraceuticals manufacturing unit shall be established inside Sundar Industrial Estate which does not have significant flora or fauna which may get impacted during operations phase of the project. There is green belt established throughout the industrial estate. It shall not be impacted. Thus overall there shall be no impact to flora and fauna during operations of the project.

4.6.5.1 Duration

Only during instances of noise and vibration, the fauna may get scared and tend to migrate. Otherwise, the operational activities shall not harm flora and fauna.

4.6.5.2 Extent & Location

The operational activities shall not cause much harm to flora and fauna. They may get scared because of noise and vibration. The impact of shall be within Sundar Industrial Estate.

4.6.5.3 Reversibility

Following mitigation measures shall assist in reversing the impact caused. If flora replenished sustainably then the caused impact (if any) shall be reversed.

4.6.5.4 Likelihood (Risk)

There may be risk of migration of local fauna to other locations if precautions not taken. Local flora, if not replenished, may become extinguished from locality.

Mitigation Measures

- Ornamental plants and fruit trees have been proposed to be planted on very large sized lawns inside the plot to improve aesthetic beauty, landscape and create a suitable habitat for fauna.
- As part of EPA-Punjab requirement, 2000 trees shall be planted with their distribution according to advice of SIE management.

4.6.6 Occupational Health and Safety

The raw materials shall be natural substances which we already use in our common life. These do not possess any toxic characteristics. Similarly the products shall also be harmless in nature.

The machines shall function automatically. Workers shall only put raw material into the hoppers of machines or collect final product to pack them. The manpower shall have interaction with machine in case of repair and maintenance issues.

The movement of machinery shall also cause noise pollution. Due to interaction of people from different backgrounds and health conditions, allergies may be caused if precautions not taken. The loading and off-loading activities may cause musculoskeletal problems if heavy weights are to be lifted manually.

The operations activity will be performed only 08 hours a day and additional time for lunch break. Thus there are less chances of night fatigue.

4.6.6.1 Duration

The occupational health and safety aspects of the operational phase of the project shall remain matter of concern throughout project.

4.6.6.2 Extent & Location

The occupational health and safety aspects of the operational activities of the project shall remain matter of concern within production rooms and to the various tiers of hierarchy of operational employees.

4.6.6.3 Reversibility

A sound corrective and preventive action plan may prevent and/or reverse the potential consequences.

4.6.6.4 Likelihood (Risk)

There may be risk from electrical hazards, mechanical hazards, cuts, burns and musculoskeletal disorders.

Mitigation Measures

- Occupational health and safety management plan shall be established and adhered to during operations.
- Electrical earthing shall be done to prevent electric shock to any of the workers.
- The machines shall have built-in auto-stop mechanism to prevent trapping of human hands into the moving parts of the machine.
- Any machine part, function, or process that may cause injury, shall be safeguarded.
- All the raw materials shall be handled according to the required handling instructions provided by their manufacturers.
- The raw materials components shall be handled according to their safety data sheets.
- Safety Data Sheets shall be displayed adequately at the unit. The information contained in these safety data sheets shall be made readable, accessible and understandable for all levels of employees. For example, these may be translated in Urdu language and interpreted in the pictorial form.
- The weights of the inputs as well as outputs of the unit shall be adjusted so as to prevent musculoskeletal problems among staff.
- Safe lifting practices shall be ensured. Staff shall be trained about safe lifting practices in order to prevent musculoskeletal problems.
- Heat ventilation and air conditioning system shall be installed to keep the indoor environment under control. This shall also assist in providing bearable temperatures and to prevent onsets of heat stress.
- Depending upon multi-skilled staff, the assignments of the employees may be changed to prevent musculoskeletal and psychological issues
- During summer season, the facility shall be equipped with bearable temperatures through air conditioning and other such facilities to prevent onsets of heat stress.
- Adequate air exchange with general ventilation should be carried out to ensure bearable temperatures in the production rooms.
- Periodic inspection and maintenance of the equipment and safeguarding devices must be conducted to ensure proper operation and safe performance.
- Workers shall be trained in safe operation of the equipment, understand the hazards related to bypassing safety devices, and recognize the limitations and effective operating ranges of safety devices.
- Maintenance personnel shall be trained to follow manufacturer’s recommended procedures.
- Ergonomic sitting arrangements shall be ensured for all employees.

- Fire extinguishers, sand buckets, smoke detectors and fire hydrants shall be installed according to PIEDMC bye-laws (Industrial and Commercial Building Regulations).
- Emergency response plan shall be made, communicated to all and maintained during all of the operations activities.
- Emergency services of Industrial Safety Unit of Sundar Industrial Estate may also be availed.
- Emergency lighting shall be provided wherever it is necessary for employees to remain at their machines or stations to shut down equipment in case of power failure. Emergency lighting shall be provided at stairways and passageways or aisle ways used by employees for emergency exit in case of power failure. Emergency lighting shall be provided in all plant first aid and medical facilities.
- Lockable power disconnect and an effective lockout procedure shall be in place.
- Artificial illumination shall be provided up to required standards according to the operational task.
- First aid facility shall be readily available for the workers.
- Good house-keeping shall be practiced to prevent slips, trips and fall.
- Mandatory personal protective equipment like working uniforms, gloves, special shoes, safety shoes, masks (N95 respirators, surgical masks and face masks), goggles/eye glass, head caps and ear plugs shall be strictly used by the employees according to their assignments. A program shall be established focused on making available the most modern and best quality of PPEs for ensuring occupational health and safety of all levels of employees.
- Smoking shall be avoided to prevent any fire incident.
- Clean drinking water availability shall be ensured by installation of domestic type reverse osmosis (RO) based drinking water treatment plant with adequate drinking facility for use by all operational staff.
- During summer, mineralized fluids should be served to the man power to manage impacts of hot season and prevent chances of heat stress.
- In order to prevent spread of infectious diseases, only the workers tested for harmful infectious diseases shall be hired. Screening test shall be performed at the time of hiring
- Adequate training and awareness about occupational and safety shall be provided to all of the employees.
- Every incident, accident or near miss shall be reported and recorded in order to ensure safe culture and with the objective of attaining zero incidences of mishaps.

4.6.7 Impact on Socio-economic Conditions

A positive impact is anticipated in terms of employment opportunity as many skilled, semi-skilled and un-skilled personnel will get direct and indirect employment during operational phase of the proposed project.

4.6.7.1 Duration

The operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.7.2 Extent & Location

The population in immediate surroundings of the project plot can get employment depending upon their skill match with the requirement of the operational phase of the project.

4.6.7.3 Reversibility

There may be some groups of people which may have concerns with the operational phase of the project. Their concerns have been discussed in Chapter-6, Stakeholder Consultation, in order to better manage them.

4.6.7.4 Likelihood (Risk)

There may be risk of negative thoughts about the project if they are not involved/consulted to express their concerns over the project.

Mitigation Measures

In order to enhance the socioeconomic benefits of the project, local people should be preferably hired for all of the operational activities so that they feel ownership of the project.

4.6.8 Traffic Flow

The project plot is situated within Sundar Industrial Estate. The transportation of raw materials and finished products through Sundar-Raiwind Road shall temporarily cause increased load on the road which already remains congested due to goods transport vehicles.

4.6.8.1 Duration

The transport of raw materials and finished goods operational phase of the project shall have life-long impact on socio-economic conditions of the local population.

4.6.8.2 Extent & Location

Traffic flow upto 5-7 Km of the project plot may get impacted because of narrow size of Sundar-Raiwind Road. It may also impact traffic to and from Raiwind and upto Adda Plot.

4.6.8.3 Reversibility

Management of transport timing during off-peak hours may prevent contribution to congestion the traffic of the area. Thus the impact may be reversed.

4.6.8.4 Likelihood (Risk)

There may be risk of accidents in case of over speeding. In case of undisciplined traffic flow, traffic congestion may occur.

Mitigation Measures

- Transportation of raw materials and finished products shall be scheduled during off-peak hours so far as possible.
- Vehicle operators should be instructed to maintain low speed to prevent any accidents.

4.7 Potential Environmental Enhancement Measures

Following steps shall be taken for environmental enhancement:

- Daily sweeping and dusting/cleaning shall be ensured.
- Vacuum cleaning shall be done daily where required.
- The perimeter and lawns of the plot shall be vegetated with flowering plants and fruit trees for environmental enhancement.
- Additionally, the proponent shall also plant 2000 trees inside and outside of Sundar Industrial estate as part of environmental responsibility.
- There shall be separate drainage for sewerage and rain water.
- Adequate firefighting system will be established and maintained at all times according to PIEDMC bye-laws.
- Visual impact of the unit and its surroundings shall be given due consideration.

CHAPTER-5

ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

5 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING PROGRAM

5.1 General

This chapter describes the Environmental Management Plan (EMP) for the environmental and social mitigation measures identified during the Environmental Impact Assessment and reported in Chapter 4 of this document. The Environmental Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all interested parties including suppliers, contractors and subcontractors and consultants, understand the potential environmental risks arising from the proposed project and take appropriate actions to properly manage that risk. EMP also ensures the project implementation is carried out in accordance with the design by taking appropriate mitigative actions to reduce adverse environmental impacts during its life cycle. Existing environmental regulations are complied with and potential adverse environmental impacts resulting from the project activities are minimized as practicably as possible. This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its execution, to enhance project benefits and to introduce standards of good practices to be adopted for all project works.

The plan outlines existing and potential problems that may adversely impact the environment and recommends preventive and corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel and contractors who are charged with the responsibility to manage the project site.

Environmental monitoring and management have been proposed to be carried out in all stages of the project namely; pre-construction, construction and operational phases. EMP will be operational to ensure legal environmental compliance. Environmental Monitoring by a third party will further ensure operation in environmentally sustainable fashion. The proponent will ensure that the implementation of all phases of the project is in line with the EIA report and Environmental Management Plan.

5.2 Objectives of EMP

For the effective implementation and management of the mitigation measures Environmental Management Plan (EMP) has been prepared to ensure compliance with the basic provisions of the Punjab Environmental Protection Act (Amendment) 2012. A structure of EMP is being given for the assistance of the management of this nutraceuticals manufacturing unit. It is recommended that project management must implement this EMP and where required, changes must be made accordingly. The key objectives of the EMP are summarized below:

- Define roles and responsibilities for all of the interested parties including the project proponent, contractors and construction supervision consultants for implementation of the plan.
- Mention standards which need to be achieved. All relevant legislation is complied with prescribed procedures/standards.
- All environmental safeguards are carried out correctly.
- Provide mechanism for unanticipated environmental situation.
- Identify training requirements at various levels.
- The EMP provides a delivery mechanism to address potential impacts of project activities.
- Minimization of adverse impacts on environment.
- Monitoring of the project for environmental impacts.

5.3 Components of EMP

The EMP of the identified environmental impacts associated with this project consists of the following components:

- Description of the activities that are to be carried during all phases of project.
- Description of aspects which are likely to be impacted due to proposed project.
- Mitigation plan to reduce the severity of associated impacts
- Institutional arrangement and framework for monitoring, reporting and supervision of EMP
- Specific requirements for communication, documentation, training, management and implementation of the mitigation measures
- Monitoring the implementation of the EMP
- Monitoring plan to monitor the impacts and their severity
- Actions required for assessing the effectiveness of the mitigation measures employed such as guide through the monitoring mechanism and identifying related parameters required for confirming the effective implementation of the mitigation measures
- Environmental and social trainings to raise awareness
- Allocation of resources required to implement the EMP and outline relevant expenses arrangements.

5.4 Institutional Capacity/Roles & Responsibilities of Environmental Management Team

Environmental management will be the integral part of the project policy. Therefore, committing to reduce the environmental impacts will reflect the management approach and believe that good performance in this area is identical with running well-managed efficient project operations.

Environmental management is basically the institutional arrangement which delegates some specific assigned responsibilities and those responsibilities are to be monitored properly. During operation phase, main responsibility for environmental performance will be supervised by top management of this

nutraceuticals manufacturing unit, while the daily management will be performed under the direction of Manager Operations and Administrator. Under their supervision, environmental management during operations will be performed as per the mitigation and monitoring plans outlined in this EIA. A brief structure of role and responsibilities is given below:

5.4.1 Top Management

Project proponent will be responsible for monitoring and evaluation. He shall be able to do so with consultation of his Environment Consultant who will be responsible to monitor EMP implementation and reporting to the proponent. The Environment Specialist of consultant will carry out a final evaluation at the end of the project construction. Management will undertake overall responsibility for compliance with the EMP. It will ensure that all activities, management executes with contractors, comply with positive environmental sensitivities as well as it will cooperate with the concerned regulatory agencies such as the Environmental Protection Agency-Punjab.

For effective environmental management, responsibilities shall be set internally as follows:

5.4.1.1 Chief Executive Officer

- To cooperate and consult with relevant environmental agency in order to perform in better way.
- Over all in-charge of all the Environmental Management Plan (EMP) and EMtP.
- He will be responsible to ensure smooth functioning of the EMP and EMtP system.
- To evaluate the progress of development and implementation of this management plan.
- Daily progress on the state of the environmental performance will be reported to her by General Manager.
- All Environmental Management and Monitoring matters, issues and problems will be reported to her.
- To approve any change in decision making with the consultation of respective managers, if appropriate.

5.4.1.2 General Manager

- He will be responsible to look into smooth functioning of the processes in environmentally sustainable fashion.
- He will directly report and will be answerable to the higher management in all matters relating to EMP.
- He will be responsible to rectify any problem regarding environmental matters.
- He will be responsible to get all environmental monitoring carried out according to the monitoring schedule and will keep records

5.4.1.3 Contractor

The contractor will carry out field activities as part of the proposed project that includes relevant and subsidiary construction work. The contractor will be subjected to certain liabilities under the environmental laws of the country which will be mentioned in the contract with the project site engineer. On behalf of contractor, top management will be responsible for all issues pertaining to environment of the assigned contractor. The delegated roles and responsibilities of the contractor will consist of the following basic points:

- To carry out construction activities in environmentally sound manner.
- To coordinate with the HSE Officer to resolve issues arise during construction phase.
- To manage and implement environmental management practices as per the impact assessment report as well as HSE polices belong to both contractor and project site engineer.
- To manage construction crew and reduce the environmental impacts.

5.4.1.4 Manager Operations

The role of these managers will be crucial during the operation phase as all of the key environmental aspects listed fall into their respective domains. Followings are some of the common roles and responsibilities given to these positions:

- To ensure that the points of views of staff, are considered and placed in the EMP accordingly
- To regularly meet and resolve the upcoming and on-going environmental issues.
- To identify issues and where possible propose solutions for inclusion in the management plan review process.
- To make sure that relevant staff is adequately trained to carry out their respective duties in order to improve environmental performance of the nutraceuticals manufacturing unit operations.
- To contribute towards the actions to deliver the management plan and ensure its continued improvement.

5.4.2 Construction Manager

The role of Construction Manager is very important. The success of an EMP will mainly depend upon effective management by this person. During the construction phase, main responsibility of environmental performance will reside with proponent’s construction manager, who will be assisted in daily activities monitoring by site HSE Officer. Followings are some of the roles and responsibilities given to the Construction Manager:

- To ensure that the staff, contractors and HSE Officer’s point of views are considered and placed in the EMP accordingly.

- To identify issues and where possible, propose solutions for inclusion in the management plan review process.
- To improve coordination and exchange of information between management, employees, contractors, etc.
- To contribute towards the actions to deliver the management plan and ensure its continued development.
- To monitor the progress of development and implementation of this management plan.

5.4.3 Role of EPA-Punjab

District Office of the EPA-Punjab will monitor the overall environmental performance of all phases of the project.

5.5 Monitoring Program to Assess Performance of EMP

Environmental monitoring of this nutraceuticals manufacturing unit will be carried out according to schedule as given in Table 5.3 and be reported to the EPA-Punjab. Monitoring of all the activities will be required to analyze the impacts of construction and operation phases on the environment. After start-up, a comprehensive monitoring for all PEQS parameters for normal operations will be carried out. Thereafter, subsequent regular monitoring will be restricted to priority parameters. This is to establish that this project of nutraceuticals manufacturing unit does meet the environmental commitments made in this EIA Report.

For external monitoring, proponent shall engage an independent agency to conduct third party validation of EMP implementation. All monitoring data shall be reviewed and analyzed regularly in comparison with the PEQS limiting values. In case of any deviation, immediate necessary corrective actions shall be taken.

5.5.1 Responsibilities for Monitoring

HSE officer will coordinate with construction manager and contractor site representative to monitor environmental parameters during the construction phase.

During operations, the Manager Operations will follow the monitoring plan as mentioned in Table 5.3. They will keep record of all environmental non-compliances and report them along with the corrective actions in regular quarterly meetings with the top management.

5.6 Reporting and Reviewing Procedures

Monitoring schedule will be adhered to and all the data to be monitored will be scrutinized at the level of General Manager and on regular basis at the Chief Executive Officer level. For presentation of the data to the Government Agencies, approved data recording format will be followed. Some of the

approaches to be followed during the environmental management practices are given below:

- Complying with the relevant legislation and regulations
- Developing appropriate indicators in order to monitor core impacts.
- Regularly reviewing of the impacts on the environment.
- Setting appropriate annual objective, targets and public reporting on progress.
- Communicating openly with internal and external stakeholders on environmental issues.

5.7 Training Needs and Schedule

Training is another major step for the implementation of EMP. All the employees will require training appropriately to work on EMP effectively. There are lots of advantages of training including help in minimizing the waste generation and conserving resources. General Manager shall be responsible to determine the training requirements in consultation with project workers.

To enhance the capacity of the proponent as well as the contractor, training will be imparted related to the environmental and social issues of the project, implementation of mitigation measures, the monitoring protocols and reporting mechanism. The training during construction will be conducted by PMU of the project. PMU will ensure in-house training for the project staff i.e., labor, masons etc., contractor, and the supervisory staff covering environmental and social aspects of the project with emphasis on the roles and responsibilities of the proponent and the contractor's staff. This shall be done just after recruitment of staff and also just before commencement of the construction activities. Subsequently, during operations, the proponent shall ensure that all the recruited staff receives basic training as well as recurrent training for his operational role as well as his role and responsibility regarding environmental management at the unit. Basic training shall be imparted just after recruitment of every staff and subsequently recurrent training shall be imparted annually.

5.7.1 Training Syllabus Contents

The training will include the following aspects:

- Identification of all environmental aspects of construction and operation.
- Likely impacts on these aspects of the environment.
- Measures to be adopted for avoiding or minimizing impacts on these aspects of the environment.
- Measures to be adopted for avoiding or minimizing water pollution, air pollution and safe waste disposal practices.
- Defining roles, responsibilities and authorities of every one for environmental management plan during construction and operations.
- Permissible limits for all environmental aspects according to Punjab Environmental Quality standards.

- Safety measures against hazards for workforce and the local communities arising from the construction and operation activities.
- Occupational health and safety aspects, use of personal protective equipment by the workforce during construction and operations.
- Emergency preparedness and response.
- Fire safety and management.
- Fire drill shall be performed every year during operations to aware the employees about their roles, responsibilities and authorities. This shall also help maintenance of the equipment installed for fire management.
- Safe work practices to ensure safe culture.

5.8 Environmental Management Plan

The preparation of this plan has involved an extensive and detailed program of investigation to the processes and issues involved and with consultation of project's management and all others concerned. Therefore, this network will provide a structure to assist in the implementation of the management plan accordingly.

The success of the management plan will lie with its implementation. An EMP requires to be executed in three stages. Those are, planning & design stage, construction stage and operation stage.

5.8.1 Pre-Construction Phase EMP

Implementation of EMP at this stage may tackle the environmental issues before they arise i.e., prior to the construction phase. Following three main components to be considered in EMP are given below:

5.8.1.1 Design Stage

It describes the location of proposed project, its adjoining conditions in the area, facilities to be installed in particular locations as well as their mechanics and other related operations. If any design parameter changes at time of approval, management will assess the environmental impacts that may arise from such changes. If the impacts are found to be different and in excess of those mentioned in the report, project management will develop further mitigation measures with respect to the changes to minimize these impacts and seek approval for the required change from Environmental Protection Agency-Punjab as well as other regulatory authorities, if comes under.

5.8.1.2 Approvals

The proponent is bound to get all relevant clearances and necessary approvals required by the government prior to commencing the project activities regarding nutraceuticals manufacturing unit (for example DRAP license). Hence No objection certificate from the Environmental Protection Agency-Punjab will not relieve the project management and they have to fulfil the other requirements as well for starting their project. Approval from PIEDMC shall take place in two steps i.e., Submission Stage and Completion

stage. Submission stage approval by PIEDMC is mandatory before commencement of construction of the project at Sundar Industrial Estate. After construction, machinery shall be installed and application shall be filed for completion stage. This shall be the time when application for Environmental Approval for Operation phase of the project shall be filed before EPA-Punjab. Thus, Submission approval by PIEDMC and Environmental approval for construction phase by EPA-Punjab shall be part of pre-construction phase.

5.8.1.3 Contractual Provisions

The requirements of environmental impact assessment in terms of environmental mitigation shall be incorporated into the operations plans and procedures of the contract. Therefore, signing of contract will strictly bind contractor to follow those procedures and must comply the environmental regulations.

5.8.2 Construction Phase

During the construction phase, the management will assign an HSE Officer, whose role will be to implement all environmental related issues as per the mitigation matrix in the EIA.

5.8.3 Operations Phase

During normal operations of the project, the proponent will assign all specific environmental related actions to respective departments who will be fulfilling their responsibilities as per the mitigation and monitoring matrices.

5.8.4 Mitigation Plan

The Environmental Management Plan is meant for mitigation, management, avoidance of the adverse impacts. It defines all the impacts and their remedies with highlighting the responsible personals to work on those mitigations. The identified impacts and suggested mitigation measures with institutional responsibilities are tabulated in Table 5.1 and Table 5.2. All these impacts and mitigations have already been given in previous chapter of this report. Project management and construction contractor will be required to adhere these mitigation measures throughout the project. For each mitigation measure to be taken, its location, timeframe, implementation and supervising responsibilities are listed in the EMP.

Table 5.1: Environmental Management Plan of Construction Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	Supervision	Monitoring
Solid Waste Solid waste shall be generated in the form of excavation waste, excess fill materials, small concrete spills, broken bricks, wasted concrete material, scrap wood and metals, etc.	The construction site shall be equipped with temporary bins for waste collection and segregation. All kinds of solid waste shall be kept segregated. Development of proper solid waste management system (Collection, storage, segregation, transportation and disposal). The waste collection and disposal schedule should be made so as to prevent any kind of nuisance at the site. The construction staff shall be trained regarding housekeeping practices. At the end of all processes, whatever left behind shall be disposed of through construction waste contractor. Municipal waste shall be stored in specific color coded bins provided and managed	Construction Staff	PMU	Proponent

	through arrangements of Sundar Industrial Estate.			
Water Quality There shall be additional load on ground water resources supplied by Sundar Industrial Estate through overhead water tanks. Construction activities may cause the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved.	Spills and wastage should be prevented which may cause contamination of ground water. Solid waste should be prevented to enter into water. Water consumption shall be kept at minimum and even the amount used also will mostly percolate to ground water table thus recharging it. Storm water shall be managed such that it can be used beneficially. The runoff shall be diverted to green belt areas of SIE. Sanitary wastewater shall be discharged to sewerage system of SIE from where this is disposed after treatment.	Construction Staff	PMU	Proponent
Air Quality Particulate matter may arise due to localized excavation in soil for foundation purpose, ground leveling activities, deposits of construction	Trucks carrying, soil, sand, aggregate and other materials will be kept covered with tarpaulin to contain the construction materials being transported within the body of each carrier. Regular tuning and maintenance of	Construction Staff	PMU	Proponent

materials and also due to movement of off-road or on-road automobiles. Off-road or on-road automobiles shall also cause exhaust pollution.	engines ensures good efficiency. Waste burning will not be allowed. Sprinkling of water on regular basis especially during dry seasonal conditions should be carried out to limit dispersion and suspension of particulate matter Regular sweeping of roads and parking areas to avoid deposition of dirt. The workers shall be provided with appropriate masks for use against air pollution due to cutting, grinding and welding.			
Noise During the construction phase of the project, noise sources may include heavy construction machinery, shuttering and scaffolding, cutting of metal parts, on-road and off-road vehicles.	All construction equipment should be maintained in good working order. The noise sources shall be enclosed with acoustic proof material to decrease the noise levels. Noise from construction equipment shall meet the applicable standard in PEQS. Avoid use of pressure horns. Provision and use of PPEs shall be	Construction Staff	PMU	Proponent

	ensured. Lubricate all moving parts of the machinery. Noise barriers shall be installed as practicable. Work shall only be done during day time thus sleep of the surrounding community shall not be disturbed.			
Spillage of oil and other lubricants	Maintenance of the contracted and outsourced logistics shall be the responsibility of outsourced contractors.	Construction Staff	PMU	Proponent
Soil Soil may erode by exposure of soil surface to rain and wind during site clearing, earth moving, and excavation activities.	Providing adequate surface material compaction and maintenance. Only localized excavation shall be done with drilling equipment.	Construction Staff	PMU	Proponent
Traffic Flow Lahore-Raiwind Road remains congested most of the times due to goods transport vehicles serving various industries of Sundar Industrial Estate. A slight increase is apprehended	The transportation of construction materials may be scheduled during off-peak hours. This is a small scale project and shall need transport of materials only few times.	Construction Staff	PMU	Proponent

due to construction of the proposed project.				
Occupational Health and Safety There may be risks associated with work at height. Due to interaction of workers from various backgrounds, there is possibility of contagious diseases. Construction activity pose particulate pollution hazard to workers. Fire safety measures.	First aid facilities should be readily available Construction workers shall be provided with adequate awareness and training about HSE aspects of the project. Provision and use of suitable Personal Protective Equipment. Work at height should be performed under supervision of HSE Officer who shall issue work at height permit after taking all appropriate measures. Emergency response plan should be made and relevant facilities established and maintained Safety signs should be displayed. Smoking should be prevented to prevent fire hazard. Electric earthing shall be done to prevent electric shock to workers.	Construction Staff	PMU	Proponent

	Welding should be done with all safety precautions. Safety shoes shall be worn by the workers while performing jobs related with electric equipment. SIE Industrial Safety Unit may assist in fire and other kinds of emergency management. Reporting and documentation of all incidents, accidents and near misses shall be ensured.			
Construction materials such as sand, gravel etc.	Stockpiles should be covered to prevent dispersion of materials These should be surrounded by low brick wall to prevent their spreading on the ground.	Construction Staff	PMU	Proponent
Socioeconomic Impacts	Aesthetic of the area should be protected so far as possible Unnecessary use of horns should be prevented Hire local people to the maximum possible extent if competent people found from the area	Construction Staff	PMU	Proponent

Table 5.2: Environmental Management Plan of Operational Stage

Anticipated Environmental Aspects and Impacts	Proposed Mitigation Measures	Institutional Responsibility		
		Implementation	Supervision	Monitoring
Air Pollution All of the processes shall be carried out inside the enclosed machines.	The dust (if any) in mixing section can be picked up by local exhaust system or dilution through ventilation. Dispensing shall be done in fume hoods. Workers shall be provided with specific masks to protect their breathing system. Heat ventilation and air conditioning system shall be installed. Offices and control rooms shall be kept air conditioned. The transport vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. Limited entry to vehicles under the	General Manager	Environment Consultant.	Proponent

	indoor areas. All the open soil shall be grassed or tuff tiled to prevent dispersion of disintegrated soil and fugitive dust.			
Water Quality Water shall be consumed for manufacturing purposes. A batch of different formula/recipe of the pharmaceutical shall require washing of the equipment. Sanitary waste from toilets.	Water after treatment through reverse osmosis (RO) shall be used. Water from washing shall be circulated again and again to recover its valuable contents as it shall contain the raw material ingredients. This recovery shall help saving quality and quantity of water. RO reject water shall be used for irrigation of the lawns and for general sanitary purposes. Screening of solid contents of water at source in order to decrease pollution load of effluent water. Drainage lines shall be periodically cleaned. There shall be separate lines for drainage of storm water and waste water.	General Manager	Environment Consultant	Proponent

	According to PIEDMC bye-laws, septic tanks shall be constructed for wastewater management. All wastewater shall flow to septic tank from where it shall reach composite effluent treatment plant of Sundar Industrial Estate for treatment before ultimate disposal. If effluents contain any substance which is out of the domain of treatment by CETP of SIE, it shall be treated locally at the unit according to type and amount of the substance to be discharged. Special care shall be taken to conserve, and preserve water resources. The leakage of sewage shall be strictly prevented and if such a chance happens, immediate action must be taken so that mixing of the sewage with ground water or soil will be absolutely avoided. All drainage works shall be designed and constructed in accordance with			

	the requirements of the EPA-Punjab.			
Noise Noise may be generated by operation of the machines.	Better maintenance and lubrication of all the machinery may keep the noise under control. Regular monitoring of noise may be carried out every year to check the efficacy of control measures. The whole machinery shall be enclosed and isolated hence decreasing the impact of noise levels. Guarding of the moving parts also shall reduce the noise. The interaction of employees with machines shall be very less. Therefore there are less chances of impact of noise to them. Employees shall be provided with ear plugs and/or ear muffs to prevent entry of sound waves into ear canal. Equipment will be regularly inspected for good working condition.	General Manager	Environment Consultant	Proponent

	Plantation of trees along perimeter of the building shall reduce impact of noise from outside sources reasonably.			
Solid Waste The manufacturing process of nutraceuticals shall be material efficient. Solid waste may be generated in the form of packing of raw material such as plastic containers, cans, sacks and wrappers. This may also include packing of finished products such as PVC, aluminum foil, cardboard, glass. According to present proposal the proposed raw materials to be used or the products produced shall not generate any hazardous solid waste. Besides this operational waste arising out of manufacturing processes, municipal solid waste shall also be generated.	The waste composition shall be non-hazardous, non-infectious and just like municipal waste. It shall be managed through certified private waste management contractor for reuse, recycling and incineration as may be appropriate. Thus the industrial solid waste shall be treated in an environment friendly manner. No on-site burning of wastes will be allowed at any time. Empty sacks/bags of resin shall be sold to contractor for reuse in the market. Packing shall be either reused or it shall be sold to open market for reuse or recycling. Commercial and industrial waste shall be carefully segregated according to the type and sold in the	General Manager	Environment Consultant	Proponent

	market for reuse and recycling as may be appropriate. All kinds of wastes shall be kept in segregated and color coded bins. Provision of sufficient waste disposal points. Collection schedule of waste will be according to the rate of generation. Training of personnel in proper waste management practices. Municipal Solid Waste shall be carefully segregated according to the type and managed by SIE.			
Occupational Health & Safety Heat Ventilation and air conditioning. Interaction of workers with machines, raw materials and finished products. Particulate Air pollution due to various processes.	All the blenders/high speed mixers shall be kept tightly closed during their operation to prevent dispersal of any fine particulate in the surroundings. All additives shall be handled according to their safety data sheets. All machinery shall be by default safe-guarded.	General Manager	Environment Consultant	Proponent

Electrical hazards Safeguards. Fire Safety measures.	Heat Ventilation and air conditioning system shall be installed to control indoor temperatures. Provision of ergonomically designed seats for machine control panel operators. All employees should undergo occupational health and safety training including training about safe lifting practices. First Aid kit shall be provided. Fire extinguishers and fire buckets shall be installed for fire safety according to PIEDMC Industrial and Commercial Building Regulations. Workers shall be provided with appropriate kind and number of Personnel Protective Equipment (PPE). Emergency response plan should be made and relevant facilities established and maintained			

	Safety signs should be displayed. Smoking should be prevented to prevent fire hazard. Electric earthing shall be done to prevent electric shock to workers. Safety shoes shall be worn by the workers while performing jobs related with electric equipment. SIE Industrial Safety Unit may assist in fire and other kinds of emergency management. All safety incidents shall be recorded and monitored with the objective of attaining zero incidences of mishaps. Weight of input materials should be kept as low as these may not cause musculoskeletal problems for loading staff.			
Ecology	Plantation of trees shall be carried out in and around the project site. A large portion of the plot has been proposed to be planted with fruit	General Manager	Environment Consultant	Proponent

	trees, flowering plants and grass.			
Socioeconomic Impacts Local norms and values Standard of Living	Local norms and values should be respected. Unnecessary use of horns should be prevented. Local people shall be hired to the maximum possible extent if competent people found from the area.	General Manager	Env. Consultant.	Proponent
Traffic Flow A slight increase in congestion is apprehended at Sundar-Raiwind Road due to proposed project.	The transportation may be scheduled during off-peak hours.	General Manager	Env. Consultant.	Proponent

5.9 Environmental Monitoring Program

The purpose of monitoring is to get acquainted with actual quantitative assessment of environmental aspects to verify that their values are within permissible limits as defined by Punjab Environmental Quality Standards. Therefore, in order to remain rational with the help of quantitative assessments instead of merely making assumptions about status of environmental aspects, following environmental monitoring plan has been proposed:

Table 5.3: Environmental Monitoring Plan

Environmental Aspect	Parameters	Concerned Location	Frequency
Construction Phase			
Ambient Air	CO, SO_x, NO_x, O_3, PM	Project Site	06 Months
Ground Water	All parameters as described in PEQS	Water Connection at site	06 Months
Noise	Industrial Noise	Project Site	06 Months
Solid Waste	Generation Rate according to type of waste	Project Site	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Project Site	Daily
Operational Phase			
Ambient Air	PM	Production rooms	Annually
Waste Water	pH, temperature, BOD, COD, TSS, TDS	End of pipe effluent	Annually
Noise	Industrial Noise	Production rooms	Annually
Solid Waste	Generation Rate according to type of waste	Solid Waste Bin	Fortnightly
Occupational Health & Safety	Fire, ERP, PPE's	Whole unit	Daily

5.10 Equipment Maintenance Schedule

The project shall involve use of machines and equipment involving calibration such as pressure and temperature gauges during operation. The quality assurance laboratory shall involve many sophisticated instruments. Maintenance & Repair plan shall be carried out as per procedures advised by the manufacturer and on need basis. After every batch of products, in case of change in the kind of nutraceuticals formulation for a specific product, there shall be need for overall cleaning and maintenance check of the equipment.

Fire safety equipment shall be kept maintained and monitored monthly. The condition of the first aid box and PPEs shall be maintained regularly. The schedule of maintenance shall be daily, weekly and monthly basis for overall cleaning and maintenance check of all of the equipment.

5.11 Communication and Documentation

Progress evaluation, documentation and communication will play a vital role in good management practices. Steps given below will assist in effective communication and documentation.

A kick-off meeting may be arranged at the start of construction phase, which will communicate the importance of meeting. EMP will be provided to the construction contractor and discuss the implementation steps.

Operation/HSE manager will arrange departmental meeting regularly on weekly basis throughout the project. The purpose of this meeting shall be to discuss day-to-day problems arise during work, steps to be taken to resolve problem, overview on the progress of HSE department and contractor with respect to the EMP. An overview on monitoring plan and progress with respect to changes made in operations/documentation/EMP will also be discussed. All the HSE matters will be discussed in detail and if any problem sought, another meeting will be called-on to discuss solutions within time.

Weekly meeting will be attended by Manager Operations/Administrator, HSE officer and contractor representative. Such meetings will help out in the effective monitoring, management and documentation of the environmental performance during construction and operations. Any issues that require attention of higher authorities will be communicated to Top Manager (Operations) for necessary action. Quarterly meetings will also be arranged which will be headed by Top Manager (Operations).

In the end of weekly and quarterly meetings, minutes will be issued that may be incorporated in the record register. Meeting minutes will also be sent to contractor and higher authorities for their own record. On the basis of decisions taken in meetings if any change in documentation required will be incorporated in the respective document.

5.12 Environmental Management Budget

The environmental management cost aside from other costs is as follows:

Table 5.4: Environmental Management Budget

Aspect	**Quantity**	**Estimated Cost (PKR)**
Tree Plantation	2000	2,00,000
Occupational Health and Safety Management		2,00,000
Fire Safety		1,00,000
Training & Awareness		200,000
Scheduled Monitoring		200,000 per year
Total		**9,00,000**

5.13 Schedule of Implementation of EMP

The implementation of environmental management plan shall start from pre-construction stage and shall remain effective throughout all phases of the project namely pre-construction, construction and operation phase. Even when life cycle of the project shall be ending, it shall be carried out under environmental controls.

CHAPTER-6

STAKEHOLDERS CONSULTATION

6 STAKEHOLDERS CONSULTATION

6.1 General

This chapter includes the output of consultations carried out with the people of the project area. This elaborates the findings from the field and data collected from public. These include local residents who also carry out different businesses such as shop keepers, labour, farmers and entrepreneurs. These also include representatives of the management of Sundar Industrial Estate. Their feedback regarding the project has been recorded through a questionnaire and interviewing them to fill the questions of questionnaire. Other stakeholders were also consulted.

6.2 Importance of Public Consultation

Public participation is an integral part of EIA. Public participation means that public should be consulted, informed, or involved in the decision making process and public should know about the project in detail. The “Policy and Procedures for the filing, review and approval of environmental assessments” requires proponents to consult with the affected community and NGOs during preparation of an environmental report. The “Guidelines for the preparation and review of environmental reports” by Pakistan Environmental Protection Agency contain a number of references to the need for public involvement. Public participation is compulsory under the Punjab Environmental Protection Act. According to Punjab Environmental Protection Regulations-2022 under section 9 require that public notice should be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the affected area at least 07 days before the hearing. The public notice contains information on project type, location, name, address of the proponent and the place from where EIA report can be accessed.

The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national/international safeguard policies.

6.3 Objectives

The objectives of this process were to:

- Inform the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts on the physical, biological and socioeconomic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts of construction and operation related activities;

- Provide an opportunity for those otherwise unrepresented to present their views and values therefore allowing more sensitive consideration of mitigation measures and trade offs
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner;
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.
- Increase public confidence in proponent, reviewers and decision makers.
- Provide better transparency and accountability in decision making
- Develop truly sustainable proposal.

6.4 Methodology

Guidelines for Public Consultation by Pakistan Environmental Protection Agency issued dated October, 1997 have been used for carrying out this process. For public consultation and participation, main stakeholders were interviewed and asked about their concerns. Subject specialists and field experts have also been consulted in order to get their technical verdict.

For ascertaining the perceptions of different stakeholders about the project (during construction/operation) consultation meetings were held with them. These meetings were carried out in the vicinity areas of Mull, Sultanke, Nullah village, Wara Siddhu Wala, Small Industrial Estate.

Firstly, the project has been described briefly before the stakeholders in local language without going into its technical details. Their response has been recorded in the form of a questionnaire (attached herewith under Annexure-III). In this questionnaire, brief introduction of the stakeholder is followed by their response in the form of their answers to questions pertaining to the project.

6.5 Identification of Stakeholders

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. These included local people, other affected communities, proponent, government agencies and interested public.

6.5.1 Proponent’s Environmental Management Team

The environmental management team of the proponent shall have to be involved to give their input to better manage all the environmental aspects of across all phases of the project. They shall define all kinds of resources required for the implementation of the EMP. Therefore, they have to be taken onboard for all decision making.

They will present the project to all stakeholders and record their stakes on the project. In the light of the feedback of stakeholders, better planning shall be possible.

6.5.2 The Responsible Authority

Various personnel of EPA-Punjab, Lahore have been consulted to format this report in accordance with stipulated statutory requirements contained in Punjab Environmental Protection (Amendment) Act-2012 and Punjab Environmental Protection (Review of IEE/ EIA) Regulations-2022.

6.5.3 Other Departments & Agencies

The board of management of Sundar Industrial Estate, Lahore has also been consulted to know their specific requirements in the light of PIEDMC Industrial & Commercial Buildings Regulations. BOM-SIE is the sole authority to approve the project submission case followed by completion case.

6.5.4 Environmental Practitioners & Experts

Teachers from College of Earth & Environmental Sciences, University of the Punjab, Lahore have also been consulted. These included subject specialists of Occupational health and safety, Waste Water Treatment, Hydrology, Geology and Toxicology. Views of other environmental consultants have also been included.

6.5.5 Affected & Wider Community

The stakeholders identified during field survey also included the local residents, politicians, private land & shop owners, shop keepers (renters), customers, pedestrians. Some of the local people were found hesitant to respond. They were engaged and taken into confidence that their response shall be beneficial to them and shall never harm them. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

Table 6.1 List of Stakeholders consulted

S#	Stakeholder Name	Designation	Area
1	Mr. Shahzad Azam	Ex. President SIE	Sundar Industrial Estate
2	Mr. Ahsan K.Gulzar	CEO	Forte Pakistan Engineering Company Limited, 89-SIE, Lahore
3	Mr. Nazar Abid	CEO	Elektra Switchgears, 68-SIE, Lahore
4	Mr. Umair Sajid	CEO	Sundar Engineering Services, 87-SIE, Lahore
5	Mr. Fawad Atif	CEO	97-SIE, Lahore

	Dosslani		
6	Mr. Mubeen Yaseen	Shopkeeper, General Store	Village Mull
7	Mr. Qamar Farooq	Shopkeeper, Cosmetics Store	Village Mull
8	Mr. Nazir Gujjar	Land Owner	Sultanke
9	Mr. Muhammad Tariq	Brick Kiln Owner	Sultanke
10	Mr. Rana Khalil Ahmed Manj	Property Dealer, Farmer, Politician	Sultanke
11	Mr. Saim Farooq	Helper	Nullah Village
12	Mr. Liaqat Maseeh	Livestock Farmer	Nullah Village
13	Mr. Salmoon Arshad Naz	Kiryana Shopkeeper	Nullah Village
14	Mr. Rana Shaukat Ali	Farmer	Wara Siddhu Wala
15	Dr. Khalid Mahmood	Homeopathic Doctor	Wara Siddhu Wala
16	Mr. Riasat Ali	Mason	Wara Siddhu Wala
17	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
18	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

6.6 Concerns of the Stakeholders

The project site exists in Sundar Industrial Estate. This unit has been surrounded by other similar kind of industrial units within Sundar Industrial Estate. At the time of establishment of Sundar Industrial estate, public consultations were held with the people from the project area as part of EIA of the estate. The public consultation for establishment of nutraceuticals manufacturing unit has been carried out with specific scope of the construction and operations of this unit inside the estate. The individual feedback has been annexed in Annexure-III. Their feedback has been summarized as follows:

- Most of the people of the study area perceive overall positive impacts as a result of establishment of nutraceuticals manufacturing unit. Their attitude towards the project is quite positive.

- They are of the view that the project will open up new direct or indirect job and business opportunities for the people of the project area. This will result in poverty alleviation though to small extent.

- People especially comment that this area had been uninhabited since long. There was no use of this land. With the industrial development, the overall standard of living of the people has improved. The establishment of this unit shall also contribute to this phenomenon.

- Local residents of the area should be preferred for filling job vacancies of the unit.

- Some people are of the perception that the unit shall not emit hazardous air emissions and shall have relatively clean workplace.

- Some of the people also responded that they do not have any link with what is going on inside the estate. They have never been consulted like this in the past for any projects inside the estate.

- The farmers of the surrounding vicinity responded that if the establishment of the unit does not harm their agricultural land, then they do not have any objections.

- The people also perceive accelerated economic activity due to the small business opportunities likely to emerge in the area, e.g. shop keepers, traders, suppliers, contractors, transporters, labor etc.

On the basis of the impacts of already established units, the public also have shown their apprehensions. These are as follows:

- After the establishment of the estate and subsequent establishment of industrial units, local demography of the area has been changed. Locals have either sold out their houses or have rented out to the migrants. We (the locals) do not have knowledge about the background of the incoming people.

- The groundwater has become polluted. Its taste has been changed after development of industrial units. We even do not desire to use it for washing.

- It has come into our knowledge that a foundry has pumped their waste water underground which has harmed the groundwater resources.

- If our land, ground water and air do not get polluted then we do not have objections over the establishment of the unit.

- Some people have shown that they will neither be benefited nor be harmed by the project.

- The unit should manage their wastes wisely without harming local natural resources.

- People have to either purchase water for drinking or are dependent on the water from treatment plant installed by people on charity basis.

- According to a homeopathic doctor, spread of skin diseases, sugar, and blood pressure has increased.

- Something should be done about the development of the locality.

6.7 Mitigation Measures proposed for addressing the Stakeholder's Concerns

- Local residents should be given priority while hiring during construction and operation phase of the proposed project.

- The waste water shall be managed in an environment friendly manner. It shall not be pumped into the underground at all. The sewerage shall be managed by Sundar Industrial Estate whereas there shall not be any hazardous kind of process wastewater.

- There shall no air emissions due to operations of the unit which can harm the surrounding community.

- The solid waste shall be managed by the management of Sundar Industrial Estate and also by outsourced contractor who shall manage the solid waste according to the environmental guidelines.

- There shall not be any displacement of the surrounding community.

Figure 6.1: Highlights of Public Consultation Survey-A

Figure 6.2: Highlights of Public Consultation Survey-B

Figure 6.3: Discussion with Owner of Plot 97 surrounding project site

Figure 6.4: Discussion with Owner of Plot 68 surrounding project site

Figure 6.5: Discussion with Owner of Plot 89 surrounding project site

Figure 6.6: Discussion with Owner of Plot 87 surrounding project site

Figure 6.7: Meeting with Assistant Professor, Punjab University, (Waste Water Expert)

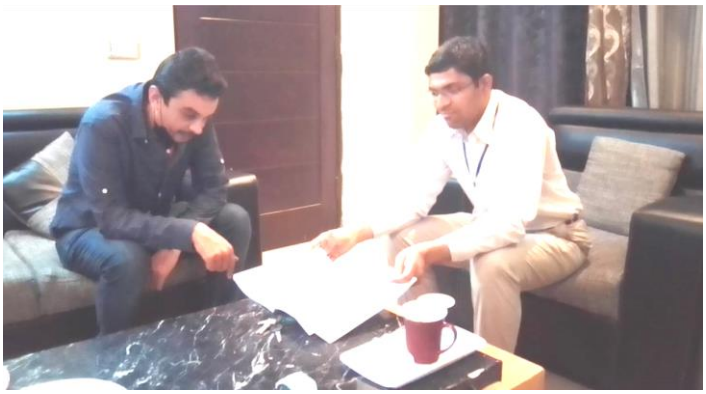


Figure 6.8: Meeting with CEO, Well On Techniques, a Water Treatment Company

CHAPTER-7

CONCLUSION & RECOMMENDATIONS

7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

The project aims at establishment of Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited at Plot No. 537-A, Sundar Industrial Estate, Raiwind Lahore. According to the "Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022" the project falls in Schedule-II. Accordingly, this Environmental Impact Assessment report has been prepared for issuance of NOC/EA by EPA-Punjab, Government of the Punjab, Lahore before initiation of the project on ground. The study has been conducted according to Guidelines issued by Environmental Protection Agency-Government of Pakistan in 1997.

On the basis of this Environmental Impact Assessment (EIA) Report of the project, it is concluded that:

i. There are no sensitive elements/segments of environment around the project site.
ii. No gaseous emissions will be generated due to the operations. Although construction phase shall cause some particulate pollution yet this shall be kept under PEQS with the help of applicable controls. Thus, air emissions during both construction and operations phase of the project shall be within Punjab Environmental Quality Standards.
iii. During operations, washing water shall be circulated again and again in the system thereby decreasing pollution load.
iv. Noise level, waste water and solid waste will remain well within the prescribed limits of the PEQS.
v. EMP as recommended in this EIA Report is to be put in place during construction as well as operations of the project.
vi. EMP shall guide about specific actions deemed necessary to assist in mitigating the environmental impact of the project.
vii. If steps described in EMP are fully practiced, the project shall not have significant harmful impacts.
viii. Monitoring of all environmental parameters by a third party shall endorse that the project will run in accordance with legal requirements.
ix. The positive impacts of the project outweigh negative impacts.
x. Endangered species have not been found in the area which is expected to be impacted by the project.
xi. The project does not involve displacement of the local population.

7.2 Recommendations

Being aware of the environmentally responsibility, the proponent has proceeded for this Environmental Impact Assessment study and making its report. The proponent aims to and commits to comply with all legal requirements pertaining to environmental protection applicable for the time being.

On the basis of the potential impacts, the project can be categorized as favorable and having only low adverse impacts. The project potential impacts will be mitigated by adopting all suggested technical/engineering best practices and measures. The EMP developed needs to be fully implemented during the both construction and operation stage of the project.

Following are the major recommendations:

1. The project should be established according to the specifications as defined in documents. If any changes needed on the ground, these should also be documented. i.e. there should not be conflict between reality and documentation.
2. Environmental monitoring should be regularly carried out according to schedule defined in this EIA report.
3. All the legal and regulatory provisions should be complied with including PIEDMC bye-laws, Punjab Environmental Quality Standards etc. during all phases of the project.

Detailed and points wise recommendations have already been described in Chapter 4 and 5 and have been summarized in executive summary of this EIA Report.

The facts summarized as above, and the whole discussion made in the foregoing chapters of this report support that the project merits for issuing Environmental Approval by the Environmental Protection Agency-Punjab, Lahore for construction and operation of the project.

ANNEXURES

ANNEXURE-I

GLOSSARY

Air Pollutant:

Any substance that causes pollution of air and includes soot, smoke, dust particles, odor, light, electromagnetic radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substance and radioactive substances.

Biodiversity:

The variability among living organisms from all sources including inter alia terrestrial, marine and other aquatic ecosystem and the ecological complexes of which they are part; including diversity within species, between species and of ecosystems.

Climate:

The weather conditions prevailing in an area in general or over a long period typically averaged over a period of 30 years.

Ecosystem:

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Effluent:

Any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor.

Environment:

Air, water, land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; all social and economic conditions affecting community life; and the inter-relationships between any of the aforesaid factors.

Environmental Impact Assessment:

An environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed.

Ergonomics:

Derived from the Greek *ergon* (work) and *nomos* (laws) Which means the science of work. It is a scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design workplace in order to optimize human well-being and overall system performance.

Initial Environmental Examination:

A preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment.

Meteorology:
The scientific study of the atmosphere that focuses on weather processes and forecasting.

Noise:
The intensity, duration and character of sounds from all sources, and includes vibration.

Occupational Health and Safety Aspects:
Health and Safety Aspects pertaining to workplace.

Proponent:
The person who proposes or intends to undertake a project.

Standards:

Qualitative and quantitative standards for discharge of effluents and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Punjab Environmental Quality Standards, emission standards and other standards established under this act and the rules and regulations made there under.

Waste:

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

Weather:
The state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc.

ANNEXURE-II

LIST OF ABBREVIATIONS AND SYMBOLS

CETP	Composite Effluent Treatment Plant
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
dB(A) Leq	Decibel (A) L Equivalent
EIA	Environmental Impact Assessment
EA	Environmental Approval
EMP	Environmental Management Plan
EMtP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
ERP	Emergency Response Preparedness
IEE	Initial Environmental Examination
HSE	Health, Safety and Environment
KW	Kilo Watt
LESCO	Lahore Electric Supply Company
MSDS	Material Safety Data Sheets
MSL	Mean Sea Level
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NO_X	Nitrogen Oxides
O_3	Ozone
OHS	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
PGA	Peak Ground Acceleration
PIEDMC	Punjab Industrial Estate Development and Management Company
PKR	Pakistani Rupees
PM	Particulate Matter
PMU	Project Management Unit
PPEs	Personal Protective Equipments
RCC	Reinforced Cement Concrete
SDS	Safety Data Sheets
SIA	Social Impact Assessment
SIE	Sundar Industrial Estate
SIR	Site Investigation Report
SO_X	Sulfur Oxides
Sq. ft.	Square Feet
TEVTA	Technical Educational and Vocational Training Authority
TMA	Tehsil Municipal Administration
TOR	Terms of References
TDS	Total Dissolved Solids
VOCs	Volatile Organic Compounds
WAPDA	Water & Power Development Authority

ANNEXURE-III

Lists of individuals and organizations consulted along with their written feedback

List of Individuals Consulted

S#	Name	Designation	Area
1	Mr. Shahzad Azam	Ex. President SIE	Sundar Industrial Estate
2	Mr. Ahsan K.Gulzar	CEO	Forte Pakistan Engineering Company Limited, 89-SIE, Lahore
3	Mr. Nazar Abid	CEO	Elektra Switchgears, 68-SIE, Lahore
4	Mr. Umair Sajid	CEO	Sundar Engineering Services, 87-SIE, Lahore
5	Mr. Fawad Atif Dosslani	CEO	97-SIE, Lahore
6	Mr. Mubeen Yaseen	Shopkeeper, General Store	Village Mull
7	Mr. Qamar Farooq	Shopkeeper, Cosmetics Store	Village Mull
8	Mr. Nazir Gujjar	Land Owner	Sultanke
9	Mr. Muhammad Tariq	Brick Kiln Owner	Sultanke
10	Mr. Rana Khalil Ahmed Manj	Property Dealer, Farmer, Politician	Sultanke
11	Mr. Saim Farooq	Helper	Nullah Village
12	Mr. Liaqat Maseeh	Livestock Farmer	Nullah Village
13	Mr. Salmoon Arshad Naz	Kiryana Shopkeeper	Nullah Village
14	Mr. Rana Shaukat Ali	Farmer	Wara Siddhu Wala
15	Dr. Khalid Mahmood	Homeopathic Doctor	Wara Siddhu Wala
16	Mr. Riasat Ali	Mason	Wara Siddhu Wala
17	Dr. Azhar Ali	Assistant Professor	College of Earth & Environmental Sciences, University of the Punjab, Lahore
18	Yousuf Jamal	CEO, Well-On Techniques	41-B, ZamZam Tower, Johar Town, Lahore

ANNEXURE-IV

Team Members of EIA Study Project

NAME	QUALIFICATIONS	STATUS IN PROJECT
Mr. Engr. Luqman Khan	ME Structural Engineering BE (Hons.) Civil Engineering;	Team Leader
Mr. Zaghum Abbas	MS Environmental Sciences; PGD Environmental Law	Environmentalist
Mr. Yousuf Jamal	MS Environmental Sciences	Environmentalist
Mr. Rana Muhammad Zahid	DAE Civil	Site Engineer; Project Coordinator
Mr. Faisal Riaz	BE (Hons.) Civil Engineering	Civil Engineer
Mr. Danish Zulfiqar	M. Phil. Chemistry	Chief Analyst
Mr. Muhammad Irfan	BS Chemistry	Deputy Analyst
Mr. Azhar Amar	M. Phil. OHS	AM Projects
Mr. Umer Kazim Ali	BS Analytical Chemistry	Analyst
Mr. Nauman Anwar	BS Environmental Sciences	Analyst
Mr. Muhammad Ahmad	BS Environmental Sciences	Customer Services Executive
Mr. Ameer Hamza	BS Environmental Sciences	Field Officer
Mr. Hashim Raza	BS Environmental Sciences	Field Executive
Mr. Ahmed Nabeel	B. Civil Technology	Draftsman

ANNEXURE-V

Terms of Reference

Title:
Establishment of Nutraceuticals Manufacturing Unit by Pharma Pak Pharmaceuticals (Pvt.) Limited at Plot#537-A, Sundar Industrial Estate, Lahore.

Environmental Consultant Organization "M/s Altec Engineers" to carry out the Environmental Impact Assessment of the project in accordance with the guidelines of EPA-Punjab. The consultant scope includes following activities:

I. Collect all the information relevant/required for the project & are required to compile EIA Report and subsequently obtain approval of same from EPA-Punjab.
II. Description of the Proposed Project Activities
III. Review of Alternatives
IV. Field Survey
V. Collection and Review of primary and secondary data as per requirement.
VI. Review of existing environmental legislation, guidelines and standards applicable to the operation and assessing their applicability.
VII. Stakeholders' Consultation (if required)
VIII. Identification and evaluation of environmental impacts
IX. Recommendations for mitigation measures
X. Development of Environmental Management Plan
XI. Any other item deemed necessary to complete the report in-line with guidelines/requirements of Punjab Environmental Protection Act-1997 (Amended) 2012.
XI. Preparation of a Final Report to meet the requirements of Pakistan EPA.

The Environmental consultant shall prepare Environmental Impact Assessment Report and subsequently submit to relevant authority after obtaining approval from the proponent.

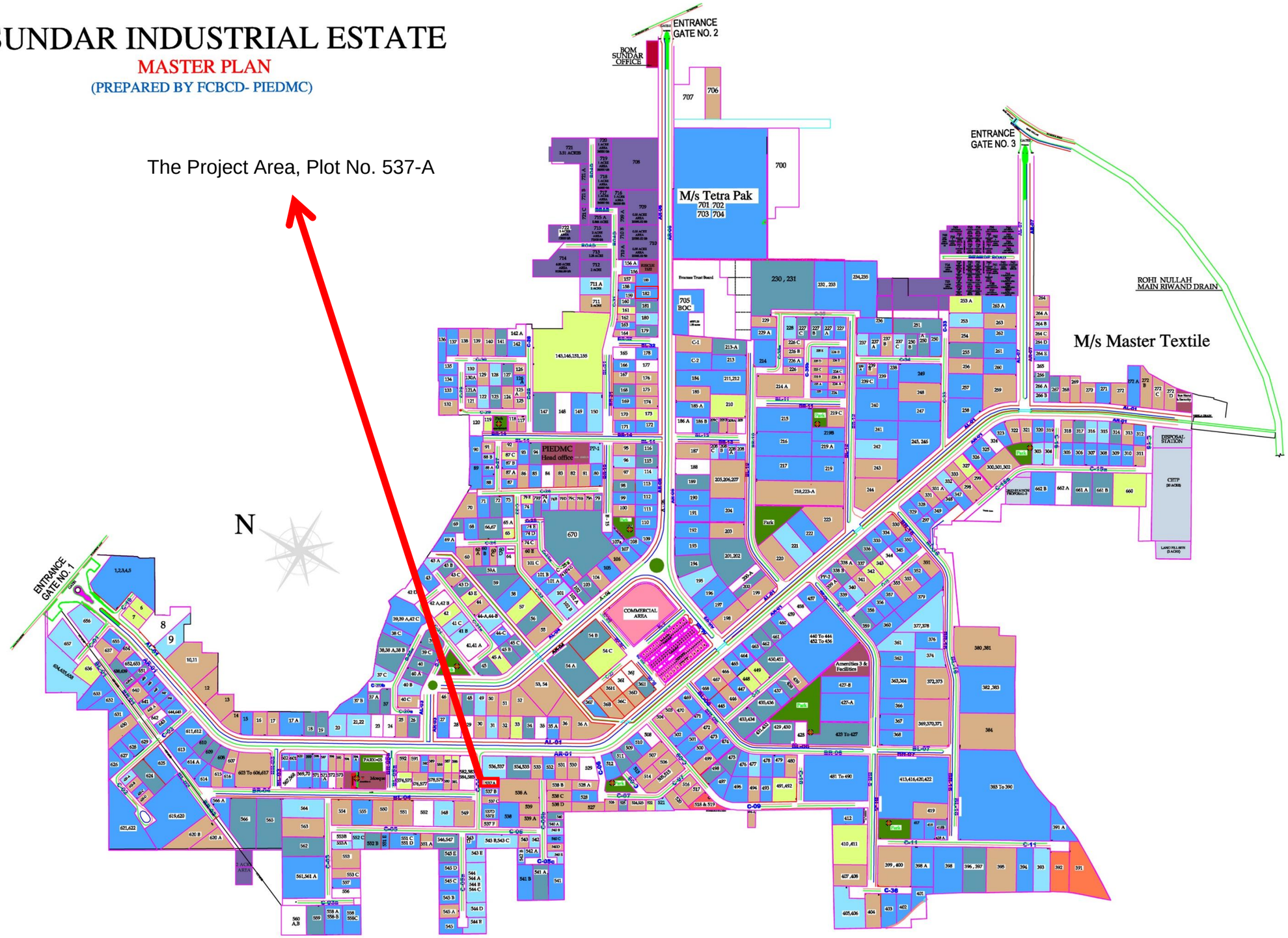
Consultant shall be solely responsible for obtaining the final approval after fulfillment of all pre-requisites as per Punjab Environmental Protection Act-1997 (Amended) 2012.

Overall correspondence and or other financial requirement(s) in this regard are to be taken care by the consultant.

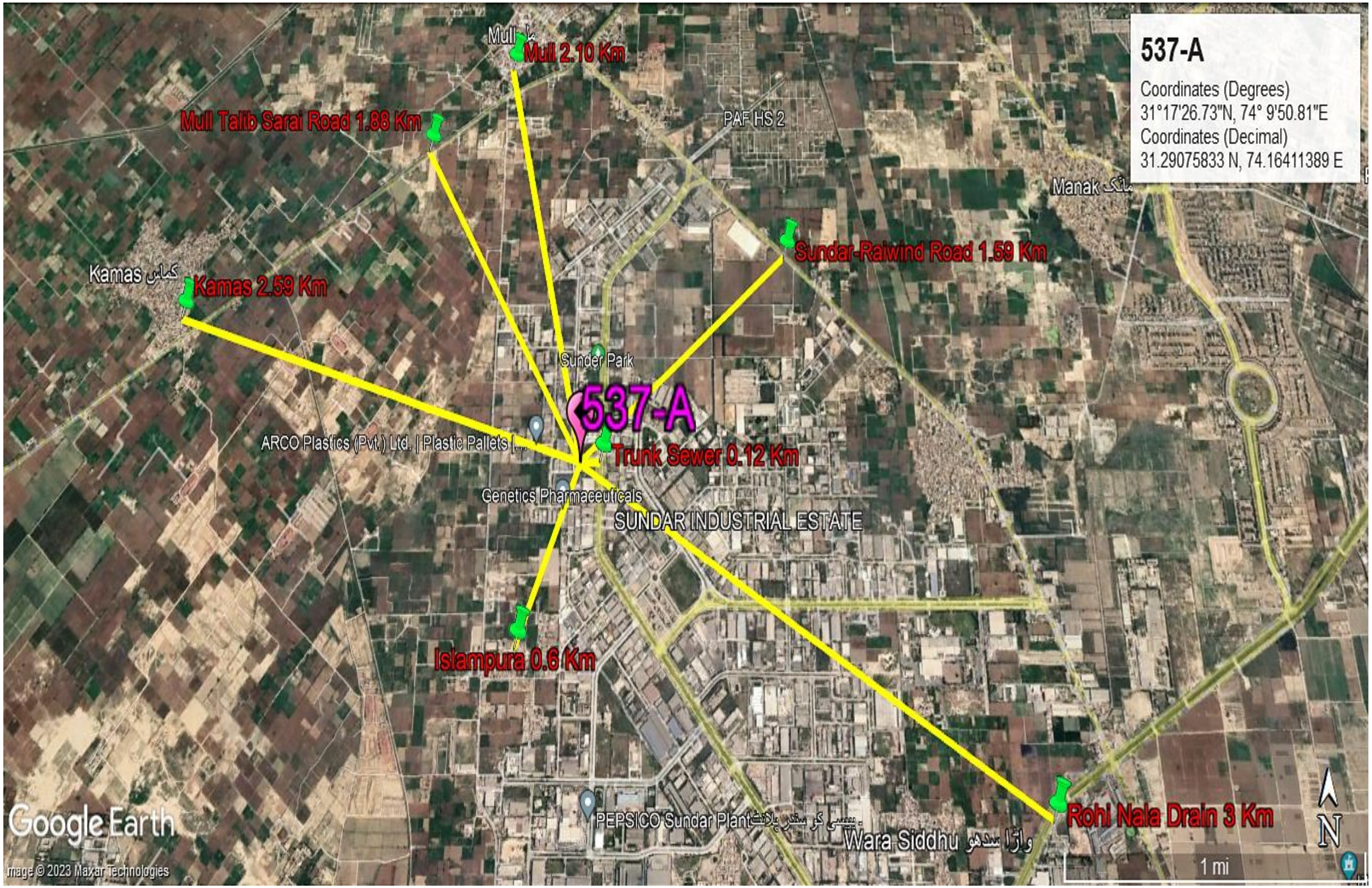
Client Signatures **Consultant Signatures**

ANNEXURE-VI

Google Map and Drawings of Proposed Project



Location of the Proposed Project Area in Sundar Industrial Estate


537-A
Coordinates (Degrees)
31°17'26.73"N, 74° 9'50.81"E
Coordinates (Decimal)
31.29075833 N, 74.16411389 E
Mull 2.10 Km
Mull Talib Sarai Road 1.88 Km
PAF HS 2
Manak
Sundar-Raiwind Road 1.59 Km
Kamas
Kamas 2.59 Km
Sunder Park
537-A
ARCO Plastics (Pvt.) Ltd. | Plastic Pallets |...
Trunk Sewer 0.12 Km
Genetics Pharmaceuticals
SUNDAR INDUSTRIAL ESTATE
Islampura 0.6 Km
PEPSICO Sundar Plant
Wara Siddhu
Rohi Nala Drain 3 Km
Google Earth
Image © 2023 Maxar Technologies
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ANNEXURE-VII

Baseline Parameters Monitoring Test Reports (Ambient Air, Ground Water, Noise)

ANNEXURE-VIII

Property Ownership Documents

ANNEXURE-IX

Land Use, Solid Waste Management, Sanitation and Drainage related Documents

ANNEXURE-X

CHECKLIST (EIA) PAK-EPA GUIDELINES FOR PREPARATION AND REVIEW OF ENVIRONMENTAL REPORTS-1997

ANNEXURE-XI

APPROVAL FROM OTHER CONCERNED DEPARTMENTS

ANNEXURE-XII

REFERENCES

- Information and data provided by the proponent
- Project feasibility report
- Technical design data related to the project
- Interviews with project related persons of project proponent
- Technical documents of various machinery/equipment
- Meteorological Data from Pakistan Meteorological Department
- Punjab Environmental Protection Act (Amendment) 2012
- Punjab Environmental Quality Standards for Ambient Air & Noise 2010
- Punjab Environmental Quality Standards for Water 2010
- Guidelines for the preparation and review of Environmental Reports
- Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022
- Punjab Occupational Health and Safety Act-2019
- Higher Education Department, Punjab
- School Education Department, Punjab
- Population Data from Ministry of Population
- Small and Medium Enterprises Development Authority
- Article by PCI Membranes on Nutraceuticals
- Guidance on Nutraceuticals Manufacturing Processes by SMP Nutra