



## PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY

“Special Economic Zone at Nankana Sahib”

# ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

February-2023



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## Quality Control Sheet



| QUALITY CONTROL SHEET |                                                                     |  |  |  |  |  |
|-----------------------|---------------------------------------------------------------------|--|--|--|--|--|
| DOCUMENT              | <b>Environmental Impact Assessment (EIA) Report</b>                 |  |  |  |  |  |
| PROJECT               | <b>"Special Economic Zone at Nankana Sahib"</b>                     |  |  |  |  |  |
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| NOTES                 | Final Report                                                        |  |  |  |  |  |

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## EXECUTIVE SUMMARY

### ES-1.1 Background

The Government of Pakistan has announced a comprehensive and a business-friendly incentive package aimed to upscale investments, promote the industry and employment; strengthen and form new industry clusters as well as promote exports of goods and services. It is estimated that this sector will create up to 800,000 jobs for the local population, earn foreign exchange through exports and save foreign exchange through import substitution.

Nankana Sahib is a city and capital of Nankana Sahib District in the Punjab province of Pakistan. Nankana Sahib is the most important religious site for the Sikh religion. Nankana Sahib is known for providing a large number of Wheat and Rice Crops and there are almost 109 units of rice mills in their district. Moreover, there are some textiles spinning and processing, flour, soaps, power generation, sugar, and chemical manufacturing industrial units. Unfortunately, all these major industries are scattered in the district.

To meet the requirements of modern era and to overcome the burden of unplanned industrial expansion, PIEDMC aims to establish a special economic zone at Nankana Sahib. With state-of-the-art infrastructure & world class facilities, this Project will not only uplift the overall industry of the region and but also generate employment for the local residents. This project will also help to preserve the cultural importance of the city by shifting the industries outside the main city but still remaining closed to city. Being closed to the city will facilitate the workers and communities to approach their workplace on daily basis without much of difficulty and being closed to industrial hub will facilitate the enterprises in acquisition of trained labour and raw material.

The proposed site is located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib on a Land Area measuring 907 Acres. The estimated development cost of this Project is estimated as 23,806.64 million PKR.

### ES-1.2 Project Title and Location

The project, for which this Environmental Impact Assessment (EIA) Study has been conducted, is Establishment of Special Economic Zone at Nankana Sahib located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib.

### ES-1.3 Project Proponent

Mr. Ali Muazzam Syed the proponent of project intends to get Environmental approval for the establishment of said unit by submitting the Environmental Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

**Table 0-1, Details of Project Proponent**

|      |                  |
|------|------------------|
| Name | Ali Muazzam Syed |
| CNIC | 35202-8279686-3  |

#### ES-1.4 The EIA Study Consultant

ASIAN Consulting Engineers Private Limited (AsCE) is providing their services to conduct environmental assessment for the project. ASIAN Consulting Engineers Private Limited is an independent consulting company working in the field of environment. Asian provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The contact details for the company are given as under:-

**Asian Consulting Engineers Private Limited**

**Tel:** +92 42 35450914-5 | **Fax:** +92 42 35450916 | **Mobile:** +92 321 4260133

**E-mail:** arslan.hanif@asiancon.com, aleem.butt@asiancon.com

**Address:** C-3, Jhelum Block, Green Forts-II, Lahore, Pakistan.

#### ES-1.5 Brief Description of the Project

Punjab Industrial Estates Development and Management Company (PIEDMC) intend to develop a Special Economic Zone (SEZ) in Nankana Sahib. The project site exists nearby Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib and 6km away from Nankana Sahib City.

#### ES-1.6 Brief Outline of the Proposal

|                                      |                                                                                                    |
|--------------------------------------|----------------------------------------------------------------------------------------------------|
| Name of the proposed project         | Special Economic Zone at Nankana Sahib                                                             |
| Purpose of the Project               | To establish Special Economic Zone at Nankana Sahib.<br>To enhance economic growth of the country. |
| <b>Land Requirement</b>              |                                                                                                    |
| Total Area Allocated for project     | 907 acres                                                                                          |
| Area for Industries                  | 635.02 acres                                                                                       |
| Area for Roads                       | 191.50 acres                                                                                       |
| Area for Parks/Open Area             | 37.31 acres                                                                                        |
| Area for Administration & Other uses | 31.03 acres                                                                                        |
| Area for Commercial                  | 12.14 acres                                                                                        |
| <b>Status and location</b>           |                                                                                                    |
| Site for proposed SEZ project        | Near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and                      |

|                                   |                                                                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | District Nankana Sahib                                                                                                                                                                              |
| <b>Water Requirement</b>          |                                                                                                                                                                                                     |
| Water consumption for the project | The total water demand is 5,000 gallon/day during construction phase and 6,612,355 gallons/day during operation phase.                                                                              |
| Ways of extraction                | Motor pump                                                                                                                                                                                          |
| Source of Water consumption       | Underground.                                                                                                                                                                                        |
| Source of waste water             | Constructional, operation and Domestic Wastewater                                                                                                                                                   |
| Mode of treatment                 | During construction phase waste water treatment facility will be installed for site camp/office wastewater.<br>During operational phase an effluent treatment plant will be installed and operated. |
| <b>Solid Waste</b>                |                                                                                                                                                                                                     |
| Source of solid waste generation  | Construction waste, Process waste during operation, Domestic waste during construction and operation                                                                                                |
| Mode of disposal                  | Handed over to contractor                                                                                                                                                                           |
| <b>Manpower</b>                   |                                                                                                                                                                                                     |
| Labor Force                       | About 100-120 persons during construction                                                                                                                                                           |
| <b>Power requirements</b>         |                                                                                                                                                                                                     |
| Source of power                   | Main source of power will be LESCO/WAPDA.<br>Estimated load is 97.65 MW (initial) which will be provided by 01 Grid Station with capacity of 132/11 kV.                                             |

#### ES-1.7 Location

Land coordinates are given below:

|       |                                 |
|-------|---------------------------------|
| North | M3 Lahore- Abdul Hakim Motorway |
| South | Saim Nallah                     |
| East  | Open land                       |
| West  | Nankana Sahib Interchange       |

For further details, google earth map of the project is attached here under.

#### ES-1.8 Major Impacts & their Mitigations

In order to identify all the activities associated with the project during construction & operation phase with potential to cause significant environmental impacts and harm a thorough review has been conducted. Project will not have significant negative impacts on the nearby community

and on environment. And, the project will have positive impacts on the local population and country as a whole.

**Table 0-2, Summary of Major Impacts during Construction & Operation Phase**

| Pollutant          | Constructional Phase                                                                                                                                                                                                                                                                                                                                                                                                                 | Operational phase                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air pollution/Dust | <ul style="list-style-type: none"> <li>Combustion products, above PEQS permissible limits, from vehicles used for project-related activities may contribute to air pollution</li> <li>Dust will also raise during material transport, construction and excavation activities</li> </ul>                                                                                                                                              | <ul style="list-style-type: none"> <li>NO<sub>x</sub>, SO<sub>x</sub> and GHG emissions from vehicles, and diesel generator, above PEQS permissible limits, may contribute to air pollution</li> <li>Dust generated due to transportation vehicles and generator stack.</li> <li>Various industries that will be established in the SEZ will have specific emission with respect to their type/category.</li> </ul> |
| Noise              | <ul style="list-style-type: none"> <li>Noise will be generated due to construction machinery and vehicles transporting materials</li> </ul>                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Noise will be generated due to generator, machines and vehicles transportation.</li> <li>Noise generated from the operations of hosted industries in the SEZ</li> </ul>                                                                                                                                                                                                      |
| Odor               | <ul style="list-style-type: none"> <li>Nil</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>Nil</li> </ul>                                                                                                                                                                                                                                                                                                                                                               |
| flora and fauna    | <ul style="list-style-type: none"> <li>(About 400 mature trees of Jamun/Java plum (<i>Syzygium cumini</i>), Mango (<i>Mangifera indica</i>), Guava (<i>Psidium guajava</i>), Dates (<i>Phoenix dactylifera</i>), Safeda (<i>Eucalyptus globulus</i>), Kikar (<i>Vachellia nilotica</i>) etc will be lost due to implementation of project)</li> <li>Disturbance to fauna due cutting of trees and construction activities</li> </ul> | <ul style="list-style-type: none"> <li>Potential impacts on the faunal resources are associated with the damage to the natural vegetation and habitat.</li> <li>In addition, the wildlife may be disturbed by noise, illumination, and mere presence of the people.</li> </ul>                                                                                                                                      |

| Pollutant                | Constructional Phase                                                                                                                                                                          | Operational phase                                                                                                                                                                                                                                |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solid Waste              | <ul style="list-style-type: none"> <li>• Solid waste may be generated from construction activity, domestic and packing material of project related machineries.</li> </ul>                    | <ul style="list-style-type: none"> <li>• Solid waste will be generated from domestic sources and industrial process of hosted industries.</li> </ul>                                                                                             |
| Soil Contamination       | <ul style="list-style-type: none"> <li>• Land or Soil Erosion during due construction activities</li> <li>• Soil can be contaminated due to leaching of oil, fuel, any stored oil.</li> </ul> | <ul style="list-style-type: none"> <li>• Leakage of oil and chemicals from storage area may contaminate soil</li> </ul>                                                                                                                          |
| Waste water              | <ul style="list-style-type: none"> <li>• Waste water will be generated from constructional and domestic sources</li> </ul>                                                                    | <ul style="list-style-type: none"> <li>• Waste water will be generated due to domestic sources.</li> <li>• Machinery washing, other process wastewater</li> <li>• Wastewater released from various industries being hosted in the SEZ</li> </ul> |
| Health and safety issues | <ul style="list-style-type: none"> <li>• Health and safety issues will be arising during construction activity, handling of material, machinery and improper practices of work</li> </ul>     | <ul style="list-style-type: none"> <li>• Health and safety issues will be arising if flue gases or noise exceed the permissible limits of PEQS, and improper practice of work during storage, handling and transportation of fuel.</li> </ul>    |
| Socioeconomic            | <ul style="list-style-type: none"> <li>• Disturbance to neighbors by constructional activities</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>• Employment opportunity</li> </ul>                                                                                                                                                                       |

#### ES-1.9 Recommendation for Mitigation Measures

| Pollutants         | Recommendations during Construction phase                                                                                                                                                                                                      | Recommendations during Operation phase                                                                                                                                                                                                         |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air pollution/Dust | <ul style="list-style-type: none"> <li>• The unpaved roads will be sprinkled with water</li> <li>• All project vehicles will be checked regularly to ensure that engines are in sound working condition and are not emitting smoke.</li> </ul> | <ul style="list-style-type: none"> <li>• The generators and vehicles will be maintained to keep the emission levels within PEQS permissible limit</li> <li>• Water will be sprinkled where required</li> <li>• Industries should be</li> </ul> |

| Pollutants                 | Recommendations during Construction phase                                                                                                                                                                                                                                                                                                                                         | Recommendations during Operation phase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            |                                                                                                                                                                                                                                                                                                                                                                                   | mandated to install air pollution control devices depending upon their type of emissions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Noise                      | <ul style="list-style-type: none"> <li>• Vehicles to carry raw materials will be operated during night time as far as possible.</li> <li>• Personal Protective Equipment PPEs including Earmuffs, Ear plugs and other noise abating equipment will be provided to the workers and other staff of the subject project.</li> </ul>                                                  | <ul style="list-style-type: none"> <li>• Ear plugs/muffs will be provided to workers in case the noise exceeds the PEQS during working hours.</li> <li>• Proper Maintenance of machines and generated will be done to avoid noise.</li> <li>• Hosted industries should be mandated to manage the noise issues within their boundary</li> <li>• Trainings for safe driving practices &amp; HSE trainings of the employees and workers will be recommended.</li> <li>• Within SEZ, horns are prohibited during working hours and speed limit of 15 km/hour should be permissible.</li> </ul> |
| Odor                       | <ul style="list-style-type: none"> <li>• Nil</li> </ul>                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Nil</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Impacts on flora and fauna | <ul style="list-style-type: none"> <li>• Efforts will be made protect the trees within the project area.</li> <li>• If the trees within the project area are inevitable to be cut, they must be transplanted in the green areas of industrial estate</li> <li>• About 10,000 trees will be planted, these trees will welcome the local animals for nesting and shelter</li> </ul> | <ul style="list-style-type: none"> <li>• Plantation will be done at project site during operation in order to improve the environment of the area.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Solid Waste                | <ul style="list-style-type: none"> <li>• Solid waste generated</li> </ul>                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Waste bins are placed at</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Pollutants               | Recommendations during Construction phase                                                                                                                                                                                                                | Recommendations during Operation phase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | <p>from the construction activity e.g., sand, stones residues etc. that will be utilized in restoration of the quarry area</p> <ul style="list-style-type: none"> <li>• Solid waste from the domestic sources should be disposed of properly.</li> </ul> | <p>suitable places.</p> <ul style="list-style-type: none"> <li>• Colored Bin System is recommended in company.</li> <li>• Individual industries will be responsible for collection of solid waste from their industry.</li> <li>• Hazardous wastes produced by the industries must be managed in a scientific manner.</li> <li>• SEZ has allocated space for intermediary storage of solid waste for the hosted industries</li> <li>• Final disposal of waste will be done responsibly through a contractor.</li> </ul> |
| Soil Contamination       | <ul style="list-style-type: none"> <li>• Designed storage facility will be provided for oils and chemical.</li> <li>• Placed plastic sheet under generator or leaching material to avoid leaching (if any)</li> </ul>                                    | <ul style="list-style-type: none"> <li>• If oils and chemicals are required in processes of hosted industries, they will be stored properly in a facility of appropriate design in order to avoid any spillage and leaks</li> <li>• Regular monitoring and maintenance will be done.</li> </ul>                                                                                                                                                                                                                         |
| Waste water              | <ul style="list-style-type: none"> <li>• Sewerage/Domestic wastewater will be treated in WWTF and disposed in Saim Nallah.</li> </ul>                                                                                                                    | <ul style="list-style-type: none"> <li>• Individual industries will be responsible for primary and secondary treatment</li> <li>• Waste water from hosted industries will be treated in ETP for tertiary treatment before disposal.</li> </ul>                                                                                                                                                                                                                                                                          |
| Health and safety issues | <ul style="list-style-type: none"> <li>• PPEs will be provided to workers during constructional activities.</li> <li>• First aid will be provided to project related employees.</li> <li>• Safety signs &amp; boards</li> </ul>                          | <ul style="list-style-type: none"> <li>• All hosted industries will designate teams for HSE concern emergency equipment like fire extinguishers, spill kits, water hydrant system, effective use of PPEs and</li> </ul>                                                                                                                                                                                                                                                                                                 |

| Pollutants    | Recommendations during Construction phase                                                                                                                                                               | Recommendations during Operation phase                                                                                                                                                                       |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | should be placed                                                                                                                                                                                        | first aid.<br><ul style="list-style-type: none"> <li>• Proper trainings on workplace health and safety will be provided.</li> </ul>                                                                          |
| Socioeconomic | <ul style="list-style-type: none"> <li>• People will be informed in advance when work is about to start at the site.</li> <li>• Job opportunity will be provided to local people of the area</li> </ul> | <ul style="list-style-type: none"> <li>• Community wellbeing should be considered and neighbor's privacy should not be disturbed.</li> <li>• Local people should be preferred for the employment.</li> </ul> |

### ES-1.10 Proposed Environmental Monitoring

To oversee the environmental performance of the project through its lifecycle enforcing the PEQS an Environmental Monitoring Program should be formulated which ensures effective surveillance of the environmental parameters at various stages of the project development and compliances with PEQS and legal obligations. Monitoring for following Environmental Parameters is recommended:

- Ambient Air

Quarterly monitoring for ambient air should be conducted during construction & operational activities of the project and report should be submitted to EPA Punjab.

- Noise

Quarterly monitoring for noise level should be maintained periodically during construction & operational phases of the project and report should be submitted to EPA Punjab.

- Water Quality

Quarterly monitoring of water quality should be conducted during construction & operational phases of the project and report should be submitted to EPA Punjab.

#### ES-1.10.1 Schedules of Proposed Monitoring:

| Sr. No. | Parameters                                                                                             |           |
|---------|--------------------------------------------------------------------------------------------------------|-----------|
| 1       | Ambient Air Monitoring (NO <sub>x</sub> , CO <sub>x</sub> , SO <sub>x</sub> , VOCs, PM <sub>10</sub> ) | Quarterly |
| 2       | Noise Level                                                                                            | Quarterly |
| 3       | Water quality                                                                                          | Quarterly |

**Note:** Environmental Monitoring data log book should be maintained by the project proponent.

## SECTION - 1: INTRODUCTION

The Industrial Zones in Lahore are generally established in the public sector and more specifically by the 'Punjab Industrial Estate Development and Management Company (PIEDMC), which runs the Sundar Industrial Estate and the Quaid Azam Industrial Estate. Both these areas have reached their full limits, yet there is a dire need of industry specific area where the enterprises can establish or extend their businesses. The Industrial growth is essential for the overall Gross Domestic Product (GDP) and helps in earning foreign exchange, substitute imports and create jobs.

Nankana Sahib is a city and capital of Nankana Sahib District in the Punjab province of Pakistan. Nankana Sahib is the most important religious site for the Sikh religion. Nankana Sahib is known for providing a large number of Wheat and Rice Crops and there are almost 109 units of rice mills in their district. Moreover, there are some textiles spinning and processing, flour, soaps, power generation, sugar, and chemical manufacturing industrial units. Unfortunately, all these major industries are scattered in the district. Unfortunately, all these major industries are scattered in the district.

To meet the requirements of modern era and to overcome the burden of unplanned industrial expansion, PIEDMC aims to establish a special economic zone at Nankana Sahib. With state-of-the-art infrastructure & world class facilities, this Project will not only uplift the overall industry of the region and but also generate employment for the local residents. This project will also help to preserve the cultural importance of the city by shifting the industries outside the main city but still remaining closed to city. Being closed to the city will facilitate the workers and communities to approach their workplace on daily basis without much of difficulty and being closed to industrial hub will facilitate the enterprises in acquisition of trained labour and raw material.

Further, the development of any Project brings about changes, both positive and negative, in the environmental and social settings of the Project Area. The intensity and the level of change, however, depend upon the nature of the project and the baseline environmental conditions of the area.

### 1.1 Purpose of the report

Environmental Impact Assessment (EIA) report is being submitted to the Environmental Protection Agency (EPA), Government of the Punjab, Lahore for the compliance of Section 12 of Punjab Environment Protection Act-1997 (Amended 2012) for obtaining No Objection Certificate (NOC) before starting the construction activity at the project site. The other relevant regulations and guidelines considered while preparing this EIA report include:

- Punjab Environment Protection Act: Review of IEE and EIA regulations 2022
- Policy and procedures for filing, review and approval of environmental assessments.
- Guidelines for the preparation and review of environmental reports.

- Guidelines for Public Participation.
- Guidelines for sensitive and critical areas.
- Detailed Sectorial Guidelines.

Various aspects like environmental, social, physical and other aspects of the project both during construction and its regular occupancy are highlighted in this EIA report. Measures necessary to be adopted to mitigate any environmental impacts on any part of the environment around are also described. All the important information is also provided as described under the format used to help decision makers (EPA Punjab), before issuing the desired Environmental Approval.

## 1.2 Identification Of the Project

The project is the Establishment of Special Economic Zone at Nankana Sahib located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib.

## 1.3 Details Of Proponent

Ali Muazzam Syed, the proponent of project, is intended to get Environmental approval for the establishment of said unit by submitting the Environmental Impact Assessment Report for the compliance of section 12, PEPA, 1997 (Amended 2012).

**Table 1-1, Details of Project Proponent**

|      |                  |
|------|------------------|
| Name | Ali Muazzam Syed |
| CNIC | 35202-8279686-3  |

## 1.4 Details of Consultant

ASIAN Consulting Engineers Private Limited (AsCE) is providing their services to conduct environmental assessment for the project. ASIAN Consulting Engineers Private Limited is an independent consulting company working in the field of environment. Asian provides consulting services and sustainable solutions for infrastructure projects, industrial projects and social development projects.

The team of experts are given as under:-

| Sr. No. | Team Member | Position Held                              | Qualifications                                                                                                                              |
|---------|-------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Aleem Butt  | Chief Environmentalist<br>Team Leader- EIA | M.Phil. Environmental Sciences, Government College University (GCU), Lahore<br>M.Sc. Environmental Sciences, Punjab University (PU), Lahore |

| Sr. No. | Team Member          | Position Held            | Qualifications                                                                                                                         |
|---------|----------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
|         |                      |                          | NEBOSH, Lead Auditor                                                                                                                   |
| 2.      | Noman Ashraf         | Environmental Specialist | M.Phil. Environmental Sciences, Government College University (GCU), Lahore<br>PGD, Environmental Law University of the Punjab, Lahore |
| 3.      | Faiza Anjum          | Environmental Specialist | MS Environmental Sciences University of the Punjab, Lahore                                                                             |
| 4.      | Muhammad Umair Iqbal | Environmentalist         | BS Environmental Sciences, Government College University (GCU), Faisalabad                                                             |
| 5.      | Sajjad Hussain       | Chief Chemist            | M.Phil. Chemistry Government College University (GCU), Lahore                                                                          |
| 6.      | Hafsa Mehmood        | Environmentalist         | BS Hons Environmental Sciences, Government College University (GCU), Lahore<br>PGD, Environmental Law University of the Punjab, Lahore |
| 7.      | Ayesha Rasheed       | Environmentalist         | M.Phil Environmental Sciences, Government College University (GCU), Lahore                                                             |
| 8.      | Maaha Kamran Dar     | Environmentalist         | MS Environmental Sciences Lahore College for Women University, Lahore                                                                  |
| 9.      | Asma Butt            | Sociologist              | M.Sc. Sociology, University of the Punjab, Lahore                                                                                      |
| 10.     | Engr. Umair Tallat   | Sr. Field Engineer       | M.S. Environmental Engineering, NUST, Islamabad                                                                                        |
| 11.     | Hammas Sohail        | Monitoring Officer       | BS. Environmental Sciences, University of Gujrat, Gujrat                                                                               |

The contact details for the company are given as under:-

**Asian Consulting Engineers Private Limited**

**Tel:** +92 42 35450914-5 | **Fax:** +92 42 35450916 | **Mobile:** +92 321 4260133

**E-mail:** arslan.hanif@asiancon.com, aleem.butt@asiancon.com

**Address:** C-3, Jhelum Block, Green Forts-II, Lahore, Pakistan.

## **1.5 Brief Description of Project**

### **1.5.1 Nature & Size of Project**

Punjab Industrial Estates Development and Management Company (PIEDMC) intend to develop a Special Economic Zone (SEZ) in Nankana Sahib spreading as per global best practices related to SEZ over an area of 907 acres. With total cost of 23,806.64 million PKR. The development works envisage provisioning of the following facilities:

- Construction of road network.
- Provision of Sewerage System
- Provision of Water Supplies
- Provision of Parking Terminals
- Provision of Administrative Block.
- Provisional of Medical Centers
- Construction of Disposal Station
- Provision of Fire Fighting System
- Provision of Green area

The capital cost of the project will be about 23,806.64 million PKR.

### **1.5.2 Location**

The project site exists almost 6km away from Nankana Sahib City and nearby Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib.

Land coordinates are given below:

|       |                                 |
|-------|---------------------------------|
| North | M3 Lahore- Abdul Hakim Motorway |
| South | Saim Nallah                     |
| East  | Open land                       |
| West  | Nankana Sahib Interchange       |

For further details, google earth map of the project is attached here under.

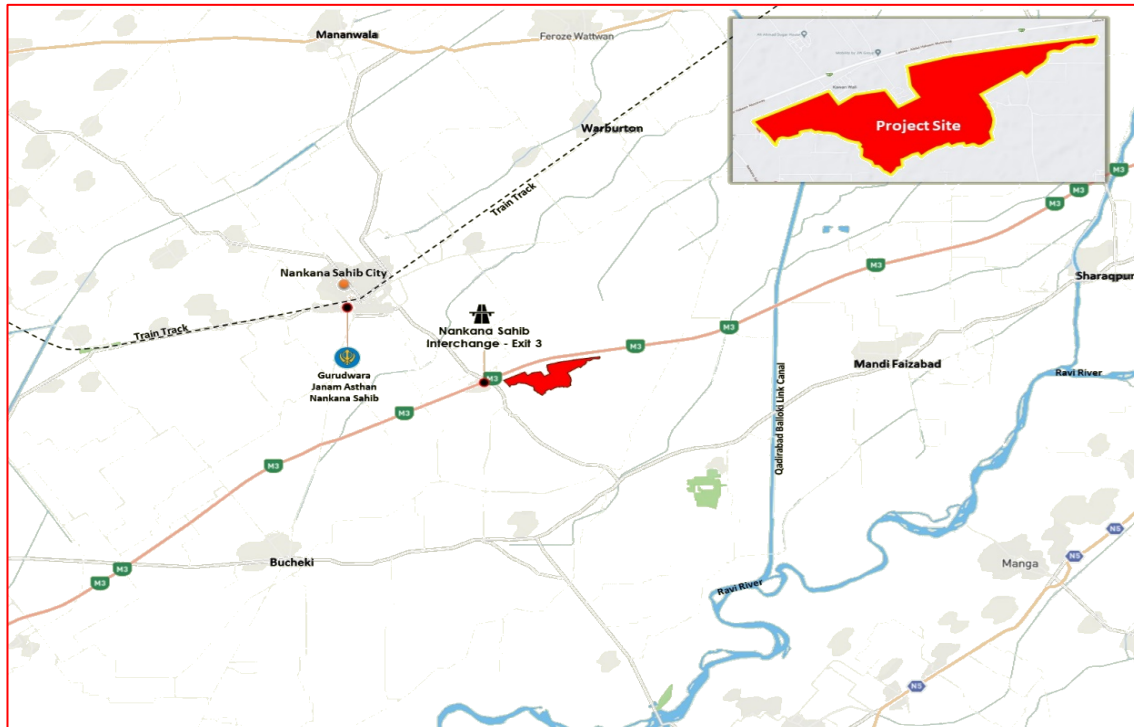


Figure 1-1, Site Location

## 1.6 Methodology of EIA Report

EIA Study comprises of Executive Summary following eight chapters as detailed below;

**Chapter 1, Introduction;** gives rational and overview of the Project, need for Environmental Impact Assessment study, its objectives and finally structure of the report.

**Chapter 2, Screening and Scoping Project;** talks about whether the project requires IEE OR EIA as per regulation and gives details about of spatial and temporal of project, important issues raised during consultation, significant impact and factor to be determine.

**Chapter 3, Description of Project;** gives a rather detailed account of the Project particularly emphasizing those Project components which are of importance in relation with environmental and social aspects.

**Chapter 4, Consideration of Alternatives;** describes the analysis of alternatives, which could be site alternative, design or technology alternatives.

**Chapter 5, Description of Environmental and Social Baseline Conditions;** provides information about the environmental and social settings of the Project Area including geology, climate, flora, fauna, water resources, socioeconomic conditions etc.

**Chapter 6, Potential Environmental Impacts and their Mitigation Measures;**

identifies the potential impacts due to the implementation of Project on the physical, biological and social environment of the Project Area.

**Chapter 7, Environmental Management and Monitoring Plan;** outlines the environmental management plan, identifies the roles and responsibilities to implement EMMP, suggest monitoring frequencies of various parameters and EMMP costs etc.

**Chapter 8, Stakeholders and Public Consultations;** deals with the outcome of the consultation carried out with the local communities, knowledgeable people, public representatives, etc. It discusses the concern of various types of the people and provides an outline how these have been addressed within the study of the Project.

**Chapter 9, Conclusion and Recommendations;** sums up the report and conclusions and recommendations resulting from the study

## SECTION - 2: SCREENING AND SCOPING OF PROJECT

### 2.1 Screening of the Project

According to the IEE and EIA Regulations, 2022, the project "Establishment of Special Economic Zone at Nankana Sahib" falls under Schedule II (List of projects requiring an EIA), Subsection H under list 5 Industrial Estate (Including Export Processing Zones).

### 2.2 Scoping of Project

#### 2.2.1 Spatial and Temporal Boundaries of Environmental Assessment

This project spans an area of 907 acres located in a majorly industrialized zone. The majority of area is owned by PIEDMC. The project site has Nankana Sahib Interchange at its west and M3 Lahore- Abdul Hakim Motorway in its North. Further, it has Saim Nallah at its Southern side and open space/vacant area in its eastern side.

**Table 2-1, Spatial and Temporal Boundaries of Environmental Assessment**

| Spatial Boundaries                                                                 | Temporal Boundaries                                                                                    |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| REGIONAL: Impact could extend to the region surrounding the proposed Project       | YEAR ROUND: Significant throughout the year                                                            |
| LOCAL: Impact limited to the local area in close proximity to the proposed Project | SEASONAL: Significant on a seasonal basis, depending on nature of valued environmental component (VEC) |

#### 2.2.2 Important Issues and Concerns Raised During Consultation

During the survey, respondents were inquired about their views regarding the proposed project. Almost all respondents showed their concerns about the Proposed Project. Some of the respondents had positive thinking and they were in favour of the project. But few respondents showed their concerns regarding the project. There concerns are,

- Employment for local people
- Noise and Dust pollution
- Health and Safety issues
- Excessive cutting of trees

### 2.3 Significant Impacts and Factors to be Determined

- Soil Contamination and Erosion
- Ground water contamination

- Air quality deterioration
- Noise
- Habitat Disturbance
- Waste material
- Labour and Local People HSE issues
- Hazardous material and Fire safety

## SECTION - 3: CONSIDERATION OF ALTERNATIVES

The EIA guidelines define alternatives as: "different means of meeting the general purpose and requirements of the activity, which may include alternatives to the: Site (location of property), Type of Activity to be undertaken; Design or Layout; Technology to be used".

It is a specific requirement of EIA process that includes the identification and consideration of feasible alternatives in the early stage or during scoping stage of environmental assessment. The value of this requirement is that alternatives are a form of mitigation, in that certain options may avoid or reduce the nature, extent or duration of one or more impacts, on one or more aspects of the receiving environment. The following section presents an outline of the alternatives which were considered for the project.

### 3.1 The No Project Alternative

This is a standard requirement of the EIA process and considers the situation where if the proposed development elements do not take place. The No Project Option for this project is feasible because:

- Land is under full control of Pakistan Industrial Estate Development and Management Company.
- Location is prime, which has direct and closest connectivity with the Motorway.
- Non availability of Industrial plots in Nankana Sahib has directed the focus of the investors towards new industrial estates, which could provide them developed plots with all the amenities and one stop shop for the facilities which are required for an enterprise.
- Establishment of proposed SEZ in an area where no public sector Industrial Estate exists will attract the target industries being a lucrative location in the close vicinity of Nankana Sahib City.
- The SEZ is also very feasible for investors from other cities like Lahore & Sheikhupura to start new production units.
- Based on the strengths of the connected districts and resource pool, this economic zone has predominant investment feasibility for industries in SMEs like followings;
  - Food Products & Beverages
  - Textiles, Apparel, & Leather
  - Wood, Wood Products & Furniture
  - Paper & Paper Products, Publishing, Printing & Reproduction, Coke & Petroleum
  - Chemicals, Rubber & Plastic Product
  - Non - Metallic Mineral Products
  - Basic Metals Industries

- Metal Products, Machinery & Equipment

### 3.2 Site Alternatives

No alternative site is proposed for assessment on the basis that the proposed site: -

- Is under control of PIEDMC
- Is zoned for SEZ,
- Is easily accessible through motorways
- Is at proper distance from locality

### 3.3 Modified Construction Technology Alternatives

The development will be constructed using modern, locally and internationally accepted technology and materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the quality standards requirements.

### 3.4 Design Alternatives

The overall function of the Zone is a composite of commercial and trading, processing, manufacturing, warehousing logistics with corresponding production and living support facilities, and according to the current land use conditions and the corresponding industrial orientation, design and layout is planned with the functional structure.

The design alternatives of SEZ-Nankana Sahib are presented **Figure 3.1 and 3.2.**

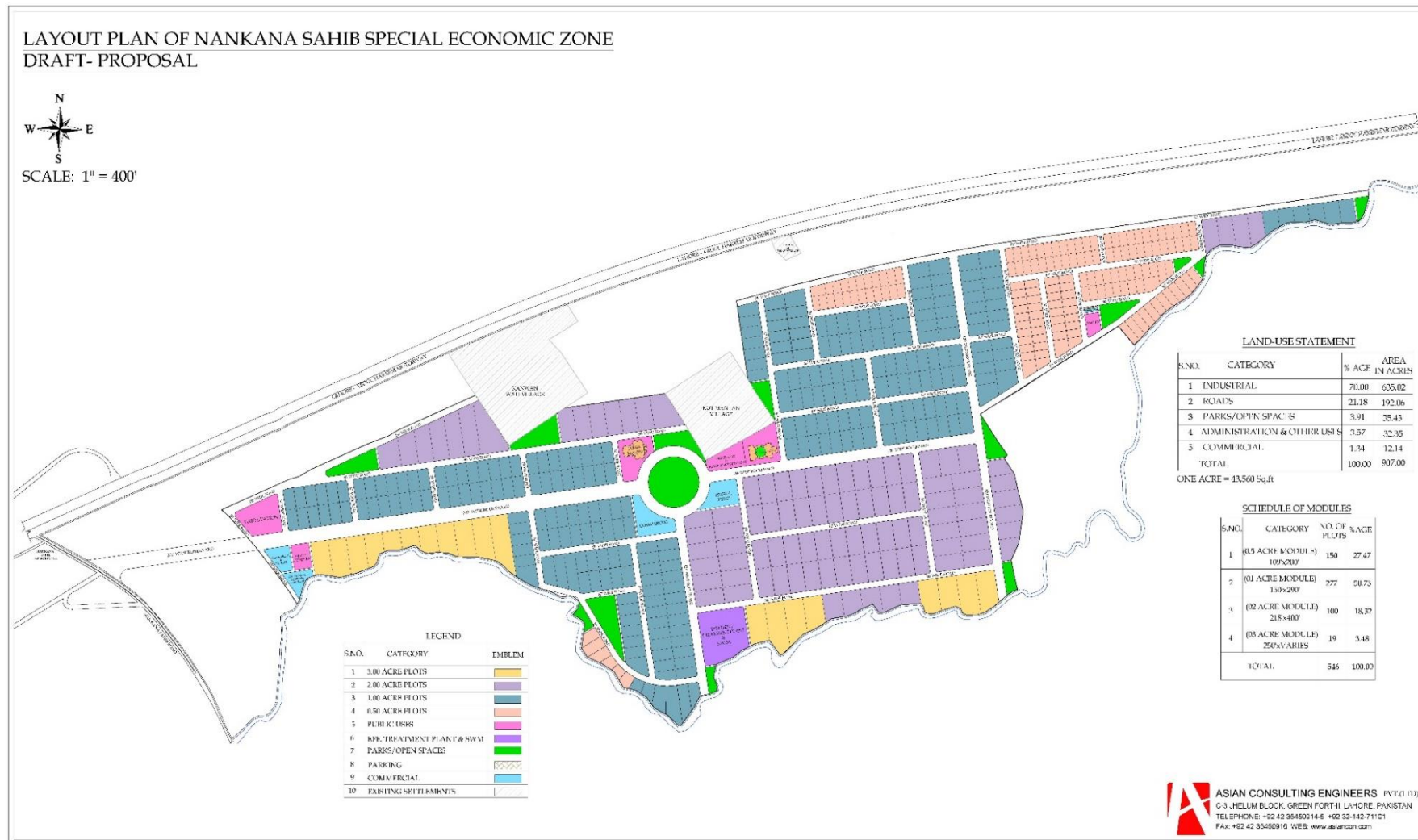


Figure 3-1, Initial Design Alternative

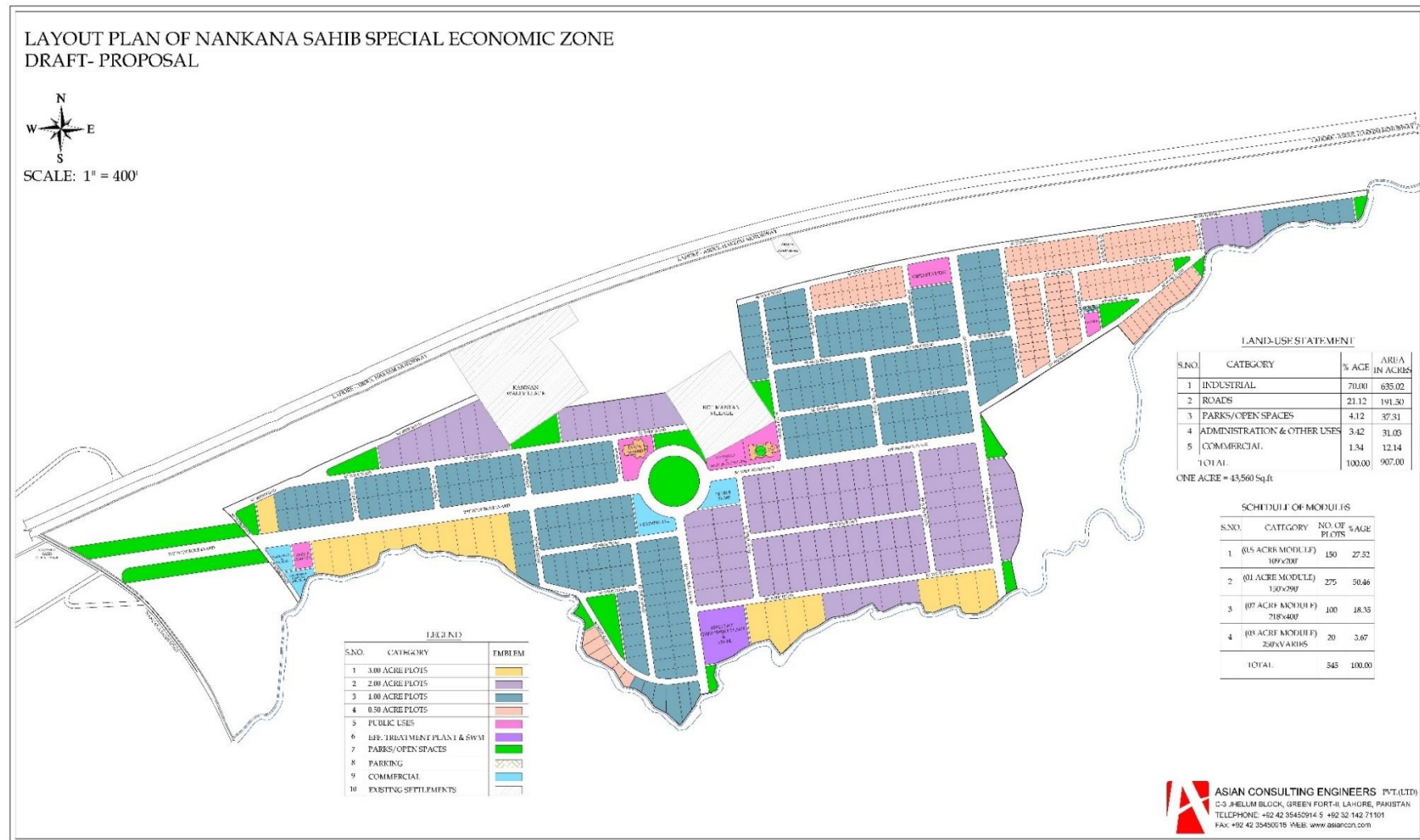


Figure 3-2, Final Design Alternative

### 3.5 Environmental Alternatives

The project is located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib. The site is located at an industrial area earmarked for industrial activity. Construction of an industrial area / Special Economic Zone in this area will have minimal impact on the daily life people living nearby. The proponent will ensure that during construction all the activities take place in a way that will have minimal effect on the surroundings. The project proponent is recommended to make sure that emission produced during the project operations are within the PEQS limits. The Proponent has ensured that that effluent treatment plant will be installed within the industrial estate / Special Economic Zone.

### 3.6 Economic Alternatives

The Project envisages the development of a State-of-the-Art SEZ near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib on a Land Area measuring 907 Acres. Such an initiative is expected to take the Pakistani industry to move up the value-chain into the next orbit of value addition. The concept and design of the proposed infrastructure takes a sustainable economic approach. This Project is expected to provide direct temporary employment during construction phase) to the tune of 100-120 persons; direct jobs will be created - both, for managerial staff as well as workers. This project will accelerate the economic development of the district Nankana Sahib and in turn, that of Pakistan

## SECTION - 4: DESCRIPTION OF PROJECT

This chapter presents all aspects of the project. It describes the nature of the project, its location, designs and site layout/ plan. It presents the activities that will be involved during all stages of project; how product will form, detail of process and machinery as well as details on supportive resources i.e., man power and utility requirements.

### 4.1 Objective of Project

Present Project has following objectives-

- To enhance the economic growth of country; help bring prosperity;
- To provide more job opportunities to local public and in the region; enhance their living standards;
- Enhance development, manufacture and sale of 'value-added', 'branded' Pakistani products;
- Incorporate and expand use of local raw materials in manufactured goods: on local materials;
- To improve the Industrial Infrastructural facilities in Lahore district of Pakistan: provide a 'nest' where Pakistani and overseas investors can operate in a 'world class', environment.
- Invite and promote local & foreign private investment that would be beneficial for the local as well as national economy and GDP.

### 4.2 Location & Site Layout of Project

The proposed Special Economic Zone is located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib". The land coordinates for the Project site are as follows:

- North M3 Lahore- Abdul Hakim Motorway
- South Saim Nallah
- East Open land
- West Nankana Sahib Interchange

For further details, Site location and layout map is attached in Figure 4.1 and Figure 4.2.

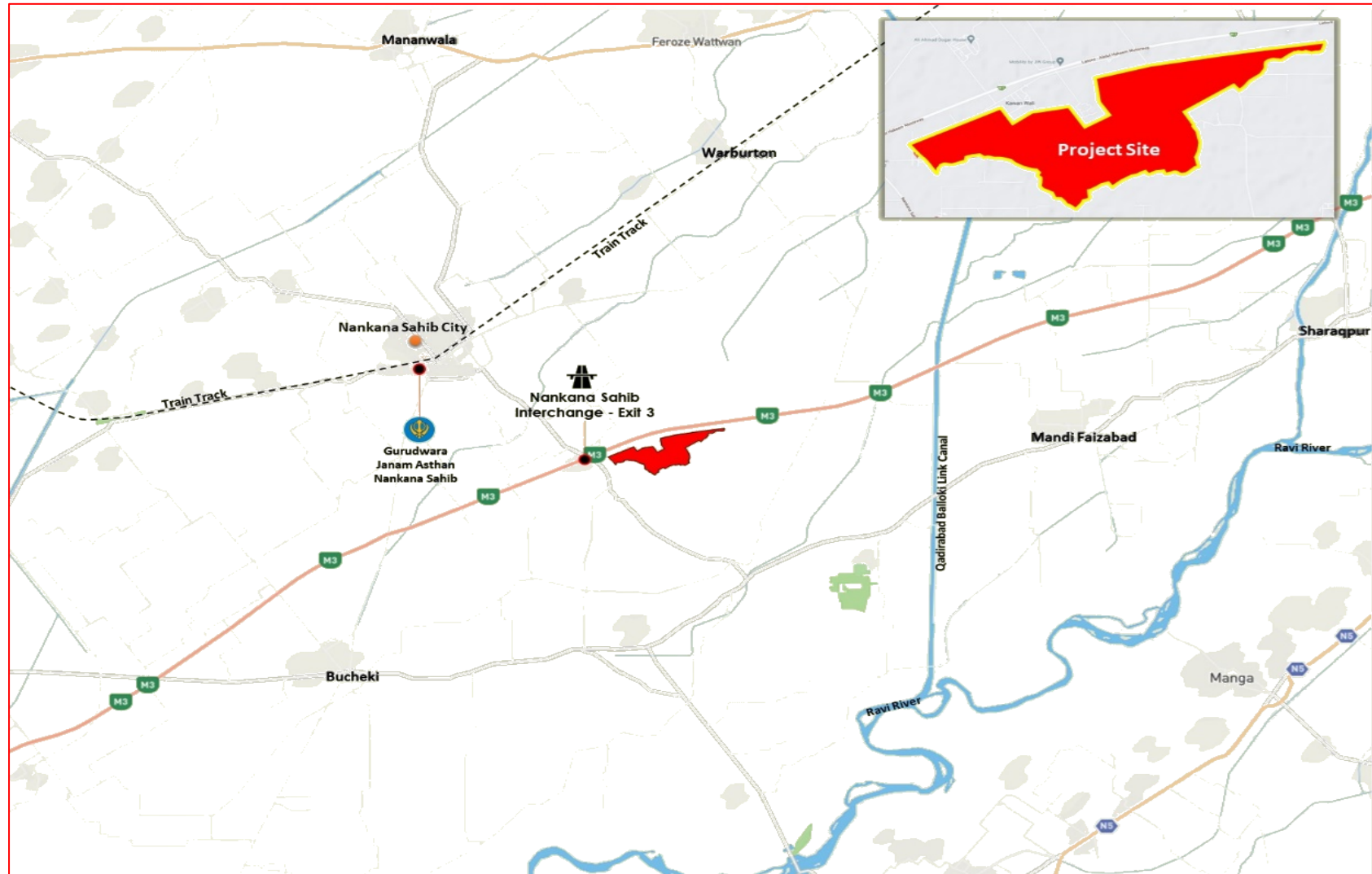


Figure 4-1, Location Map of Project Site

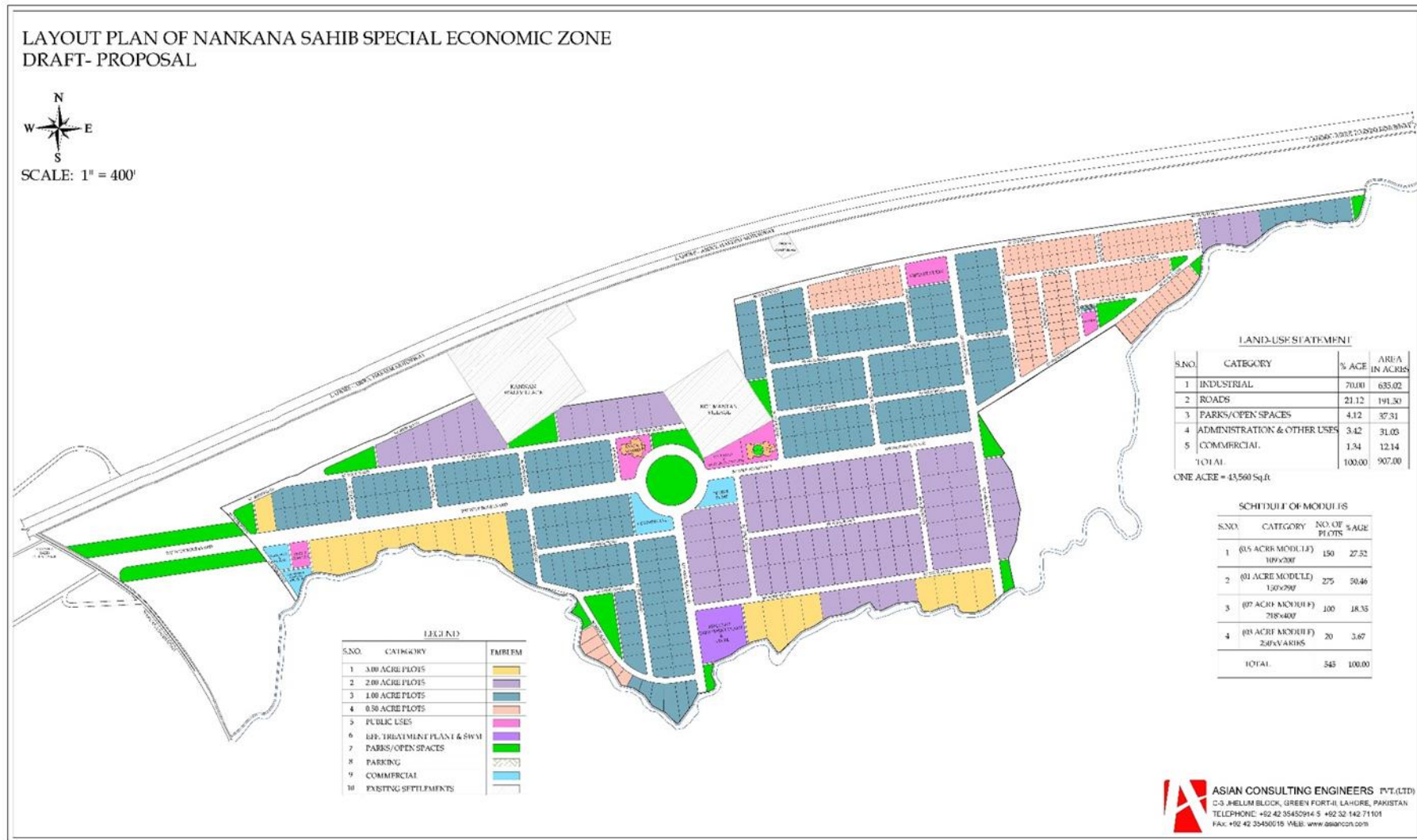


Figure 4-2, Layout Map of the Project

### 4.3 Land Use Plan on Site

Previous status of land at project site is agricultural. But now the land is designated to develop industrial estates. The land use plan of SEZ is given in **Table 4-1** and **Table 4-2**.

**Table 4-1, Summarized Land Use of Proposed SEZ**

| Sr. No. | Land Use                   | Area          |            |
|---------|----------------------------|---------------|------------|
|         |                            | Acres         | %age       |
| 1       | Industrial Plots           | 635.02        | 70.00      |
| 2       | Roads Network              | 191.50        | 21.12      |
| 3       | Administrative & Other use | 37.31         | 4.12       |
| 4       | Open-Green Spaces          | 31.03         | 3.42       |
| 5       | Commercial                 | 12.14         | 1.34       |
|         | <b>Total</b>               | <b>907.00</b> | <b>100</b> |

**Table 4-2, Schedule of Modules**

| Sr. No. | Module Category    | No. of Plots | %Age       |
|---------|--------------------|--------------|------------|
| 1       | 0.5 Acres          | 150          | 27.52      |
| 2       | 01 Acres           | 275          | 50.46      |
| 3       | 02 Acres           | 100          | 18.35      |
| 4       | 03 Acres           | 20           | 3.67       |
|         | <b>Total Plots</b> | <b>545</b>   | <b>100</b> |

### 4.4 Road Access

The Project is sited near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway. So, the main access road for the project is M3 Lahore- Abdul Hakim Motorway that is connected to the project site from the North side; it serves the heavy traffic related to the industrial area around the Project site. On the west side of the Project site, Nankana Sahib road runs across the project. Mangtan wala road is also located at north-west side of the project. The Road Access map is given below in Figure 4.3.

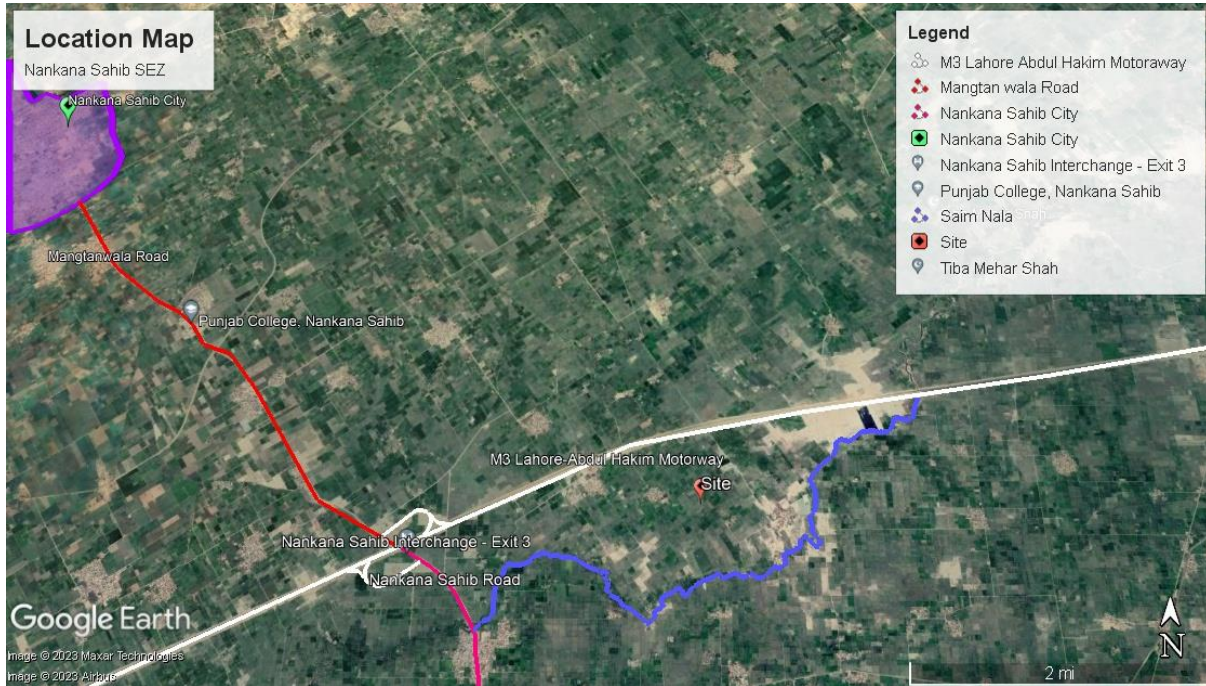


Figure 4-3, Road Map

#### 4.5 Vegetation Features of the site

Vegetation is naturally occurring plants in a particular region developed, naturalized or existed for many years in an area. It is represented by some common flora of that area. The land of the project site is partially agricultural in nature with common crops and approximately 400 mature trees of Jamun/Java plum (*Syzygium cumini*), Mango (*Mangifera indica*), Guava (*Psidium guajava*), Dates (*Phoenix dactylifera*), Safeda (*Eucalyptus globulus*), Kikar (*Vachellia nilotica*) etc.



Figure 4-4, Vegetation Features of the Site

#### 4.6 Cost & Magnitude of the Project

The proposed industrial park / Special Economic Zone will consist of development of plots along with industrial sheds, office spaces, research and development facilities, installation of boilers for steam generation along with air emission control devices and waste water treatment facility.

The Project will include social-infrastructure amenities such as roads, street lightening commercial area /shopping facility, residential, cafeterias and canteens, first-response fire-fighting facility, first-response first-aid rescue and medical facility (incl. dispensary), parking, open spaces and green belt, etc.,

The Project will also include utilities and services that are necessary in a world-class industrial estate such as water supply, power supply, natural gas supply, effluent collection network, effluent treatment and disposal network, storm water drainage, horticulture and gardening, building maintenance.

The total cost of the project is 23,806.64 million PKR which include all the thing regarding this project.

#### 4.7 Schedule of Implementation

The completion duration of development of Industrial Parks Private Limited Special Economic Zone is 01 years. There will be a symmetrical process.

##### **Project Pre- Construction**

The project pre-construction phase involves preparation of master plan, Business Plan and designing documents of the SEZ, financial feasibility, Land Acquisition, obtaining NOC of all concerned departments, site evaluation and schedule of working.

##### **Development Phase**

Construction of SEZ: The construction works include civil works, car park, Fire Stations, Electrification, Sewerage, Waste Water Treatment Plant, Water Supply, Civil Pavements, horticulture and finishing.

##### **Project Operation Phase**

The SEZ will be in operation soon after the Development work of the special economic zone with allied facilities. The estimated time frame for the project to be in full scale operational phase depends upon multiple factors but expected in 01 years.

#### 4.8 Project Description

The subject Project is Establishment of Special Economic Zone at Nankana Sahib which will host facilities for design, research & development, manufacturing, warehousing and associated activities.

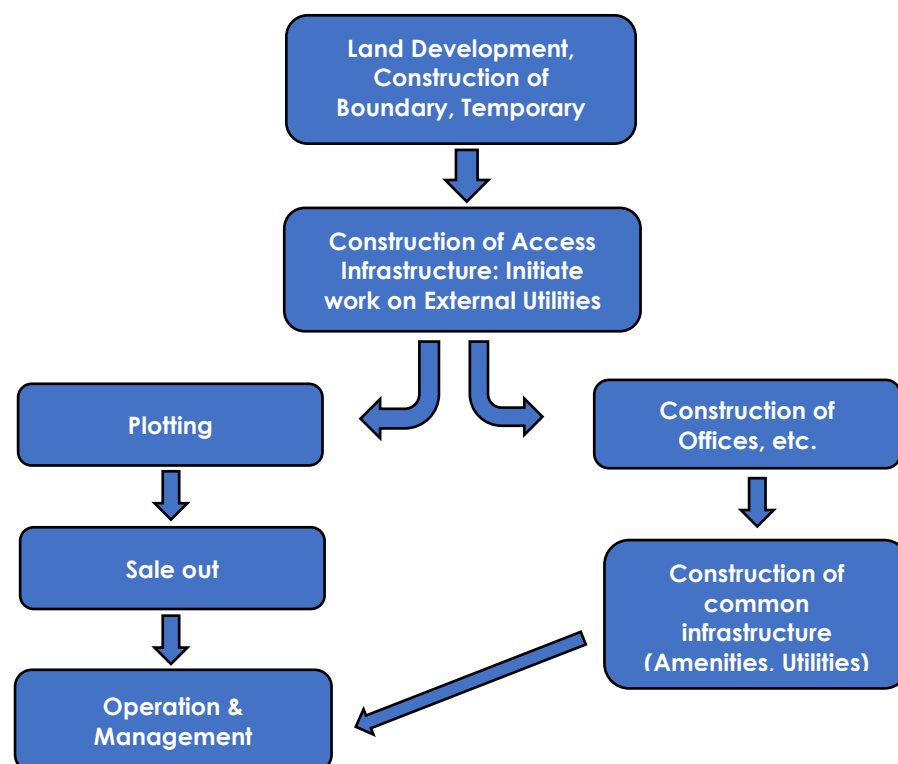
The construction will include a waste water treatment facility and

infrastructure such as roads, commercial facility, hostel apartments, training centre, cafeterias and canteens, first-response fire-fighting facility, first-response first-aid rescue and medical facility, parking, open spaces and green belt, etc. Further, 'ready-to use' industrial sheds, and office spaces; spaces for research and development facilities, lab testing facilities will also be constructed.

The total area allocated for the project is 907 acres. In which four types of industrial plots are proposed including 0.5-acre, 1 acre, 2 acres and 3 acres. Total number of plots proposed are 545. The total cost of proposed project of land development approximately 23,806.64 million PKR.

Major advantages of Special economic zone development plan are given below:

- i. Environmental benefits
- ii. Good working conditions
- iii. Advantage of economy of scales
- iv. Benefits for industrialists
- v. Economic benefits for the authorities
- vi. Employment opportunities
- vii. Secure environment for the firms
- viii. Stimulates new industries



**Figure 4-5, Process Flow Diagram of Proposed SEZ**

#### 4.9 Water Consumption & Wastewater Disposal

For development stage of the project the ground water will be used. The total area of construction land of the Project is 907 acres. The total water consumption of the Project is predicted to be about 6,612,355 gallons/day. Water requirement is met through 11 tube wells of 3 cusecs each and 8 Overhead Reservoirs.

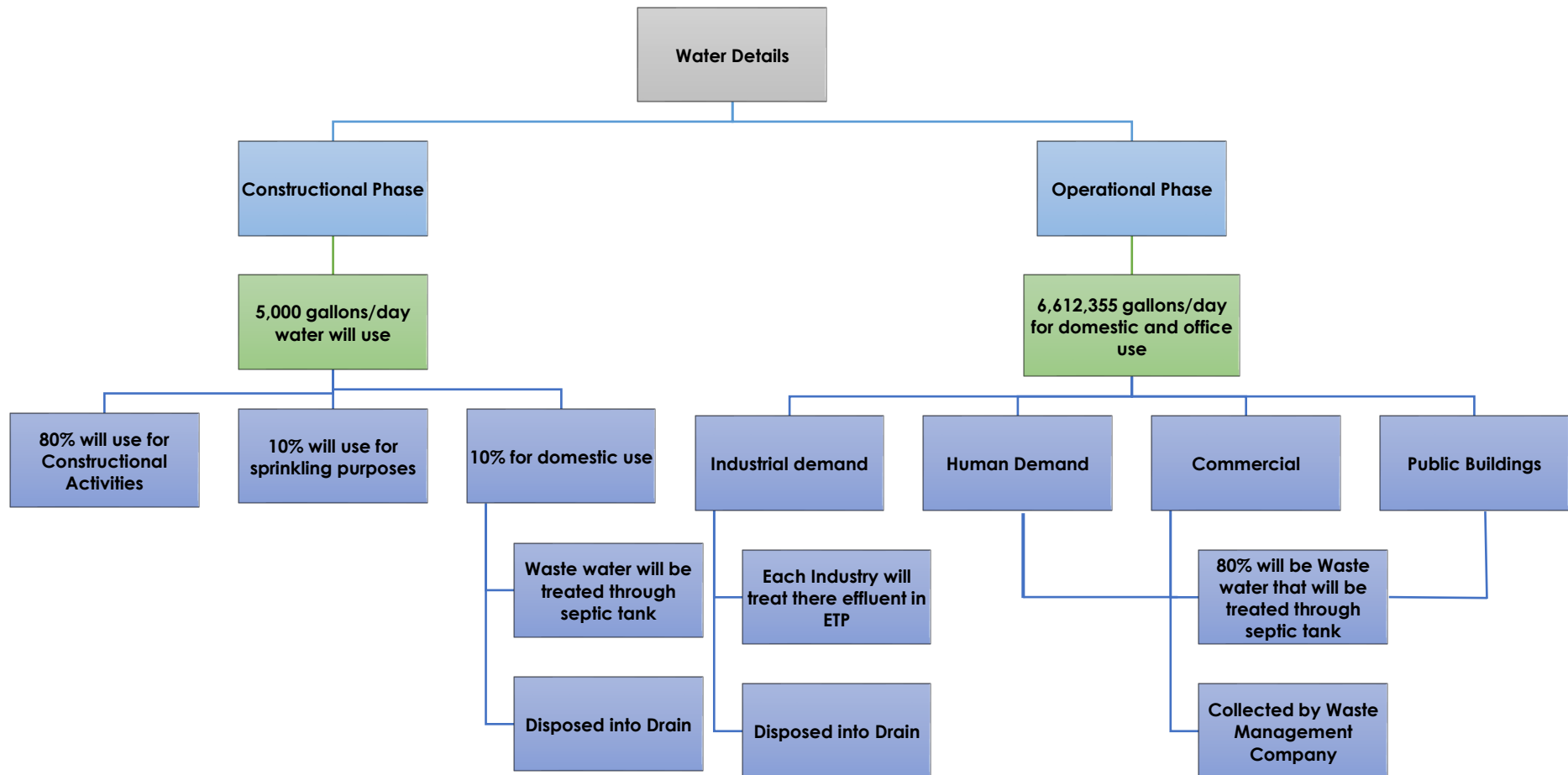


Figure 4-6, Water Balance

## 4.10 Solid Waste

Solid waste is expected to be produced both during construction and the operational phase from construction as well as operations & maintenance activities.

Typical, routine type solid waste from construction will be collected at a designated location(s) with the Project site area, and then handed over to the contractor for to dispose it off in the environmentally friendly. During operations & maintenance phase, solid waste produced from industrial estate will include domestic/office waste left-overs of miscellaneous materials, packaging waste, leftover toxic chemicals, sludge, etc.

Domestic waste during operational phase is expected to be 0.5kg / per person per day. Individual industries must collect their waste from the entire unit to the common collection point. It will be collected by the janitorial workers at the Special Economic Zone and handed over to the contractor to dispose off the waste in an environmentally friendly manner. While Industrial waste from 545 industrial unit is expected to be 23.80 tons/day. Special care will be taken while handling hazardous process waste. PPEs will be provided to the workers handling hazardous waste and the safe disposal of such hazardous waste will be ensured through an EPA certified contractor.

A specific area has been allocated by SEZ for the intermediate disposal of solid waste. Final disposal of solid waste will be done responsibly through contractor.

## 4.11 Construction Aspect

### 4.11.1 Construction Materials

Large quantities of building and road construction materials will be required for construction of the proposed project.

The materials mainly required are listed below:

- Sandy gravel
- Cement
- Steel
- Bitumen
- Kerb Stones
- Coarse and fine aggregate for concrete works
- Other materials

### 4.11.2 Construction Camps

The construction camps have to build by the selected contractor to accommodate construction staff, machinery and batching plants. The

Location of the camps has been selected in a way that there should be minimum disturbance to the ecological environment. The area of the camp has been kept sufficiently large to accommodate parking areas for machinery, construction materials and workshops. For the drinking water and other domestic uses of the camp, the treated ground water is being used.

#### 4.11.3 Work Force and Machinery

It has been estimated that the Project will employ about 100-120 skilled, semi-skilled and unskilled workforce for its development. The Project will deploy various types of machineries for construction purposes. These will include bulldozers, excavators, shovels, dumpers, batching plant, tankers, trucks, vibrator, compactor, cranes, loaders, grader, compressors, generators, roller, bowser etc.

#### 4.12 Facilities Provision

##### 4.12.1 Roads

Roads network plays key role in urban and industrial development. A good road network ensures the efficient mobility and ease of access to any locality/facility. In this project, various category of roads has been proposed in the plan; the minimum width has been maintained as 60 feet.

The category of roads provided in the master plan are included in **Table 4-3**.

**Table 4-3, Various Category of Roads in the Master Plan**

| Sr. No. | Type of Road        | Right of Way, ft |
|---------|---------------------|------------------|
| 1       | Main Boulevard      | 200              |
| 2       | Principle Collector | 150              |
| 3       | Minor Collector     | 120              |
| 4       | Streets             | 80 / 60          |

##### 4.12.2 Electricity

The proposed SEZ plans to facilitate its enterprises through one stop shop, whereby all the facilities are available at the door steps and they can start their businesses immediately after the construction. This will encourage the entrepreneurs to invest in the industries confidently. Salient electrical features which will be provided for Special Economic Zone, Electrical Works are:

- 01 Nos. Separate (132/11 kV) Grid Stations.
- 11 kV Distribution system with 38 Feeders
- Road/ Street lighting through LED lights
- Based on the estimation to cater 100% of the load requirements, one (01) No. of Grid Station is required at proposed location in the vicinity of the project as per industrial growth. The total estimated load for the Industrial Park has been

calculated as 97.65 MW. The total estimated load of 97.65 MW shall be fed from (132/11 kV) Grid Station with average capacity of 2.5 to 4.0 MW for each 11kV feeder.

#### **4.12.3 Natural Gas**

The Natural Gas is planned to be supplied through SNGPL, for which the application will be submitted by the PIEDMC. The Punjab SEZ Authority will be requested to assist in provision of required natural gas/ LNG to the enterprises through its network. The SNGPL will supply the gas directly to the enterprises and charge the dues from each user.

#### **4.12.4 Water**

The estimated water consumption of project is 6,612,355 gallons/day during operation phase. The Water will be supplied through 11 Tube wells each having 3 cusecs capacity. Further, 08 Overhead Reservoirs will also be installed to ensure hindrance free water supply. Water table in the area exists at around 1420 feet and therefore, sufficient quantity of water will be available for the needs of the enterprises and the labor residences.

#### **4.12.5 Waste Water Treatment**

Normally about 80% to 90% of water supplied is received as wastewater, therefore, the average sewage flow in the design will be based on 80% of water supplied. To treat domestic waste water septic tanks will be installed. . For industrial effluent, each industry will be mandated for primary and secondary treatment of their waste water as per its nature and constituent pollutants. Each industry will be bound through by-laws to use the combined effluent treatment plant (CETP) for tertiary treatment before dumping it in drain.

#### **4.12.6 Security**

The proposed Project site is designed as a 'gated-community' with controlled access and egress. The site will be secured by means of boundary wall along with the presence of security guards round the clock to maintain the security. Beside this, security cameras at various places will be installed.

#### **4.12.7 Fire Protection**

Proper fire management plan and equipment will be provided. Following measures will be taken;

- A non-coded digital addressable fire alarm system shall be designed for each existing and new building to meet the NFPA and local codes. The fire alarm system shall be connected to building's emergency power source.

- Per 2009 Virginia Statewide Fire Prevention Code 908.1 for H-use buildings, a digital voice fire alarm system will be installed that uses standard smoke detectors and manual pull stations.
- All new construction shall be equipped with fire alarm system that includes a building wide Public Announcement system. The microphone shall be placed in a locked cabinet in the lobby, fire control room, or other space accessible to building management and first responders. When an emergency occurs, building management must have access to the system microphone to make announcements.
  - Fire detection equipment that is located on a pitched roof must have the appropriate tie-offs and guide rails to facilitate a safe ascent to and descent from the equipment.

#### **4.12.8 Medical Facilities**

The proposed SEZ will have an emergency medical care unit (a dispensary) with all necessary facilities including a burn unit. It will be linked with District Head Quarter Hospital Nankana Sahib at a distance of 09 Km and Umar Hospital (7.2 Km) on referral system for secondary and tertiary medical care. The hospitals are nearest to the zone and in case of further medical care, the patients would be referred to Tertiary care hospitals of Lahore.

#### **4.12.9 Academic and Vocational Training Facilities**

This Special Economic Zone will be an Industrial Hub. Therefore, it would be most appropriate to create a training and vocational center for the benefit of all the industries. Therefore, Provincial Government would be requested for the general benefit of all the industries to establish a vocational center to cater for the skills training pertaining to the industries of proposed SEZ as well as established in the near vicinity.

#### **4.12.10 Plantation**

Sufficient plantation will be done at the proposed project site after the land development process has been completed in accordance with the approved Master Plan of Special Economic Zone. Green belt along the roads will be established in accordance with approved Master Plan of Special Economic Zone.

#### **4.12.11 Parking Area**

Ample parking area, adequate to serve the businesses, industries and establishments hosted inside Special Economic Zone will be provided in accordance with the approved Master Plan for Special Economic Zone.

#### 4.13 Restoration and Rehabilitation Plans

The main areas to be considered for the site restoration include the construction areas, roads and camp site tracks etc. These areas will be restored to the original condition with the maximum possible effort. The restoration work comprises the removal of temporary construction works and removal of any fence installed, levelling of areas (wherever required), etc. The following procedures will be adopted for the restoration of the site:

- All temporary construction built for the developing SEZ-Nankana Sahib will be removed.
- All the toxic and hazardous chemicals/materials will be completely removed the site and properly disposed of. Efforts will be made to completely remove the spills during the construction stage.
- All fencing and gates will be removed and pits will be backfilled.
- Necessary landscaping will be done as required to restore the site as per plantation plan.
- Whole of the site will be covered with the original soil and re-vegetation will be done, wherever required.
- Finally, after the completion of the restoration process, PIEDMIC will inspect the site and give restoration clearance to the Contractor.

#### 4.14 Government & Local Approvals:

The proponent will submit all relevant NOCs from other departments after the issuance of NOC from EPA.

## SECTION - 5: DESCRIPTION OF ENVIRONMENTAL & SOCIAL BASELINE CONDITIONS

### 5.1 Introduction

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Project Area as well as the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the Project/Study Area and information obtained through detailed consultation with the Government departments and other agencies.

### 5.2 Physical Resources

#### 5.2.1 Topography

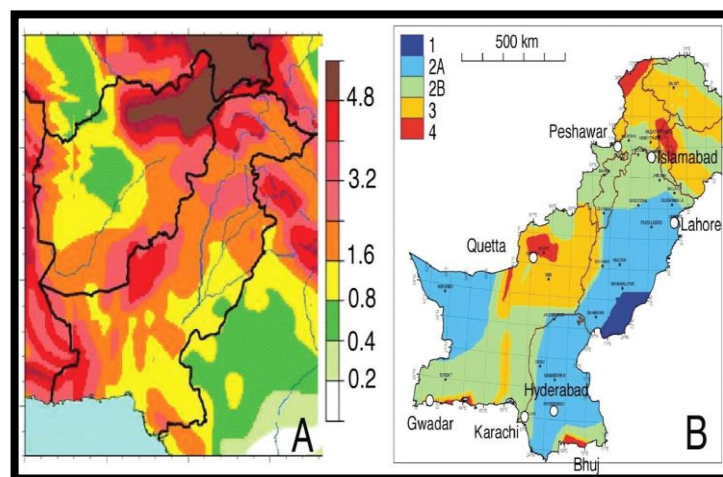
The topography of Nankana Sahib is generally flat, as there is no hilly area in the district.

#### 5.2.2 Geology

The major part of project site basin is an alluvial plain.

#### 5.2.3 Seismology

The project area falls in Zone 2A in accordance with Seismic zone of Pakistan. The project site falls in the Punjab plain which shows low to moderate level of seismicity. It is therefore recommended that the project structures should be designed to cater the requirements of Zone 2A of Building Code of Pakistan (2007). Based on the evaluation of tectonic setting and seismicity of the project region, it is recommended that the important project structures should be designed to withstand a horizontal peak ground acceleration of 0.15g with 10% probability of exceedance in 50 year.



**Figure 5-1, Seismic Zone of Pakistan (Geological Survey of Pakistan)**

#### 5.2.4 Soil

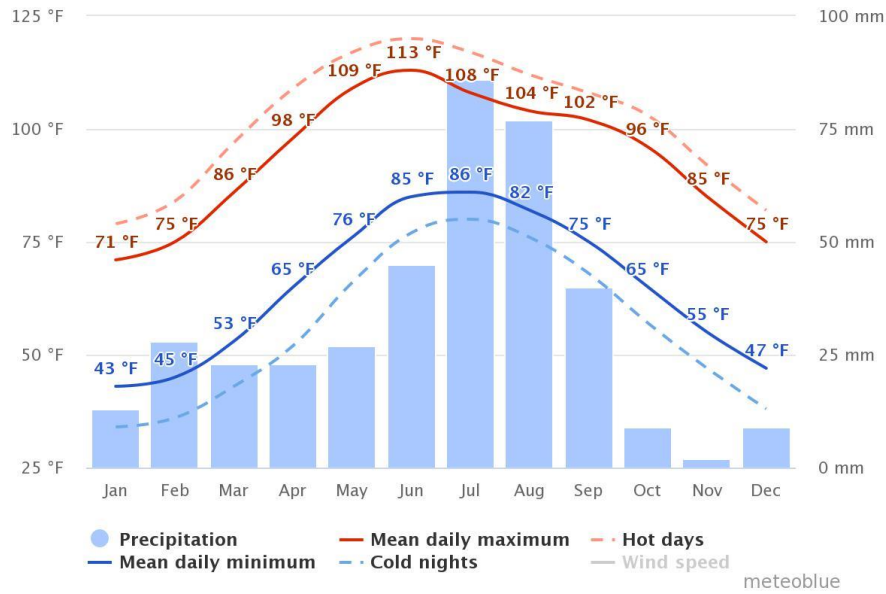
Some marshy areas exist along the river Ravi and the nature of land is sandy and clay-loam. River Ravi passes through Nankana Sahib district and the entire district is irrigated through canals and tube wells. The sub-soil water is considered sweet and abundant.

#### 5.2.5 Climate

Climate of Nankana Sahib District is extreme in both summer and winter. Following statistics of temperature, precipitation/rainfall, and wind speed and wind direction are represented climate trend of 1990- 2020. The summer season starts from the month of April and continues till October. May and June are the hottest months with day temperature usually ranging from 39 to 41-degree centigrade. The winter season begins from the month of November and continues till March. January is the coldest month with a mean minimum temperature of 5-degree centigrade. Dust storms occur occasionally during the hot season relieving temporarily the intensity of heat. Towards the end of June monsoon conditions appear and during the following two and half month's spell of rainy season alternates with intervals of sultry weather.

**Temperature & Precipitation:** With the global rising temperature, more evaporation occurs leading to an increase in overall precipitation. Therefore, a warming climate is expected to increase precipitation in many areas.

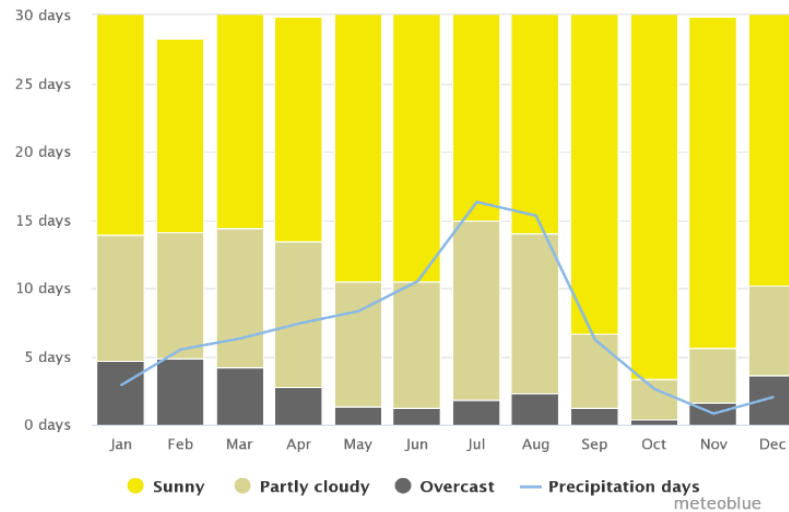
Figure 5-2 show the precipitation and temperature data of the Nankana Sahib district.



**Figure 5-2, Temperature & Precipitation Data of Nankana**

**Cloudy, Sunny, and Precipitation:** Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.

Figure 5-3 show the cloudy sunny and precipitation days at Nankana Sahib District.



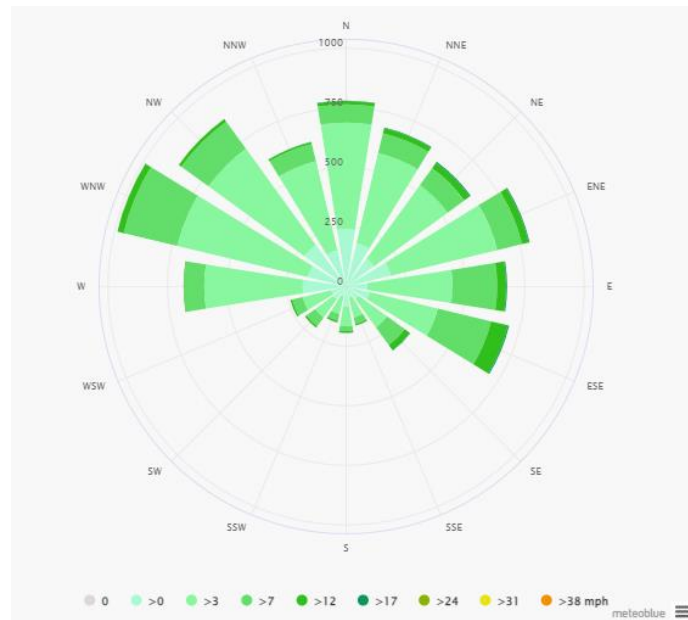
**Figure 5-3, Cloudy, Sunny, and Precipitation days in Nankana**

**Precipitation:** The below precipitation diagram shows on how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated. Usually in July and August precipitation amount is high as compared to other months.

Figure 5-4 show the precipitation amount in Nankana Sahib District.

**Figure 5-4, Precipitation Amount of Nankana**

**Wind Speed:** During cold seasons of the year northern winds prevail and during hot seasons southern winds. The below diagram shows the annual data of wind speed. Speed of wind is varying in Nankana Sahib District at different Time. Figure 5-5 show wind speed Nankana Sahib District



**Figure 5-5, Wind rose of Nankana**

### 5.2.6 Surface Water

There are no rivers or lakes present near project corridor. The nearest water body is Saim Nallah located at south of the project site.

## 5.3 Ecological Resources

In order to develop the ecological baseline of the site, the diverse ecological surveys were conducted given as under:-

### 5.3.1 Flora

Trees commonly found in this district Jamun/Java plum (*Syzygium cumini*), Mango (*Mangifera indica*), Guava (*Psidium guajava*), Dates (*Phoenix dactylifera*), Safeda (*Eucalyptus globulus*), Kikar (*Vachellia nilotica*) etc.

### A) Endangered Species

There are no endangered species of flora in the Study Area.

**B) Forest**

There is no forest and protected land in the study area

**5.3.2 Fauna**

A short description of fauna in project site is discussed below:

**A) Mammals**

Animals like jackal, wild rabbit, foxes, wild cats, wild boar are commonly found in the entire district. Wild boars damage and destroy various agricultural crops such as rice, potatoes and other vegetables in the riverine areas.

**B) Reptiles**

The most common reptiles in the area include, lizards, Varanis (Goh/large lizard), spiders and scorpions, etc.

**C) Amphibians**

Amphibians found in the tract include common frog (*Rana tigrina*) and common toad (*Bufo bufo*)

**D) Birds**

Water fowl (bird) are found in the water holes in low level areas in the winter season. The birds such as dove, quail, pigeon, crow, parrot, nightingale etc. are found in the wild. In winter season, various species of ducks and migratory birds can be found on the bank of River Ravi and water reservoirs in the villages.

**E) Fish**

Fishing is very common on the bank of River Ravi. There are many water reservoirs which are being used as fish farms. Fish of different kinds as mohri, raho, thaila etc. are being bred in the fish farms

**5.4 Socioeconomic Environment**

Socioeconomic environment of district Lahore has been studied through secondary sources and a brief introduction has been given below:

**5.4.1 Demographic Characteristics of the Project Area**

The total population of Nankana Sahib District has crossed 1.356 million.

**5.4.2 Religion**

The population of the district is predominantly Muslims i.e., approx. 95 percent, other minorities like Christians, Sikhs and Hindus etc. are approx. 5 percent.

**5.4.3 Ethnic Structure**

Ethnically the population of the project area can be divided in to Rajput, Bhatti, Awan, Raja and Chaudhary.

#### **5.4.4 Dress in the Project Area**

The most common male dress is trouser shirt shalwar kameez. The ladies also wear shalwar kameez with dupata and some girls were also found wearing western dress jeans shirt. However, school students were found wearing proper uniform.

#### **5.4.5 Languages**

The main languages are Urdu and Punjabi.

#### **5.4.6 Education**

The overall literacy rate of Nankana Sahib City is 66%. There are 08-degree colleges, 08 higher secondary schools and more than 500 primary and middle schools. But during the survey it was observed that there are only 2 primary schools on the project site and people mostly go to educational institutes in Nankana Sahib City. So, there is lack of proper educational facilities.

#### **5.4.7 Health Facilities**

There is no immediate medical facility on the project site. People often go to nearby hospital in Nankana Sahib city. The nearest hospitals in Nankana Sahib City are District Head Quarter Hospital Nankana Sahib at a distance of 09 Km and Umar Hospital (7.2 Km). Some major diseases found in the project area are asthma, diabetes, diarrhea, typhoid and blood pressure.

#### **5.4.8 Quality of Life Values**

All classes of people are present in Nankana Sahib District; People lead lives according to their income.

#### **5.4.9 Civic Amenities**

Civic amenities like potable drinking water, dispensary and rest area are available near the project site.

#### **5.4.10 HOUSING PATTERNS**

Most of the area is consist of agricultural land, main two village located on the project site are Kot Mantan and Kanwan Wali. Majority of house in these villages are mud houses and few are cemented.

#### **5.4.11 TRANSPORTATION**

Mode of transportation in the area are cycles, bikes, cars, donkey and horse carts. There is lack of proper road on the site.

#### **5.4.12 Games**

Cricket, Football, badminton, Hockey, Volleyball, Kabaddi and Kushti are major sports of Nankana District.

#### **5.4.13 Welfare of Employees**

Management of project is mindful of the fact that the satisfied employees will deliver better output.

#### **5.4.14 Aesthetic Values**

Like the general trend among the citizens of area, most of the people have low awareness about environment. Even then, some people take cleanliness and neatness of the environment lightly. Some people throw municipal solid wastes (MSWs) on the streets. Sense of personal responsibility to keep the environment clean as good citizens is even now lacking among a few people.

#### **5.4.15 Indigenous People and Vulnerable Social Groups**

No indigenous group of people was identified.

#### **5.4.16 Religious, Historical, Archaeological and Recreational Sites**

##### **A) Religious Sites**

Religious sites include mosques, shrines and graveyards. These are socially sensitive areas to deal with. Mosques and graveyards are regarded as sacred heritage and receive devoted attention from the people. As far as the present study is concerned, there is no disturbance to religious sites due to development and operation phase of the project.

##### **B) Historical and Archaeological Sites**

There is no historical and archaeological site immediately near the Project Area but there is a famous Gurudwara named "Gurudwara Janam Asthan" at 8km from the Project area.

##### **C) Recreational Sites**

No recreational site was identified in the study area.

### **5.5 Lab Reports of Environmental Analysis**

#### **5.5.1 Ground Water Analysis**

It was observed that the project site has good groundwater at depths from 120ft. For the purpose of checking the quality of groundwater, one sample was taken from localities located on project site i.e., Kot Mantan and Kawan Wali through motor pump present on the site and analysed for 30 PEQS parameters.

Based on the laboratory test results, it was found that all the parameters of Groundwater samples are within the permissible limits. The details of the results

have been shown in Table 5-1 and 5-2 below.

The detailed Ground water analysis is attached as Annexure 9.

**Table 5-1, Ground Waste Quality of Village Kawan Wali**

| Ground Water Analysis Results             |                                          |                   |                   |            |         |
|-------------------------------------------|------------------------------------------|-------------------|-------------------|------------|---------|
| Parameter                                 | Analysis Method                          | PEQS              | Result            | MU (CL95%) | Remarks |
| <b>Lab Analysis</b>                       |                                          |                   |                   |            |         |
| Color*                                    | SMWW 2120 C                              | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                    | SMWW 2160 C                              | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Odor*                                     | SMWW 2150 B                              | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                                | SMWW 2130 B                              | < 5 NTU           | 0                 | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> )**  | SMWW 2340 C                              | < 500 mg/L        | 196               | ± 2.07     | Optimal |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C                              | < 1000 mg/L       | 491               | ± 7.21     | Optimal |
| pH**                                      | SMWW 4500 H <sup>+</sup> B               | 6.5- 8.5          | 7.52              | ± 0.049    | Optimal |
| Aluminum (Al)                             | SMWW 3111 B                              | ≤ 0.2 mg/L        | <0.005            | N.A.       | Optimal |
| Antimony (Sb)                             | SMWW 3114 B                              | ≤ 0.005 mg/L      | <0.005            | N.A.       | Optimal |
| Arsenic (As)                              | SMWW 3114 B                              | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Barium (Ba)                               | SMWW 3113 B                              | 0.7 mg/L          | <0.0035           | N.A.       | Optimal |
| Boron (B)                                 | SMWW 3113 B                              | 0.3 mg/l          | <0.02             | N.A.       | Optimal |
| Cadmium (Cd)                              | SMWW 3113 B                              | 0.01 mg/L         | <0.006            | N.A.       | Optimal |
| Chloride (Cl <sup>-</sup> )**             | SMWW 4500 Cl <sup>-</sup> B              | < 250 mg/L        | 38                | ± 1.26     | Optimal |
| Chromium (Cr)                             | SMWW 3113 B                              | ≤ 0.05 mg/L       | <0.004            | N.A.       | Optimal |
| Copper (Cu)                               | SMWW 3111 B                              | 2.0 mg/L          | 0.164             | N.A.       | Optimal |
| Cyanide (CN <sup>-</sup> )*               | SMWW 4500 CN <sup>-</sup> F              | ≤ 0.05 mg/L       | 0                 | N.A.       | Optimal |
| Fluoride (F <sup>-</sup> )**              | SMWW 4500 F <sup>-</sup> D               | ≤ 1.5 mg/L        | 0.73              | ± 0.61     | Optimal |
| Lead (Pb)                                 | SMWW 3114 B                              | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Manganese (Mn)                            | SMWW 3113 B                              | ≤ 0.5 mg/l        | 0.015             | N.A.       | Optimal |
| Mercury (Hg)                              | SMWW 3114 B                              | ≤ 0.001 mg/L      | <0.001            | N.A.       | Optimal |
| Nickel (Ni)                               | SMWW 3113 B                              | ≤0.02 mg/L        | <0.02             | N.A.       | Optimal |
| Nitrate (NO <sub>3</sub> <sup>-</sup> ) * | SMWW 4500 NO <sub>3</sub> <sup>-</sup> B | ≤ 50 mg/L         | 0                 | N.A.       | Optimal |

| Ground Water Analysis Results             |                                          |              |       |      |         |
|-------------------------------------------|------------------------------------------|--------------|-------|------|---------|
| Nitrite (NO <sub>2</sub> <sup>-</sup> ) * | SMWW 4500 NO <sub>2</sub> <sup>-</sup> B | ≤ 3.0 mg/L   | 0.15  | N.A. | Optimal |
| Selenium (Se)                             | SMWW 3114 B                              | 0.01 mg/L    | <0.01 | N.A. | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) *    | SMWW 4500 Cl <sup>-</sup> B              | 0.5 mg/L     | 0     | N.A. | Optimal |
| Phenolic Compounds (as Phenols) *         | SMWW 5530 D                              | NGVS         | 0     | N.A. | -       |
| Zinc (Zn)                                 | SMWW 3113 B                              | 5.0 mg/L     | 0.038 | N.A. | Optimal |
| <b>Microbiological Analysis</b>           |                                          |              |       |      |         |
| Total Coliforms*                          | SMWW 9222 B                              | 0 CFU/100 mL | 0     | N.A. | Optimal |
| Fecal Coliforms *                         | SMWW 9222 D                              | 0 CFU/100 mL | 0     | N.A. | Optimal |

**Table 5-2, Ground Waste Quality of Village Kot Mantan**

| Ground Water Analysis Results             |                             |                   |                   |            |         |
|-------------------------------------------|-----------------------------|-------------------|-------------------|------------|---------|
| Parameter                                 | Analysis Method             | PEQS              | Result            | MU (CL95%) | Remarks |
| <b>Lab Analysis</b>                       |                             |                   |                   |            |         |
| Color*                                    | SMWW 2120 C                 | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                    | SMWW 2160 C                 | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Odor*                                     | SMWW 2150 B                 | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                                | SMWW 2130 B                 | < 5 NTU           | 0                 | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> ) ** | SMWW 2340 C                 | < 500 mg/L        | 380               | ± 2.07     | Optimal |
| Total Dissolved Solids (TDS)**            | SMWW 2540 C                 | < 1000 mg/L       | 980               | ± 7.26     | Optimal |
| pH**                                      | SMWW 4500 H <sup>+</sup> B  | 6.5- 8.5          | 7.42              | ± 0.049    | Optimal |
| Aluminum (Al)                             | SMWW 3111 B                 | ≤ 0.2 mg/L        | <0.005            | N.A.       | Optimal |
| Antimony (Sb)                             | SMWW 3114 B                 | ≤ 0.005 mg/L      | <0.005            | N.A.       | Optimal |
| Arsenic (As)                              | SMWW 3114 B                 | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Barium (Ba)                               | SMWW 3113 B                 | 0.7 mg/L          | <0.0035           | N.A.       | Optimal |
| Boron (B)                                 | SMWW 3113 B                 | 0.3 mg/l          | <0.02             | N.A.       | Optimal |
| Cadmium (Cd)                              | SMWW 3113 B                 | 0.01 mg/L         | <0.006            | N.A.       | Optimal |
| Chloride (Cl <sup>-</sup> ) **            | SMWW 4500 Cl <sup>-</sup> B | < 250 mg/L        | 134               | ± 1.38     | Optimal |
| Chromium (Cr)                             | SMWW 3113 B                 | ≤ 0.05 mg/L       | <0.004            | N.A.       | Optimal |
| Copper (Cu)                               | SMWW 3111 B                 | 2.0 mg/L          | 0.165             | N.A.       | Optimal |
| Cyanide (CN <sup>-</sup> )*               | SMWW 4500 CN <sup>-</sup> F | ≤ 0.05 mg/L       | 0                 | N.A.       | Optimal |

| Ground Water Analysis Results             |                                          |              |        |        |         |
|-------------------------------------------|------------------------------------------|--------------|--------|--------|---------|
| Fluoride (F <sup>-</sup> )**              | SMWW 4500 F-D                            | ≤ 1.5 mg/L   | 0.67   | ± 0.61 | Optimal |
| Lead (Pb)                                 | SMWW 3114 B                              | ≤ 0.05 mg/L  | <0.005 | N.A.   | Optimal |
| Manganese (Mn)                            | SMWW 3113 B                              | ≤ 0.5 mg/l   | 0.015  | N.A.   | Optimal |
| Mercury (Hg)                              | SMWW 3114 B                              | ≤ 0.001 mg/L | <0.001 | N.A.   | Optimal |
| Nickel (Ni)                               | SMWW 3113 B                              | ≤ 0.02 mg/L  | <0.02  | N.A.   | Optimal |
| Nitrate (NO <sub>3</sub> <sup>-</sup> ) * | SMWW 4500 NO <sub>3</sub> <sup>-</sup> B | ≤ 50 mg/L    | 0      | N.A.   | Optimal |
| Nitrite (NO <sub>2</sub> <sup>-</sup> ) * | SMWW 4500 NO <sub>2</sub> <sup>-</sup> B | ≤ 3.0 mg/L   | 0.15   | N.A.   | Optimal |
| Selenium (Se)                             | SMWW 3114 B                              | 0.01 mg/L    | <0.01  | N.A.   | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) *    | SMWW 4500 Cl <sup>-</sup> B              | 0.5 mg/L     | 0      | N.A.   | Optimal |
| Phenolic Compounds (as Phenols) *         | SMWW 5530 D                              | NGVS         | 0      | N.A.   | -       |
| Zinc (Zn)                                 | SMWW 3113 B                              | 5.0 mg/L     | 0.042  | N.A.   | Optimal |
| <b>Microbiological Analysis</b>           |                                          |              |        |        |         |
| Total Coliforms*                          | SMWW 9222 B                              | 0 CFU/100 mL | 0      | N.A.   | Optimal |
| Fecal Coliforms *                         | SMWW 9222 D                              | 0 CFU/100 mL | 0      | N.A.   | Optimal |



**Figure 5-6, Ground Water Sampling**

### 5.5.2 Ambient Air Quality

At present, major sources of air pollution are mobile sources. Ambient air quality was monitored for the purpose of this study at one central location. All vales of ambient air quality are in compliance with PEQS.

The monitored parameters included Carbon mono-oxide (CO), Nitrogen dioxide (NO<sub>2</sub>), Sulphur dioxide (SO<sub>2</sub>), Particulate Matter (PM<sub>10</sub>) and Particulate Matter (PM<sub>2.5</sub>). The monitoring was carried out for a period of 24 hours with an interval of 1 hours between consecutive readings at each monitoring point. The detail Environmental Monitoring Report is attached as Annexure 9 while the 24 hours average results are presented below in Table 5-3 and 5-4.

**Table 5-3, Ambient Air Quality**

| Sr. No. | Time  | CO<br>(mg/m <sup>3</sup> ) | NO<br>(µg/m <sup>3</sup> ) | NO <sub>2</sub><br>(µg/m <sup>3</sup> ) | NO <sub>x</sub><br>(µg/m <sup>3</sup> ) | SO <sub>2</sub><br>(µg/m <sup>3</sup> ) |
|---------|-------|----------------------------|----------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 1       | 13:30 | 1.37                       | 13.67                      | 44.33                                   | 68.74                                   | 42.10                                   |
| 2       | 14:30 | 1.99                       | 14.20                      | 53.53                                   | 97.22                                   | 32.49                                   |
| 3       | 15:30 | 1.82                       | 15.21                      | 44.89                                   | 86.31                                   | 47.64                                   |
| 4       | 16:30 | 1.99                       | 14.41                      | 51.27                                   | 96.23                                   | 50.83                                   |
| 5       | 17:30 | 1.06                       | 15.96                      | 44.18                                   | 91.47                                   | 52.62                                   |
| 6       | 18:30 | 1.02                       | 16.08                      | 44.64                                   | 95.92                                   | 37.44                                   |
| 7       | 19:30 | 2.55                       | 15.59                      | 46.97                                   | 98.67                                   | 44.06                                   |
| 8       | 20:30 | 2.18                       | 14.24                      | 45.08                                   | 102.07                                  | 46.56                                   |
| 9       | 21:30 | 1.99                       | 13.45                      | 57.01                                   | 93.59                                   | 51.34                                   |
| 10      | 22:30 | 1.66                       | 12.66                      | 57.57                                   | 90.51                                   | 43.43                                   |
| 11      | 23:30 | 1.55                       | 12.87                      | 41.14                                   | 76.97                                   | 40.62                                   |
| 12      | 00:30 | 1.62                       | 11.09                      | 59.80                                   | 97.12                                   | 45.39                                   |
| 13      | 01:30 | 1.98                       | 11.90                      | 43.78                                   | 85.68                                   | 40.62                                   |
| 14      | 02:30 | 0.81                       | 11.41                      | 44.27                                   | 87.78                                   | 45.39                                   |
| 15      | 03:30 | 1.05                       | 10.54                      | 48.75                                   | 88.36                                   | 40.28                                   |
| 16      | 04:30 | 1.16                       | 9.36                       | 57.32                                   | 95.23                                   | 37.11                                   |
| 17      | 05:30 | 1.75                       | 8.23                       | 57.72                                   | 91.20                                   | 32.04                                   |
| 18      | 06:30 | 2.21                       | 9.42                       | 45.12                                   | 94.66                                   | 30.55                                   |
| 19      | 07:30 | 2.10                       | 11.34                      | 61.91                                   | 117.01                                  | 27.30                                   |
| 20      | 08:30 | 1.63                       | 11.73                      | 61.91                                   | 121.32                                  | 22.20                                   |
| 21      | 09:30 | 2.44                       | 12.85                      | 68.07                                   | 126.75                                  | 25.48                                   |
| 22      | 10:30 | 3.14                       | 14.58                      | 60.42                                   | 125.07                                  | 37.43                                   |
| 23      | 11:30 | 3.38                       | 15.74                      | 55.21                                   | 112.80                                  | 45.37                                   |
| 24      | 12:30 | 3.38                       | 16.11                      | 44.89                                   | 98.10                                   | 49.00                                   |

| Sr. No.               | Time | CO<br>(mg/m <sup>3</sup> ) | NO<br>(µg/m <sup>3</sup> ) | NO <sub>2</sub><br>(µg/m <sup>3</sup> ) | NO <sub>x</sub><br>(µg/m <sup>3</sup> ) | SO <sub>2</sub><br>(µg/m <sup>3</sup> ) |
|-----------------------|------|----------------------------|----------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Average Concentration |      | 1.91                       | 13.02                      | 51.66                                   | 97.45                                   | 40.30                                   |

**Table 5-4, Ambient Air Quality of Proposed Site**

| Parameters                                | Units             | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS  | Remarks |
|-------------------------------------------|-------------------|---------------------|------|--------------------------------|-------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | µg/m <sup>3</sup> | 24Hours             | 1.00 | 51.66                          | 80.0  | Optimal |
| Nitrogen Oxide (NO)*                      | µg/m <sup>3</sup> | 24Hours             | 1.00 | 13.02                          | 40.0  | Optimal |
| NO <sub>x</sub> *                         | µg/m <sup>3</sup> | 24Hours             | 1.00 | 97.45                          | 120.0 | Optimal |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | µg/m <sup>3</sup> | 24Hours             | 1.00 | 40.30                          | 120.0 | Optimal |
| Carbon Monoxide (CO) *                    | mg/m <sup>3</sup> | 24Hours             | 0.01 | 1.91                           | 05.0  | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | µg/m <sup>3</sup> | 24Hours             | 1.00 | 112.08                         | 150   | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | µg/m <sup>3</sup> | 24Hours             | 1.00 | 30.16                          | 35    | Optimal |
| Total Particulate Matter (TSP)            | µg/m <sup>3</sup> | 24Hours             | 1.00 | 201.23                         | 500   | Optimal |



**Figure 5-7, Ambient Air Monitoring**

### 5.5.3 Noise Levels

Major sources of noise generation are operations due to vehicular traffic. Noise levels were monitored for the period of 24 hour at proposed SEZ. The results show that the noise levels are in compliance with PEQS. The results are presented in Table 5-5 below,

**Table 5-5, Noise Level Monitoring Report**

| Sr. No. | Time  | Noise dB(A) |            | PEQS |
|---------|-------|-------------|------------|------|
| 1       | 13:30 | 47          |            |      |
| 2       | 14:30 | 43          |            |      |
| 3       | 15:30 | 49          |            |      |
| 4       | 16:30 | 41          |            |      |
| 5       | 17:30 | 53          | Day Time   | 75   |
| 6       | 18:30 | 55          |            |      |
| 7       | 19:30 | 59          |            |      |
| 8       | 20:30 | 51          |            |      |
| 9       | 21:30 | 50          |            |      |
| 10      | 22:30 | 48          |            |      |
| 11      | 23:30 | 54          |            |      |
| 12      | 00:30 | 56          |            |      |
| 13      | 01:30 | 43          |            |      |
| 14      | 02:30 | 49          | Night Time | 65   |
| 15      | 03:30 | 41          |            |      |
| 16      | 04:30 | 40          |            |      |
| 17      | 05:30 | 51          |            |      |
| 18      | 06:30 | 53          |            |      |
| 19      | 07:30 | 59          |            |      |
| 20      | 08:30 | 54          |            |      |
| 21      | 09:30 | 48          |            |      |
| 22      | 10:30 | 47          | Day Time   | 75   |
| 23      | 11:30 | 46          |            |      |
| 24      | 12:30 | 41          |            |      |

### 5.5.4 Waste Water Analysis

The nearest drain present on the project site is Saim Nallah. For the purpose of checking the quality of wastewater, one sample was taken and analysed for 30 PEQS parameters.

Based on the laboratory test results, it was found that BOD, COD, and TSS are above then permissible limit. Moreover, all remaining parameters of waste water samples are within the permissible limits. The details of the results have been shown below in Table 5-6.

The detailed Ground water analysis is attached as Annexure 9.

**Table 5-6, Waste water Quality of Proposed Site**

| Wastewater Analysis Results                     |                                           |           |             |             |         |
|-------------------------------------------------|-------------------------------------------|-----------|-------------|-------------|---------|
| Parameter                                       | Analysis Method                           | PEQS      | Result      | MU (CL95 %) | Remarks |
| <b>Lab Analysis</b>                             |                                           |           |             |             |         |
| pH**                                            | SMWW 4500 H <sup>+</sup> B                | 6 - 9     | 7.28        | ± 0.049     | Optimal |
| Biochemical Oxygen Demand (BOD <sub>5</sub> ) * | SMWW 5210-B                               | 80 mg/L   | <b>1151</b> | N.A.        | High    |
| Chemical Oxygen Demand (COD)**                  | SMWW 5220 D                               | 150 mg/L  | <b>2710</b> | ± 5.48      | High    |
| Total Suspended Solids (TSS)**                  | SMWW 2540 D                               | 200 mg/L  | <b>985</b>  | ± 5.95      | High    |
| Total Dissolved Solids (TDS)**                  | SMWW 2540 C                               | 3500 mg/L | 2899        | ± 9.18      | Optimal |
| Phenolic Compounds (as Phenols) *               | SMWW 5530 D                               | 0.1 mg/L  | 0           | N.A.        | Optimal |
| Grease and Oil*                                 | USEPA 1664 B                              | 10 mg/L   | 6.0         | N.A.        | Optimal |
| Chloride (Cl) <sup>-</sup> **                   | SMWW 4500 Cl-B                            | 1000 mg/L | 439         | ± 3.07      | Optimal |
| Fluoride (F) <sup>-</sup> **                    | SMWW 4500 F- D                            | 10 mg/L   | 0.31        | ± 0.61      | Optimal |
| Cyanide (CN) <sup>-</sup> *                     | SMWW 4500 CN-F                            | 1.0 mg/L  | 0           | N.A.        | Optimal |
| An-ionic Detergents (as MBAs) *                 | SMWW 5540-C                               | 20.0 mg/L | 1.2         | N.A.        | Optimal |
| Sulfate (SO <sub>4</sub> <sup>2-</sup> ) *      | SMWW 4500 SO <sub>4</sub> <sup>2-</sup> E | 600 mg/L  | 126         | N.A.        | Optimal |
| Sulfide (S <sup>2-</sup> ) *                    | SMWW 4500 S <sup>2-</sup> F               | 1.0 mg/L  | 0           | N.A.        | Optimal |
| Ammonia (NH <sub>3</sub> ) *                    | SMWW 4500-NH <sub>3</sub> C               | 40 mg/L   | 0           | N.A.        | Optimal |
| Cadmium (Cd)                                    | SMWW 3113 B                               | 0.1 mg/L  | 0.006       | N.A.        | Optimal |
| Chromium (Cr)                                   | SMWW 3113 B                               | 1.0 mg/L  | <0.004      | N.A.        | Optimal |
| Copper (Cu)                                     | SMWW 3113 B                               | 1.0 mg/L  | 0.170       | N.A.        | Optimal |
| Lead (Pb)                                       | SMWW 3113 B                               | 0.5 mg/L  | <0.005      | N.A.        | Optimal |

| Wastewater Analysis Results            |                  |           |                     |      |         |
|----------------------------------------|------------------|-----------|---------------------|------|---------|
| Mercury (Hg)                           | SMWW 3112 B      | 0.01 mg/L | <0.001              | N.A. | Optimal |
| Selenium (Se)                          | SMWW 3114 B      | 0.5 mg/L  | <0.01               | N.A. | Optimal |
| Nickel (Ni)                            | SMWW 3113 B      | 1.0 mg/L  | <0.006              | N.A. | Optimal |
| Silver (Ag)                            | SMWW 3113 B      | 1.0 mg/L  | <0.007              | N.A. | Optimal |
| Total Toxic Metals                     | Calculated Value | 2.0 mg/L  | 0.24                | N.A. | Optimal |
| Zinc (Zn)                              | SMWW 3111 B      | 5.0 mg/L  | 0.054               | N.A. | Optimal |
| Arsenic (As)                           | SMWW 3114 B      | 1.0 mg/L  | 0.005               | N.A. | Optimal |
| Barium (Ba)                            | SMWW 3113 B      | 1.5 mg/L  | <0.003 <sub>5</sub> | N.A. | Optimal |
| Iron (Fe)                              | SMWW 3113 B      | 8.0 mg/L  | 0.965               | N.A. | Optimal |
| Manganese (Mn)                         | SMWW 3111 B      | 1.5 mg/L  | <0.05               | N.A. | Optimal |
| Boron (B)                              | SMWW 3113 B      | 6.0 mg/L  | 0.02                | N.A. | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl-B   | 1.0 mg/L  | 0                   | N.A. | Optimal |



**Figure 5-8, Waste Water Sampling**

## 5.6 Testing Team

All laboratory tests for water, noise and ambient air were conducted by AES (Asian Environmental Services Private Limited) which is certified laboratory form EPA-Punjab. Expert team for laboratory is following.

**Table 5-7, Testing Team**

|    |                 |                |                                            |
|----|-----------------|----------------|--------------------------------------------|
| 1. | Sajjad Hussain  | Chief Chemist  | M.phil. Chemistry, GCU<br>Lahore           |
| 2. | Ashir Shahbaz   | Chemist        | BS. Chemistry, University of The<br>Punjab |
| 3. | Musharaf Jabeen | Chemist        | BS. Chemistry, University of The<br>Punjab |
| 4. | Haider Khan     | Microbiologist | BS. Microbiology , University of<br>Lahore |
| 5. | Sadia Sarwar    | Lab Analyst    | BS. Environmental Science,<br>GCU          |

## 5.7 Site Suitability

The selected site is suitable for the proposed project as it is under control of PIEDMC, is zoned for SEZ, is easily accessible through motorways, and is at proper distance from locality.

## SECTION - 6: POTENTIAL ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

### 6.1 General

This chapter identifies the potential impacts related with Preconstruction, construction and operation phases of the Project on the physical, ecological and socio-economic domains of the environment. Accordingly, mitigation measures have been proposed to mitigate the negative impacts and to enhance the positive impacts.

### 6.2 Approaches and Methodology

During the preparation for the project construction phase the future contractors must be notified and prepared to co-operate with the executing agency, project management, supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must document the implement the EMP in full and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the EMP will be prepared and must be audited and this will be considered as the most important part of planning. In this regard the proponent must fulfil the requirements of the law and guidance prepared by EPA on the environmental aspects of power projects and the recommendations already made for projects in this EIA and under EIA/IEE regulation and Punjab Environmental Protection Act (2012).

For impact identification, various EIA methodologies are available including the checklists, interaction matrices, networks and overlays. Among these four methods, following three are used in EIA of Establishment of Special Economic Zone at Nankana Sahib.

- Project Interaction Matrix
- Checklists
- Overlays

Interaction matrix is a two-dimensional matrix wherein the project actions are placed along one axis (i.e., along y-axis) and on the other axis there are different environmental parameters likely to be affected by the proposed project actions grouped into categories i.e. Physical, Ecological & Socio-economic Environment. Interaction matrix is used in this project due to the following reasons:

- It provides cause-effect relationship between the project actions and resulting consequences impacts.
- It provides nature (+ve or -ve) and weighting of different impacts.
- It provides cumulative impacts of a project.

Matrix grouped project actions into temporal phases. For the impact assessment, project interaction matrix is used by dividing the project action into different phases (Preconstruction, construction and operation). The environmental impacts are divided into three main categories including physical, ecological and socio-economic domains. The environmental impacts of the project actions are identified and weighed into the following categories:

|    |   |                      |
|----|---|----------------------|
| +3 | = | Extremely Beneficial |
| +2 | = | Potentially Positive |
| +1 | = | Slightly Positive    |
| 0  | = | Insignificant        |
| -1 | = | Slightly Negative    |
| -2 | = | Potentially Negative |
| -3 | = | Extremely Negative   |

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. It may be noted that the environmental parameters, which are not related to the implementation of the projects, have not been considered in the matrix.

#### 6.2.1 Checklist

The assignment of significance is based on the previous knowledge and professional judgment of EIA team experts. The project Checklist has been developed for "without" and "with mitigation". It may be noted that the environmental parameters, which are not related to the implementation of the projects, have not been considered in the matrix.

#### 6.2.2 Overlays

In order to identify spatial based impacts, overlays were used. An overlay is based on a set of transparent maps, each of which represents the spatial distribution of an environmental characteristic (for example, susceptibility to erosion). Information for an array of variables is collected for the standard geographical units within the study area, and recorded on a series of maps, typically one for each variable. These maps are overlaid to produce a composite. The resulting composite maps characterize the area's physical, social, ecological, land use and other relevant characteristics, relative to the location of the proposed development.

### 6.3 Characteristics of Impacts

The predicted impacts have been characterized; various aspects of the impact characterized include:

- Nature (direct/indirect)
- Duration of impact (short term, medium term, long term)

- Geological extend (local, regional)
- Timing (Project phase)
- Reversibility of impact (Reversible/Irreversible)
- Likelihood of the impact (certain, likely, unlikely, rare)
- Impact consequence severity (major, moderate, minor)
- Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in **Table 6-1**.

**Table 6-1, Impact Characterization**

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nature                       | <p><b>Direct:</b> The environmental parameter is directly changed by the project.</p> <p><b>Indirect:</b> The environmental parameter changes as a result of change in another parameter</p>                                                                                                                                                                                                                                                                                                                                                                    |
| Duration of Impacts          | <p><b>Short-term:</b> lasting only for the duration of the project such as noise from the construction activities.</p> <p><b>Medium-term:</b> Lasting for a period of few months to a year after the project before naturally reverting to the original condition such as loss of vegetation due to clearing of campsite, contamination of soil or water by fuels or oil.</p> <p><b>Long-term:</b> lasting for a period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.</p> |
| Geographical Extent          | Local, regional (spatial dimension)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Timing                       | Construction and Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Reversibility of Impact      | <p><b>Reversible:</b> when a receptor resumes its pre-project condition.</p> <p><b>Irreversible:</b> when a receptor does not or cannot resume its pre-project condition.</p>                                                                                                                                                                                                                                                                                                                                                                                   |
| Likelihood of the Impact     | <p><b>Almost Certain:</b> Impact expected to occur under most circumstances.</p> <p><b>Likely:</b> Impact will probably occur under most circumstances.</p> <p><b>Possibly:</b> Impact may possibly occur at some time.</p> <p><b>Unlikely:</b> Impact could occur at some time.</p> <p><b>Rare:</b> Impact may occur but only under exceptional circumstances.</p>                                                                                                                                                                                             |
| Impact Consequences severity | <p><b>Major:</b> When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than</p>                                                                                                                                                                                                                                                                                                                                                                                      |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | <p>one generation of an entire population of species of flora and fauna: has long term effects (period of years) on socioeconomic activities of significance on regional level.</p> <p>Moderate: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna: have short-term effects (period of years) on socioeconomic activities of significance on regional level.</p> <p>Minor: When an activity causes short-term (period of a few months), reversible damage to a unique environmental feature; slight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socioeconomic activities of local significance.</p> <p><b>Negligible:</b> when no measurable damage to physical, socioeconomic, or biological environment above the existing level of impact occurs.</p> |
| Significance of Impact | <p>Categorized as High, Medium, Low</p> <p>Based on the consequence, likelihood, reversibility, geographical extent, and duration: level of public concern: and conformance with legislative of statutory requirements.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

The impact characterization due to Design, Location, Construction and operational phase is given in their respective sections.

## 6.4 Environmental Impacts and Their Mitigation During Pre-Construction Phase

### 6.4.1 Environmental Impacts Regarding Project Location

As already discussed in the location alternative that most of the current site is already under control of PIEDMC and this location is best suitable with reference to feasibility studied, it is established that this location is the best for development of special economic zone.

#### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Unlikely

- **Consequence:** Minor
- **Impact significance:** Low

#### **Mitigation**

No mitigation is required as there is no land acquisition for the project.

## **6.5 Environmental Impact and Their Mitigation During Construction Phase**

### **6.5.1 Physical Impacts**

#### **A) Soil Contamination**

- Soil Construction activities such as excavation, filling and disposal of materials (both solid and liquid) will affect the existing soil conditions in the Project Site and in its nearby surroundings. Spillage from the generator or from moving vehicle will cause contamination of soil at construction sites.
- Construction Camp site will generate about 0.5 kg/person/day solid wastes from site camps and construction debris from construction activities. Although quantity of waste is much less, inappropriate disposal methods will have a negative impact on the physical environment of the project area.
- During the construction stage of the project, minimal quantity of waste materials, chemicals, fuel and lubricants will be used apart from the generation of solid waste and liquid waste from the construction camps. Fuels and chemicals will be stored at the site for their immediate use, which will contaminate the soil.

#### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Low

#### **Mitigation**

Good engineering practices will help in controlling soil erosion at construction sites. Following measures will be adopted as per site conditions:

- Soil contamination can be curtailed by reducing the oil spill at project construction areas by well maintaining the construction vehicles as well as generators.
- The Contractor is required to impart proper training to his workforce in the handling and proper disposal of solid waste.

- Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination.
- Ground shall be levelled to avoid slopes.
- Proper solid waste management plan should be developed by the Contractor and implemented to avoid the litter and any other waste problems.

#### **B) Contamination of Surface and Groundwater Resources**

- There is no surface water body in the vicinity of the project, the nearest water body is Saim Nallah. Hence its quality might be affected due construction works.
- Due to the construction activities i.e., drilling, concreting, excavation and dumping of soil, chemicals, oil, lubricants, detergents etc. ground water quality might get deteriorated.
- Sewage is generated from the construction camps.

##### **Impact Characteristics (ground water):**

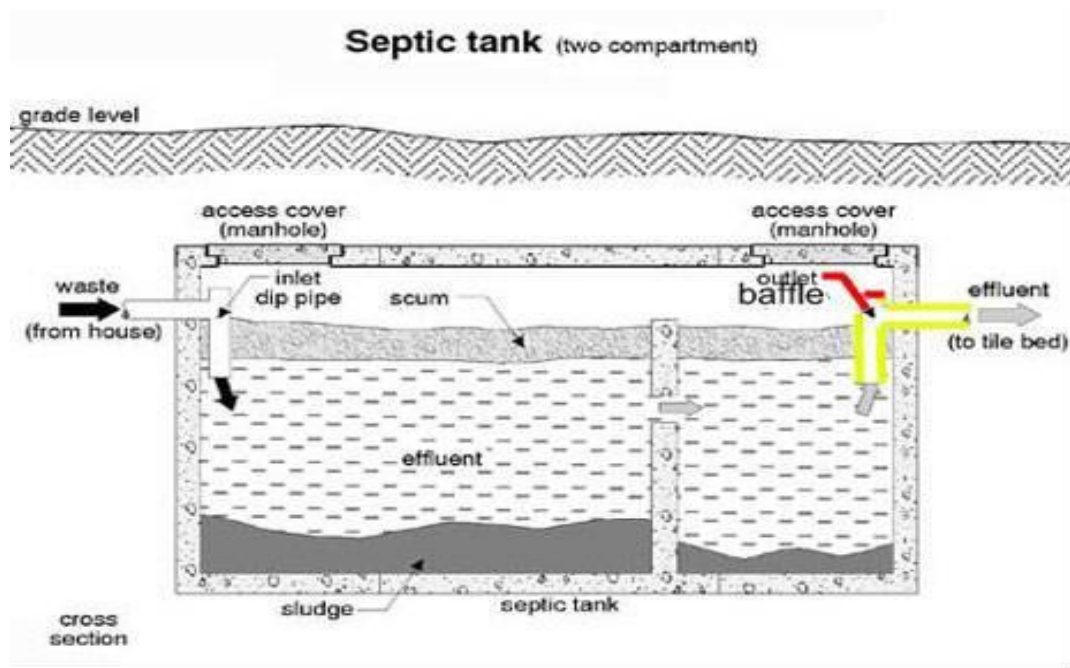
- **Nature:** Indirect and Direct
- **Duration:** Medium term
- **Geo Extent:** Regional
- **Reversibility:** Irreversible
- **Likelihood:** Possibly
- **Consequence:** Moderate
- **Impact significance:** medium

##### **Mitigation Measures**

Sewage from construction camp will be disposed off using septic tank which has been designed properly keeping in view the following parameters:

- Soil stratigraphy at site
- Depth of groundwater table
- Discharge of sewage from construction camp

The septic tank has been designed by the Design Consultant according to the relevant standards. The example of the septic tank is shown in **Figure 6-1**.



**Figure 6-1, Septic tank**

- The Contractor should instruct its staff not to throw any of the waste and the other scarified/scrapped materials directly into the river or canal passing from the project area in order to avoid contamination.
- Construction camps should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents.
- Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard.

### **C) Impact on Ambient air quality**

Due to the construction activities like excavation, clearing, levelling and compaction with the use of machinery like batching plants, excavators, dump truck and other transport vehicles etc. Most of these are using diesel engines that generate noise and exhaust emissions. The possibility of exhaust emissions increases when old vehicles/plants are utilized for the execution purposes. Generally, the above activity is generating particulate- matter (PM<sub>10</sub>), smoke, dust, CO and NO<sub>x</sub> in the ambient air, which is deteriorating the air quality and resulting in impacts on human health, fauna and flora. The movement of heavy machinery and vehicles on the dirt tracks is also causing dust emissions. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface.

#### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local

- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Medium

#### **Mitigation Measures of Impacts on Ambient Air Quality**

- Tuning of vehicles should be made mandatory to reduce the emissions of NO<sub>x</sub>, SO<sub>x</sub>, CO and PM<sub>10</sub>.
- Equipment and vehicles powered with diesel should be well maintained to minimize particulate emissions.
- Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin.
- The fugitive dust emission will not be a problem because the roads are paved but for the precautionary measure sprinkling of water-by-water trucks will be done.

#### **D) Impact on Ambient Noise Levels & Vibration**

During the implementation of the project, equipment and construction machinery will be utilized for construction. The equipment would include excavators, concrete mixer, trucks and other machinery and vehicles. The operation and movement of such equipment will increase the noise and vibration in the Project Area and Neighbourhood residential may be disturbed by the noisy activities. The impact will be significant when compared to the without project situation.

##### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Medium

##### **Mitigation Measures**

- For the construction machinery generating noise level in excess of that prescribed in PEQS and WHO limits,
- Contractor will make arrangements to bring the noise level within applicable limits (including proper tuning of vehicles and mufflers/silencers).
- Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time to avoid disturbance to the nearby locality.

- Truck drivers should be instructed not to play loud music especially night and stop use of horn.

#### E) **Disposal of Construction Debris & Garbage**

During construction phase of the Project, large quantity of construction waste will produce, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas. Clearing of shrubs and grass could pose a fire hazard and affect air quality if burned on location. Construction materials including concrete waste, wood, steel, packaging plastics etc. could be dispersed that may result in the blockage of drainage channels if not disposed of at approved disposal sites.

##### **Impact Characteristics:**

- **Nature:** Direct and Indirect
- **Duration:** Medium
- **Geo Extent:** Regional
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Moderate
- **Impact significance:** Medium

##### **Mitigations**

- A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site.
- The construction waste will be disposed on approved landfill site from Punjab-EPA
- The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping.
- Arrangements should be made for regular garbage collection and removal of sewage from the construction site.

#### 6.5.2 **Ecological Environment**

##### A) **Impact on Flora and Fauna**

The land of the project site is partially agricultural in nature with common crops and approximately 400 mature trees of Jamun/Java plum (*Syzygium cumini*), Mango (*Mangifera indica*), Guava (*Psidium guajava*), Dates (*Phoenix dactylifera*), Safeda (*Eucalyptus globulus*), Kikar (*Vachellia nilotica*) etc. will be lost due to the development of this area. Cutting of trees can speed up the land erosion as project area is 907 acres which will disturb the soil ecology of adjacent area. Ground flora and the seed bank of this flora will be severely disturbed after compaction of soil due to the movement of heavy machinery.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Regional
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Moderate
- **Impact significance:** High

### Mitigation

- Efforts will be made protect the trees within the project area.
  - If the trees within the project area are inevitable to be cut, they must be transplanted in the green areas of industrial estate.
- About 10,000 trees will be planted at all the available open spaces in the project area or with consultation of Punjab Horticulture Authority (PHA).
- These trees will welcome the local avifauna and other associated animals for nesting and shelter.

#### 6.5.3 Traffic annoyance

Due to construction activities, there is little increase in traffic flow on link roads for regular income and outgoing of construction vehicles. Due to increase in the traffic flow the locals may be affected in respect of traffic delays in and around the project site.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Regional
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Moderate
- **Impact significance:** Medium

### Mitigation

During the construction phase traffic control measurement will be implemented. All raw materials will be transported to the site at night time because at night time the traffic flow is very low in the project area.

#### 6.5.4 Socio Economic environment

## A) Impact on Livelihood

Main occupation in the project area is agriculture. Majority of the locals are related to agriculture farming. They have no other skill except agriculture, so after the acquisition of their agriculture land, livelihood of the people will be affected. They cannot perform other work which create social problem and it may convert in to violence.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Moderate
- **Impact significance:** High

### Mitigation Measures

- People will be informed in advance when work is about to start at the site.
- Capacity building and rehabilitation plans to be implanted for the betterment of Project Affected Persons (PAP)
- Project Affected Persons (PAP) should be given preference for direct and indirect employment opportunities especially in the project
- Skill development and training programs in the field of agriculture farming, livestock and mechanical equipment to be organized in the area

## B) Influx of Construction Workers

For the construction of proposed project, the contractors are likely to use unskilled labor drawn from local community but use of specialized construction equipment will require trained personnel not likely to be found locally. Therefore, sudden and relatively short-lived influxes of construction skilled workers to communities near the SEZ may have the potential to skew certain demographic variables, privacy and the traditional social coherence.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly
- **Consequence:** Minor

- **Impact significance:** Low

#### **Mitigation Measures**

- Preference to be given to locals for construction work
- Local suppliers for machineries and construction materials to be given preference
- Local transporters to be preferred for transportation of machinery/material
- To train unskilled local workers, short term skill development courses to be organized in the area

#### **C) Heritage Structures**

There is no heritage, historical, cultural or archaeological structure in the area around the SEZ. Therefore, no impact is anticipated due to extension of runway and expansion of proposed SEZ. Hence, no mitigation measure is required.

#### **D) Protected Areas**

Based on the social surveys and GIS maps it has been identified that there is no protected site exists in the proposed project. Therefore, no mitigation measure is required.

#### **E) Vulnerable Social Groups**

During the field survey, it was identified that there was no vulnerable social group (e.g., widow and women headed household) exists in the proposed project. Thus, no mitigation measure is required.

#### **F) Impacts on Local Population**

The population residing in and the surroundings of the Project Area will be affected during the construction phase as follows:

- Insecurity problems may arise for the local population due to the Contractor's workers during the construction phase
- Community may face the noise and dust problems during the construction activities.
- Theft problems to the community by the Contractor's workers and vice versa.

#### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly
- **Consequence:** Moderate
- **Impact significance:** Medium

#### **Mitigation Measures**

- Contractor should select specific timings for heavy machinery operation so as to cause least disturbance to the population considering their peak movement hours.
- Effective construction controls may be made by the Contractor to avoid inconvenience to the population due to noise, smoke and fugitive dust.
- Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to help contain the construction materials being transported to the specific site.
- The heavy vehicles should not play loud music and horns during transporting material at night time
- The Contractor should warn the workers not to involve in any theft activities and if anyone would involve in such type of activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring labour/workers, Contractor has to ensure that the workers should be of good repute/character.

#### **G) Impacts on Public Health and Safety Hazard**

- Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for local residents.
- Contractor's staff while working on the high-rise columns, transoms, etc. may slip and get injured. Similarly, working at excavated areas may also cause injuries due to the failure of side slopes of excavation.
- The storage of all solid waste shall be practiced so as to prevent the attraction, harbourage or breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odours, unsightliness or public nuisance.

#### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly
- **Consequence:** Minor
- **Impact significance:** Low

#### **Mitigation Measures**

- Contractor will ensure the provision of medicines, first aid kits, emergency vehicles, etc. at the work place. Compliance with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62 will be ensured by the Contractor.

- Health safety procedure is also prepared and will be implemented. Training of workers in the construction safety procedures, environmental awareness, and equipping all construction workers with safety boots, helmets, gloves, ear plugs, and protective masks, and monitoring their proper and sustained usage.

## 6.6 Environmental Impact and their Mitigation During Operational Phase

### 6.6.1 Physical Impacts

#### A) Soil contamination

Leakage of oil and chemicals from storage area may contaminate soil.

##### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Low

##### Mitigation

Following measures will be adopted as per site conditions:

- Proper training to worker about chemical handling, storage and transportation.
- Proper drainage facility will be provided to avoid the water accumulation, which will minimize the soil contamination.
- Floor tiling to be done at the entire project area to avoid chemicals leaching into the soil in case of spillage and leakages.
- Hazardous solid waste to be managed by EPA certified Waste Management Company

#### B) Solid Waste

The solid waste will be generated due to operations of industries in Special Economic Zone. Hazardous solid waste produced from SEZ if not managed properly, will cause aesthetic problems and also produce odor along with the spread of many diseases

##### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly

- **Consequence:** Moderate
- **Impact significance:** Medium

### **Mitigation Measures**

The solid waste management plan for SEZ is developed given as under:-

- Industries should have operational phase NOC from Punjab EPA and proper solid waste management mechanism before commencement of operations.
- SEZ has allocated space for intermediary storage of solid waste for the hosted industries. The waste containers will be placed at suitable places along industries present in SEZ and large waste bins will be placed at open areas, parking area and staff office locations.
- Individual industries will be responsible for collection of solid waste from their industry.
- Hazardous wastes produced by the industries must be managed in a scientific manner.
- The waste management contractor will be hired by the PIEDMC-SEZ whose responsibility is to look after the cleanness in zone.
- The waste will be collected from the containers placed by the workers of waste management team.
- Waste Management team will transfer the waste at the designated area/secondary collection point from where the waste contractor will pick the waste and dispose in the Punjab EPA approved landfill site.

### **C) Groundwater**

During the operational phase the ground water will be used. The total area of construction land of the Project is 907 acres. The water consumption is calculated with land usage index method according to the land usage and area. Therefore, the total water consumption of the Project is predicted to be 6,612,355 gallons/day. The quantities of required water are from direct groundwater usages that will ultimately impact on level of ground water resource which may reduce with the passage of time.

### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Long term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Unlikely
- **Consequence:** Moderate
- **Impact significance:** medium

### **Mitigation Measure**

In order to reduce the impact on ground water resource following measures

will be adopted.

- There will be proper lining and engineered structure to avoid the leakage.
- Rainwater harvesting should be done on the roof top of the building. It is a simple technique of catching rainwater and storing it in underground aquifers. Rainwater harvesting helps increase the water table, improve the quantity of groundwater and reduce tube well pumping costs. Management will ensure plan for industries integrated with rainwater harvesting system.
- The water conservation will be adopted in Industries that will be installed water saving gadgets and eco-devices.
- Promote recycling of water where possible especially during machinery washing
- Industries should install secondary waste water treatment plant and discharge treated water within PEQS.
- The treated Wastewater can be used for firefighting and landscaping purposes, so the total fresh water requirement during the operational phase will be reduced.

#### D) **Waste Water**

80% of water consumed for domestic purposes will be wastewater. Wastewater may also be released during machinery washing. The waste water released from various industries being hosted in the SEZ water if dumped without treatment in Saim Nallah that ultimately falls in River Ravi, this waste water poses the threat to fresh water resource especially to River Ravi as if not been treated. Additionally, it may deteriorate quality of downstream and may also be threat to the local flora and fauna.

##### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly
- **Consequence:** Moderate
- **Impact significance:** Medium

##### **Mitigation Measure**

- Septic Tanks will be installed in each Industry.
- The wastewater will be the industrial in nature and will be treated in Effluent Treatment Plant (ETP) before the final disposal in the sewage line.
- It should be made compulsory for each industry to install secondary treatment plant and compliance with PEQS on outlets. PIEDMIC will check the design of wastewater treatment plant before giving approval to industry.
- Water conservation and efficient techniques of process water usage should be encouraged and subsidized in SEZ.

- The wastewater will ensure to compliance with PEQS before the final disposal.

#### **E) Occupational Safety**

Following health and safety impacts arise during the operational phase of the proposed project:

- Spillage and Leakage of Chemicals
- Slips, trips and falls on ground
- Unguarded machinery
- Falling objects
- Hazards associated with the fire and explosion
- Noise and vibration
- Electrical burns and electric shock

##### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Long term
- **Geo Extent:** Local
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Low

##### **Mitigation Measures**

- To ensure worker's safety during operation phase, following measures should be taken:
- First Aid box should be placed at different location within plant.
- First Aid training should be provided to all supervisors and relevant staff.
- Maintaining equipment in good operation order is of paramount importance in preventing equipment failure.
- Training program for plant operation and maintenance activities should be observed.
- Contact addresses and numbers of local hospitals and other emergency organizations should be available at plant all the time.
- Emergency response plan should be developed to cater different emergency situation as mentioned above.
- Ensure provision of first aid at site in case of any emergency.
- Protective measures and emergency rescue procedures should be followed strictly
- Only authorized persons shall be allowed in the processing and chemical storage areas

## F) Fire safety

Outbreak of fire can be major risk at project site due to the presence of flammable chemicals and machinery such as photocopier machines, desktops, servers etc. An incident of fire can take place due to short circuit.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Long term
- **Geo Extent:** Local
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Major
- **Impact significance:** High

### Mitigation

- Special Measure to be taken for the management for flammable chemicals present on site
- Fire safety equipment such as sand buckets, fire pump and fire extinguishers to be placed on each floor.
- Regular electrical inspection to be done to find any faulty wiring
- Fire alarms to be installed at all sensitive sites on each floor.
- The management has developed a comprehensive health, safety and emergency response plan in order to stay proactive in case of any emergency due to fire hazard.
- Fire alarms to be installed at all sensitive sites on each floor.

## G) Chemical Hazard

Exposure to chemicals may occur during the handling of chemicals in industries. Avoid unnecessary chemical exposure to the workers who are working in the process area or related to the process. A long term and direct chemical exposure may impact the health of the workers and the risk of the spillage may increase.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Long term
- **Geo Extent:** Local
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Major
- **Impact significance:** High

### Mitigation Measures

- Personal Protective Equipment (PPEs) should be given to workers including protection and impermeable clothing for use during processing and handling chemicals
- Wearing of the PPEs should be regulated strictly by the concerned authority
- Chemical spillage will be avoided by developing proper SOPs for the handling of the chemicals
- Chemicals and final products will be stored properly and all precautionary measures will be adopted to eliminate all the hazards and risks associated with the handling and storage of chemicals and final products

#### H) **Noise & Vibration**

Noise pollution during operation would be generated by mechanical equipment. Noise and vibration may cause unpleasant hearing impacts on workers associated with operational activities and on nearby communities. However, it is anticipated that during operations noise and vibration from all equipment will be kept within the permissible limits, transient in nature, reversible and not significant.

##### **Impact Characteristics:**

- **Nature:** Direct
- **Duration:** Short term
- **Geo Extent:** Local
- **Reversibility:** Irreversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Low

##### **Mitigation Measures of Impacts**

- Hosted industries should be mandated to manage the noise issues within their boundary.
- Effective noise management protocols should be implemented, wherever applicable, during operational phase of the project. The implementation of following measures further reduces predicted impacts.
- Management will take all required measures to ensure that the noise levels do not exceed the threshold values for occupational noise and remain within the bearable limit of the workers.
- Proper engineering controls should be applied to all noise producing sources.
- Proper maintenance of all mechanical equipment should be carried out to reduce elevated noise produced due to any worn part.
- Generators should be installed in an isolated area.
- Noise monitoring should be carried out on regular basis.
- Site labour working in high noise areas (where noise level exceeds 85 dB (A)), should wear earplugs.

## I) Air Quality

- There are various key air emission sources due to operation of hosted industries, which include industrial process emissions; stacks emissions; Vehicular Emissions; truck terminal operation and from the power plants.
- The dominant pollutant emissions to air associated above include Nitrogen Oxides (NO<sub>x</sub>), Volatile Organic Compounds (VOCs), Carbon Monoxide (CO), Carbon di oxide (CO<sub>2</sub>), Sulphur di oxide (SO<sub>2</sub>) and Particulates. These pollutants may be increased in ambient condition due to operation of the SEZ.

### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Regional
- **Reversibility:** Reversible
- **Likelihood:** Almost Certain
- **Consequence:** Moderate
- **Impact significance:** Medium

### Mitigation Measures

- Provide appropriate covering/ ventilation of the fumes/odour sources, wherever possible.
- Use of specific PPEs should be ensured to reduce any respiratory problems due to odour/fumes from chemical formulations.
- Banned all substandard fuel in SEZ.
- Industries should have operational phase NOC from Punjab EPA before commencement of operations.
- The generators and vehicles will be maintained to keep the emission levels within PEQS permissible limit
- Water will be sprinkled where required
- Industries should be mandated to install air pollution control devices depending upon their type of emissions.
- Regular Monitoring should be conducted by industries as per provisional legislative framework of environment.
- Requiring all new power plants to be fuel-efficient, and making it a prerequisite for the licensing process;
- Generators should be maintained properly and tuned up by industries in respect of air to fuel ratio in order to have these pollutants within the PEQS limit.
- Regular monitoring on all emission sources should be done and measures will be taken if found non-compliance with PEQS.
- Conducting a review on existing GHGs emission performance and exploring measures to further control air emissions.

With above mitigation measures it is also recommended that ambient air quality monitoring station should be installed at the SEZ in order to continuous measure of pollutants and generate the annual ambient air quality data. The data will be useful in analysing the ambient quality that should not be deteriorating in such a way that the pollutants may exceed the standard limit against the PEQS. If that happen then the emergency measures with the advice of the environmental experts should be implemented.

#### 6.6.2 Ecological Environment

##### A) Impact on Flora& Fauna

The impacts of industrial estate on the natural vegetation of the area are likely to be comparatively less than those which would be encountered during the construction phase. Most of the potential impacts of the estate operation on the faunal resources are associated with the damage to the natural vegetation and habitat.

In addition, the wildlife may be disturbed by noise, illumination, and mere presence of the people.

##### Impact Characteristics:

- **Nature:** Direct
- **Duration:** Medium term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Possibly
- **Consequence:** Minor
- **Impact significance:** Low

##### Mitigation

- Most of the mitigation measures for protecting the biological resources during the construction phase would be applicable during the operation as well. The additional mitigation measures are:
- Keeping the light low (mounting the fixture as low as possible) where possible.
- Lower the wattage of all outdoor lighting, over lighting reduces the eye's ability to see outside of the lit area. In addition, excess light can produce glare, which also reduces visibility. Selecting the correct lamp wattage increases safety and reduces costs (for industrial buildings).
- Closing curtains (where possible) at night to keep indoor light in, will prevent bird crashes
- Extra lights in the lawns and core doors in industrial buildings should be avoided as at night light may start photosynthesis in plant which stops other processes.

- Floodlight at a higher mounting height with narrow beam angle should be used.
- The additional 10,000 trees planted will welcome the local avifauna and other associated animals for nesting and shelter.

### 6.6.3 Socio Economic Environment

#### A) Impact on Socio Economy

In project area, no significant changes are envisaged in the traditional life style and occupation of the local people in residing in the nearby communities. The local people are rather benefited due to the provision of job opportunities. No impact is envisaged due to the influx of the workers as the local will be preferred and hired for working.

Social issues may arise which will cause minor negative impact on the social life style of the people. Moreover, health and safety related issues may arise during the construction activities. These impacts are in-significant can be further reduced significantly by adopting best management practices.

#### Impact Characteristics:

- **Nature:** Direct
- **Duration:** short term
- **Geo Extent:** Local
- **Reversibility:** Reversible
- **Likelihood:** Likely
- **Consequence:** Minor
- **Impact significance:** Medium

#### Mitigation Measures

- Good relations with the local communities will be promoted by encouraging Contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on-job training
- In the case of not hiring the locals, Contractor will restrict his permanent staff to mix with the locals to avoid any social problems
- The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-social activities otherwise they may face dire consequences
- At the time of hiring the Contractor has to ensure that the workers should be of good repute
- First aid kits having all the necessary first aid stuff will be available at the site
- Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon

- Training of workers should be carried out for operating various constructional machinery, safety procedures should be adopted, environmental awareness should be carried out, equip all workers with safety boots, helmets, gloves, protective masks and monitoring of their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community
- The Contractor will be responsible for the sensitivity towards the local customs and traditions

#### **6.6.4 Security Issue**

There is need for vigilant security presence in and around the Special Economic Zone (SEZ) round the clock on a permanent basis to guard against any theft and terrorist activities. The security concerns will have to be addressed adequately. Any threat to the security should be dealt with as a major challenge.

##### **Mitigation**

A comprehensive Security Plan is developed and implemented for the SEZ which includes construction of a security check post on the main entrance gate consisting of security guards. The aim of the security is to check out the in and out movements of vehicles and to monitor all the security related issues. The security towers are also built at boundary walls of the SEZ. The boundary wall will be secured through fence wire. The walk through gates will also be installed for checking of the workers and visitors. In addition to this the security guards regularly monitor in and around the whole SEZ to ensure proper security. Moreover, the security cameras will be installed at SEZ and will be control through common control room.

#### **6.6.5 Traffic Impact**

In order to improve the traffic flow within the zone boundary area, the 200ft wide boulevard has been proposed. Efforts shall be done to build a ring arterial road system, so as to form an arterial road network of "one horizontal three vertical" within the Zone and serve internal divisions. Import road traffic facilities along the collector road in important blocks should be improved.

### **6.7 Potential Environmental Enhancement Measures**

In order to enhance environment, the following measures will be adopted:

- a. Landscaping around proposed project
- b. Air emission control technology will be installed on stacks of industry.
- c. Sprinkling of water will be done on dusty roads and tracks.
- d. PPEs will be provided during construction & operational activity.
- e. Constructional waste and domestic solid waste will be disposed-off

or utilized properly.

- f. Local people will be informed in advance when work is about to start in an area.
- g. Machinery will never be left unattended.
- h. Efforts should also be made to discuss traffic conditions so that regular traffic is not disturbed. Transporters engaged for the project would be forced to adhere to the load specifications of the access road. No overloading would be allowed in any case.
- i. Safety signs and boards will be placed during construction.
- k. Machinery will be kept maintained.
- l. Proper SOPs will be followed with proper schedule along with the HSE conditions.
- m. Solid waste will be handed over to contractors and agreement is made.
- n. Noise will be controlled by adopting proper measures.
- o. PPEs will be provided to workers during working.
- p. Firefighting equipment and system will be installed.
- q. Chemical management plan to be developed and implemented.
- r. Safety signs will be placed at all locations where required.
- s. Hygienic conditions will be ensured and proper quality will be maintained by quality control testing.
- t. First aid facilities will be made available.
- u. Every Industry that will be established in the SEZ will be covered by its separate environmental approval.

## 6.8 Positive Impacts

Following are the positive social impacts of the proposed project:

### 6.8.1 Impact on Economy

Implementation of economic zone has been linked with economic development so the proposed project will play a significant role in the economic development of a region, as well as the nation as a whole. It will support hi-technology businesses of the future. Implementation of proposed project will increase per capita income of locals due to export-oriented industrial enterprises. It will improve domestic investment and domestically owned capital stock.

### 6.8.2 Impact on Employment

Establishment of Special Economic Zone will support employment generation which will have beneficial impacts on the socio-economic conditions of the

area. According to the baseline survey, the proposed project will create direct and indirect employment opportunities. Direct employment includes skilled or unskilled labor while indirect employment includes jobs created in support of the economic zone like fuel stations, hotels, restaurants, retail stores, sports and night clubs, rental cars, banks and local transportation. It will also generate employment opportunities for women workers. Therefore, the proposed project would open new avenues for alternative sources of income and employment in different sectors.

### **6.8.3 Impact on Standard of Living**

Standard of living means good living condition, happiness and satisfaction of people living near the proposed project. People living in the community will experience gradual changes brought about by the construction and full operation of the proposed project. The experiences will have great impact on the quality of life of the people. Completion and operation of the proposed project will increase income of the people which will raise the standard of living. Increased economic activities will promote development of business, trade and commerce which leads to the generation of income and employment. These activities would help to meet the basic needs of housing, health, education and food that will ultimately improve their living condition, quality of life and assuages poverty.

## SECTION - 7: ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

The primary objectives of the EMMP are to:

- 1) Facilitate the implementation of the mitigation measures identified in the EIA.
- 2) Define the responsibilities of the project proponent.
- 3) Define a monitoring mechanism and identify monitoring parameters in order to:
  - a. Ensure the complete implementation of all mitigation measures.
  - b. Ensure the effectiveness of the mitigation measures.
  - c. Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
  - d. Identify training requirements at various levels.

A well-defined environmental monitoring program would be followed for the development of the Special Economic Zone. It would be ensured that trained and qualified staff, supervisors undertake the monitoring and sampling of ambient air, stack emissions, common sewage, waste water, trade / industrial effluents, noise etc. to see that prescribed standards laid down as PEQS and committed to under the approved Environmental Management Plan. The monitoring program will be done in two phases.

- (a) Construction Phase
- (b) Operation Phase

### Construction Phase

The proposed industrial estate / Special Economic Zone will have its major 'building blocks or components in the shape of civil-structural items, and mechanical, electronic, electrical machinery which will become part of the common utilities.

The construction activities involve clearing of vegetation, mobilization of construction material and equipment, installation of machinery. Mobilization of construction material & equipment for excavation of earth etc. will be involved. The construction activities are expected to last for a short period.

### Operations Phase

During operations stage, continuous air emissions (particulate matter, SO<sub>2</sub>, NO<sub>x</sub>, CO emissions, etc.) and waste water generation are expected. The following aspects which merit regular monitoring based on the environmental setting and nature of project activities are listed below:

- Source emissions and ambient air quality
- Groundwater levels and ground water quality
- Water and wastewater quality (water quality, effluent & sewage quality, etc.)

- Soil quality Environmental Impact Assessment
- Noise levels in and around the proposed Industrial Area (equipment and machinery noise levels, occupational exposures and ambient noise levels)
- Ecological preservation and afforestation.

## 7.1 Management Approach

The overall responsibility for compliance with the environmental management plan rests with the project proponent. A certain degree of redundancy is inevitable across all management levels, but this is in order to ensure that compliance with the environmental management plan is crosschecked.

## 7.2 Institutional Capacity

The overall responsibility for compliance with the environmental management plan rests with the project proponent. He will appoint HSE/ Quality Manager of relevant qualification. HSE/ Quality Manager will act as Environmental Manager and will manage all HSE conditions at the PEQS.

A certain degree of redundancy is inevitable across all management levels, but this is in order to ensure that compliance with the environmental management plan is crosschecked.

Following functionaries will be involved in the implementation of EMP:

- Project Proponent
- HSE Manager
- Project Manager
- In-Charge Administration
- Supervisor of Construction
- Supervisor of Operations
- Environmental Engineer
- Safety Supervisor
- Safety Officer

## 7.3 Training Schedule

Training for the management/contractors/engineers and workers on environmental aspects of the project will be arranged during the constructional phase of the project. It will be imparted by a team of experienced trainers.

Management has an appointed HSE officer for initiation of constructional work at the project site. HSE officer is responsible for conducting the training of the labour, which will be organized either by the management of industry or by the contractor. Following schedules of training will be implemented:

### 7.3.1 Training of Building Contractor

Training of building contractor & workers will be the part of the TORs pertaining to the construction of the scheme. The provisions given in EIA Report Chapter 6 "Potential Environmental Impacts & Their Mitigation Measures" will be followed.

TORs will be including the training and submission of reports in the following area:

- 1) Handling of Machineries in a safe way
- 2) Use of PPEs
- 3) Maintenance of vehicles and submission of Environmental Monitoring Reports
- 4) Maintenance of Water Consumption records
- 5) Testing of water and waste water and submission of Environmental Monitoring Reports
- 6) Placement of safety signs/boards during construction
- 7) Sprinkling of water on the roads and dusty tracks
- 8) Monitoring of generator emissions

Training regarding all other aspects of HSE will be ensured by the contractor during the construction phase.

## 7.4 Matrix (MMM)

This matrix identifies the environmental impacts of multipurpose project during the construction and operation stages and establishes the linkages between the environmental and social impacts, mitigation strategy and the agencies responsible for execution. The MMM presented in Table 7-1 identifies the following:

- The mitigation measures recommended in EIA.
- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The person/organization responsible for ensuring and monitoring adherence to the mitigation measures.
- The parameters which will be monitored to ensure compliance with the mitigation measures.
- The timing at which the mitigation or monitoring has to be carried out.

**Table 7-1, Mitigation management matrix**

| Sr. no.                | Anticipated impacts                                           | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                                                                                          |
|------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Execution      | Monitoring     |                                                                                                                                                                                           |
| Pre-Construction Phase |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                                                                                                                                                                                           |
| Project Location       |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                                                                                                                                                                                           |
| 01                     | Land Acquisition and Resettlement during Pre-Construction     | <ul style="list-style-type: none"><li>No land acquisition and resettlement involved.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | --             | --             | <ul style="list-style-type: none"><li>Grievance Redressal Committee (GRC) to be develop during Pre-construction and construction phase</li></ul>                                          |
| Construction Phase     |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                                                                                                                                                                                           |
| Physical Impacts       |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                                                                                                                                                                                           |
| 02                     | Soil Erosion and Contamination due to construction activities | <ul style="list-style-type: none"><li>Good engineering practices should be adopted by Contractors, which will help to control soil erosion at the construction sites.</li><li>Soil contamination can be curtailed by reducing the oil spill from generator and other machinery at project construction areas, proper solid waste management.</li><li>The Contractor is required to impart proper training to his workforce in the storage and handling of obnoxious materials, like oil, diesel and petrol that can potentially cause soil contamination.</li><li>Proper drainage facility will be</li></ul> | CC             | SC and PIEDMIC | <ul style="list-style-type: none"><li>Equipment maintenance.</li><li>Placement of solid waste storage containers at project site.</li><li>Collection and disposal by Contractor</li></ul> |

| Sr. no. | Anticipated impacts                                                   | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                                              |
|---------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Execution      | Monitoring     |                                                                                                                                               |
|         |                                                                       | provided to avoid the water accumulation, which will minimize the soil contamination.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                                                                                                                                               |
| 03      | Surface and Ground Water Contamination during construction activities | <ul style="list-style-type: none"> <li>• Septic tank and artificial drainage pipe should be developed and attached to natural drainage.</li> <li>• The Contractor should instruct its staff not to throw any of the waste and the other scarified/scrapped materials directly into the river or canal passing from the project area in order to avoid contamination.</li> <li>• Construction camps should be established in areas with adequate natural drainage channels in order to facilitate flow of the effluents.</li> <li>• Avoid accidental spills of oils and lubricants through good practice. Prepare and implement Emergency Response Procedures in case of any spill hazard.</li> </ul> | CC             | SC and PIEDMC  | <ul style="list-style-type: none"> <li>• Septic tank</li> <li>• Verify that the camp has constructed on adequate natural drainage.</li> </ul> |
| 04      | Generation of noise, vibration and exhaust                            | <ul style="list-style-type: none"> <li>• Tuning of vehicles should be made mandatory to reduce the</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CC             | SC and PIEDMIC | <ul style="list-style-type: none"> <li>• Maintenance of Vehicles</li> </ul>                                                                   |

| Sr. no. | Anticipated impacts                                                                                       | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                                  |
|---------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Execution      | Monitoring     |                                                                                                                                   |
|         | emission due to construction activities. Ambient Air Quality Deterioration due to Construction Activities | <p>emissions of NO<sub>x</sub>, SO<sub>x</sub>, CO and PM<sub>10</sub>.</p> <ul style="list-style-type: none"> <li>• Water Sprinkling on roads</li> <li>• Equipment and vehicles should be well maintained to minimize particulate emissions.</li> <li>• Haul-trucks carrying, earth, sand, aggregate and other materials should be kept covered during transportation of materials and during storage at site, with tarpaulin</li> <li>• Use of silencers Mufflers and proper tuning of vehicles to control noise</li> <li>• Movements of the trucks and other construction machinery causing high noise levels must be restricted at night time</li> </ul> |                |                | <ul style="list-style-type: none"> <li>• Water Sprinkling</li> <li>• Filled Vehicles covered with tarpaulin</li> </ul>            |
| 05      | Disposal of Construction Debris and Garbage                                                               | <ul style="list-style-type: none"> <li>• A site waste management plan should be made the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of</li> </ul>                                                                                                                                                                                                                                                                                                                                                                       | CC             | SC and PIEDMIC | <ul style="list-style-type: none"> <li>• SC have to ensure that the site waste management plan is properly implemented</li> </ul> |

| Sr. no.                         | Anticipated impacts                                                               | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                       | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                          |
|---------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|---------------------------------------------------------------------------------------------------------------------------|
|                                 |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Execution      | Monitoring     |                                                                                                                           |
|                                 |                                                                                   | <p>construction debris to an approved dump site.</p> <ul style="list-style-type: none"> <li>The construction waste will be disposed on approved landfill site from Punjab-EPA</li> <li>The organic waste produced during site clearing should be mechanically mulched and composted at the site and used for landscaping.</li> <li>Arrangements should be made for regular garbage collection and removal of sewage from the construction site</li> </ul> |                |                |                                                                                                                           |
| 06                              | Traffic Disturbance due to additional Construction Vehicles                       | <ul style="list-style-type: none"> <li>During the construction phase traffic control measurement will be implemented. All raw materials will be transported to the site at night time due to at night time traffic flow very low in the project area.</li> </ul>                                                                                                                                                                                          | CC             | SC and PIEDMIC | <ul style="list-style-type: none"> <li>Timings of the construction vehicles</li> <li>Grievance Record Register</li> </ul> |
| <b>• Ecological Environment</b> |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                                                                                                                           |
| 07                              | Loss and Damage of Natural Vegetation [About 400 mature trees of Jamun/Java plum] | <ul style="list-style-type: none"> <li>Efforts will be made protect the trees within the project area.</li> <li>If the trees within the project area</li> </ul>                                                                                                                                                                                                                                                                                           | CC             | SC and PIEDMIC | <ul style="list-style-type: none"> <li>SC to verify that plantation plan is properly implemented.</li> </ul>              |

| Sr. no. | Anticipated impacts                                                                                                                                                                                                     | Mitigation measures                                                                                                                                                                                                                                                                                                                                                            | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                       |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                | Execution      | Monitoring     |                                                                                                                        |
|         | ( <i>Syzygium cumini</i> ), Mango ( <i>Mangifera indica</i> ), Guava ( <i>Psidium guajava</i> ), Dates ( <i>Phoenix dactylifera</i> ), Safeda ( <i>Eucalyptus globulus</i> ), Kikar ( <i>Vachellia nilotica</i> ) etc.] | <p>are inevitable to be cut, they must be transplanted in the green areas of industrial estate</p> <ul style="list-style-type: none"> <li>About 10,000 trees will be planted at all the available open spaces in the project area. As almost significant amount of open area will be used for the landscaping, so it will enhance the natural features of the area.</li> </ul> |                |                |                                                                                                                        |
| 08      | Soil Erosion and Nutrient Removed due to Construction Activities.                                                                                                                                                       | <ul style="list-style-type: none"> <li>To avoid the loss of natural nutrient rich topsoil, upper 6-inch layer of soil of the present lawns should be stored at safe point, which will be used in the landscaping of the expansion of SEZ.</li> </ul>                                                                                                                           | CC             | SC and PIEDMC  | <ul style="list-style-type: none"> <li>Site Inspections by SC</li> </ul>                                               |
| 09      | Disturbance to fauna due cutting of trees and construction activities                                                                                                                                                   | <ul style="list-style-type: none"> <li>The 10,000 trees planted will welcome the local avifauna and other associated animals for nesting and shelter.</li> </ul>                                                                                                                                                                                                               |                |                | <ul style="list-style-type: none"> <li></li> </ul>                                                                     |
| 10      | Threats to aquatic life due to construction and liquid waste disposal                                                                                                                                                   | <ul style="list-style-type: none"> <li>The impact will be mitigated by construction of temporary fences with construction management practices to prevent accidental damage to the water resources.</li> </ul>                                                                                                                                                                 | CC             | SC and PIEDMIC | <ul style="list-style-type: none"> <li>SC to verify the fences</li> <li>Regular Monitoring of Surface water</li> </ul> |

| Sr. no.                     | Anticipated impacts                                                                                     | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Responsibility |                | Actions/Monitoring parameters/Monitoring methods                                                                        |
|-----------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-------------------------------------------------------------------------------------------------------------------------|
|                             |                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Execution      | Monitoring     |                                                                                                                         |
| • <b>Social Environment</b> |                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |                                                                                                                         |
| 11                          | Issues to Local Population due to influx of construction workers                                        | <ul style="list-style-type: none"><li>• Community wellbeing should be considered and neighbor's privacy should not be disturbed.</li><li>• Local people should be preferred for the employment.</li><li>• Local suppliers for machineries and construction materials to be given preference</li><li>• Local transporters to be preferred for transportation of machinery/material</li><li>• The Contractor should warn the workers not to involve in any theft activities</li><li>• Effective construction control should be done by the contractors by management of heavy vehicles and machinery operation</li></ul> | CC             | SC and PIEDMIC | <ul style="list-style-type: none"><li>• Employment records of contractors</li></ul>                                     |
| • <b>Operational phase</b>  |                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |                                                                                                                         |
| 12                          | During operation phase, noise levels are not expected to exceed current baseline measurements. However, | <ul style="list-style-type: none"><li>• Hosted industries should be mandated to manage the noise issues within their boundary</li><li>• Proper engineering controls should</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                   | PIEDMIC        | Punjab-EPA     | <ul style="list-style-type: none"><li>• Regular Environmental Monitoring of noise and air quality monitoring.</li></ul> |

| Sr. no. | Anticipated impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                                                                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Execution      | Monitoring |                                                                                                                                                          |
|         | expected noise sources with their impacts are discussed here. Noise pollution during operation would be generated by mechanical equipment. Noise and vibration may cause unpleasant hearing impacts on workers associated with operational activities and on nearby communities. However, it is anticipated that during operations noise and vibration from all equipment will be kept within the permissible limits, transient in nature, reversible and not significant. | <p>be applied to all noise producing sources.</p> <ul style="list-style-type: none"> <li>• Proper maintenance of all mechanical equipment should be carried out to reduce elevated noise produced due to any worn part.</li> <li>• Generators should be installed in an isolated area.</li> <li>• Noise monitoring should be carried out on regular basis.</li> <li>• Site labor working in high noise areas [where noise level exceeds 85 dB (A)], should wear earplugs.</li> <li>• Within SEZ, horns are prohibited during working hours and speed limit of 15 km/hour should be permissible.</li> </ul> |                |            |                                                                                                                                                          |
| 13      | Operational phase will involve mechanical equipment. Operational activities will involve human interaction which increases the possibility of accidental injury. Moreover, any other emergency situation like                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• First Aid box should be placed at different location within plant.</li> <li>• First Aid training should be provided to all supervisors and relevant staff.</li> <li>• Maintaining equipment in good operation order is of paramount</li> </ul>                                                                                                                                                                                                                                                                                                                    | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Regular inspection of OHS at plant side</li> <li>• Trainings for workers related to workplace safety</li> </ul> |

| Sr. no. | Anticipated impacts                                                                                                                                                                                                                                                                                                                                                              | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                                                                                                                                                                                                                                        |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Execution      | Monitoring |                                                                                                                                                                                                                                                                                         |
|         | fire emergency, plant failure, oil spill or any natural disaster may occur and HI facility workers may be exposed to occupational hazards or accidental injury. PIEDMIC facility management will make sure that workers are using personnel protective equipment (PPEs) during operational activities specially working on heights and working in the dust and high noise areas. | <p>importance in preventing equipment failure.</p> <ul style="list-style-type: none"> <li>• Training program for operation and maintenance activities should be observed.</li> <li>• Contact addresses and numbers of local hospitals and other emergency organizations should be available at plant all the time.</li> <li>• Emergency response plan should be developed to cater different emergency situation as mentioned above.</li> <li>• Ensure provision of first aid at site in case of any emergency.</li> </ul> |                |            |                                                                                                                                                                                                                                                                                         |
| 14      | In project area, no significant changes are envisaged in the traditional life style and occupation of the local people in residing in the nearby communities. The local people are rather benefited due to the provision of job opportunities. No impact is envisaged due to the influx of the workers as the local                                                              | <ul style="list-style-type: none"> <li>• Good relations with the local communities will be promoted by encouraging Contractor to provide opportunities for skilled and un-skilled employment to the locals as well as on-job training</li> <li>• The contractor will keep the copy of National Identity Card (CNIC) of his employees and will warn the workers not to involve in any anti-</li> </ul>                                                                                                                      | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Training of workers should be carried out for operating various constructional machinery, safety procedures should be adopted, environmental awareness should be carried out, equip all workers with safety boots, helmets, gloves,</li> </ul> |

| Sr. no. | Anticipated impacts                                                                                                                                                                                                                                                                                                                                     | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                                                                                                                                                                                                                                                                                         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Execution      | Monitoring |                                                                                                                                                                                                                                                                                                                                          |
|         | will be preferred and hired for working.<br>Social issues may arise which will cause minor negative impact on the social life style of the people. Moreover, health and safety related issues may arise during the construction activities. These impacts are insignificant can be further reduced significantly by adopting best management practices. | <p>social activities otherwise they may face dire consequences</p> <ul style="list-style-type: none"> <li>• At the time of hiring the Contractor has to ensure that the workers should be of good repute</li> <li>• First aid kits having all the necessary first aid stuff will be available at the site</li> <li>• Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by qualified physician and surgeon</li> </ul> |                |            | <p>protective masks and monitoring of their proper and sustained usage will be carried out. In case of accidents, contractor will provide free medical treatment to the community</p> <ul style="list-style-type: none"> <li>• The Contractor will be responsible for the sensitivity towards the local customs and tradition</li> </ul> |
| 15      | Exposure to chemicals (gases and vapors) may occur during the handling of chemicals related to manufacturing of the final products. Avoid unnecessary chemical exposure to the workers who are working in the process area or related to the process. A long term and direct chemical exposure may impact the health of the workers and                 | <ul style="list-style-type: none"> <li>• Personal Protective Equipment (PPEs) should be given to workers including protection and impermeable clothing for use during processing and handling chemicals</li> <li>• Wearing of the PPEs should be regulated strictly by the concerned authority</li> <li>• Chemical spillage will be avoided by hosted industries through developing proper SOPs for the</li> </ul>                                                  | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Training on chemical handling and other health and safety measures.</li> </ul>                                                                                                                                                                                                                  |

| Sr. no. | Anticipated impacts                    | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                              |
|---------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|-------------------------------------------------------------------------------|
|         |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Execution      | Monitoring |                                                                               |
|         | the risk of the spillage may increase. | <p>handling of the chemicals</p> <ul style="list-style-type: none"> <li>Chemicals and final products will be stored properly by the hosted industries and all precautionary measures will be adopted to eliminate all the hazards and risks associated with the handling and storage of chemicals and final products</li> </ul>                                                                                                                                                                                                                                   |                |            |                                                                               |
| 16      | Solid Waste Management & Disposal      | <ul style="list-style-type: none"> <li>Industries should have operational phase NOC from EPA and proper solid waste management mechanism before commencement of operations.</li> <li>Individual industries will be responsible for collection of solid waste from their industry.</li> <li>SEZ has allocated space for intermediary storage of solid waste for the hosted industries. The waste containers will be placed at suitable places along industries present in SEZ and large waste bins will be placed at open areas, parking area and staff</li> </ul> | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>Good housekeeping practices</li> </ul> |

| Sr. no. | Anticipated impacts             | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                            |
|---------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|-----------------------------------------------------------------------------|
|         |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Execution      | Monitoring |                                                                             |
|         |                                 | <p>office locations.</p> <ul style="list-style-type: none"> <li>Hazardous wastes produced by the industries must be managed in a scientific manner.</li> <li>The waste management contractor will be hired by the PIEDMC SEZ whose responsibility is to look after the cleanness in zone.</li> <li>The waste will be collected from the containers placed by the workers of waste management team.</li> <li>Waste Management team will transfer the waste at the designated area/secondary collection point from where the waste contractor will pick the waste and dispose in the EPA approved landfill site.</li> </ul> |                |            |                                                                             |
| 17      | Reduction in ground water level | <ul style="list-style-type: none"> <li>There will be proper lining and engineered structure to avoid the leakage.</li> <li>Rainwater harvesting should be done on the roof top of the building. It is a simple technique of catching rainwater and storing it</li> </ul>                                                                                                                                                                                                                                                                                                                                                  | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>Water consumption records</li> </ul> |

| Sr. no. | Anticipated impacts                                | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                        | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                                       |
|---------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|----------------------------------------------------------------------------------------|
|         |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                            | Execution      | Monitoring |                                                                                        |
|         |                                                    | <p>in underground aquifers. Rainwater harvesting helps increase the water table, improve the quantity of groundwater and reduce tube well pumping costs.</p> <ul style="list-style-type: none"> <li>• The water conservation will be adopted in washrooms that will be installed water saving gadgets and eco-devices.</li> <li>• Promote recycling of water where possible especially during machinery washing</li> </ul> |                |            |                                                                                        |
| 18      | Waste water Generation due to operation of SEZ     | <ul style="list-style-type: none"> <li>• The wastewater will be the Industrial in nature and will be treated Effluent Treatment Plant before the final disposal in sewage line.</li> <li>• Each Industry should install secondary effluent treatment plants to ensure compliance with PEQS.</li> <li>• PIEDMIC will check the design of wastewater treatment plant before giving approval to industry.</li> </ul>          | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Regular cleaning of septic tanks</li> </ul>   |
| 19      | Outbreak of fire can be major risk at project site | <ul style="list-style-type: none"> <li>• Special Measure to be taken for the management for flammable</li> </ul>                                                                                                                                                                                                                                                                                                           | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Regular inspection of firefighting</li> </ul> |

| Sr. no. | Anticipated impacts                                                                                                                                                    | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Responsibility |            | Actions/Monitoring parameters/Monitoring methods                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Execution      | Monitoring |                                                                                                                                                |
|         | due to the presence of flammable chemicals and machinery such as photocopier machines, desktops, servers etc. An incident of fire can take place due to short circuit. | <p>chemicals present on site</p> <ul style="list-style-type: none"> <li>• Fire safety equipment such as sand buckets, fire pump and fire extinguishers to be placed on each floor.</li> <li>• Regular electrical inspection to be done to find any faulty wiring</li> <li>• Fire alarms to be installed at all sensitive sites on each floor.</li> <li>• The management has developed a comprehensive health, safety and emergency response plan in order to stay proactive in case of emergency due to fire hazard.</li> <li>• Fire alarms to be installed at all sensitive sites on each floor.</li> </ul> |                |            | <p>arrangement at project side</p> <ul style="list-style-type: none"> <li>• Trainings and drills for workers related to fire safety</li> </ul> |
| 20      | Air Emissions due to operations of Industries                                                                                                                          | <ul style="list-style-type: none"> <li>• Banned all substandard fuel in SEZ.</li> <li>• Industries should have operational phase NOC from EPA before commencement of operations.</li> <li>• Industries should be mandated to install air pollution control devices depending upon their type of emissions. Regular Monitoring should be conducted by</li> </ul>                                                                                                                                                                                                                                              | PIEDMIC        | Punjab-EPA | <ul style="list-style-type: none"> <li>• Maintenance of generators</li> </ul>                                                                  |

| Sr. no. | Anticipated impacts | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Responsibility |            | Actions/Monitoring parameters/Monitoring methods |
|---------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------------------------------------------|
|         |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Execution      | Monitoring |                                                  |
|         |                     | <p>industries as per provisional legislative framework of environment.</p> <ul style="list-style-type: none"> <li>• Requiring all new power plants to be fuel-efficient, and making it a prerequisite for the licensing process;</li> <li>• Ensuring the cleanest fuel at SEZ</li> <li>• Generators should be maintained properly and tuned up by industries in respect of air to fuel ratio in order to have these pollutants within the PEQS limit.</li> <li>• Regular monitoring on all emission sources should be done and measures will be taken if found non-compliance with PEQS.</li> <li>• Conducting a review on existing GHGs emission performance and exploring measures to further control air emissions.</li> </ul> |                |            |                                                  |

## 7.5 Environmental Budget

The cost which is required to effectively implement the mitigation measures is important for the sustainability of the Project in operation stage of the Project. Management will allocate 2% of total cost as Environmental Budget for meeting the environmental and sustainability purposes.

## 7.6 Schedule of Implementation

**Table 7-2, Schedule for Implementation of Environmental Budget**

| HSE training                                                         | On quarterly basis         |
|----------------------------------------------------------------------|----------------------------|
| Maintenance and management of environment                            | On regular basis           |
| Maintenance of equipment                                             | On regular basis           |
| Restoration                                                          | As per requirement         |
| Plantation                                                           | During the operation phase |
| Strategic planning to cope with any emergency situation              | As per policy              |
| Formulate the disaster management plan to cope with natural disaster | As per policy              |

Implementation of all these parameters will be included in the environmental budget. Any equipment failure will not be included in this budget.

## 7.7 Propose EMP Reporting and Reviewing Procedure

A comprehensive, Environmental Management Plan (EMP) has been developed for the Project. An environmental Mitigation Management Matrix (MMM) has been prepared considering impacts on different components of physical, ecological and socio-cultural environment. All the precautionary measures are suggested in EMP to minimize the pollution creating by construction and operation of project. In addition, a comprehensive monitoring program has been proposed. The EMP include Review of regulatory requirements and applicable standards, MMM Institutional Arrangements for Implementation of EMP, Roles and Responsibilities of different agencies, Environmental Monitoring Plan.

. Reporting and reviewing procedure is following:

- EIA Report & File Submission
- SIR Letter
- Review of EIA Report
- Issuance of Query letters by EPA
- Submission of satisfactory replies of Query Letter
- Public hearing

- Expert committee meeting and presentation
- DG EPA meeting and Presentation
- NOC issuance
- Proper Follow up of case from submission to Issuance of NOC

## 7.8 Proposed Environmental Monitoring

### 7.8.1 Objectives

The objectives of the environmental monitoring during the construction and operation stages are as follows:

- To check compliance with the requirements of the EMP by monitoring activities of the project contractors. This will be called Activity Monitoring.
- To monitor actual impacts of the project activities on physical, ecological and socioeconomic receptors of the Project Area so that any impacts not anticipated in the EMP or impacts which exceed the levels anticipated in the EMP can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.

Monitoring for following Environmental Parameters is recommended:

### 7.8.2 Ambient Air

Quarterly monitoring for ambient air should be conducted during construction & operational activities of the project and report should be submitted to EPA Punjab.

### 7.8.3 Noise

Quarterly monitoring for noise level should be maintained periodically during construction & operational phases of the project and report should be submitted to EPA Punjab.

### 7.8.4 Water Quality

Quarterly monitoring of water quality should be conducted during construction & operational phases of the project and report should be submitted to EPA Punjab.

### 7.8.5 Ecological Environment

Floral surveys will be conducted to determine the effects of different project activities on Flora. The recommended effects monitoring protocol for Flora is provided in **Table 7-3**.

### 7.8.6 Socio-economic Environment

Effects on the socio-economic environment will be monitored by the consultants who will conduct survey both during construction and operation stage. The surveys will be structured to ascertain the level of impacts during the course of the project and the implementation of mitigation measures prescribed in the EMP such as health and safety of communities.

**Table 7-3, Recommended Monitoring Protocol for Physical, Ecological and Social Environment**

| Parameter/Receptor              | Location                                                                                                | Monitoring Mechanism                                            | Monitoring and Reporting Frequency                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water Quality                   | Near the project area<br>Concrete preparation plants<br>Fuel (Petrol. Oil and Grease) products storages | Discrete grab sampling and laboratory testing of water samples. | Sampling and laboratory testing should be done on quarterly basis during construction and operational stage. Outlet and drains from the mechanical repair units should include testing.                          |
| Dust Emissions                  | Construction site                                                                                       | Visual checks                                                   | Daily visual monitoring during routine monitoring by activity monitors and reported on a quarterly basis during the construction period.                                                                         |
| Noise Levels                    | Construction site Nearby area due to track movement                                                     | Noise meter                                                     | Quarterly monitoring should be done throughout the construction period through a 3 <sup>rd</sup> party environmental laboratory Quarterly during the operational stage.                                          |
| Stack emissions and Ambient Air | Silencers of heavy machinery, trucks and other vehicles. Stack monitoring of generator. Construction    | Monitoring of ambient air quality in ppb.                       | Quarterly monitoring of air pollution parameters including PM, NO <sub>x</sub> , SO <sub>x</sub> , CO, Hydrocarbons during the construction period, and annually during the operation stage only for ambient air |

| Parameter/Receptor                | Location                                                                                                        | Monitoring Mechanism                                                                                                                       | Monitoring and Reporting Frequency                                                                                                                                      |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | site Ambient Air                                                                                                |                                                                                                                                            |                                                                                                                                                                         |
| <b>Ecological Environment</b>     |                                                                                                                 |                                                                                                                                            |                                                                                                                                                                         |
| Plants disruption                 | As plants are not present at site so it will be monitored around the Project Area during the construction phase | Plants                                                                                                                                     | Weekly during routine monitoring and reported on monthly basis during the construction period, and once in a year monitoring and reporting during the operation period. |
| <b>Socio-cultural Environment</b> |                                                                                                                 |                                                                                                                                            |                                                                                                                                                                         |
| Inconvenience to community        | All around the Project Area                                                                                     | Consultations with community to get feedback about inconvenience due to the construction activities to perform their daily routine chores. | Monthly monitoring and reporting during the construction period.                                                                                                        |

**Note:** Environmental Monitoring data log book should be maintained by the project proponent.

## SECTION - 8: STAKEHOLDERS AND PUBLIC CONSULTATION

The consultation process with various stakeholders of Asian team has been carried out to involve community and other stakeholders at earlier stages. Information dissemination during public consultation is fundamental to successful conclusion of the Project. This chapter describes the objectives and details of the consultative process adopted; its outcome and the conclusions drawn thereafter.

Public consultation has been done during the planning and design phases of the Project with Government departments, line agencies, NGOs and affected persons of the Project area; concerns and suggestions thereafter have been taken into account and included where appropriate. The consultative process to date has been effective in addressing the concerns over the Project Operational impacts.

### 8.1 Objectives of Consultation

Public consultation plays a vital role in studying the effects of any development project on stakeholders and in its successful implementation and execution. It affords an opportunity to exchange knowledge with those who as members of the society are concerned with the Project, immediately or remotely. Referring particularly to a Project related to environmental assessment, involvement of public is all the more essential, as it leads to better and more acceptable decision-making.

The objectives of the stakeholder and public consultation conducted in Project Area were;

- To apprise the Project community and stakeholders about Project interventions and potential impacts,
- To record the community concerns and recommendations regarding the project;
- To address/incorporate those recommendations in the Project design to the extent possible and;
- To share the mitigation measures with the local communities.

### 8.2 Proponents Environmental Management Team

HSE Team will be taking charge of the proposed project. They will be managing health and safety issues as well as issues to employees and locals.

### 8.3 Responsible Authority

The EPA shall be the responsible authority for reviewing, site inspection and provision of environmental approval for the project.

### 8.4 Consultative Aspect

The project involves stakeholders from various segments of the society, who have direct or indirect interest in the developmental activity. The Environment

and Social team have endeavoured to hold consultative sessions with a number of prominent stakeholders (Project Proponent, Government departments, line agencies, NGOs and affected persons of the Project Area) to evince their views on the project and their opinions, suggestions, understanding on various issues and concerns. The consultations aimed specifically at:

- Dissemination of Project information through discussions, education and liaison.
- Eliciting the comments and feedback on the project.
- Documentation of information narrated by the stakeholders.
- Documentation of mitigation measures proposed by the stakeholders.
- Incorporation of public concerns and their addresses in the EIA/ EMMP.

### 8.5 Identification of Main Stakeholders Department and Agencies

There are two types of stakeholders related to the project i.e., primary and secondary stakeholders. Primary stakeholders are those which are directly affected by the Project activities and secondary stakeholders are those which are affected indirectly.

The project has direct impacts on any individual; therefore, so primary stakeholders are identified. Secondary stakeholders are institutional stakeholders, which includes Project Proponent, local Government representatives, and Government officials of the relevant departments, NGO, general public, local residents, shop keepers, vendors, hospital owners/staff, teachers, pedestrians, and businessmen/traders of the city. The categories of the stakeholders who provided useful feedback, included:

- Project Proponent
- Government officials
- Environmental practitioners and experts
- Teachers/students
- Shopkeepers

All those stakeholders have different types of stakes according to their involvements in various aspects of the Project. The consultant tried to contact all the stakeholders and shared their views and concerns and also interacted with the community-based organizations that can support the community.

### 8.6 Environmental Practitioners and Experts

Team of Asian Consulting Engineer visited the project site, had discussion with stakeholders and consulted with the local people of nearby to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably. People provide the massive information about the project and have positive remarks regarding the

project development.

The Asian team have endeavoured to hold consultative sessions with a number of prominent stakeholders (Project Proponent, Government departments, line agencies, NGOs and affected persons of the Project Area) to evince their views on the project and their opinions, suggestions, understanding on various issues and concerns. The consultations aimed specifically at:

- Dissemination of Project information through discussions, education and liaison.
- Eliciting the comments and feedback on the project.
- Documentation of information narrated by the stakeholders.
- Documentation of mitigation measures proposed by the stakeholders.
- Incorporation of public concerns and their addresses in the EIA/ EMMP.

## 8.7 Affected and Wider Community

A series of consultation was carried out with stakeholders and general public in nearby areas.

The purpose of this survey was to achieve the objectives of the consultation, highlight the main issues in the implementation of the project and finally propose mitigation measures. Open and close ended questionnaire was used to collect the views concerning the assessment survey. Scoping sessions and informal group discussions were also carried out with local residents and local government representatives regarding the project. The outcome of whole consultation process was very encouraging. The following issues were discussed during Informal Meetings with local representatives:

- a. Brief Description of the Project
- b. Current economic condition in the area
- c. Suggestions for improvement in the current industrial system and all activities related to industry
- d. Perceptions about the project
- e. Perceived impacts of the project

The local poor people predominantly requested for unskilled and semi-skilled jobs during implementation of the Project. On the basis of the consultations so far, it appears that the Project will have no insurmountable environmental and social impact. The community generally supported the project.

A summary of the key issues raised by stakeholders and how these are being addressed by Project Proponent is provided in **Table 8-1** below.

**Table 8-1, Summary of issues and commitments by Proponent**

| Issue                                  | Aspect/ Concern raised by Stakeholders                                                                                                                                          | Project Proponent Commitments                                                                                                                                                                                                                                                   |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Employment Opportunities               | Expectations of employment are very high. Job opportunities are less for herders as they generally have less skills and training.                                               | Employment is the main priority of the industry. Mostly locally skill and unskilled labor will be prioritized and also there will be job in executive level.<br>Max. persons according to the requirement will be employed by the industry.                                     |
| Training Opportunities                 | People are keen to consult with subject industry if the Project offers training and upgrading opportunities to enhance their trade or professional skills.                      | Development of the Training Strategy, including commitment of allocation of budget investment for training infrastructure, delivery and design.<br>Installation of training facilities in for worker of the company and students will also be accommodate.                      |
| Health & safety                        | Health and safety issues may be arising due to industrial and constructional activity.                                                                                          | All possible safety measures will be taken during operation and construction phase.<br>PIEDMC will designate teams for HSE concern emergency equipment like fire extinguishers, spill kits, water hydrant system, effective use of PPEs and first aid are already well managed. |
| Local economy and business development | Local service providers are keen to participate in providing services to provide raw material and expect to receive in order to adjust their businesses to meet specific needs. | Proponent has main focus that they will all the material regarding construction to buy from the local market.<br>This will help the local and small business and to people who are keen                                                                                         |

| Issue                      | Aspect/ Concern raised by Stakeholders                                                                                                                                                                    | Project Proponent Commitments                                                                                                                                                                                    |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            |                                                                                                                                                                                                           | interested to become suppliers.                                                                                                                                                                                  |
| Environmental Issues       | Dust and noise impacts, particularly from the construction activities and in operation of mechanically unfit machines, are of concern to nearby residents. Environmental degradation during construction. | Implementation of controls under the Environmental Management Plans, including on and off-site dust and noise monitoring. A Participatory Environmental Monitoring Program will be launched to spread awareness. |
| Water quantity and quality | Water quality and quantity, and impacts from the wastewater disposal are all key concerns for nearby community.                                                                                           | Implementation of consultation in relation to water use, recycle and development of the Participatory Environmental Monitoring Program.                                                                          |



**Figure 8-1, Public Consultations**

## SECTION - 9: CONCLUSION & RECOMMENDATIONS

Based on the study conducted for Environmental Impact Assessment (EIA) for the subject project, the following conclusions are made:

### 9.1 Conclusion

To achieve a true economic benefit and worldwide introduction of Pakistani products as per international quality standards, PIEDMIC as decided to plan & develop Special Economic Zone at Nankana Sahib located near Nankana Sahib Interchange at M3 Lahore- Abdul Hakim Motorway, Tehsil and District Nankana Sahib.

The proposed SEZ is spread over an area of 907 acres, and is planned to integrate the advantages and featured resources of Punjab Province. This proposed project has variety of positive impacts such as boosting the economy of the region, generates employment, increased standard of living and quality of life of people, boost up SMEs.

Apart from the positive impacts of the project, it will also generate some negative impacts during the planning, construction and operational stages of the project. These negative impacts can be avoided or mitigated by adopting suitable mitigation or remedial measures as mentioned in this report.

The phase wise summary of major impacts with mitigations are summarized hereunder.

#### 9.1.1 Per-Construction Stage

As the land is already under control of PIEDMIC so there will be no pre-construction impacts.

#### 9.1.2 Construction Stage

The development camp will result in generation of solid waste. This waste can contaminate the surface, ground water and soil. Proper solid waste management plan should be developed by the Contractor and implemented to avoid the littering and any other waste problems. Adequate number of solid waste containers should be placed at various locations for ease in storage and collection/disposal of solid waste by the contractor

Soil Construction activities such as excavation, filling, development of road runway, construction camps may affect the existing soil conditions in the Project Area. In addition, such work is likely to lead to changes in the existing drainage pattern and may have a significant adverse impact on the environment that can be mitigated by good engineering practices. The proper drainage facility will be provided at the camp areas to avoid the water accumulation, which will minimize the soil contamination

Due to the construction activities i.e. drilling, concreting, excavation and dumping of soil, chemicals, oil, lubricants, detergents etc its quality might get deteriorated. The impact can be mitigated by providing temporary fences to surface water body and avoiding accidental spills of oils lubricants through good practices. Prepare and implement Emergency Response Procedures in case of any spill hazard and dispose the sewage from construction camp and site by using septic tank

During construction stage, dust problem can affect the health of the community belonging to nearby residential areas. However, proper mitigation measures will remedy the impacts and in order to avoid dust problems during the construction stage, contractor will sprinkle water at least twice a day during the construction activities.

Construction machinery using diesel engines will generate noise and exhaust emissions. Generally, the above machinery will generate particulate matter (PM<sub>10</sub>), smoke, dust, CO and NO<sub>x</sub> in the ambient air, which can deteriorate the air quality and result in impacts on human health and nearby fauna and flora. The movement of heavy machinery and vehicles on the dirt tracks can also cause fugitive dust emissions. Periodic tuning of vehicles should be made mandatory to reduce the emissions of NO<sub>x</sub>, CO, Hydrocarbons (HC) and PM<sub>10</sub>.

During construction phase of the Project, construction waste will produce, the disposal of which, if not managed properly could have negative impacts on the site and surrounding areas. The impact will be mitigated through site waste management plan that will be the responsibility of the construction contractor to provide for the designation of appropriate waste storage area on the site and a schedule for the timely collection and removal of construction debris to an approved dump site. The construction waste will be disposed on approved landfill site from Punjab-EPA.

Around 400 trees at site will be affected due to the implementation of the project. The proponent will plant about 10,000 trees mostly of indigenous species at available open spaces in and around the project. The tree plantation plan is given in the EMP.

### 9.1.3 Operation Stage

The usage of ground water for the operational activities will ultimately impact on level of ground water resource which may reduce with the passage of time. The impact will be mitigated through rainwater harvesting in industrial buildings at roof top and industry will recycle at least 30 % of its water.

Large amount of waste water will be generated from the SEZ site which if not treated will pose threat to fresh water resource especially to Ravi River. Additionally, it may deteriorate quality of downstream and may also be threat to the local flora and fauna. The wastewater will be the municipal in nature and will be treated in Combined Effluent Treatment Plant (CETP)

before the final disposal in the sewage line, which is connected with River Ravi Through Saim Nallah. Industries should obtain environmental approval from Punjab-EPA and install secondary waste water treatment plant. The wastewater will ensure to compliance with PEQS before the final disposal in in sewage line. SEZ will check the design of wastewater treatment plant before giving approval to industry.

The emissions from industrial process and operations of boilers, power plants and generators will release the pollutants Nitrogen Oxides (NO<sub>x</sub>), Volatile Organic Compounds (VOCs), Carbon Monoxide (CO), Carbon di oxide (CO<sub>2</sub>), Sulphur di oxide (SO<sub>2</sub>) and Particulates. Industries should have operational phase NOC from Punjab EPA before commencement of operations. Industries should install air pollution control devices from stacks. Regular Monitoring should be conducted by industries as per provisional legislative framework of environment. Requiring all new power plants & boilers to be fuel-efficient, and making it a prerequisite for the licensing process; ensuring the cleanest fuel at SEZ. Generators should be maintained properly and tuned up by industries in respect of air to fuel ratio in order to have these pollutants within the PEQS limit. Regular monitoring on all emission sources should be done and measures will be taken if found non-compliance with PEQS. Conducting a review on existing GHGs emission performance and exploring measures to further control air emissions. With these mitigation measures it is also recommended that ambient air quality monitoring station should be installed at the SEZ in order to continuous measure of pollutants and generate the annual ambient air quality data. The data will be useful in analysing the ambient quality that should not be deteriorating in such a way that the pollutants may exceed the standard limit against the PEQS. If that happen then the emergency measures with the advice of the environmental experts should be implemented.

Noise has been identified as one of the most significant environmental aspects of Industries should have operational phase NOC from Punjab EPA before commencement of operations. Industries should adopt compartmentalization technique to contained industrial process related to noise. Regular Monitoring should be conducted by industries as per provisional legislative framework of environment. Generators should be maintained properly and tuned up by industries in respect of air to fuel ratio in order to have these pollutants within the PEQS limit. Regular monitoring on all sources should be done and measures will be taken if found non-compliance with PEQS. To mitigate the noise, impact the generator will be put in a separate generator room with sound proofing and it will be compulsory to use PPEs in case of Inspection and any other activity in generator room.

Industries should have operational phase NOC from EPA and proper solid waste management mechanism before commencement of operations. The

waste containers will be placed at suitable places along industries present in SEZ and large waste bins will be placed at open areas, parking area and staff office locations. The waste management contractor will be hired by the SEZ whose responsibility is to look after the cleanness in zone. The waste will be collected from the containers placed by the workers of waste management team. Waste Management team will transfer the waste at the designated area/secondary collection point from where the waste contractor will pick the waste and dispose in the EPA approved landfill site.

A comprehensive EMP has been developed identifying the impacts, mitigation measures, agencies responsible for implementation, monitoring and auditing of the proposed measures. EMP also provides the roles and responsibilities of the agencies responsible for mitigation, monitoring and auditing of EMP. The EMP also provides the proposed institutional setup for effective implementation of the mitigation measures, monitoring parameters, and training of SEZ, Contractors and Supervisory Consultant staff to enhance their capacity. As the EIA Study has been carried out at Design Stage of the Project, so a change management plan has been provided in the EMP to cater the changes that may occur at detailed design and even during construction and operation stages of the Project. Similarly, generic guidelines for HSE, EMS, Waste Management and Air Emissions etc. have also been provided in EMP at zone level which will help to prepare detailed management plans for estate and individual units on later stage by the SEZ and private investors.

Based on the EIA report, it can be concluded that the development of SEZ will play a vital role in empowering the people of Punjab especially Lahore and adjacent areas with economic development and employment opportunities in the region. The EMP as recommended in this EIA Report is to be put in place during implementation of the project. In accordance with EMP the monthly and annual monitoring of environmental parameters by a third-party environmental laboratory also certifies that the project will run in accordance with legal requirements. Further, the implementation of the environmental mitigation measures, proper monitoring and compliance of the environmental standards/legislations will make the Project environmentally more sustainable.

## 9.2 Recommendations

In view of the comprehensive screening process and findings of the present study there is no need of conducting further investigations.

- Tree plantation inside and near the project area is recommended.
- The Management of will continue to assist the local communities as a corporate social responsibility (CSR).

- Any seepage and leakage will be controlled through proper mitigation measures.
- Sound proof room should be constructed for generator to control its sound (If required).
- Use of narcotics and smoking must be prohibited during working, filling or handling of fuel.
- PPEs must be provided to workers such as gloves, masks, ear muffs /etc.
- Proper solid waste management system must be adopted.
- Safety signs, safety board's etc. must be placed on site during various developmental stages.
- Machinery will never be left in running condition.
- First Aid measures, health & safety Equipment (PPEs) will be provided to workers.
- Fire Fighting station & system will be installed.
- The management of subject project will assist the local communities as a corporate social responsibility.
- Jobs and employment will be provided to the local area.

The present EIA report is enough to meet the administrative and legal framework. After the complete study of the project, it is concluded that project will not have significant adverse impacts on the nearby community and on environment. Overall, the project will have positive impacts on the local population and country as a whole. Therefore, it is requested for the environmental approval for the subject project.

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## ANNEXURES

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## ANNEXURE - 1: LIST OF ABBREVIATION

|             |                                                               |
|-------------|---------------------------------------------------------------|
| BOD         | Biological Oxygen Demand                                      |
| COD         | Chemical Oxygen Demand                                        |
| CETP        | Combined Effluent Treatment Plant                             |
| CC          | Construction Contractor                                       |
| ETP         | Effluent Treatment Plant                                      |
| EPA         | Environmental Protection Agency                               |
| EPD         | Environmental Protection Department                           |
| GIS         | Global Information System                                     |
| GDP         | Gross Domestic Product                                        |
| Km / KM     | Kilometer                                                     |
| LDA         | Lahore Development Authority                                  |
| m           | Meter                                                         |
| NEQS        | National Environmental Quality Standards                      |
| NRM         | National Reference Manual                                     |
| PIEDMC      | Pakistan Industrial Estate Development and Management Company |
| Rs. or PKR. | Pakistan Rupee                                                |
| PAP         | Project Affected Persons                                      |
| PEQS        | Punjab Environmental Quality Standards                        |
| SOPs        | Standard Operating Procedures                                 |
| SC          | Supervisory Consultant                                        |
| TOR         | Terms of Reference                                            |
| TSS         | Total Suspended Solid                                         |
| WWTF        | Waste Water Treatment Facility                                |
| WHO         | World Health Organization                                     |

## **ANNEXURE - 2: REFERENCES**

- <https://www.epa.gov/sites/production/files/2015-10/documents/njmc-wpp-2.pdf>
- Schedule 1 of Punjab Environmental Protection Act 1997 (Amended 2012)
- Section 12 of Punjab Environmental Protection Act 1997 (Amended 2012)
- Pakistan Environmental protection act 1997
- Punjab Environmental Protection Act 1997 (Amended 2012)
- Guideline for the Environmental Assessment
- Regulations of Environmental Assessment, Regulations 2022
- National Conservation Strategy- Pakistan
- Guideline for the public consultation
- National Resettlement Policy and Ordinance
- National Environmental Quality Standards (Self-monitoring and reporting by the industry)
- Labor laws
- Canal and Drainage Act, 1873
- National Environmental Policy 2005.
- The Land Acquisition act, 1894
- The Punjab local Governmental ordinance, 2001.
- Meteorological data from meteorological department and website
- Pakistan Biosafety rules 2005
- Pakistan Environmental agency (review of IEE/EIA) regulation 2000.
- Punjab Portal (<http://www.punjab.gov.pk/attock>)
- Sectorial Guideline for environmental reports, industrial states
- Pakistan Environmental Protection ordinance (PEPO), 1983
- OSHAS 1800 for health and safety

## ANNEXURE - 3: GLOSSARY

| Words         | Dictionary                                                        |
|---------------|-------------------------------------------------------------------|
| Mitigation    | The action of lessening in severity or intensity                  |
| Legislation   | law enacted by a legislative body                                 |
| Compliance    | Acting according to certain accepted standards                    |
| Flora         | All the plant life in a particular region or period               |
| Fauna         | All the animal life in a particular region or period              |
| Demarcated    | Separate clearly, as if by boundaries                             |
| Screening     | The display of a motion picture                                   |
| Substitutions | An event in which one thing is substituted for another            |
| Regulations   | An authoritative rule                                             |
| Stakeholders  | A person or organization with an interest or concern in something |
| Vulnerable    | Susceptible to attack                                             |

## ANNEXURE - 4: TORS

### **ESTABLISHMENT OF SEZ IN NANKANA SAHIB ON 907 ACRES**

#### **TERMS OF REFERENCES (TORs)**

##### **TERM OF REFERENCES**

These terms of references are being submitted for the subject EIA study under Clause 5 (f) of policy and procedure for the filing, review and approval of environmental assessment. These TORs of EIA have been prepared by the environmental consultants, in consultation with the project proponent.

##### **Introduction of Project**

The project deals with the Establishment of Special Economic Zone at Nankana Sahib under the name PIEDMC.

##### **Cost of Project:**

The capital cost of the project will be about 23,806.64 million rupees.

##### **Area of the Project:**

Total area of project is 907 acres.

##### **Name of Proponent**

Mr. Ali Muazzam Syed is the Project Proponent.

##### **Environmental Consultant & Client**

PIEDMC has appointed the Asian Consulting Engineers, as the Consultant for the subject project to conduct the EIA. Asian Consulting Engineers will be called as "Consultant" and PIEDMC as the "Client".

##### **Objective of the EIA study**

The Objective of study includes Compliance of section 12 of PEPA 1997 (Amended 2012), PEQS and fulfilment of HSE conditions.

##### **Purpose of the EIA**

The key objectives of the EIA are to:

- Document the ecological and socioeconomic baseline conditions of the study area and the affected communities
- Inform and obtain input from stakeholders, (e.g., governmental authorities, the public, and indigenous communities) and capture their relevant issues and concerns
- Assess in detail the environmental, social, and health impacts that would result from the project
- Suggestion of environmental and social mitigation measures to identified environmental impacts

- Develop the EMPs as discussed above, based on the mitigation measures developed in the EIA.
- Meet the requirements or recommendations of the applicable National Environmental Laws and Guidelines

## SCOPE OF SERVICES

EIA for the subject project is construction of Special Economic Zone at Nankana Sahib

Accordance with:

1. The Punjab Environmental Protection Act, 1997 (amended 2012) and the
  - Various guidelines developed by the Punjab Environmental Protection Agency
  - Pakistan Environment Protection Agency Guidelines
  - Guidelines of Labour & Human Resource Department
  - Punjab Local Government Guidelines
  - Punjab Food Authority Guidelines
2. Methodology for carrying out this study
  - Project Description
  - Site Selection
  - Project Alternatives
3. Process Description
  - Detailed review of the processes
  - Design Parameters
  - Process flow chart
  - Details related top Plant and Equipment
4. Environmental profile of the environmental study area
  - Climatology
  - Geographical features
  - Geological and Hydrological features
  - Historical review
  - Land Use
  - Ecology, i.e., Flora and Fauna etc.
5. Analysis of EPA required environmental parameters
  - Sampling for Air, Water, and Noise Level
  - Ambient Air Quality will be monitored at the existing project site by using certified instruments/methods to check the concentration of pollutants in ambient air before construction.
  - Groundwater quality of the area will be checked through analysing EPA Smart Parameters. 2-3 representative samples will be collected to check

- the groundwater quality by using certified sampling techniques and analysis procedures.
- Noise Level will be monitored at 5 to 6 localities at existing project site
6. Investigate Socio-Economic and Socio-Environmental aspects and cultural values within and around the operating facility
    - Administrative Set up
    - Cultural and Social Values
    - Social Cohesion
    - Interviews from different groups
  7. Development activities and Waste Management
  8. Identify and evaluate major environmental impacts
  9. Identify mitigation measures and develop Environmental Management and Monitoring plan
  10. Conclusions based on the study conducted for this EIA.

#### **EIA PROCEEDING**

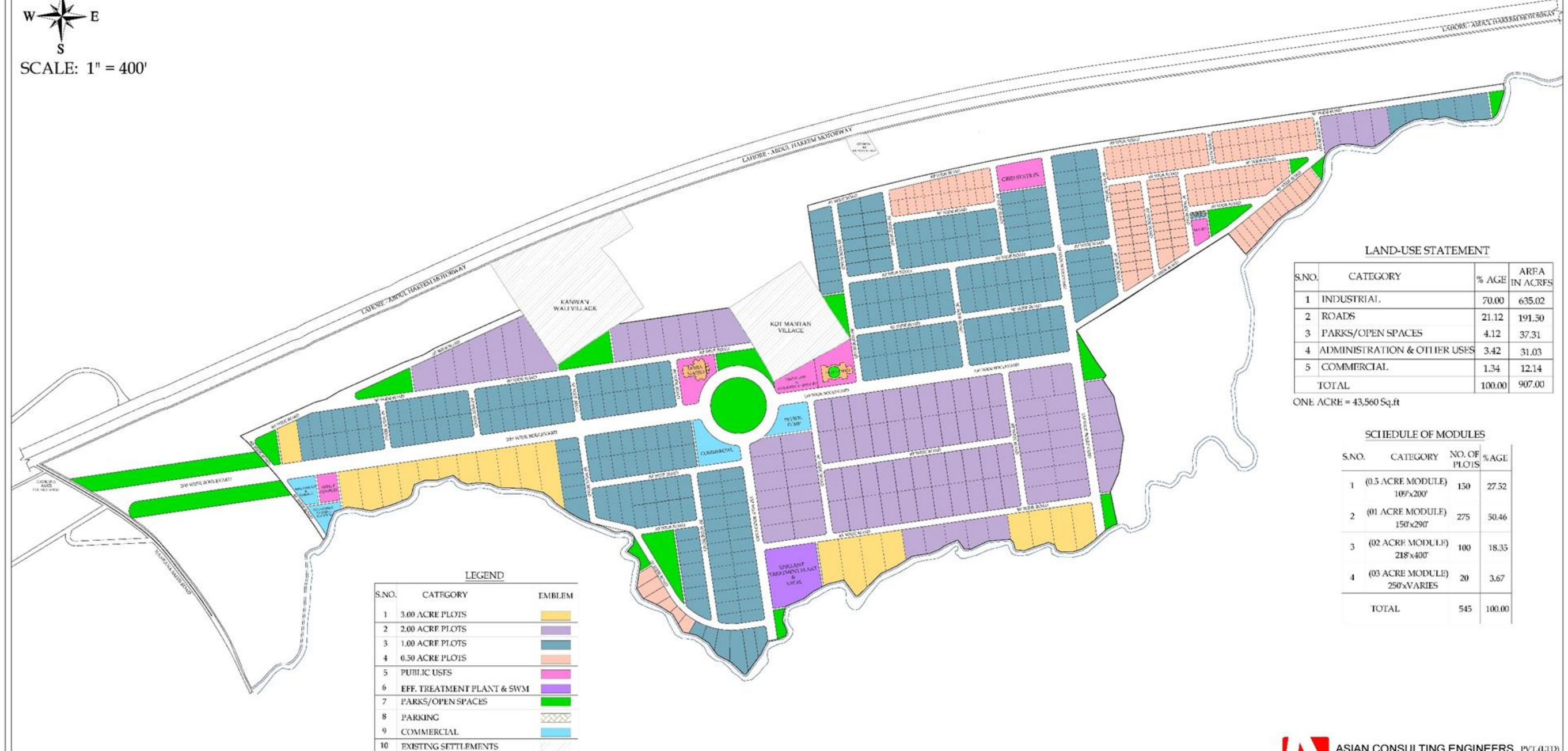
1. All other requirements, as set forth by
  - The Punjab Environmental Protection Act, 1997 (Amended 2012) and the
  - Various guidelines developed by PEPA
  - Any other legal requirements existing within Pakistan
2. 1-2 Site Visits for data acquisition
3. Environmental Monitoring
4. Preparation of Lab Analysis Report
5. Preparation of Environmental Impact Assessment (EIA)
6. Submission of all EIA report in office of DG EPA Punjab
7. Conduction of Public Hearing of EIA
8. Briefing & Presentation at the site to District Officer/Inspector for Environmental Management.
9. Reply to technical Environmental Objections/Review
10. Presentation in the office of DG EPA, Punjab
11. Issuance of NOC

## ANNEXURE - 5: LAYOUT & GOOGLE MAP OF PROJECT



## LAYOUT PLAN OF NANKANA SAHIB SPECIAL ECONOMIC ZONE DRAFT- PROPOSAL

N  
W E  
S  
SCALE: 1" = 400'



## ANNEXURE - 6: LAND OWNERSHIP DOCUMENT

EXTRA ORDINARY ISSUE

REGISTERED No. L-7532



# The Punjab Gazette

PUBLISHED BY AUTHORITY

LAHORE TUESDAY OCTOBER 25, 2022

## Office of the District Collector, Nankana Sahib

### NOTIFICATION

**UNDER SECTION 4 OF THE LAND ACQUISITION ACT, 1894**

Date 24 / 10 /2022

No. DRA/85 Whereas it appears to District Collector, Nankana Sahib that the land is likely to be required by the Punjab Industrial Estates Development & Management Company, Lahore at its own expenses for the public purpose namely Establishment of "Nankana Sahib Industrial Estate". It is hereby notified that the land in the locality described below is likely to be required for the said purpose.

This Notification is made under the provisions of Section-4 of the Land Acquisition Act, 1894 to all whom it may concern.

Now, therefore, in exercise of the powers conferred by the aforesaid section the District Collector, Nankana Sahib is pleased to authorize the officer for the time being engaged in the undertaking with the servants and workmen to enter upon the land and survey in the locality and do all acts required or permitted by that section.

Any person interested who has any objection to the acquisition of this land in the locality may within thirty days of the publication, file an objection in writing before the Assistant Commissioner / Land Acquisition Collector, Nankana Sahib District Nankana Sahib.

### SPECIFICATION OF THE LAND

| District      | Tehsil        | Locality      | Maraba No. | Killa No. | Area   |        |
|---------------|---------------|---------------|------------|-----------|--------|--------|
|               |               |               |            |           | Kanals | Marias |
| Nankana Sahib | Nankana Sahib | Khieray Kalan | 3          | 24        | 3      | 14     |
|               |               |               | 9          | 24        | 2      | 11     |
|               |               |               |            | 25/1      | 6      | 0      |
|               |               |               | 10         | 13        | 2      | 0      |
|               |               |               |            | 14        | 6      | 9      |
|               |               |               |            | 15        | 8      | 0      |
|               |               |               |            | 16        | 8      | 0      |
|               |               |               |            | 17        | 8      | 0      |
|               |               |               |            | 18        | 8      | 0      |

Price Rs. 10.00 Per Page

( 1469 )

1470

THE PUNJAB GAZETTE (EXTRA ORDINARY) OCTOBER 25, 2022

| District | Tehsil | Locality | Maraba No. | Killa No. | Area   |        |
|----------|--------|----------|------------|-----------|--------|--------|
|          |        |          |            |           | Kanals | Marias |
|          |        |          |            | 19        | 6      | 9      |
|          |        |          |            | 20        | 2      | 9      |
|          |        |          |            | 21        | 8      | 0      |
|          |        |          |            | 22        | 7      | 8      |
|          |        |          |            | 23        | 8      | 0      |
|          |        |          |            | 24        | 8      | 0      |
|          |        |          |            | 25        | 8      | 0      |
|          |        |          | 11         | 1         | 0      | 5      |
|          |        |          |            | 2         | 3      | 4      |
|          |        |          |            | 3         | 6      | 15     |
|          |        |          |            | 4/1       | 2      | 0      |
|          |        |          |            | 4/2       | 6      | 0      |
|          |        |          |            | 5         | 6      | 8      |
|          |        |          |            | 6         | 8      | 0      |
|          |        |          |            | 7         | 8      | 0      |
|          |        |          |            | 8         | 8      | 0      |
|          |        |          |            | 9         | 8      | 0      |
|          |        |          |            | 10        | 7      | 6      |
|          |        |          |            | 11        | 8      | 0      |
|          |        |          |            | 12        | 8      | 0      |
|          |        |          |            | 13        | 8      | 0      |
|          |        |          |            | 14        | 8      | 0      |
|          |        |          |            | 15        | 8      | 0      |
|          |        |          |            | 16        | 8      | 0      |
|          |        |          |            | 17        | 8      | 0      |
|          |        |          |            | 18        | 8      | 0      |
|          |        |          |            | 19        | 8      | 0      |
|          |        |          |            | 20        | 8      | 0      |
|          |        |          |            | 21        | 8      | 0      |
|          |        |          |            | 22/1      | 4      | 0      |
|          |        |          |            | 22/2      | 4      | 0      |
|          |        |          |            | 23        | 8      | 0      |
|          |        |          |            | 24        | 8      | 0      |
|          |        |          |            | 25/1      | 1      | 11     |
|          |        |          |            | 25/2      | 6      | 9      |
|          |        |          | 12         | 10        | 5      | 2      |
|          |        |          |            | 11        | 8      | 0      |
|          |        |          |            | 12        | 3      | 2      |
|          |        |          |            | 19        | 8      | 0      |
|          |        |          |            | 20        | 8      | 0      |
|          |        |          |            | 21/1      | 6      | 0      |
|          |        |          |            | 21/2      | 1      | 16     |
|          |        |          |            | 22        | 2      | 12     |
|          |        |          | 15         | 1         | 3      | 2      |
|          |        |          | 16         | 1/1       | 4      | 0      |
|          |        |          |            | 1/2       | 4      | 0      |
|          |        |          |            | 2         | 8      | 0      |
|          |        |          |            | 3         | 8      | 0      |
|          |        |          |            | 4         | 8      | 0      |
|          |        |          |            | 5         | 8      | 0      |
|          |        |          |            | 6         | 4      | 0      |
|          |        |          |            | 7         | 8      | 0      |
|          |        |          |            | 8         | 8      | 0      |
|          |        |          |            | 9/1       | 3      | 0      |

## ANNEXURE - 7: EIA TEAM

| Sr. No. | Team Member          | Position Held                              | Qualifications                                                                                                                                                      |
|---------|----------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Aleem Butt           | Chief Environmentalist<br>Team Leader- EIA | M.Phil. Environmental Sciences, Government College University (GCU), Lahore<br>M.Sc. Environmental Sciences, Punjab University (PU), Lahore<br>NEBOSH, Lead Auditor |
| 2.      | Noman Ashraf         | Environmental Specialist                   | M.Phil. Environmental Sciences, Government College University (GCU), Lahore<br>PGD, Environmental Law<br>University of the Punjab, Lahore                           |
| 3.      | Faiza Anjum          | Environmental Specialist                   | MS Environmental Sciences<br>University of the Punjab, Lahore                                                                                                       |
| 4.      | Muhammad Umair Iqbal | Environmentalist                           | BS Environmental Sciences, Government College University (GCU), Faisalabad                                                                                          |
| 5.      | Sajjad Hussain       | Chief Chemist                              | M.Phil. Chemistry<br>Government College University (GCU), Lahore                                                                                                    |
| 6.      | Hafsa Mehmood        | Environmentalist                           | BS Hons Environmental Sciences, Government College University (GCU), Lahore<br>PGD, Environmental Law<br>University of the Punjab, Lahore                           |
| 7.      | Ayesha Rasheed       | Environmentalist                           | M.Phil Environmental Sciences, Government College University (GCU), Lahore                                                                                          |
| 8.      | Maaha Kamran Dar     | Environmentalist                           | MS Environmental Sciences<br>Lahore College for Women<br>University, Lahore                                                                                         |
| 9.      | Asma Butt            | Sociologist                                | M.Sc. Sociology, University of the Punjab, Lahore                                                                                                                   |
| 10.     | Engr. Umair Tallat   | Sr. Field Engineer                         | M.S. Environmental Engineering, NUST, Islamabad                                                                                                                     |
| 11.     | Hammas Sohail        | Monitoring Officer                         | BS. Environmental Sciences, University of Gujrat, Gujrat                                                                                                            |

## ANNEXURE - 8: SOCIO ECONOMIC SURVEY

### Public Consultation/ Stakeholder Participation regarding EIA

| Name:                                                              |                          |                          |                          |                          |                          |
|--------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Residence:                                                         |                          |                          |                          |                          |                          |
| Age:                                                               |                          |                          |                          |                          |                          |
| Gender: <input type="checkbox"/> <input type="checkbox"/>          |                          |                          |                          |                          |                          |
| Qualification:                                                     |                          |                          |                          |                          |                          |
| Profession:                                                        |                          |                          |                          |                          |                          |
| REMARKS                                                            |                          |                          |                          |                          |                          |
|                                                                    | Strongly Agree           | Agree                    | No Comments              | Disagree                 | Strongly Disagree        |
| Are you in favor of the proposed construction?                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Will the project increase the importance of the area?              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Will the project help to improve the living standards of the area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Will the project affect the environment of the area?               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Level of satisfaction?                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Signature of Interviewer

## ANNEXURE - 9: LAB REPORTS



LAB 208  
ISO 17025






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### ENVIRONMENTAL MONITORING & ANALYSIS REPORT

### SPECIAL ECONOMIC ZONE, NANKANA SAHIB

- Ambient Air Monitoring
- Noise Level Monitoring
- Drinking Water Analysis
- Wastewater Analysis

Reference No.: AES-ENV-010-NS/2023

Dated: 20, February 2023

**Asian Environmental Services Pvt. Ltd.**  
has prepared this report as per prerequisites of client.  
Any other individual using the content of this document shall do so at their own liability.  
The client is responsible for lawful usage of this reported data.

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## Ambient Air Monitoring Report

### Monitoring Details

**Reference Number** AES-ENV-NS-010/2023-AA-01 **Monitoring Point** Kot Mantan  
**Date of Monitoring** 09-Feb-2023 to 10-Feb-2023 **Monitoring Coordinates** 31°41'09.78" N  
73°79'59.24" E  
**Validation Officer** Mr. Nadeem Ahmed (Research Officer- Punjab EPA)

| Sr. No.               | Time  | CO (mg/m <sup>3</sup> ) | NO (µg/m <sup>3</sup> ) | NO <sub>2</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) | SO <sub>2</sub> (µg/m <sup>3</sup> ) |
|-----------------------|-------|-------------------------|-------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1                     | 13:30 | 1.37                    | 13.67                   | 44.33                                | 68.74                                | 42.10                                |
| 2                     | 14:30 | 1.99                    | 14.20                   | 53.53                                | 97.22                                | 32.49                                |
| 3                     | 15:30 | 1.82                    | 15.21                   | 44.89                                | 86.31                                | 47.64                                |
| 4                     | 16:30 | 1.99                    | 14.41                   | 51.27                                | 96.23                                | 50.83                                |
| 5                     | 17:30 | 1.06                    | 15.96                   | 44.18                                | 91.47                                | 52.62                                |
| 6                     | 18:30 | 1.02                    | 16.08                   | 44.64                                | 95.92                                | 37.44                                |
| 7                     | 19:30 | 2.55                    | 15.59                   | 46.97                                | 98.67                                | 44.06                                |
| 8                     | 20:30 | 2.18                    | 14.24                   | 45.08                                | 102.07                               | 46.56                                |
| 9                     | 21:30 | 1.99                    | 13.45                   | 57.01                                | 93.59                                | 51.34                                |
| 10                    | 22:30 | 1.66                    | 12.66                   | 57.57                                | 90.51                                | 43.43                                |
| 11                    | 23:30 | 1.55                    | 12.87                   | 41.14                                | 76.97                                | 40.62                                |
| 12                    | 00:30 | 1.62                    | 11.09                   | 59.80                                | 97.12                                | 45.39                                |
| 13                    | 01:30 | 1.98                    | 11.90                   | 43.78                                | 85.68                                | 40.62                                |
| 14                    | 02:30 | 0.81                    | 11.41                   | 44.27                                | 87.78                                | 45.39                                |
| 15                    | 03:30 | 1.05                    | 10.54                   | 48.75                                | 88.36                                | 40.28                                |
| 16                    | 04:30 | 1.16                    | 9.36                    | 57.32                                | 95.23                                | 37.11                                |
| 17                    | 05:30 | 1.75                    | 8.23                    | 57.72                                | 91.20                                | 32.04                                |
| 18                    | 06:30 | 2.21                    | 9.42                    | 45.12                                | 94.66                                | 30.55                                |
| 19                    | 07:30 | 2.10                    | 11.34                   | 61.91                                | 117.01                               | 27.30                                |
| 20                    | 08:30 | 1.63                    | 11.73                   | 61.91                                | 121.32                               | 22.20                                |
| 21                    | 09:30 | 2.44                    | 12.85                   | 68.07                                | 126.75                               | 25.48                                |
| 22                    | 10:30 | 3.14                    | 14.58                   | 60.42                                | 125.07                               | 37.43                                |
| 23                    | 11:30 | 3.38                    | 15.74                   | 55.21                                | 112.80                               | 45.37                                |
| 24                    | 12:30 | 3.38                    | 16.11                   | 44.89                                | 98.10                                | 49.00                                |
| Average Concentration |       | 1.91                    | 13.02                   | 51.66                                | 97.45                                | 40.30                                |

Monitored By



Reviewed By  
(TM)

Approved By  
(QM)

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## Ambient Air Monitoring Report

### Monitoring Details

|                    |                                                 |                        |                                  |
|--------------------|-------------------------------------------------|------------------------|----------------------------------|
| Reference Number   | AES-ENV-NS-010/2023-AA-01                       | Monitoring Point       | Kot Mantan                       |
| Date of Monitoring | 09-Feb-2023 to 10-Feb-2023                      | Monitoring Coordinates | 31°41'09.78" N<br>73°79'59.24" E |
| Validation Officer | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |                        |                                  |

| Parameters                                | Units             | Monitoring Duration | LDL  | Average Obtained Concentration | PEQS  | Remarks |
|-------------------------------------------|-------------------|---------------------|------|--------------------------------|-------|---------|
| Nitrogen Dioxide (NO <sub>2</sub> ) *     | µg/m <sup>3</sup> | 24Hours             | 1.00 | 51.66                          | 80.0  | Optimal |
| Nitrogen Oxide (NO)*                      | µg/m <sup>3</sup> | 24Hours             | 1.00 | 13.02                          | 40.0  | Optimal |
| NO <sub>x</sub> *                         | µg/m <sup>3</sup> | 24Hours             | 1.00 | 97.45                          | 120.0 | Optimal |
| Sulphur Dioxide (SO <sub>2</sub> ) *      | µg/m <sup>3</sup> | 24Hours             | 1.00 | 40.30                          | 120.0 | Optimal |
| Carbon Monoxide (CO) *                    | mg/m <sup>3</sup> | 24Hours             | 0.01 | 1.91                           | 05.0  | Optimal |
| Particulate Matter (PM <sub>10</sub> ) *  | µg/m <sup>3</sup> | 24Hours             | 1.00 | 112.08                         | 150   | Optimal |
| Particulate Matter (PM <sub>2.5</sub> ) * | µg/m <sup>3</sup> | 24Hours             | 1.00 | 30.16                          | 35    | Optimal |
| Total Particulate Matter (TSP)            | µg/m <sup>3</sup> | 24Hours             | 1.00 | 201.23                         | 500   | Optimal |

\*Parameters are approved from Punjab Environment Protection Agency.

#### Abbreviations:

LDL= Lower Detection Limit

PEQS= Punjab Environmental Quality Standards

µg/m<sup>3</sup>= Micro Gram per Meter Cube

#### Remarks:

Optimal = Compliance with Permissible Range

Marginal = Close to Extreme Edge

High = Exceeds from Permissible Range

Low = Less Than Permissible Range

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Page 3 of 5

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## Noise Monitoring Report

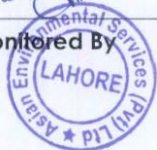
### Monitoring Details

**Reference Number** AES-ENV-NS-010/2023-AA-01  
**Date of Monitoring** 09-Feb-2023 to 10-Feb-2023  
**Validation Officer** Mr. Nadeem Ahmed (Research Officer- Punjab EPA)

**Monitoring Point** Kot Mantan  
**Monitoring Coordinates** 31°41'09.78" N  
73°79'59.24" E

| Sr. No. | Time  | Noise dB(A) | PEQS             |
|---------|-------|-------------|------------------|
| 1       | 13:30 | 47          | Day Time<br>75   |
| 2       | 14:30 | 43          |                  |
| 3       | 15:30 | 49          |                  |
| 4       | 16:30 | 41          |                  |
| 5       | 17:30 | 53          |                  |
| 6       | 18:30 | 55          |                  |
| 7       | 19:30 | 59          |                  |
| 8       | 20:30 | 51          |                  |
| 9       | 21:30 | 50          |                  |
| 10      | 22:30 | 48          | Night Time<br>65 |
| 11      | 23:30 | 54          |                  |
| 12      | 00:30 | 56          |                  |
| 13      | 01:30 | 43          |                  |
| 14      | 02:30 | 49          |                  |
| 15      | 03:30 | 41          |                  |
| 16      | 04:30 | 40          |                  |
| 17      | 05:30 | 51          |                  |
| 18      | 06:30 | 53          |                  |
| 19      | 07:30 | 59          | Day Time<br>75   |
| 20      | 08:30 | 54          |                  |
| 21      | 09:30 | 48          |                  |
| 22      | 10:30 | 47          |                  |
| 23      | 11:30 | 46          |                  |
| 24      | 12:30 | 41          |                  |

Monitored By



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(TM)

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## GROUND WATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                       |                                                 |
|--------------------------------------------------------|---------------------------------------|-----------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-GW-04             | Reporting Date        | 20-02-2023                                      |
| Nature of Sample                                       | Ground Water                          | Sampling Method       | AES/LMS/QSP-014                                 |
| Grab/Composite                                         | Grab                                  | Sample Collected by   | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Receiving Date | 10-02-2023                                      |
| Analysis Completion Date                               | 15-02-2023                            | Lab Temp & Humidity   | 24.5°C & 50%                                    |
| Ambient Temperature & Humidity at the Time of Sampling |                                       |                       | 17°C & 67%                                      |
| Sample ID                                              | AES-ENV-GW-04/2023                    | Sampling Location     | Kawan Wali                                      |
| Client Details                                         | Special Economic Zone, Nankana Sahib. | Validation Officer    | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



### Ground Water Analysis Results

| Parameter                                | Analysis Method               | PEQS              | Result            | MU (CL95%) | Remarks |
|------------------------------------------|-------------------------------|-------------------|-------------------|------------|---------|
| <b>Lab Analysis</b>                      |                               |                   |                   |            |         |
| Color*                                   | SMWW 2120 C                   | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                   | SMWW 2160 C                   | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Odor*                                    | SMWW 2150 B                   | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                               | SMWW 2130 B                   | < 5 NTU           | 0                 | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> )** | SMWW 2340 C                   | < 500 mg/L        | 196               | ± 2.07     | Optimal |
| Total Dissolved Solids (TDS)**           | SMWW 2540 C                   | < 1000 mg/L       | 491               | ± 7.21     | Optimal |
| pH**                                     | SMWW 4500 H* B                | 6.5- 8.5          | 7.52              | ± 0.049    | Optimal |
| Aluminum (Al)                            | SMWW 3111 B                   | ≤ 0.2 mg/L        | <0.005            | N.A.       | Optimal |
| Antimony (Sb)                            | SMWW 3114 B                   | ≤ 0.005 mg/L      | <0.005            | N.A.       | Optimal |
| Arsenic (As)                             | SMWW 3114 B                   | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Barium (Ba)                              | SMWW 3113 B                   | 0.7 mg/L          | <0.0035           | N.A.       | Optimal |
| Boron (B)                                | SMWW 3113 B                   | 0.3 mg/L          | <0.02             | N.A.       | Optimal |
| Cadmium (Cd)                             | SMWW 3113 B                   | 0.01 mg/L         | <0.006            | N.A.       | Optimal |
| Chloride (Cl) **                         | SMWW 4500 Cl* B               | < 250 mg/L        | 38                | ± 1.26     | Optimal |
| Chromium (Cr)                            | SMWW 3113 B                   | ≤ 0.05 mg/L       | <0.004            | N.A.       | Optimal |
| Copper (Cu)                              | SMWW 3111 B                   | 2.0 mg/L          | 0.164             | N.A.       | Optimal |
| Cyanide (CN)*                            | SMWW 4500 CN* F               | ≤ 0.05 mg/L       | 0                 | N.A.       | Optimal |
| Fluoride (F)**                           | SMWW 4500 F* D                | ≤ 1.5 mg/L        | 0.73              | ± 0.61     | Optimal |
| Lead (Pb)                                | SMWW 3114 B                   | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Manganese (Mn)                           | SMWW 3113 B                   | ≤ 0.5 mg/L        | 0.015             | N.A.       | Optimal |
| Mercury (Hg)                             | SMWW 3114 B                   | ≤ 0.001 mg/L      | <0.001            | N.A.       | Optimal |
| Nickel (Ni)                              | SMWW 3113 B                   | ≤ 0.02 mg/L       | <0.02             | N.A.       | Optimal |
| Nitrate (NO <sub>3</sub> )*              | SMWW 4500 NO <sub>3</sub> * B | ≤ 50 mg/L         | 0                 | N.A.       | Optimal |
| Nitrite (NO <sub>2</sub> )*              | SMWW 4500 NO <sub>2</sub> * B | ≤ 3.0 mg/L        | 0.15              | N.A.       | Optimal |
| Selenium (Se)                            | SMWW 3114 B                   | 0.01 mg/L         | <0.01             | N.A.       | Optimal |

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## GROUND WATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                       |                                                 |
|--------------------------------------------------------|---------------------------------------|-----------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-GW-04             | Reporting Date        | 20-02-2023                                      |
| Nature of Sample                                       | Ground Water                          | Sampling Method       | AES/LMS/QSP-014                                 |
| Grab/Composite                                         | Grab                                  | Reference             | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Collected by   | AES                                             |
| Analysis Completion Date                               | 15-02-2023                            | Sample Receiving Date | 10-02-2023                                      |
| Ambient Temperature & Humidity at the Time of Sampling |                                       | Lab Temp & Humidity   | 24.5°C & 50%                                    |
| Sample ID                                              | AES-ENV-GW-04/2023                    |                       | 17°C & 67%                                      |
| Client Details                                         | Special Economic Zone, Nankana Sahib. | Sampling Location     | Kawan Wali                                      |
|                                                        |                                       | Validation Officer    | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



### Ground Water Analysis Results

| Parameter                              | Analysis Method | PEQS         | Result | MU (CL95%) | Remarks |
|----------------------------------------|-----------------|--------------|--------|------------|---------|
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl-B  | 0.5 mg/L     | 0      | N.A.       | Optimal |
| Phenolic Compounds (as Phenols) *      | SMWW 5530 D     | NGVS         | 0      | N.A.       | -       |
| Zinc (Zn)                              | SMWW 3113 B     | 5.0 mg/L     | 0.038  | N.A.       | Optimal |
| <b>Microbiological Analysis</b>        |                 |              |        |            |         |
| Total Coliforms*                       | SMWW 9222 B     | 0 CFU/100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms *                      | SMWW 9222 D     | 0 CFU/100 mL | 0      | N.A.       | Optimal |

\*Parameters are approved from Punjab Environment Protection Agency.

\*\*Parameters are accredited from Pakistan National Accreditation Council.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

#### Abbreviations:

PEQS = Punjab Environment Quality Standards  
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NTU = Nephelometric Turbidity Unit

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N.A. = Not Available  
MU = Measurement Uncertainty

CFU = Colony forming Unit  
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#### Remarks:

Optimal = Compliance with Permissible Range  
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Analyzed By



Reviewed By  
(TM)

Approved By  
(QM)

-----End of Report-----

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## GROUND WATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                           |                                                 |
|--------------------------------------------------------|---------------------------------------|---------------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-GW-05             | Reporting Date            | 20-02-2023                                      |
| Nature of Sample                                       | Ground Water                          | Sampling Method Reference | AES/LMS/QSP-014                                 |
| Grab/Composite                                         | Grab                                  | Sample Collected by       | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Receiving Date     | 10-02-2023                                      |
| Analysis Completion Date                               | 15-02-2023                            | Lab Temp & Humidity       | 24.5°C & 50%                                    |
| Ambient Temperature & Humidity at the Time of Sampling |                                       |                           | 17°C & 67%                                      |
| Sample ID                                              | AES-ENV-GW-05/2023                    | Sampling Location         | Kot Mantan                                      |
| Client Details                                         | Special Economic Zone, Nankana Sahib. | Validation Officer        | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



### Ground Water Analysis Results

| Parameter                                | Analysis Method                          | PEQS              | Result            | MU (CL95%) | Remarks |
|------------------------------------------|------------------------------------------|-------------------|-------------------|------------|---------|
| <b>Lab Analysis</b>                      |                                          |                   |                   |            |         |
| Color*                                   | SMWW 2120 C                              | ≤ 15 TCU          | 0                 | N.A.       | Optimal |
| Taste*                                   | SMWW 2160 C                              | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Odor*                                    | SMWW 2150 B                              | Non-Objectionable | Non-Objectionable | N.A.       | Optimal |
| Turbidity*                               | SMWW 2130 B                              | < 5 NTU           | 0                 | N.A.       | Optimal |
| Total Hardness (as CaCO <sub>3</sub> )** | SMWW 2340 C                              | < 500 mg/L        | 380               | ± 2.07     | Optimal |
| Total Dissolved Solids (TDS)**           | SMWW 2540 C                              | < 1000 mg/L       | 980               | ± 7.26     | Optimal |
| pH**                                     | SMWW 4500 H* B                           | 6.5- 8.5          | 7.42              | ± 0.049    | Optimal |
| Aluminum (Al)                            | SMWW 3111 B                              | ≤ 0.2 mg/L        | <0.005            | N.A.       | Optimal |
| Antimony (Sb)                            | SMWW 3114 B                              | ≤ 0.005 mg/L      | <0.005            | N.A.       | Optimal |
| Arsenic (As)                             | SMWW 3114 B                              | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Barium (Ba)                              | SMWW 3113 B                              | 0.7 mg/L          | <0.0035           | N.A.       | Optimal |
| Boron (B)                                | SMWW 3113 B                              | 0.3 mg/l          | <0.02             | N.A.       | Optimal |
| Cadmium (Cd)                             | SMWW 3113 B                              | 0.01 mg/L         | <0.006            | N.A.       | Optimal |
| Chloride (Cl <sup>-</sup> )**            | SMWW 4500 Cl* B                          | < 250 mg/L        | 134               | ± 1.38     | Optimal |
| Chromium (Cr)                            | SMWW 3113 B                              | ≤ 0.05 mg/L       | <0.004            | N.A.       | Optimal |
| Copper (Cu)                              | SMWW 3111 B                              | 2.0 mg/L          | 0.165             | N.A.       | Optimal |
| Cyanide (CN <sup>-</sup> )*              | SMWW 4500 CN* F                          | ≤ 0.05 mg/L       | 0                 | N.A.       | Optimal |
| Fluoride (F <sup>-</sup> )**             | SMWW 4500 F* D                           | ≤ 1.5 mg/L        | 0.67              | ± 0.61     | Optimal |
| Lead (Pb)                                | SMWW 3114 B                              | ≤ 0.05 mg/L       | <0.005            | N.A.       | Optimal |
| Manganese (Mn)                           | SMWW 3113 B                              | ≤ 0.5 mg/l        | 0.015             | N.A.       | Optimal |
| Mercury (Hg)                             | SMWW 3114 B                              | ≤ 0.001 mg/L      | <0.001            | N.A.       | Optimal |
| Nickel (Ni)                              | SMWW 3113 B                              | ≤ 0.02 mg/L       | <0.02             | N.A.       | Optimal |
| Nitrate (NO <sub>3</sub> <sup>-</sup> )* | SMWW 4500 NO <sub>3</sub> <sup>-</sup> B | ≤ 50 mg/L         | 0                 | N.A.       | Optimal |
| Nitrite (NO <sub>2</sub> <sup>-</sup> )* | SMWW 4500 NO <sub>2</sub> <sup>-</sup> B | ≤ 3.0 mg/L        | 0.15              | N.A.       | Optimal |
| Selenium (Se)                            | SMWW 3114 B                              | 0.01 mg/L         | <0.01             | N.A.       | Optimal |

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## GROUND WATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                           |                                                 |
|--------------------------------------------------------|---------------------------------------|---------------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-GW-05             | Reporting Date            | 20-02-2023                                      |
| Nature of Sample                                       | Ground Water                          | Sampling Method Reference | AES/LMS/QSP-014                                 |
| Grab/Composite                                         | Grab                                  | Sample Collected by       | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Receiving Date     | 10-02-2023                                      |
| Analysis Completion Date                               | 15-02-2023                            | Lab Temp & Humidity       | 24.5°C & 50%                                    |
| Ambient Temperature & Humidity at the Time of Sampling |                                       |                           | 17°C & 67%                                      |
| Sample ID                                              | AES-ENV-GW-05/2023                    | Sampling Location         | Kot Mantan                                      |
| Client Details                                         | Special Economic Zone, Nankana Sahib. | Validation Officer        | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



| Ground Water Analysis Results          |                 |              |        |            |         |
|----------------------------------------|-----------------|--------------|--------|------------|---------|
| Parameter                              | Analysis Method | PEQS         | Result | MU (CL95%) | Remarks |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl- B | 0.5 mg/L     | 0      | N.A.       | Optimal |
| Phenolic Compounds (as Phenols) *      | SMWW 5530 D     | NGVS         | 0      | N.A.       | -       |
| Zinc (Zn)                              | SMWW 3113 B     | 5.0 mg/L     | 0.042  | N.A.       | Optimal |
| <b>Microbiological Analysis</b>        |                 |              |        |            |         |
| Total Coliforms*                       | SMWW 9222 B     | 0 CFU/100 mL | 0      | N.A.       | Optimal |
| Fecal Coliforms *                      | SMWW 9222 D     | 0 CFU/100 mL | 0      | N.A.       | Optimal |

\*Parameters are approved from Punjab Environment Protection Agency.

\*\*Parameters are accredited from Pakistan National Accreditation Council.

The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

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(TM)

Approved By

(QM)

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## WASTEWATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                       |                                                 |
|--------------------------------------------------------|---------------------------------------|-----------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-WW-14             | Reporting Date        | 20-02-2023                                      |
| Nature of Sample                                       | Wastewater                            | Sampling Method       | AES/LMS/QSP-014                                 |
| Grab/Composite                                         | Grab                                  | Reference             | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Collected by   | AES                                             |
| Analysis Completion Date                               | 17-02-2023                            | Sample Receiving Date | 10-02-2023                                      |
| Ambient Temperature & Humidity at the Time of Sampling |                                       | Lab Temp & Humidity   | 24.5°C & 50%                                    |
| Sample ID                                              | AES-ENV-WW-14/2023                    |                       | 17°C & 67%                                      |
| Client Detail                                          | Special Economic Zone, Nankana Sahib. | Sampling Location     | Nearby Drain                                    |
|                                                        |                                       | Validation Officer    | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



### Wastewater Analysis Results

| Parameter                                       | Analysis Method                           | PEQS      | Result | MU (CL95%) | Remarks |
|-------------------------------------------------|-------------------------------------------|-----------|--------|------------|---------|
| <b>Lab Analysis</b>                             |                                           |           |        |            |         |
| pH**                                            | SMWW 4500 H+ B                            | 6 - 9     | 7.28   | ± 0.049    | Optimal |
| Biochemical Oxygen Demand (BOD <sub>5</sub> ) * | SMWW 5210-B                               | 80 mg/L   | 1151   | N.A.       | High    |
| Chemical Oxygen Demand (COD)**                  | SMWW 5220 D                               | 150 mg/L  | 2710   | ± 5.48     | High    |
| Total Suspended Solids (TSS)**                  | SMWW 2540 D                               | 200 mg/L  | 985    | ± 5.95     | High    |
| Total Dissolved Solids (TDS)**                  | SMWW 2540 C                               | 3500 mg/L | 2899   | ± 9.18     | Optimal |
| Phenolic Compounds (as Phenols) *               | SMWW 5530 D                               | 0.1 mg/L  | 0      | N.A.       | Optimal |
| Grease and Oil*                                 | USEPA 1664 B                              | 10 mg/L   | 6.0    | N.A.       | Optimal |
| Chloride (Cl) <sup>-</sup> **                   | SMWW 4500 Cl- B                           | 1000 mg/L | 439    | ± 3.07     | Optimal |
| Fluoride (F) <sup>-</sup> **                    | SMWW 4500 F- D                            | 10 mg/L   | 0.31   | ± 0.61     | Optimal |
| Cyanide (CN) <sup>-</sup> *                     | SMWW 4500 CN- F                           | 1.0 mg/L  | 0      | N.A.       | Optimal |
| An-ionic Detergents (as MBAs) *                 | SMWW 5540-C                               | 20.0 mg/L | 1.2    | N.A.       | Optimal |
| Sulfate (SO <sub>4</sub> <sup>2-</sup> ) *      | SMWW 4500 SO <sub>4</sub> <sup>2-</sup> E | 600 mg/L  | 126    | N.A.       | Optimal |
| Sulfide (S <sup>2-</sup> ) *                    | SMWW 4500 S <sup>2-</sup> F               | 1.0 mg/L  | 0      | N.A.       | Optimal |
| Ammonia (NH <sub>3</sub> ) *                    | SMWW 4500-NH <sub>3</sub> C               | 40 mg/L   | 0      | N.A.       | Optimal |
| Cadmium (Cd)                                    | SMWW 3113 B                               | 0.1 mg/L  | 0.006  | N.A.       | Optimal |
| Chromium (Cr)                                   | SMWW 3113 B                               | 1.0 mg/L  | <0.004 | N.A.       | Optimal |
| Copper (Cu)                                     | SMWW 3113 B                               | 1.0 mg/L  | 0.170  | N.A.       | Optimal |
| Lead (Pb)                                       | SMWW 3113 B                               | 0.5 mg/L  | <0.005 | N.A.       | Optimal |
| Mercury (Hg)                                    | SMWW 3112 B                               | 0.01 mg/L | <0.001 | N.A.       | Optimal |
| Selenium (Se)                                   | SMWW 3114 B                               | 0.5 mg/L  | <0.01  | N.A.       | Optimal |
| Nickel (Ni)                                     | SMWW 3113 B                               | 1.0 mg/L  | <0.006 | N.A.       | Optimal |
| Silver (Ag)                                     | SMWW 3113 B                               | 1.0 mg/L  | <0.007 | N.A.       | Optimal |
| Total Toxic Metals                              | Calculated Value                          | 2.0 mg/L  | 0.24   | N.A.       |         |

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## WASTEWATER ANALYSIS REPORT

### Sample Detail

|                                                        |                                       |                       |                                                 |
|--------------------------------------------------------|---------------------------------------|-----------------------|-------------------------------------------------|
| Reference No.                                          | AES-ENV-NS-010/2023-WW-14             | Reporting Date        | 20-02-2023                                      |
| Nature of Sample                                       | Wastewater                            | Sampling Method       | AES/LMS/QSP-Q1 4                                |
| Grab/Composite                                         | Grab                                  | Reference             | AES                                             |
| Sampling Date                                          | 09-02-2023                            | Sample Collected by   | AES                                             |
| Analysis Completion Date                               | 17-02-2023                            | Sample Receiving Date | 10-02-2023                                      |
| Ambient Temperature & Humidity at the Time of Sampling | 17°C & 67%                            | Lab Temp & Humidity   | 24.5°C & 50%                                    |
| Sample ID                                              | AES-ENV-WW-14/2023                    | Sampling Location     | Nearby Drain                                    |
| Client Detail                                          | Special Economic Zone, Nankana Sahib. | Validation Officer    | Mr. Nadeem Ahmed (Research Officer- Punjab EPA) |



### Wastewater Analysis Results

| Parameter                              | Analysis Method | PEQS     | Result  | MU (CL95%) | Remarks |
|----------------------------------------|-----------------|----------|---------|------------|---------|
| Zinc (Zn)                              | SMWW 3111 B     | 5.0 mg/L | 0.054   | N.A.       | Optimal |
| Arsenic (As)                           | SMWW 3114 B     | 1.0 mg/L | 0.005   | N.A.       | Optimal |
| Barium (Ba)                            | SMWW 3113 B     | 1.5 mg/L | <0.0035 | N.A.       | Optimal |
| Iron (Fe)                              | SMWW 3113 B     | 8.0 mg/L | 0.965   | N.A.       | Optimal |
| Manganese (Mn)                         | SMWW 3111 B     | 1.5 mg/L | <0.05   | N.A.       | Optimal |
| Boron (B)                              | SMWW 3113 B     | 6.0 mg/L | 0.02    | N.A.       | Optimal |
| Residual Chlorine (Cl <sub>2</sub> ) * | SMWW 4500 Cl- B | 1.0 mg/L | 0       | N.A.       | Optimal |

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Low = Less Than Permissible Range

### Report Disclaimer

- The remaining portion of the sample (s) will be disposed off after 15 days after the issuance date of report from the laboratory unless otherwise instructed (Condition Apply).
- This report shall not be reproduced in part/parties.
- The provided results relate only to the sample provided/collected.
- Values reflect the testing results; decision for usage of report totally depends on client.

Analyzed By: *Hida* 20-2-23



Reviewed By: *my* 02-2-2023  
(TM)

Approved By: *[Signature]* 20/02/2023  
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-----End of Report-----

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