PUNJAB INDUSTRIAL ESTATES
DEVELOPMENT AND MANAGEMENT COMPANY
A Company setup under Section 42 of the Companies Ordiance, 1984 (now Companies Act, 2017)

PIE/BIE/NEPRA/ 1562
29th June 2022

To,

The Registrar, NEPRA
NEPRA Tower,
Attaturk Avenue (East), Sector G-5/1, Islamabad.

Subject: **APPLICATION FOR POWER SUPPLY LICENSE FOR PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY (PIEDMC) OWNED BY GOVT.OF PUNJAB AT BHALWAL INDUSTRIAL ESTATE.**

Dear Sir,

Chief Executive Officer being duly authorized representative of Punjab Industrial Estates Development and Management Company (PIEDMC), by virtue of power of Attorney / Board Resolution as stipulated in its 104th BOD Meeting dated 21st July 2016, to apply to National Electric Regulatory Authority, Islamabad, for the grant of Distribution License to the Punjab Industrial Estates Development and Management Company (PIEDMC) Govt. of Punjab at its Bhalwal Industrial Estate.

Please find the attached application as per SRO No. 760(I)/2021 dated June 17th, 2021 for obtaining the Electricity Power Distribution License for the Punjab Industrial Estates Development and Management Company (PIEDMC), at its industrial estate located in Bhalwal, Punjab.

A cross cheque in the sum of Rs. 1,706,451/- being the 'Non-refundable License Applicant Fee also attached here with this application.

The application may please be processed at your end for the early issuance of Power Distribution License for PIEDMC at its Bhalwal Industrial Estate.

Thanking you and best regards.

DA/As above:

(ALI MUAZZAM SYED)
CHIEF EXECUTIVE OFFICER

Copy to:-
1. The Chairman, PIEDMC.

Head Office: Commercial Area (North) Sundar Industrial Estate, Sundar Raiwind Road, Lahore.
Tel: 042-35297203-6, Fax: 042-35297207, UAN: +92-42-111-743-743
Website: www.pie.com.pk E.Mail: info@pie.com.pk
An Approved Non Profit Organisation U/S 2(36)of Income Tax Ordiance 2001

PUNJAB INDUSTRIAL ESTATES DEVELOPMENT & MANAGEMENT COMPANY (PIEDMC)

Sundar Industrial Estate

QUAID-E-AZAM INDUSTRIAL ESTATE KOT LAKHPAT

Multan Industrial Estate

Head Office:
Commercial Area (North), Sundar Industrial Estate,
Sundar-Raiwind Road, Lahore.
Tel :- 042-35297203-6 Fax :- 042-35297207

City Office:
27-Egerton Road, 3rd Floor Ajmal house, Adjacent Hotel Holi
Tel :- 042-99203661-3 Fax :- 042-99203660
URL: www.pie.com.pk, Email: info @pie.com.pk

PIEDMC INTRODUCTION

Punjab Industrial Estates Development & Management Company (PIEDMC) is a Company setup under section 42 of the Companies Ordinance, 1984(now Companies Act, 2017). PIEDMC is an autonomous, not for profit entity owned by the Government of Punjab and is run by a Board of Directors (BOD) comprising of private sector industrialists and ex-officio members. PIEDMC is a successful example of Public Private Partnership.

The Government of Punjab has set up Punjab Industrial Estates Development and Management Company (PIEDMC) Ltd. to achieve orderly, planned and rapid industrialization of Punjab by developing a chain of industrial estates in a dynamic and innovative manner, this aims at providing turnkey solutions to the problems by prospective entrepreneurs.

PIEDMC is led by private sector so that it can be more flexible, able to respond to the changing environment and designed to be financially self-sustainable in order to maintain desired impetus or developmental works.

The organization consists of a central board of Directors consisting of 15 members from private sector representing different sectors of economy and from most of the regions of Punjab, further each Industrial Estate has its own board of management which identifies their requirements for the type of industries and its supporting requirements so that they can be consolidated, value addition increased and over heads reduced.

PIEDMC Objective:

a) To provide international standard state of the art infrastructure.
b) Promote rapid industrialization
c) Enforcement of environmental compliance.
d) Push for sustainable GDP growth
e) Bring least developed areas into main stream
f) Creation of employment opportunities

g) Provision of electricity, gas, power plant, CETP and security

h) Up-gradation of existing parks/clusters

i) Foreign collaboration to attract FDIs

j) Ensure efficient, cost effective and sustainable management of industrial estates.

k) To enact on "One Window Operation" by providing utilities and services to industrial estates.

PIEDMC Projects:

i. Sundar Industrial Estae at Sundar, Lahore (2,000 Acres)
ii. Up-gradation of Quaid-e-Azam Industrieal Estate at Lahore (565 Acres)
iii. Up-gradation of Multan Industrial Estate Phase-I (743 Acres)
iv. Development of Multan Industrial Estate Phase-II (667 Acres)
v. Development of New Industrial Estate at Rahim Yar Khan (456 Acres)
vi. Development of Bhalwal Industrial Estate Sargodha (427 Acres)
vii. Vehari Industrial Estate (350 Acres)
viii. Quaid-e-Azam Business Park, Sheikhupura (1800 Acres)
ix. Bahawalpur Industrial Estate (500 Acres)

PIEDMC Upcoming Projects:

i. Sialkot Industrial Estate
ii. Muzafargarh Industrial Estate
iii. Gujrat Industrial Estate.
iv. Leather Industrial Park at Sua Asil (Distt. Kasur).
v. D. G. Khan Industrial Estate.
vi. Okara Industrial Estate.
vii. Bahawalpur Industrial Estate

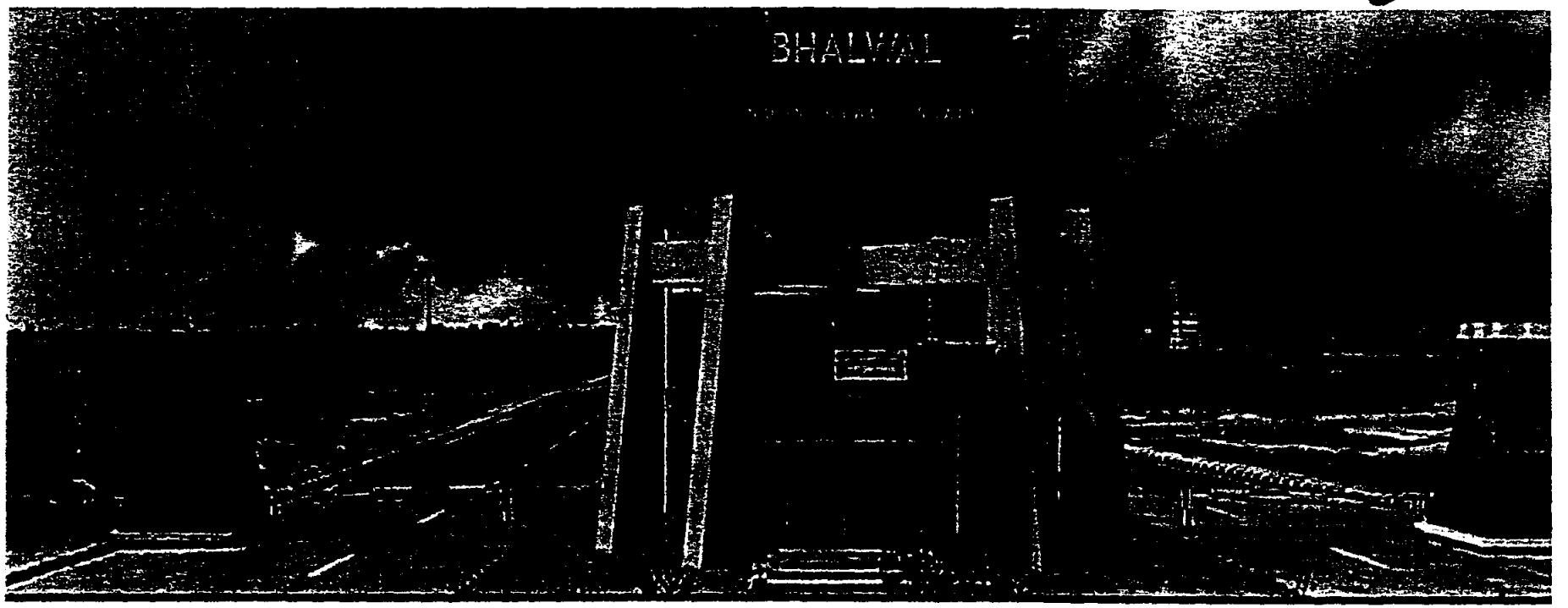
PIEDMC Mission:

To develop a chain of industrial estate in a dynamic and innovative manner by capitalizing on proposed and existing industrial and agricultural strength of Punjab while keeping the cultural strengths and heritage of various districts.

Types of Industries at PIEDMC Industrial Zone

- Pharmaceuticals
- Food Processing
- Engineering.
- Textile / Garments.
- Apparel
- Carpet
- Packaging
- Paper and Board
- Plastics
- Electronics
- Chemicals
- Paints
- Steel
- Auto parts.
- Wood products
- Shoe manufacturing
- Warehouse etc.

BHALWAL INDUSTRIAL ESTATE (BIE)
SPECIAL ECONOMIC ZONE (SEZ)



BHALWAL
INDUSTRIAL ESTATE

BHALWAL INDUSTRIAL ESTATE

Project Salient Features

- Stimulate the innovation generation and upgrade of several kind of industries in Punjab province.
- Bhalwal Industrial Estate (SEZ-Zone), with its related land uses, is planned as a functional & mutually compatible arrangement, easily accessible through efficient road network allowing free flow of traffic.
- Provide adequate safety standards (fire etc.)
- Provision of amenities including administration building, bank facility, large teaching hospital, emergency 1122, Fire brigade, food areas, truck parking, parks, commercial areas, vocational training center, computerized weigh station, petrol pumps, restaurants and Jamia Mosque etc.
- Compliance with environmental regulations.

Project Salient Features

- Connected with Salim Interchange on M2 and easy access of link roads
- Infrastructure designed by Renowned Consultants 'M/s EA'
- Project duly approved by Environment Protection Agency (EPA)
- Central Combined Effluent Treatment Plant (CETP)
- SEZ Facilitation Centre in collaboration with PBIT/SEZA Punjab (One Window Facility)
- Dedicated Grid Station 132 KV, Gas Supply and underground electricity cabling
- Shopping Arcades, Hotels, Banks, Truck Parking Areas
- Amenity Area / Food Courts, Community Centre
- International Apparel University designed by 'CNTEX China'
- 24 – hour Emergency Centre, Mosque & Hospital (Burn Unit)

Project Key Features

- Regular Plots easy to divide or combine to meet different requirements with sizes of Factory building of enterprises, different functional requirements, easy to sale.
- The road network is reasonable, to meet the needs of transport and the laying of underground pipelines , such as water supply, drainage lines and firefighting.
- Regular Plots enable the high efficiency of land use , the proportion of total salable lands reaches 70% .
- Large enterprises arranged at M2 side, better demonstration towards the outside, whose logistics needs are also effectively met.
- All functions of the apparel park are available
- A good layout as it is, the total area of green land is rather small but well distributed over the whole BIE area.
- More entrances lead to better logistics , but meanwhile it increases the workload of security check

BHALWAL INDUSTRIAL ESTATE

SPECIAL ECONOMIC ZONE (SEZ)

PROPOSED INVESTMENT

SR.#	DESCRIPTION	AMOUNT (MILLION RS.)	REMARKS
A-	**Proposed Investment**		
1.0	Amenities area development (Construction of Jamia Masjid, Rescue Station 1122, Food Court, Bank etc)	450.00	Under Planning stage
2.0	Balance Infrastructure Works	414.00	Balance Works of Boundary Wall, Security Surveillance, Drainage Works etc.
3.0	Construction of Internal Sui Gas Network	100.00	
	Total (A)=	**964.00**	
B-	**Investment already Incurred**		
4.0	Land	138.97	
5.0	External Development	78.00	
6.0	Internal Development	1,724.20	Road Network, Sewerage and Water Supply Network, Internal Electrical Network etc
7.0	Electrical Infrastructure	80.40	
8.0	Grid Station (132 KV)	506.50	Paid to FESCO
9.0	External Sui Gas Network	400.50	
10.0	Consultancy	24.00	
11.0	Operational Cost	183.60	
	Total (B)=	**3,136.17**	Breakup attached
	Grand Total (A+B)=	**4,100.17**	
		Million	

GOVERNMENT OF PUNJAB

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY

DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE SARGODHA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FINAL

November 2012

EA Consulting Pvt Ltd

(Formerly Engineering Associates)

Engineering, Architecture & Project Management

Head Office: AL-9, 15th Lane, Khayaban-e-Hilal,
Phase VII, D.H.A., Karachi-75500.,
Tel: UAN: 111-111-584, Fax: (021) 3584-1825

Executive Summary

Punjab Industrial Estates Development and Management Company (PIE) intend to implement Bhalwal Industrial Estate in tehsil Bhalwal district Sargodha.

Bhalwal Industrial Estate is located on Bhalwal-Bhera Road which is 16 km off Salam Interchange and at a distance of 36 km from Sargodha.

The main objective of Bhalwal Industrial Estate is to provide developed plots to the interested entrepreneurs for establishment of industries for the economic development of Sargodha district and to develop an industrial estate where issues of industrialists are handled and problems solved through 'One Window' operation.

Project Description

Bhalwal Industrial Estate is being established at an area of 426 acres which will have industrial plots of 0.5, 1 and 2 acres, Warehousing and cold storage, Utilities and commonn Facilities. The estate will have a Combined Effluent Treatment Plant and Solid Waste Collection and Disposal System.

The design of Bhalwal Industrial Estate Sargodha Project consists of two main components i.e. Land reclamation, and Master planning and infrastructure. The cost of the Project is Rs 3 billion and would be completed in 18 months.

Regulatory Requirement

The Pakistan Environmental Protection Act (PEPA), 1997 is the principal law enabling the government to enact regulations for the protection of the environment.

The key features of the law that have a direct bearing on the proposed project include compliance requirements with respect to the National Environmental Quality Standards (NEQS), and the requirement to conduct an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) prior to the construction of any project.

The Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, Bhalwal Industrial Estate Sargodha falls under schedule-II that's why this project require an EIA.

EIA Methodology

This study has been conducted using standard environmental assessment methodology, in accordance with national and international environmental guidelines. The contents of this report conform to the environmental guidelines of the Pakistan Environmental Protection Agency.

Analysis of the Alternatives

Three concept plans for the Industrial Estate were proposed in which most of the facilities were same, size of road were same but the difference was in the arrangement of plots and roads. So the most feasible selected plan is concept plan option-2 which have grid iron pattern of roads in the estate. This concept plan is better than other two proposed plans as it have proper distribution of plots and other facilities; there location is good and easily accessible through main and tertiary roads. It has 2 acre plots near to main entrance which will benefit big industries to load, unload and export things outside estate.

Environmental Baseline Conditions

Knowledge on the baseline environmental conditions was obtained by collecting and reviewing the available secondary data of the project area. The review process was also helpful in establishing the scope and methodology for collection of field data inside the project area.

The EIA team comprising of environmental engineers, sociologist, and water resources specialist collected area specific primary data. A detailed account of the baseline environmental conditions in the project area pertaining to physical, biological and socio-economic environment is summarized as follows.

Physical Environment

Topography: The whole of Sargodha district is plain and lies between 150-200 meters above the sea level. The Jhelum river crosses this plain at the extreme West of the district while the Chenab at the extreme East of it. The land away from the river Chenab and the Jhelum is higher than that near the two rivers. The land between the two rivers is known as Chej Doab.

The topography of project site is plain having average elevation of 195.2 M and slop of 1%. Lower Jhelum Canal flows South-west of the project site and a small canal flows from South-east of the project site.

Geology and Soil: The Sargodha district is a part of West Indus basin that has gradually been filled up by alluvium brought by the Indus and its tributaries from the North. The alluvial deposit is generally more than 300 meters thick and extends down to several hundred meters at some places. Towards the South of Sargodha this alluvium is locally interrupted by rock out crops of a buried hill range drown as Karana hill. This is a range of Precambrian age which is known on Dehbi Shahpur ridge. The soil of project area is saline.

Land use: Bhalwal is an old but fairly planned city based on the grid iron street pattern. The project site is a barren land.

Surface Water: The Chenab River, locally known as the Chanhan, which forms the East-southern boundary of the district, for a distance of 24 kilometers must at some comparatively recent period, flowed considerably to the West of its present bed. The deposit left by the annual floods of the Chenab are usually very sandy and much

inferior to the silt brought down by Jhelum and some other rivers flowing in Punjab. New alluvium has to worth cultivating and odd land is apt to deteriorate. Since the opening of the lower Chenab Canal, with its weir at Khanki, practically the river discharge is diverted, in winter about 20% of ordinary flood discharge in summer.

Ground Water: The project area near lower Jhelum canal and hence the ground water table is high at most of the places. Normally, the ground water is available at depth of 20-100 ft. at different locations in the Project area.

Climate: The climate of the Sargodha district on the whole is hot. The district has extremes of climate. May, June and July are the hottest months and December, January and February are the coldest months. Mostly rainfall in the months of July, August and September.

Air Quality: There are no major anthropogenic sources of air pollution in the Project area.

Noise and Vibration: There is no continuous major source of noise in the project area. Intermittent sources include farm tractors, farm equipment and vehicles on Bhalwal Bhera road. Considering the intermittent nature of these noise sources, it can be concluded that the noise pollution in the area is low.

Traffic count: The Bhalwal-Bhera road is a 24 ft. wide single carriageway and the traffic count shows that a total of 3,474 vehicles going from Bhalwal to Bhera and 4,104 vehicles going from Bhera to Bhalwal by Bhalwal Bhera Road in a day which shows that average 2.63 vehicles passes every minute which is medium traffic.

Ecological Environment

Flora: The area selected for the Bhalwal Industrial Estate is situated between Chak 11, Chak 13, Chak 14 and Chak 13 Rajgan village of Bhalwal. The area is almost barren and looks like a mini desert due to flooding during the monsoon season. Flooding occurs due to rising of water table and flooding from the surrounding areas. Major part of the area remains inundated from August to February. Salinity and overgrazing during late spring are other causes of denudation and absence of flora. There are few plants of Sarkenda (sachrum spp), lawn grass (Cynodan dactylon), Dhab grass (desmostachya bipinnata) and sedges (in the depressions) could be seen in the project area.

Fauna: Wolves are common in the district. Jackals are numerous everywhere, and do considerable damage to the crops, especially to maize and sugarcane. Wild boards are also found the abundance and damage the crops in the villages near the river. Foxes and wild cats also thrive in the district.

Among the birds Chikor and Sissi are very common. They grey partridges are found in many places but the black are only here and there in the riverine. Ducks of many kinds are found on the river and on their ponds in the jungle. The real shoveled sand smaller kind of poachers come early and stay late in winter. Quail come with the cranes at the end of August, in large numbers mostly at night.

Socio-Economic and Cultural Environment

In order to assess the present socio-economic and socio-cultural conditions of the Project area, a social survey was conducted.

In the Project area, four villages were visited and 33 persons were interviewed during the EIA. The age of the persons interviewed ranged from 20-60 years wherein 19 male and 13 female were interviewed.

There was one Dargah/Shrine in the project area named as Baba Halim Shah which is approximately 150 years old. People celebrate a festival in Baba Halim Shah Shrine on 2nd July of every year.

Punjabi and Saraiki are most spoken languages in Sargodha district followed by some Urdu speaking and very few people speak Pashtu.

The most common and generally used male dress is shalwar and a long shirt (Qameez) and Dohti. The ladies also wearing shalwar and the long shirt both of light and fancy colors along with a headscarf (dopatta).

The people in the project area being illiterate, work mostly as tenants and earn wages by harvesting crops and fruit cultivated lands; the area is suitable for agriculture. People are also engaged with business and small workshops. A small proportion of the population is engaged with brick kiln as labour.

The main Rabi crops are wheat, barley, gram, oil-seeds, and masoor and Kharif crops include cotton, sugarcane, rice, bajar, maize, mung, moth and mash. In addition to these main crops there are subsidiary crops known as Zaid Rabi and Zaid Kharif in which tobacco, Vegetables, fodder and toria. Citrus is the main production in Bhalwal tehsil, many citrus processing units are install in the project area.

The availability of basic amenities of life to community living in the Project area is indicator of its socio-economic condition.

Public Consultation

Public consultations were held with the project proponent, government agencies, NGOs (secondary stakeholder) and local communities (primary stakeholders) during the field visits.

The important stakeholders consulted include District Wildlife Officer Sargodha, the Divisional Forest Officer Sargodha, Program Coordinator IUCN, Islamabad, Head of WWF Islamabad, Inspector General of Forest Islamabad, General Manager Noon sugar Mills LTD Bhalwal and Project Director Mona Reclamation Experimental Project.

The outcome of these consultations have been used in the EIA for the understanding of the project area environment, expectations of different stakeholder groups, key sensitivities and proponent's expected obligations. Generally, the people living in the project area are in favor of the project and they hope that this project will open new employment opportunities and prosperity in the area.

Physical Environment

Impacts:

Soil may be contaminated as a result of fuel/oils/chemical spillage and leakage, and inappropriate waste (solid as well as liquid) disposal.

It is estimated that 300 workers will be employed for construction of the project. Ground water will be used as a water source for the camp, to minimize the water related conflicts with the local communities. Construction camp will produce sewerage which if not treated properly will impact on the water resources. Most of the construction machinery will be having diesel engines, which will generate noise and exhaust emissions.

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SOx), Oxides of Nitrogen (NO_x) and Particulate Matter (PM). These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, land leveling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

Mitigations Measures:

Soil contamination by asphalt and other obnoxious materials will be minimized by placing all containers in caissons or dumped into temporary pits lined with impervious liners to avoid contamination of soil/ground water from leachate. Proper solid waste management plan will be developed by the Contractor and implemented to avoid the litter and any other waste problems.

Adequate number of solid waste containers will for storage and will be transported to the designated site for disposal. The contractor will instruct their staff not to throw any of the waste and other scrape materials into canals in order to avoid contamination of water resources.

Septic Tank with soakage pit will also be provided for disposal of sewerage from the camp site. Periodic tuning of vehicles will be made mandatory to reduce the emissions of NO_x, CO and PM_{10}.

For the construction machinery generating noise level in excess of the prescribed NEQS limits, effective control measures will be adopted by the Contractor in order to avoid inconvenience to the adjoining community due to noise, smoke and fugitive dust.

Biological Environment

Impacts:

The project area is mostly barren but has some natural vegetation cover. The site preparation and construction activities may necessitate removal of the natural vegetation from the areas where road, culverts and other buildings will be

constructed. Damage and/or loss of vegetation would include elimination of trees (mainly Kikar), and clearing of other indigenous and introduced species, as well as undergrowth comprising bushes, grass, etc.

The project site is located at Bhalwal, which provides habitat for wildlife. The loss of natural vegetation discussed above, and other project activities will potentially have adverse impacts on the faunal resources and habitats of the area as well. There is a game reserve near project area in Nabi Shah Lake but outside the project site.

Mitigations Measures:

A Plantation Plan has been developed for the project which will result in habitat restoration and ecological improvement. Noise control measures will be enforced during the construction phase such as provision of silencers on heavy construction vehicles.

It is further recommended that activities, which are expected to generate high noise, will be executed during the day time only. Furthermore, over speeding of vehicles will be prohibited and construction machinery, vehicles and equipment should remain confined within their designated areas of movement to avoid and minimize any accidental killing of fauna.

Wastes of the camp will be properly disposed off to prevent the chances of its attraction by wild animals, which may prove hazardous for them. Hunting, poaching and harassing of wild animals and birds should be strictly prohibited and contractor should be held responsible for any such act of his workers. Dust may be avoided by frequent water sprinkling.

Socio-Economic Environment

Impacts:

The population residing in the Project area will get more employment opportunities which will improve their socio-economic conditions. During the construction phase, general mobility of the population using the road in and around the Project area will be hindered causing traffic congestion. Construction activities, particularly excavation and movement of haul trucks and machinery may prove dangerous for the safety of the workers as well as for the residents. The Contractor should be aware of the health/safety conditions of their workers, e.g. staff while working on high rise columns may slip and get injured. Fall from the side slopes in an excavated area can be another reason for the injury.

Mitigations Measures:

Temporarily, the Contractor will select specific timings for heavy machinery operation so as to cause least disturbance to the adjoining community by considering their peak movement hours. Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to control the dust pollution, in provision of safety measures, first aid kits, emergency vehicles, etc., at the work place. Contractor will have a full time Environmental officer at the Project site.

Proper arrangement in the form of alternative routes on the Project site during construction phase will be made to ensure that the mobility of the community is not disturbed.

Positive Impacts of the project

The operation of the Bhalwal Industrial Estate, Sargodha will accelerate the business activity in the area and will provide employment to locals that will have positive impact on the local economy thereby increasing the quality of life. In addition the establishment of industrial estate will accelerate the export of citrus from the region which will further increase in business of the area.

Cumulative Impacts of the Project

The Report recommends that there is a need that District and Provincial Government of Punjab should issue policy guidelines to the future development of the adjoining area to ensure that no haphazard housing colonies are allowed on Bhalwal-Bhera Road without conducting IEE/EIA, and keeping in view of the potential increase in the traffic, it is recommended that dualisation of Bhalwal-Bhera Road should be carried out.

Environmental Management Plan

For effective implementation and management of mitigation measures, an Environmental Management Plan has been prepared. The EMP provides a delivery mechanism to address potential impacts of project activities, to enhance project benefits and to introduce standards of good practice in all project activities.

Environmental sensitivities and impacts, as well as the associated mitigation plan have been addressed in the EMP. The proponent will ensure that the project staff will be adequately trained in HSE sensitivities and operational management procedures, so that all levels of staff effectively contribute to impact prevention and mitigation at all times.

An Environmental Management Plan (EMP), providing:

- A systematic approach to ensure that mitigation strategies prepared in this EIA are implemented during project activities.
- An appropriate monitoring plan is device to ensuring strict adherence to the environmental mitigation and control measures.
- A waste management plan, identifying the most suitable waste disposal and pollution control options throughout the project lifecycle.

The cost estimates for Environmental Monitoring of the Project during construction phase is Rs 1.58 m. The Plantation management plan is made for effective tree plantation and to reduce deforestation in project area by planting 506 saplings and Total cost of plantation on 1 acre land for the first year is estimated to be Rs 0.154 m.

Conclusion and Recommendations

It is concluded that there is a need for an industrial estate in Northern Punjab for establishment of industries in Sargodha District. Bhalwal Industrial Estate Sargodha Project will accelerate Socio-economic development and create job opportunities in Sargodha district.

The Bhalwal Industrial Estate Sargodha site has been examined with respect to the Pakistan Environmental Protection Agency guidelines for industrial estate and found to be in line with the criteria developed.

The EIA has identified potential impacts that are likely to arise during pre-construction, construction and operational phases of the project. For the effective implementation and management of the mitigation measures an Environmental Management Plan (EMP) has been prepared.

The PIE will ensure that the implementation of all phases of the project are in line with the EIA report and Environmental Management Plan. The industries, to be established at the estate, will be subjected to the basic provisions related to pollution control under the Pakistan Environmental Protection Act of 1997.

On the basis of the overall impact assessment and more specifically, nature and magnitude of the residual environmental impacts identified during the EIA, it is concluded that Project is likely to cause a few adverse environmental impacts during its construction phase as well as limited negative impacts during its operational phases, that could be prevented provided the proposed activities are carried out as mentioned in this EIA report, and the mitigation measures included in this report are completely and effectively implemented.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADB	Asian Development Bank
BIE	Bhalwal Industrial Estate
BOD	Biological Oxygen Demand
CETP	Combined Effluent Treatment Plant
CO	Carbon Mono Oxide
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
D.Com	Diploma of Commerce
E	East
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
IEE	Initial Environmental Examination
Govt.	Government
G T Road	Grand Trunk Road
Mgt. Sc.	Management Sciences
MPN	Most Probable Number
N	North
NaCl	Sodium Chloride
NCS	National Conservation Strategy
NE	North-East
NEQS	National Environment Quality Standards
NOC	No Objection Certificate
No.s	Numbers
NOx	Nitrogen Oxides
Pak-EPA	Pakistan Environmental Protection Agency
PEPA	Pakistan Environmental Protection Act 1997
PEPC	Pakistan Environmental Protection Council
PSQCA	Pakistan Standards Quality Control Authority

PM	Particulate Metter
Pvt.	Private
S	South
PIE	Punjab Industrial Estates Development and Management Company
SE	South-East
SOx	Sulphur Oxides
Sr. No.	Serial Number
SW	South-West
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UNEP	United Nations Environment Programme
W	West
WAPDA	Water and Power Development Authority
WB	World Bank
WHO	World Health Organization

List of Units

%	Percent (age)
°C	Degree centigrade
cm	Centi meter
dB (A)	Decibel
ft^2	Square foot
ft^3	Cubic foot
Km	Kilo meter
Km/h	Kilometer/hour
m	Meter
m^2	Square meter
m^3	Cubic meter
MT	Metric Ton

1 Introduction

1.1 The Project

Punjab Industrial Estate Development and Management Company (PIE) has planned the establishment of Bhalwal Industrial Estate Sargodha Project. The key location map of the Project is provided in **Figure 1.1**.

In order to comply with the regulatory requirement of Pakistan Environmental Protection Act (PEPA, 1997), Punjab Industrial Estate Development and Management Company (PIE) has acquired the services of M/s EA Consulting Pvt Ltd. is project Consultants.

This report provides an overview of Project description, alternatives considered, baseline environmental conditions, identification and assessment of potential impacts, mitigation measures and environmental management plan.

1.2 The Proponent

The Government of Punjab has set up PIE to achieve orderly, planned and rapid industrialization of Punjab by developing a chain of industrial estates in a dynamic and innovative manner, this aims at providing turnkey solutions to the problems by prospective entrepreneurs.

The objective of establishing PIE is providing quality infrastructure; ensure efficient, cost effective and sustainable management of industrial estates; and to enact on "One Window Operation" by providing utilities and services to industrial estates.

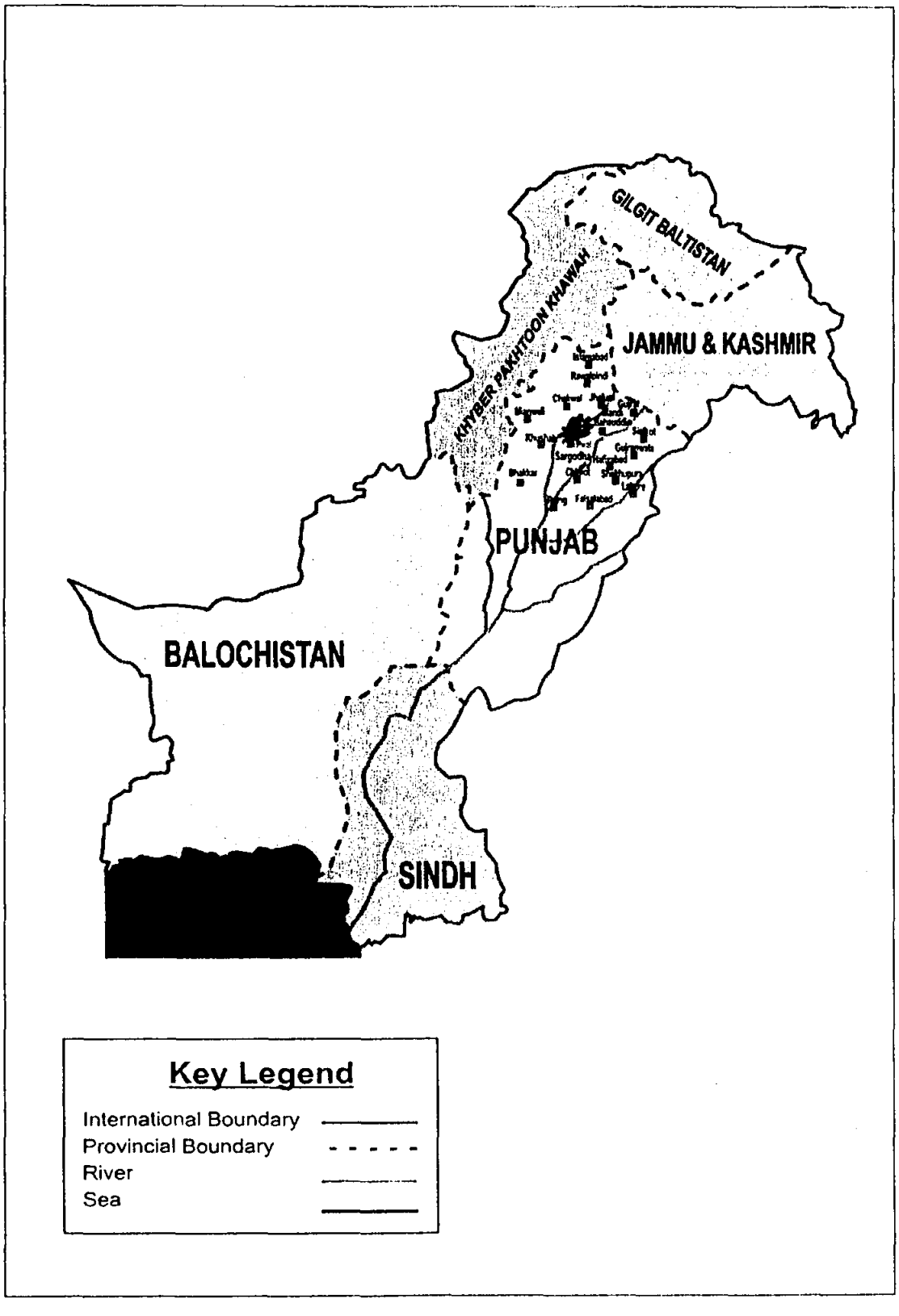
The PIE is led by private sector so that it can be more flexible, able to respond to the changing environment and designed to be financially self-sustainable in order to maintain desired impetus or developmental works.

The PIE has successfully launched and completed Industrial Estates at Sundar, Rahim Yar Khan and Kot Lakhpat with the participation of private sector and encouraged by the previous experience, intends to launch a new Industrial Estate in Bhalwal located in the center and sugar cane producing area.

1.3 Environmental Impact Assessment

According to the Pakistan Environmental Protection Act, 1997, Section12 (1): "No proponent of a Project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection Agency or Provincial Environmental Protection Agencies, as the case may be, or, where the Project is likely to cause an adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof. "Under the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000", Industrial Estates in Schedule II, List of projects requiring an EIA. Therefore, an Environmental Impact Assessment of Bhalwal Industrial Estate Sargodha has to be carried out.

Figure 1.1: Key Location of the Project



1.4 Aims and Objectives of the EIA

The aims and objectives of the EIA of Bhalwal Industrial Estate Sargodha are as follows:

- Develop the baseline environmental conditions of the project area.
- Identification of all significant impacts that may require detailed assessment.
- Consultation with the community to be affected by the Project.
- Identification and assessment of all major and minor impacts during Pre-Construction, Construction and Operation phases
- Evaluating those impacts;
- To propose mitigation measures in order to minimize, eliminate or compensate the potential adverse impacts of the Project that are identified during assessment.
- Preparation of Environmental Management Plan (EMP)
- Preparation of an Environmental Impact Assessment (EIA) report for submission to the Environmental Protection Agency Punjab.

In case of further details or clarifications regarding this EIA, please contact the proponent's representative or the consultant at the addresses provided in the **Table 1.1**.

Table 1.1: Name and Addresses of Proponents Representative and Consultant

Proponent's Representative	**Consultant**
Punjab Industrial Estates Development and Management Company Commercial Area (North) Sundar Industrial Estate, Raiwind Road, Lahore. Tel: 042-35297203-6 info@pie.com.pk **Mr Naveed Mushtaq Gill** General Manager Technical	**EA Consulting Pvt. Ltd** Al 9, 15th Lane, OFF Kh-e-Hilal, DHA 7, Karachi 75500 Pabx: 021 111 111 584 Fax: 021 351825 Email: tayyab.syed@eaworld.com **Mr Syed Muhammad Tayyab** Principal Engineer (Transp. Engg. & Management)

1.4 EIA Approach and Methodology

1.4.1 Approach

The approach for conducting EIA of Bhalwal Industrial Estate Sargodha is to follow the requirement of Pakistan Environmental Protection Agency's (Review of IEE/EIA), Regulations 2000.

The Consultant engaged a team of experts for conducting EIA study, which included the following persons:

- Engr. Muhammad Tayyab, Principal Engineer

- Engr. Saadat Ali, Environmental Advisor/Team Leader
- Engr. Sabah Iqbal, Environmental Engineer
- Engr. Warda Ajaz, Environmental Engineer
- Dr Ali Gohar, Flora and Fauna Expert

1.4.2 EIA Methodology

Kick off Meeting with the client: The Consultant team held a kick off meeting with PIE technical staff at the start of the EIA study.

Collection of secondary data: The consultant team obtained published secondary data of Bhalwal Tehsil and Sargodha District that included:

Physical conditions - including topography, geology, soils, surface and groundwater resources and climate:

Ecological resources - including flora and fauna:

Human and economic development – including settlements, socio-economic conditions, infrastructure and land use;

Heritage aspects – including sites of cultural, archaeological or historical significance

The secondary data was also collected which provided a detailed insight into the biological environment of the area which included work conducted by International INGOs i.e., IUCN, WWF-P, as well as Forest and Wildlife Departments of GoP.

Information on all secondary data sources consulted during the EIA study is provided in **Annexure-1.**

Collection of primary data and field visit: The EIA team visited the Project area for collection of base line data. The baseline data of the Project site for ambient air quality, noise, surface and ground water resources was collected. The analyses were carried out by SGS Pakistan (Private) Limited, Karachi.

Biological Data Collection: Primary data for flora and fauna was collected at different sampling locations. Sampling locations were randomly selected, ensuring that sufficient locations are sampled to observe maximum number of vegetation and faunal species.

The faunal field data collection included incidental sightings and plot searches for birds, small mammals and reptiles.

Analysis of alternatives: The EIA report gives the details of three alternatives conceptual plans which were considered during the detailed design stage of the Project.

Public consultation: Public consultations were held with the major stakeholders including meetings World Wide Fund (WWF), International Union for Conservation of Nature (IUCN), Industrialists, MONA, Wildlife and Forest Departments of

Government of Punjab, and the communities living around Bhalwal Industrial Estate Sargodha Project area to obtain and document their views/concerns. The information obtained from the local communities was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report.

During public consultation with the community, a total of four villages were visited and 33 males and females were interviewed. The Rapid Social Appraisal (RSA) method was applied to discover the facts, empirically verifiable observations or verifying the old facts, on the prevailing socio-economic and cultural conditions of the Project area. A list of persons met during EIA study is provided in **Annexure 2.**

Review of Legislative Requirements: The information on all legislation pertaining to the Project was reviewed and a synopsis of all relevant laws has been narrated in the report.

Impacts Assessment: The identification of impacts is a key activity in the environmental assessment process, which is based on the professional judgment of our experienced team on the basis of national and international guidelines. Impacts were identified for methodical consideration of likely or possible significant effects on environment because of Bhalwal Industrial Estate Sargodha. The objective of this task was to assess the risks associated with these impacts.

Evaluation of Impacts: Each impact identified was evaluated against its significance in terms of its severity and likelihood of its occurrence. The impact evaluation process prioritized each potential impact and screened out insignificant or inconsequential impacts. The significance of the impacts was then assessed in terms of the effects on the natural ecosystem. The evaluation of the significant impacts thus formed the basis for development of environmental mitigation, management and monitoring plans.

Identification of Mitigation Measures: The objective of identification of mitigation measures was to identify practices, technologies or activities that would prevent or minimize all significant environmental impacts and propose physical and procedural controls to ensure that mitigation is effective. On the basis of the impact evaluation performed, changes or improved practices were suggested where applicable, in the planned activities, to prevent and control unacceptable adverse impacts resulting from normal or extreme events.

Development of Environmental Management Plan: An EMP has been developed for effective implementation of the recommended mitigation measures. The EMP includes controls to minimize the identified impacts, and monitoring program to monitor residual impacts, if any, during the construction and operational phases of the Project. The EMP also lays down procedures to be followed during the operational phase of the Project. The EMP also identifies roles and responsibilities of all concerned personnel during the Project's construction and operational phases.

1.4.3 Organization of the Report

This report has been structured in the following manner:

Chapter 1 (*Introduction*) provides an overall introduction to the project and impact assessment methodology.

Chapter 2 (*Legal Framework)* describes the regulatory framework of Pakistan on environment and its implications on the project.

Chapter 3 *(Project Description)* provides the description of the proposed project, its layout plan and associated activities, raw material details and utility requirement.

Chapter 4 (Existing *Environment*) provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the physical, ecological and socioeconomic resources land of project area and surroundings.

Chapter 5 *(Public Consultation)* this chapter describes details of discussions held with primary and secondary stakeholders.

Chapter 6 *(Impact Assessment and mitigation measures)* describes the potential environmental and social impacts of proposed project on the different features of the micro and macro-environment using the matrix method.

Chapter 7 *(Environmental Management Plan)* explains the mitigation measures proposed for the project in order to minimize the impacts to acceptable limits. It also describes implementation of mitigation measures on ground and monitoring of environmental parameters against likely environmental impacts.

Chapter 8 *(Conclusion)* summarizes the report and presents its conclusions.

The last Chapter is followed by the references and series of **Annexes** that provide supporting information.

2 Policy, Legal and Administrative Framework

2.1 Introduction

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is an ongoing phenomenon in Pakistan. The basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is now in place. The detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are also in place.

The Bhalwal Industrial Estate Sargodha Project has been assessed in compliance of existing legal framework on the environment in Pakistan as described henceforth.

2.2 National Conservation Strategy

The National Conservation Strategy is the first policy document that pledged to balance Pakistan's economic development with the conservation of natural resources. It is the underlying goal of this document that all economic and statutory development in the country should be such that it does not conflict with the interests of nature conservation. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame rules and regulations for the protection of the environment. NCS covers 14 cover areas and environment is also included.

The policy, laws, regulations and standards relevant to the Bhalwal Industrial Estate Sargodha Projecting the context of environmental protection are described in the following sections.

2.3 Biodiversity Action Plan

Pakistan has ratified on 5th June 1992 to the Convention on Biological Diversity, and is thereby obligated to develop a National Strategy for the Conservation and management of Biodiversity in the country. The Government of Pakistan has constituted a Biodiversity Working Group under the auspices of the Ministry of Environment to develop a Biodiversity Action Plan for the country. After an extensive consultative exercise, a draft Action Plan has been developed. The Plan, which has been designed to complement the National Conservation Strategy (NCS) and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country.

2.4 National Environmental Policy, 2005

The National Environment Policy (NEP) aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. In NEP, the further sectorial guidelines, Energy Efficiency

and Renewable directly related to building energy code for newly constructed buildings were introduced.

2.5 Laws and Regulations

2.5.1 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 (the Act) is the basic legislative tool. The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the import and handling of hazardous waste. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency (Pak EPA), and penalties have been prescribed for those contravening the provisions of the Act. The powers of the Federal and Provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Act 1997, have also been considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon the registration of a complaint.

The requirement for environmental assessment is laid out in Section12 (1) of the Act. The section 12(6) of the act states that this provision is applicable only to such categories of Projects as provided in Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000.

2.5.2 Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000

The Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 (the Regulations) prepared by the Pakistan Environmental Protection Agency under the powers conferred upon it by the Act, provide the necessary details on preparation, submission and review of the IEE and the EIA. Categorization of Projects for IEE and EIA is one of the main components of the Regulations. Projects have been classified on the basis of expected degree of adverse environmental impacts. Project types listed in Schedule-I are designated as potentially less damaging to the environment and those listed in Schedule-II as having potentially serious adverse effects. Schedule-I Projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the schedule-II Projects, conducting an EIA is necessary.

2.6 National Environmental Quality Standards (NEQS), 2000

The National Environmental Quality Standards (NEQS), 2000 specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers)

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources
- Maximum allowable concentration of pollutants (02 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.
- Maximum allowable noise levels from vehicles.

These standards also apply to the gaseous emissions and liquid effluents generated by generator, process waste etc. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for air quality have not been prescribed as yet.

2.6.1 NEQS for Liquid Effluent

The National Environmental Quality Standards (NEQS) for discharge of effluent from industry are presented in **Table 2.1**.

Table 2.1: NEQS for Liquid Effluent Discharge

Parameters	Existing Standards	Revised Standards		
		Into Inland Waters	Into Sewage Treatment	Into Sea
Tempereture	40°C	=<3°C	=<3°C	=<3°C
pH Value	6-10	6-9	6-9	6-9
Biological Oxygen Demand $(BOD)_5$	80	80	250	80
Chemical Oxygen Demand (COC)	150	150	400	400
Total Suspended Solids (TSS)	150	200	400	200
Total Dissolved Solids (TDS)	3500	3500	3500	3500
Grease & Oil	10	10	10	10
Phenolic Compounds (as phenol)	0.1	0.1	0.3	0.3
Chlorides (as Cl')	1000	1000	1000	SC
Fluoride (as F')	20	10	10	10
Cyanide (CN') total	2	1.0	1.0	1.0
An-ionic Detergents (as MBAs)	20	2.0	20	20
Sulphate (SO'')	600	600	1000	SC
Sulphide (S')	1.0	1.0	1.0	1.0
Ammonia (NH^3)	40	40	40	40
Pesticides	0.15	0.15	0.15	0.15
Cadmium	0.1	0.1	0.1	0.1
Chromium (trivalent & hexavalent)	1.0	1.0	1.0	1.0
Copper	1.0	1.0	1.0	1.0
Lead	0.5	0.5	0.5	0.5
Mercury	0.01	0.01	0.01	0.01

Parameters	Existing Standards	Revised Standards		
		Into Inland Waters	Into Sewage Treatment	Into Sea
Selenium	0.5	0.5	0.5	0.5
Nickel	1.0	1.0	1.0	1.0
Silver	1.0	1.0	1.0	1.0
Total Toxic Metals	2.0	2.0	2.0	2.0
Zinc	5.0	5.0	5.0	5.0
Arsenic	1.0	1.0	1.0	1.0
Barium	1.5	1.5	1.5	1.5
Iron	2.0	8.0	8.0	8.0
Manganese	1.5	1.5	1.5	1.5
Boron	6.0	6.0	6.0	6.0
Chlorine	1.0	1.0	1.0	1.0

Source: *NEQS, Pakistan Environmental Protection Agency*

2.6.2 NEQS for Gaseous Emission

The National Environmental Quality Standards (NEQS) for permissible limits of gaseous emission from industry are presented in **Table 2.2**.

Table 2.2: NEQS for Gaseous Emission

Parameter	Source of Emission	Existing Standards	Revised Standards
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate Matter	Boilers & Furnaces:		
	Oil Fired	200	300
	Coal Fired	500	500
	Cement Kilns	200	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500	500
Hydrogen Chloride	Any	400	400
Chlorine	Any	150	150
Hydrogen Fluoride	Any	150	150
Hydrogen Sulphide	Any	10	10

Parameter	Source of Emission	Existing Standards	Revised Standards
Sulphur Oxides	Sulfuric Acid/sulphonic Acid Plants	400	5000
	Other Plants except power plants operating an oil and coal	400	1700
Carbon Monoxide	Any	800	800
Lead	Any	50	50
Mercury	Any	10	10
Cadmium	Any	20	20
Arsenic	Any	20	20
Copper	Any	50	50
Animony	Any	20	20
Zinc	Any	200	200
Oxides Nitrogen	of Nitric Acid Manufecturing Unit	400	3000
	Other plants except power plants operation on oil or coal:		
	Gas fired	400	400
	Oil fired	-	600
	Coal fired	-	1200

Source: *NEQS, Pakistan Environmental Protection Agency*

2.6.3 NEQS for Vehicular Emission

The National Environmental Quality Standards (NEQS) for permissible limits of exhaust emissions from vehicles are presented in **Table 2.3.**

Table 2.3: NEQS for Vehicular Emission

Parameters	Standards (Maximum permissible limits)	Measuring Method
Smoke	40% or 2 on the Ringleman Scale During engine acceleration mode	To be compared with Ringleman chart at a distance of 6 meters or more
Carbon Monoxide	Emission Standards:	Under idling conditions: non-dispersive infrared detection through gas analyzer.
	New Vehicle = 4.5%	
	Used Vehicle = 6%	
Noise	85 db (A)	Sound meter at 7.5 meter from the source

Source: *NEQS Pakistan Environmental Protection Agency*

2.6.4 NEQS for Drinking Water, 2010

The National Environmental Quality Standards (NEQS) for drinking water quality, 2010 are presented in **Table 2.4.**

Table 2.4: NEQS for drinking water quality

Parameter	Standard values for Pakistan	WHO standards
Physical		
Color	≤ 15 TCU	≤ 15 TCU
Taste	Non acceptable	Non acceptable
Odour	Non acceptable	Non acceptable
Turbidity	< 5 NTU	< 5 NTU
Total hardness	< 500 mg/L	---
TDS	<1000	<1000
pH	6.5- 8.5	6.5- 8.5
Chemical		
Essential Organic	**Mg/Litre**	**Mg/Litre**
Alminium	≤ 0.2	0.2
Antimony	≤ 0.005	0.02
Arsenic	≤ 0.05	0.01
Barium	0.7	0.7
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	≤ 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic		**mg/Litre**
Cyanide	≤ 0.05	0.07
Flouride	≤ 1.5	1.5
Lead	≤ 0.05	0.01
Mangnese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3	3
Zinc	5	3
Organic		
Pesticides mg/L		PSQCA No.4639-2004.page No 4 Table No. 3serial No. 20-58
Phenolic Compounds		<0.002
Polynuclear aromatic hydrocarbons		0.01
Radioactive		
Alpha emitters bq/L	0.1	0.1
Beta emitters	1	1

Source: *NEQS Pakistan Environmental Protection Agency*

2.6.5 NEQS for Ambient Air and Noise, 2010

The National Environmental Quality Standards (NEQS) for Ambient Air and Noise, 2010 are presented in **Table 2.5** and **2.6.**

Table 2.5: NEQS for Ambient Air

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)	
		Effective from 1st July, 2010	Effective from 1st January, 2013
Sulphur Dioxide	Annual Average*	80	80
	24 hrs**	120	120
oxides of Nitrogen (NO)	Annual Average*	40	40
	24 hrs**	40	40
O3	1 hour	180	130
Suspended	Annual Average*	400	360
Particulate Matter	24 hours	550	500
Lead	Annual Average*	1.5	1
	24 hrs**	2	1.5
Carbon monoxide	8 hours	5mg/m^3	5mg/m^3

** *Annual Arithmetic mean of minimum 40 measurements in a year taken twice a week 24 hourly at uniform interval*
* *24 hourly /8 hourly values should be met 98 % of the year, 2 % of time, it may exceed.*

Source: *NEQS Pakistan Environmental Protection Agency*

Table 2.6: NEQS for Noise

Category of Area/ Zone	Effective from 1st July, 2010		Effective from 1st July, 2012	
	Limits in dB(A) Leq			
	Day time	Night time	Day time	Night time
Residential area	65	50	55	45
Commercial area	70	60	65	55
Industrial area	80	75	75	65
Silence area	55	45	50	45

Source: *NEQS Pakistan Environmental Protection Agency*

2.7 Industrial Building Regulations of Punjab Industrial Estates

These By-Laws may be called Punjab Industrial Estate Building By-Laws and shall come into force as and when notified by PIE from September 2007. These By-laws shall be applicable within areas acquired or to be acquired by PIE in the estate. The design and construction of buildings in the estate shall be in conformity with these Building By-Laws. The industrial plots shall only be used for industrial purpose and will not be used directly or indirectly for residential or any other purpose which contravenes with the industrial uses. The PIE or any person authorized in this behalf shall have power shall have power to make amendments, alternations, or additions in these By-Laws or relax any of its provinces.

- The ground to be covered by the building shall be reasonably free from any material that might damage the building or affect is stability, including vegetable matter, topsoil and preexisting foundations.
- For the purpose of this requirement "containment" means any substance which is or may become harmful to persons or buildings including substances which are corrosive, explosive, flammable, radioactive or toxic.
- A wide range of solid, liquid and gaseous containments can arise on the sites; especially in those that have has a previous industrial use. In particular, the burial of biodegradable waste in landfill can give rise to land filled gas. Sites with a generally rural use such as agriculture or forestry may be containment by pesticides, fertilizers, fuel and oils and decaying matter of biological origin.

Compliance to design codes

The structural design of buildings shall meet the requirements of the specified or latest editions of the following design codes.

- Uniform Building Code, 1997 Edition, International Conference of Building Officials, USA
- International Buildings Code, 2000 Edition, International Code Council, USA
- Building code of Pakistan
- Building Code Requirement for structural concrete (ACT 318-99) and Commentary (ACT 318 R-99), American Concrete Institute, USA.

Sanitation and drainage

On every plot, there shall be paved surface drains for disposal of surplus water. These surface drains shall be regularly flushed at least once a day. No obnoxious sewerage shall be connected with sewerage system of the estate. The pumping system for the sewerage shall be connected with sewerage system of the estate or any other arrangements approved by PIE. Industrial wastes of effluents shall be pretreated to a level as approved by PIE and NEQS standards of Pakistan, before disposal into sewerage system or any other arrangements provided. Minimum pre-treatment will be in the form of an approval size/shape of a solid Retention Tank/septic tank.

Solid Waste Storage

Every plot shall have adequate means of storing solid waste for a minimum of 24 hours generation. Waste treatment plants and disposal works shall be provided in accordance will design and construction requirements of industries department and Environmental Protection Agency (EPA). Waste treatment plant and disposal station shall not be constructed in the mandatory open spaces.

2.8 Antiquity Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The act is designed to protect antiquities from destruction, theft, negligence, unlawful

excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc.

The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance.

Under the Act, the Project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity, and
- If during the course of the Project an archaeological discovery is made, it should be reported to the Department of Archaeology, Government of Pakistan.

2.9 The Cutting of Trees (Prohibition Act), 1975

Section 3 of this Act states "No person shall, without the prior written approval of the local formation commander or an officer authorized by him in this behalf, cut fell or damage or cause to cut, fell or damage any tree."

2.10 The Protection of Trees and Bush wood Act, 1949

This Act prohibits cutting or chopping of trees and bush wood without permission of the Forest Department.

2.11 The Local Government Ordinance, 2001

A schedule 4 and 8 of this Ordinance pertains to environmental pollution. Under the Ordinance, the local councils are authorized to restrict Projects causing pollution to air, water or land. They may also initiate schemes for improving the environment.

2.12 Pakistan Penal Code, 1860

This outlines the penalties for violations concerning pollution of air, water bodies and land. Sections 272 and 273 of this Act deal with the adulteration of food or drink. Noise pollution has been covered in Section 268, which defines and recognizes noise as a public nuisance. "A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right."

2.13 Land acquisition Act, 1894

The land acquisition act of 1894 was created with the expressed purpose of facilitating the government's acquisition of privately held land for public purposes. The word "public purpose", as defined in the act, refers to the acquisition of land for putting up educational institutions or schemes such as housing, health or slum

clearance, apart from the Projects for rural planning or formation of sites. The word "government" refers to the central government if the purpose for acquisition is for the union and for all other purposes it refers to the state government. It is not necessary that all the acquisition has to be initiated by the government alone. Local authorities, societies registered under the societies registration act, 1860 and co-operative societies established under the co-operative societies act can also acquire the land for developmental activities through the government.

2.14 Institutional Set Up

The apex environmental body in the country is the Pakistan Environmental Protection Council (PEPC), presided by the Chief Executive of the Country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, AJK and Northern Areas), and environmental tribunals.

The EPAs were first established under the 1983 Environmental Protection Ordinance; the PEPA 1997 further strengthened their powers. The EPAs have been empowered to receive and review the environmental assessment reports (IEEs and EIAs) of the Projects, and provide their approval (or otherwise).

The Bhalwal Industrial Estate Sargodha Project is located in Sargodha. Therefore, the EIA report will be submitted to PEPA for obtaining environmental approval for the Project.

2.15 Environmental Guidelines

Three sets of guidelines, the Pak-EPA's Environmental Guidelines, the World Bank Environmental Guidelines, and ADB Environmental Guidelines are reviewed here.

2.15.1 Environmental Protection Agency's Environmental Guidelines

The Pak EPA has prepared a set of guidelines for conducting environmental assessments. The package of regulations, of which the guidelines form a part, includes the PEPA 1997 and the NEQS. The guidelines themselves are listed below:

- Guidelines for the Preparation and Review of Environmental Reports,
- Guidelines for public consultation,
- Guidelines for Sensitive and Critical Areas, Sectorial Guidelines.

It is stated in the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 that the EIA or IEE must be prepared, to the extent practicable, in accordance with the Pakistan Environmental Protection Agency guidelines.

2.15.2 Guidelines for the Preparation of IEE/EIA Reports

The GoP has also framed guidelines for the preparation of EIA of Projects in various developmental sectors.

2.15.3 World Bank Environmental Guidelines

The principal World Bank publications that contain environmental guidelines are as follows:

- Pollution Prevention and Abatement handbook 1998: Towards Cleaner Production, (WB/UNIDO/UNEP, 1999).
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectorial issues, (WB, 1991).

2.15.4 ADB Guidelines

The principle ADB guidelines relevant to this Project are the Environmental Assessment Guidelines (ADB, 2003). The guidelines has two parts; the first providing an overview of the environmental assessment requirements and procedures, and the second, the technical guidelines. In addition, the guidelines include Rapid Environmental Assessment checklists for different sectors, contents and templates of the EIAs as well as IEEs.

2.16 Obligation under International Treaties

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is obliged to adhere to the commitments specified in these treaties. The Convention of Biological Diversity (CBD) was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity and to integrate these plans into national development programs and policies.

Parties are also required to identify components of biodiversity that are important for conservation and to develop systems to monitor the use of such components with a view to promote their sustainable use.

The Convention on the Conservation of Migratory species of Wild Animals, 1979 requires countries to take action to avoid endangering migratory species, where the term migratory species refers to species of wild animals of which significant proportions cyclically and predictably cross one or more national jurisdictional boundaries.

The parties are also required to promote or cooperate with research into migratory species. Under the international plant protection convention, 1951, Pakistan is required to take steps to ensure the protection of certain plant species that face the extinction threat. Pakistan signed and ratified on a number of international agreements and Convention and bound to implement them in its territory

2.17 Implication of Legislations to the Project

The implication of the above mentioned legislations to the pre-construction, construction and operation of Bhalwal Industrial Estate Sargodha Project would be as follows:

The PIE being the proponent of the project shall ensure that during pre-construction and construction phases of the project are in line with the EIA report and Environmental Management Plan is implemented.

During operation phase, the industrial units at Bhalwal Industrial Estate Sargodha will be subjected to four basic provisions relating to pollution control under the PEPA 97 are contained in section 11, 13, 14, 15, 16 and 17 (7) as follows:

- Section 11, prohibits discharge or emission of any effluent or waste or air pollutant or noise in excess of the NEQS, or the established ambient standards for air, water or land.
- Section 13, prohibits of hazardous wastes.
- Section 14, prohibits the handling of hazardous substance expect under license or in accordance with provision of any local law or international agreement.
- Section 15, prohibits operation of motor vehicles for each air pollutant or noise is being emitted in excess of the NEQS or the established ambient standard.
- Under section 16 of PEPA, the Director General of the agency can issue EPO.
- Section 17 (7), the Director General, EPA may be imposed administrative penalty.

3 Description of the Project

3.1 Introduction

Punjab Industrial Estates Development and Management Company (PIE) intend to implement Bhalwal Industrial Estate Sargodha Project. This Chapter provides a description of the project, location, its salient features, components and various phases.

3.2 Objective of the Project

The main objective of Bhalwal Industrial Estate Sargodha Project is to provide developed plots to the interested entrepreneurs, for establishment of industries for the economic development of Sargodha district and to develop an industrial estate where issues of industrialists are handled and solved through 'One Window' operation.

3.3 Statement of Need

Pakistan has tremendous potential for industrial growth and export through value addition to its agricultural production. Lack of facilities and infrastructure, and under-developed entrepreneurship especially of small and medium scale, has been a constraint in the realization of their full potential, for agro-industries. Shortage of serviced land and facilitation especially for small and medium entrepreneur has been a constraint in utilization of full potential.

Experience in the country and elsewhere strongly indicates that industries thrive better when established in a planned environment of an industrial estate. The benefits of an industrial estate include:

- Structured platform available to set up industries
- Developed infrastructure available
- Support services/utilities provided at one location
- Availability of skilled/unskilled manpower
- Relatively secure environment
- Easy to comply with environmental regulations

Punjab economy is mainly agricultural, although industry makes a substantial contribution. The province is playing a leading role in agricultural production. It contributes about 68% to the annual food grain production in the country. 51 million acres of land is cultivated and another 9.05 million acres is lying as cultivable waste in different parts of the province.

Cotton and rice are important cash crops that contribute substantially to the national exchequer. Attaining self-sufficiency in agriculture has shifted the focus of the strategies made towards small and medium farming, stress on barani areas, farms-

to-market roads, electrification for tube-wells and control of water logging and salinity.

Punjab also has more than 48 thousand industrial units. The small and cottage industries are in abundance. According to Punjab Board of Investment and Trade, there are 20,134 industrial units, employing 2.3 million in 13 cities of Punjab. The Central Punjab has a maximum concentration of industries, i.e. Lahore has 41 % of industries mainly comprising of small light engineering units; Sialkot has 36% of industries comprising of sports goods, surgical instruments and cutlery goods whereas, Sargodha has only 1.74% of industries comprising of citrus and as such there is a need to spread the industrial base from Central Punjab to the North. **Table 3.1** provides data of industries with employees located in selected cities of Punjab. The **Figure 3.1** shows the Industrial Estates located in Punjab.

Table 3.1: Industries located in selected cities of Punjab

District	Industries	Employees	% Industries
Lahore			
Auto Parts	610	200,000	
Foundry	600	10,000	
Plastics	90	1,500	
PVC Pipes	250	3,000	41.47
Printing	2,000	50,000	
Publishing	150	30,000	
Publishing	150	30,000	
Garment	4,500	250,000	
Sialkot			
Sports Goods	4,500	60,000	
Surgical Equipment	1,900	150,000	35.81
Sports Wear	310	10,000	
Leather Garments	500	21,300	
Multan			
Handloom	423	3,300	
Bed linen	160	10,000	4.29
Mangos	280	250,000	
Okara and Sahiwal			
Potato	450	240,000	3.87
Dairy	330	800,000	
Gujranwala			
Ceramic Sanitary	100	3,500	
Electrical Home Appliances	280	4,000	3.38
Cutlery	300	5,000	

District	Industries	Employees	% Industries
Gujrat			
Wooden Furniture	350	8,000	3.03
Electric Fans	260	10,000	
Faisalabad			
Light Engineering	220	2,700	2.36
Textile Processing	255	35,000	
Kasur			
Tanneries	237	2,300	1.75
Flowers	115	3,000	
Sargodha			
Electrical Fittings	150	100,000	1.74
Citrus processing	200	30,000	
Rawalpindi			
Marble and Granite	200	2,000	1.29
Pharmaceutical	60	4,000	
Bahawalpur and Rahim Yar Khan			
Cotton Ginning	204	6,700	1.01
G Total	**20,134**	**2,335,300**	**100.00**

Source: *Punjab Board of Investment and Trade 2012*

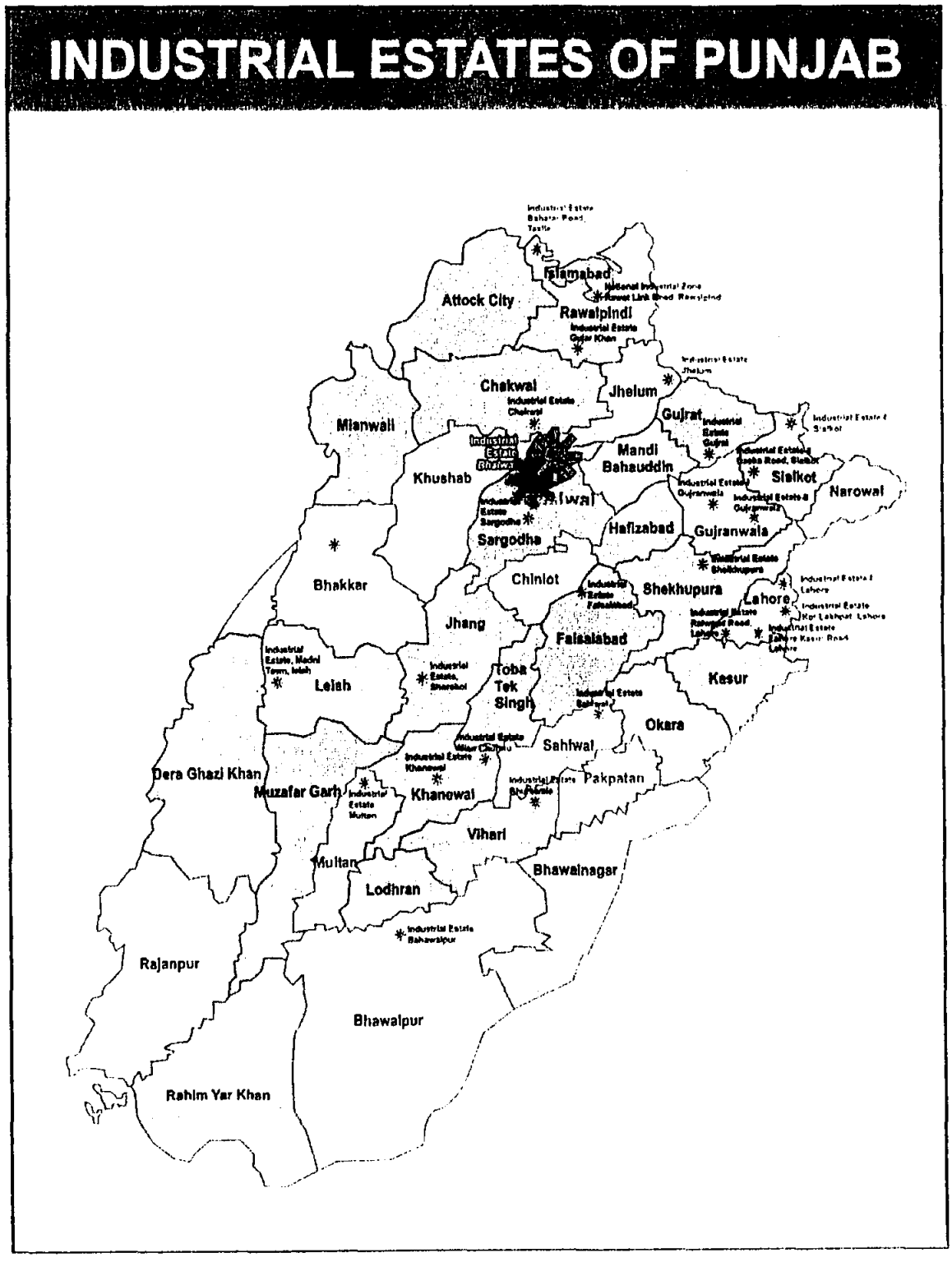
Pakistan is the sixth largest producer of Kinow (Mandarin) and oranges in the world, with a production of 2.1 million tons. Pakistan is also the largest producer of "Citrus Reticula", a variety of Kinow. This unique variety of citrus is indigenous to this part of the world. According to an estimate, approximately 95% of the total Kinow produced all over the world is grown in Pakistan. During 2008-09, a total of US$237 million of horticultural were exported from Pakistan, out of which 25% were of Kinow.

Citrus fruit is grown in all four provinces of Pakistan but Punjab produces over 97% of the crop because of its favorable growing conditions and adequate water, whereas Sargodha's share is 50%.

The importance of establishment of modern industrial parks/estates cannot be over emphasized in the present era of economic recession when we need to generate economic activities and create employment opportunities.

There is a need for industrial estates in Northern Pakistan for establishment of industries for socio-economic development of Sargodha District.

Figure 3.1: Industrial Estates in Punjab



***Source**: Punjab Industrial Estate*

3.4 Location of the Project

Bhalwal is located in Sargodha District, surrounded by rich agricultural land irrigated by Upper Jhelum Canal. The area is a major producer of citrus and sugar cane and offers good potential for agro based industries.

It has good connectivity with adjoining hinterland, major markets and Urban Centres including Lahore, Faisalabad, Sargodha and Gujarat, etc.

The Industrial Estate is being built in Bhalwal Tehsil of Sargodha District. This area is surrounded by citrus farms and is the best place, for the setting up of a processing plant for citrus fruits. There is a strong need for a state of the art industrial estate at Bhalwal, Sargodha.

The Bhalwal Industrial Estate BIE, is located at Tehsil Bhalwal (Latitude 32°18'27.17" N & Longitude 72°53'5.89" E) in Sargodha District. The project site is located on Bhalwal – Bhera Road about 4 Km away from Bhalwal Town and 36 Km from Sargodha. The site is accessible from the Lahore-Islamabad Motorway from Salam Interchange (16 Km) or Bhera Interchange (19 Km). The railroad connection is through Bhalwal Railway Station at a distance of five kilometer from the site.

3.5 Description of the Project

The BIE will be established at 426 acres, in which 410 acres of cultivated /barani land has been acquired whereas about 16 acres is further being acquired. The layout of BIE is presented in **Figure 3.2.**

The site is in irregular shape having zigzag boundary. Northwestern part of the site is a low lying area that experiences ponding over a large area. Some water logged area in the North- east was found to be draining on the low lying area, creating a large pond.

The drainage from North-east in the site has now been blocked and the ponding area has now been planned for reclamation purpose. For the purposes of master planning the ponding area has been assumed as "reclaimed" and "fit" for development. Presently, the whole project site is dry though the water table was observed to be as high as around one foot.

Bhalwal Industrial Estate Sargodha will have following facilities:

- Industrial plots of 0.5, 1 and 2 acres
- Warehousing and cold storage
- Utilities i.e., Grid station, Water works, Roads, Pumping station, Combined Effluent Treatment Plant, Truck Stand, Security Offices and visitors parking.
- Common Facilities i.e., Mosque, Central Park, Shopping area with food outlets, Administrative offices of BIE; including one-window-hall, Maintenance department, Fire station, Business Centre; including offices of producers association(s), display hall for local products, banks, insurance company, convenience stores, clearing/forwarding agents, PTCL etc. .

The **Table 3.2** shows land distribution of Bhalwal Industrial Estate Sargodha Project.

Table 3.2: Area analysis of Bhalwal Industrial Estate Sargodha Project

Description	Acres	%
Industrial Plots	300.50	71
Administrative and commercial buildings	17.28	4
Utilities	13.50	3
Roads	94.72	22
Total	**426.00**	**100**

The design of Bhalwal Industrial Estate Sargodha Project consists of two main components i.e. Land reclamation, and Master planning and infrastructure. The details are as follows:

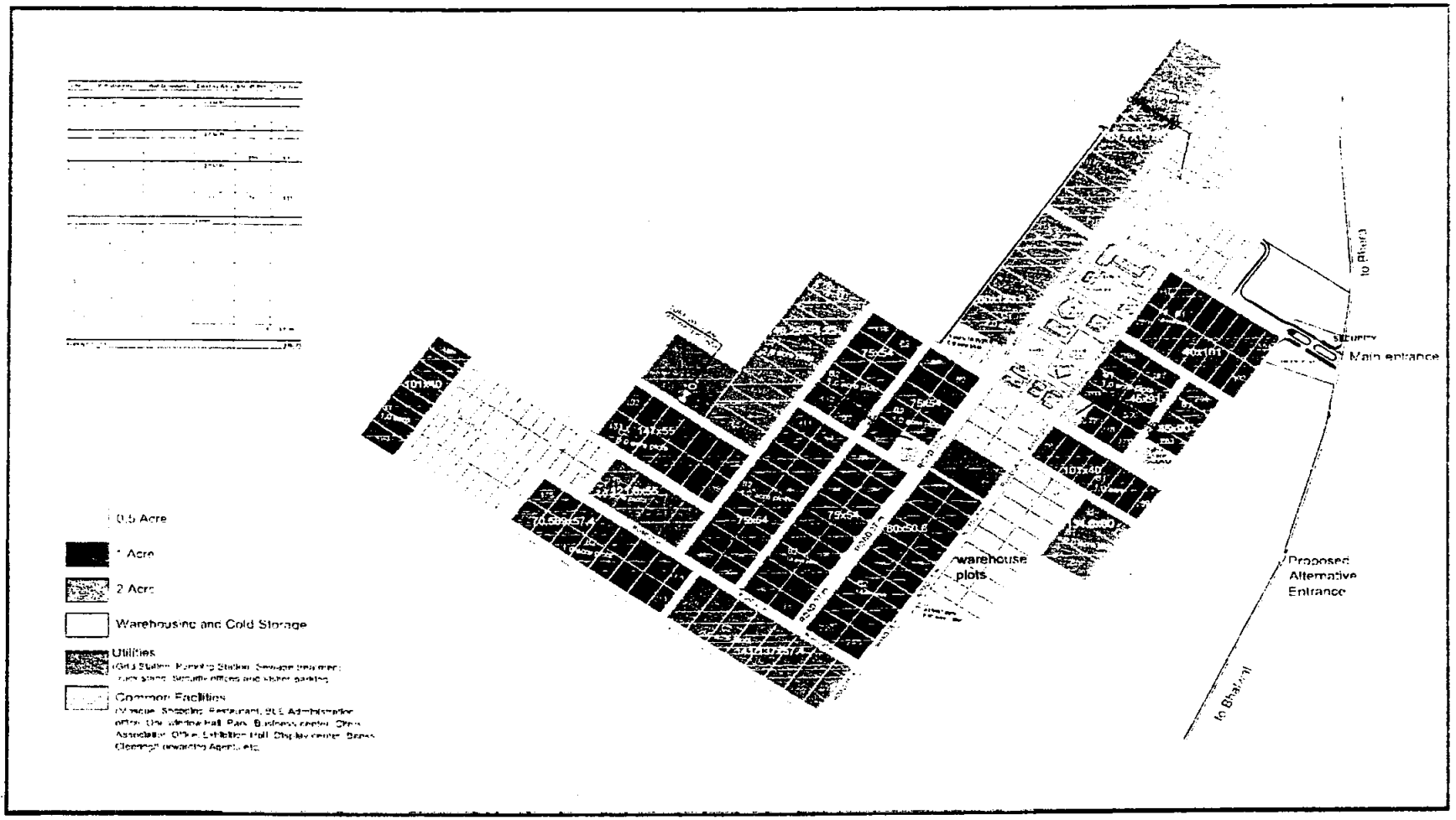
Land Reclamation

- Preliminary Design including Reconnaissance Survey, Ground water supply, Geotechnical Investigation, Proposed Land Reclamation work options and methodology, and estimated cost of Land Reclamation work.
- Detailed Design including detailed survey, ground water and sub soil
- Preparation of BOQs and Tender documents with specifications and construction drawings

Master Planning and infrastructure

- Preparation of preliminary layout plan of the estate
- Detailed master planning including design of Road, Sewerage, Drainage, Water supply; including provision for fire-fighting, electrification, waste water treatment, solid waste collection and disposal system and waste structures.
- Preparation of Environmental Impact Assessment (EIA) for approval of Environmental Protection Department (EPD)
- Preparation of BOQs and Tender documents with specification and construction drawings

Figure 3.2: Layout Plan of Bhalwal Industrial Estate, Sargodha, Punjab



Source: *Punjab industrial Estate*

3.5.1 Types of industries

In view of the potential of the area and input from the stakeholders, the following types of industries accommodated in Bhalwal Industrial Estate:

- Citrus Processing
- Juices, Jams and Marmalade
- Food Processing
- Dairy and Milk
- Flour Mills
- Oil Mills
- Cold Storage
- Warehouses
- Handicraft and Furniture
- Engineering
- Pharmaceutical
- Sugar Mill
- Textile Mill

3.5.2 Design Parameters

Bhalwal Industrial Estate will have following design parameters.

Roads

- Main Road Row 120 feet, Dual Carriageway
- Feeder Roads Row 80 feet, Dual Carriageway
- Access Roads Row 66 feet, Dual Carriageway
- Pavement: Rigid pavement (RCC)
- Flexible pavement (Asphalt)

Water Supply

- Source: Tube wells, 3 each at four Locations
- Distribution of water by OH Tanks 4, 70,000 gallons Capacity
- Pipe Size 75 mm Ø, 100 mm Ø, 150 mm Ø, 200 mm Ø
- Pipe: model - I uPVC Pipe
- model – II PE Pipe

Sewerage

- Underground Sewerage network with Sewage Treatment Plant. Final treated effluent will be drained to Nabi Shah Lake.
- Pipe Sizes: 200 mm Ø, 250 mm Ø, 300 mm Ø, 350 mm Ø, 400 mm Ø, 500 mm Ø, 550 mm Ø, 600 mm Ø, 650 mm Ø
- Pipe Materials: UPVC + RCC + RCC

Drainage

- Separate storm water drainage system with disposal in Nabi Shah Lake.
- Pipe Sizes: 300 mm Ø, 400 mm Ø, 500 mm Ø, 600 mm Ø, 800 mm Ø, 900 mm Ø, 1200 mm Ø
- Pipe Materials: RCC drains + RCC pipes.

Combined Effluent Treatment Plant

The combined Effluent Treatment Plant will be constructed at Bhalwal Industrial Estate Sargodha. The maximum daily average flow of influent is estimated to be 2.5 MGD.

The Combined Effluent Treatment Plant will be based on following influent parameters:

Table 3.3: Characteristics of influent of Bhalwal Industrial Estate Sargodha

Parameter	Units
BOD	375 mg/L
COD	750 mg/L
TSS	325 mg/L

The effluent from Combined Effluent Treatment Plant will meet the NEQS requirement of Pakistan for discharge into public water bodies. The PIE has reserved a plot for Combined Effluent Treatment Plant.

The CETP could only be designed when at least 50 to 60 % of the industries are operational and technical (characteristic and discharge) data for its design is available.

Solid Waste Collection and Disposal System

All the industries located at Bhalwal Industrial Estate will have primary storage of their waste inside their plot as per PIE Bye-Laws. The estate will design and implement Solid Waste Collection and Transportation System which will be comprised of i.e., recyclable, biodegradable, non-biodegradable and hazardous wastes. The recycling and biodegradable waste will be given to their respective contractors for further processing. The non-biodegradable will be disposed off at the exiting disposal sites at Sargodha and hazardous industrial materials will be disposed off in accordance with their standard disposal protocols.

3.5.3 Land Acquisition

The site measuring about 426 acres is in irregular shape having zigzag boundary. The land acquisition process is still in progress however, so far the land acquired is about 410 acres which is in the possession of the PIE while about 16 acres is further being acquired.

3.5.4 Project's Cost

The total estimated cost of Bhalwal Industrial Estate Sargodha is approximately Rs 3 billion as given in **Table 3.4**.

Table 3.4: Estimated Cost of the Industrial Estate, Bhalwal

Description	Amount in Rs Billion
Warehousing and cold storage	
Utilities i.e., gird station, Water works, Roads, Pumping station Combined Effluent Treatment Plant, Truck Stand, Security Offices and visitors parking.	
Common Facilities i.e., Mosque, Shopping, Restaurant, BIE Administrative office, one window hall, Park, Business centre, Citrus Association Office, Exhibition Hall, Display centre, Banks, Clearing and Forwarding Agents offices etc.	3.0
Total	**3.0**

***Source**: Punjab Industrial Estate*

3.5.5 Time Schedule

Bhalwal Industrial Estate Sargodha Project will be constructed by PIE in a period of 6 months the time schedule of the project is given in the **Table 3.5**.

Table 3.5: Time Schedule for construction of Bhalwal Industrial Estate Sargodha Project

No	Activities	Activity Duration	Tentative Construction Schedule																
		Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Detailed Engineering design	3																		
2	Earthwork	3																		
3	Construction of utilities	12																		
4	Construction of Common Facilities	12																		
5	Hand over to PIE	1																		

Source: *Punjab industrial Estate*

3.6 Project Phases

The construction of Bhalwal Industrial Estate would be implemented in three phases i.e. Pre-construction/ design, Construction and Operational.

3.6.1 Pre-construction/Design Phase

During pre-construction/design phase, PIE has hired a consultant for land reclamation and master planning of infrastructure of Bhalwal Industrial Estate.

- The preliminary design of land reclamation Reconnaissance Survey, Ground water study and Geotechnical Investigation will be carried out. The land reclamation work options and methodologies for its implementation, along with the cost estimates will be worked out. After the approval of preliminary design of land reclamation works, a detailed survey and, ground water and sub soil investigations will be carried out.
- The detailed design of land reclamation works including BOQs and, tender documents with specifications and construction drawings, will be prepared.

The design of Master Planning and infrastructure development of Bhalwal Industrial Estate is comprised of preparation of preliminary layout plan, detailed master planning including design of Road, Sewerage, Drainage, Water supply including provision for fire-fighting, electrification, Combined Effluent Treatment Plant, solid waste collection and disposal system, and waste structures.

- The detailed design of Master Planning and Infrastructure development works of Bhalwal Industrial Estate including BOQs and, tender documents with specifications and construction drawings will be prepared.

Once the detailed design of land reclamation works and infrastructure development of Bhalwal Industrial Estate is available then the tender documents for construction works will be prepared. The PIE will float the tender for works and a contractor will be selected on the basis of experience, expertise and available resources to carry out the quality work.

3.6.2 Construction Phase

a - Contractor Mobilization

This component involves transportation of construction machinery and equipment to the project site, and establishment of the contractor's camp and office. The contractor camp site will be selected within the boundary of the estate.

The equipment and machinery will be brought to the project site through Bhalwal Bhera road. The camp site facilities of the contractor include site office, temporary residence for workers and areas for equipment and installation materials.

b - Site Preparation

Usually this activity involves operation of heavy earth- moving machinery and substantial land clearing, leveling and grading, as well as cutting and filling activities.

Although, the land for the estate is flat and will be designed in a manner to minimize these operations, which will be built on the existing contours, to the extent technically possible.

The first task during this activity is to demarcate the road alignment and other bench marks, with the help of drawings prepared during the design phase of the project. Once the, demarking is complete, the land will be cleared and prepared for subsequent construction activities. The whole purpose is to maintain the harmony of the area during construction phase.

c - Construction Activities

The construction activities will be carried out using the conventional methodology and sequence of work. The activities will include excavation, roads, culverts, water supply system, masonry work, carpentry, wiring, piping and plumbing, flooring, painting and instillation of fixtures. Other activities will include the laying of cables, construction of sanitary sewerage system, junction boxes and providing connections to the individual buildings. Supervision of this whole activity will be carried out by the PIE staff and the Engineering consultant.

d - Staffing

Construction crews will the responsibility of the civil contractor and its petty contractor. It is estimated that a maximum of 300 personnel will be working at site at a given time during peak construction period. These will essentially include masons, carpenters, electricians, painters, plumbers and general labour. For unskilled employment, preference will be given to local residents of Chak 14, Chak 13, Chak 11 and Chak 13 Rajgan.

e - Construction Machinery

The following construction machinery is expected to be present at the project site:

- Dozer
- Well drilling machines
- Concrete Mixing plant
- Water tanker
- Water pumps
- Diesel generator
- Vehicles for personnel movement
- Compactors
- Road rollers
- Concrete mixer plants
- Asphalt mixing plants

Exact quantity of the above-mentioned equipment and vehicles will vary depending upon the work schedule. But movement of all machinery will be restricted during day time.

f - Construction Material

The construction material will include cement, sand, crush, bricks, steel bars, paint, piping material, electrical material and finishing material. Most materials will be procured from Sargodha, Bhera and Lahore. The Bills of Quantities of the material will depend upon the construction activities.

g - Traffic Load during Mobilization (and Demobilization) of the Contractor

All of the contractor's equipment and vehicles will be transported to the site via Islamabad Lahore Motorway through Bhera and Makhdom Interchanges via Bhalwal Bhera Road.

h - Traffic Load for Construction Materials Supplies

It is estimated that on average 20 truckloads per day will bring construction materials to the project site during peak construction period. The condition of the Bhalwal Bhera Road is good and as such larger trucks can be used.

i - Other Resources

The appropriate sources of various construction materials will be identified by the Engineering Consultant during detailed design phase of the Project.

Water: During the construction phase, maximum of about 30,000 gallons per day of water will be required during peak construction period for construction activities and human consumption. The water is available near the project site.

Fuels: For the construction equipment and vehicle, diesel will be required. It is estimated that the peak consumption of diesel would be 10, 000 liters per day. The diesel will be procured from the nearby petrol pumps and brought to the project site.

Electricity: Temporary connections will be obtained from FESCO.

Camp Supplies: Camp supplies can be procured from Bhera, Sargodha and Lahore.

Contractor staff: During construction phase, the contractor will engage a staff of 300 for construction activities. The **Table 3.6** shows the break down.

Table 3.6: Contractor staff during construction phase of the project

Description	Nos.
Managerial	5
Clerical	10
Technical/Professional	10
Skilled workers	75
Un-skilled and others	200
Total	**300**

3.6.3 Operational Phase

The PIE will manage the operation phase of the project with the provision of a dedicated management team.

Maintenance

The PIE will carry out periodic maintenance works of Bhalwal Industrial Estate during its operational phase.

3.7 Project Alternative Considered

The Project Consultant has prepared three Concept Plan options to firm up the directions for further work on plan formulation as hereunder:

3.7.1 Concept Plan 1

The main entrance has been provided from the newly acquired area near Janazgah. The entrance road will be 120 feet wide and will make a connection with the existing Bhera Road with attractively designed T-Junction with a monument in the central island.

The gate will be located at the end of T-Junction with security office on the North side and parking on the South side. A properly designed gate structure will be provided at the entrance. The truck stand with parking area, food outlets, workshops, is located close to the entrance and next to the security office, Common Facilities area is in longitudinal configuration with the BIE administrative office, the making vista with the main entrance and mosque and the parks to make vista with second entrance at Jinnah colony. Modular plots of 0.5 and 1 acre have been provided on the Eastern side and 2 acres plots have been provided on the Western side. The warehousing area which is expected to be quieter and less polluting is provided next to the existing settlement of Chak 13 SB.

The total saleable area of this option is above 70% which will be fine-tuned during the detail planning when the location of water works, overhead tanks and sewerage pumping stations etc. will be precisely known.

The Option 1 follows a curvilinear road network which creates a softer layout pattern and looks more pleasing. The **Figure 3.3** represents concept plan option-1.

3.7.2 Concept Plan 2

Maintaining the save common features of option, this option include the two entrances and location of common facilities, in the centre. It follows graphical design of straight road and T-Junctions avoiding through roads and cross-roads. The location of warehouse and cold storages is in the South-west corner closer to the existing settlement.

The location of smaller plots and larger plots has been reversed on the exemption that industries on larger plots will generate more waste water which can be disposed off through the existing drain in the earlier stages, until the Combined Effluent Treatment plant is commissioned.

The total saleable area of this option is above 77% which will be fastened during the detail planning when the location of water works, overhead tanks and sewerage pumping stations etc. will be precisely known. The Option-2 is based on a more orthogonal network design with a loose grid iron pattern. The **Figure 3.4** represents concept plan Option-2

3.7.3 Concept Plan 3

The Option-3 has same common feature, as Option-1 and Option-2 but the plan configuration is the mix of grid iron pattern and curvilinear pattern. The main difference is that, the common facilities and utilities are all grouped together in the central with block of smaller plots and larger plots located in flanks on the East and West of the central area. This is expected to increase the function efficiency of the common facilities.

The total saleable area of this option is above 70% which will be fastened during the detail planning when the location of water works, overhead tanks and sewerage pumping stations etc. will be precisely known.

The Option-3 is a graphical combination of the above two options but functionally is quite different. The **Figure 3.5** represents concept plan Option-3.

3.7.4 The Estimated Cost of Plans

The estimated cost for three concept plans in Pak rupees for per acre is given in **Table 3.7**

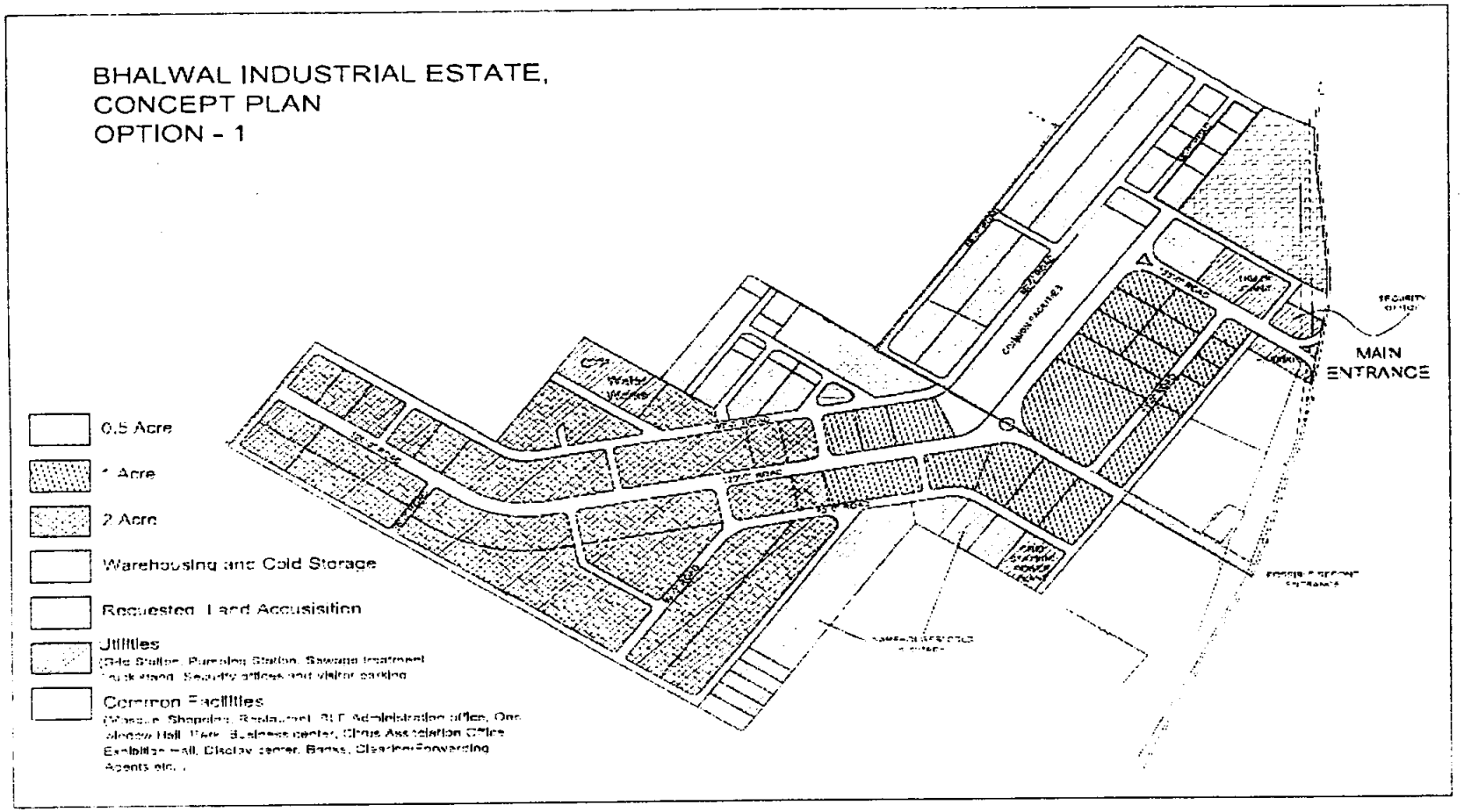
Table 3.7: Estimated cost for concept plans

Activity		Cost per acre (Rs)		
		Option-1	**Option-2**	**Option-3**
Road construction	Rigid Pavement	3,114,479	2,832,827	2,903,615
	Flexible Pavement	1,786,820	1,604,345	1,664,853
Electrification		2.05 million	1.96 million	0.75 million
Development		316	347	314

3.7.5 The selected Plan

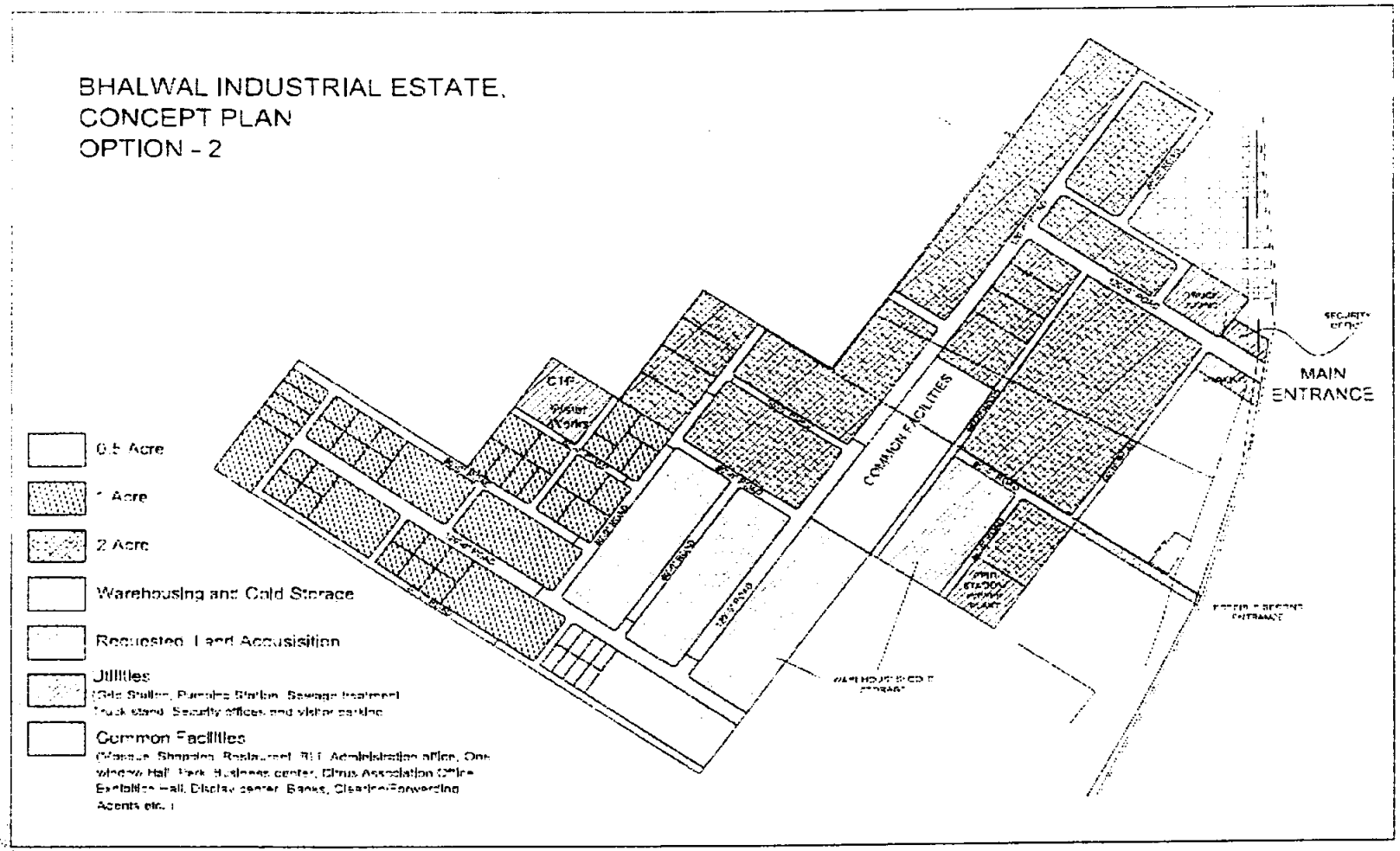
The selected plan is concept plan option-2 which has grid iron pattern of roads in the estate. This concept plan is better than other two proposed plans as it has proper distribution of plots and other facilities; there location is good and easily accessible through main road and other roads. The estimated cost plan also shows the affectivity of Option-2, in terms of environment and economically friendly plan. The **Figure 3.4** represents concept plan Option-2.

Figure 3.3: Concept plan Option-1of Bhalwal Industrial Estate, Sargodha, Punjab



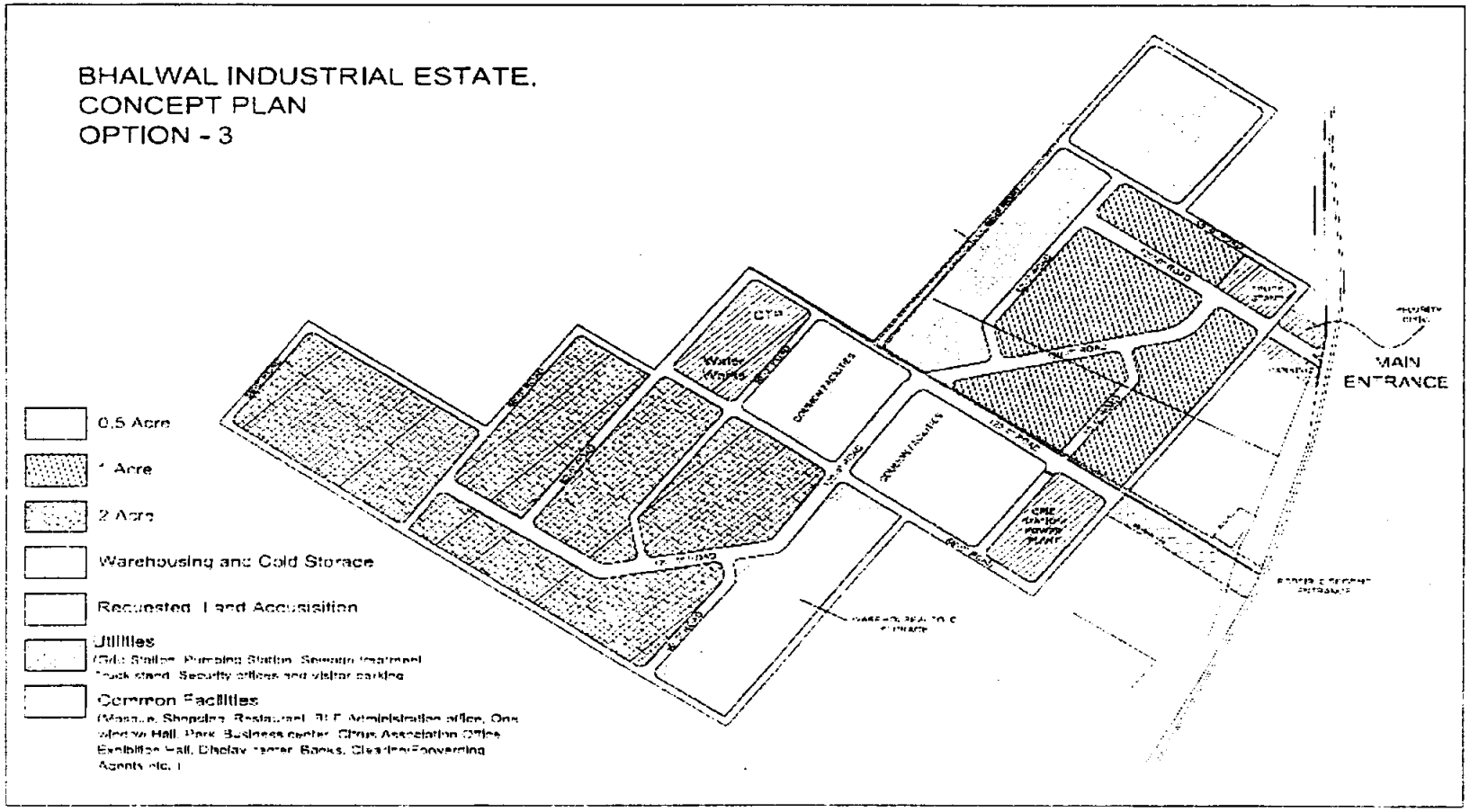
Source: *Punjab industrial Estate*

Figure 3.4: Concept plan Option-2 of Bhalwal Industrial Estate, Sargodha, Punjab



Source: *Punjab industrial Estate*

Figure 3.5: Conceptual Option-3 for Bhalwal Industrial Estate Project



Source: *Punjab Industrial Estate*

4 Existing Environment

4.1 Introduction

The environmental and socioeconomic baseline defines the prevailing environmental and socioeconomic settings of the project area and surroundings. The project area in this document is defined as 'the areas where the project related activities to be carried which include the proposed project site and surroundings and the areas that can interact with the project's positive and negative externalities in the long run'. The environmental impact of any activity or process will be assessed on the basis of a deviation from the baseline or normal situation.

The project site is located in district Sargodha. The district derives its name from the headquarters town of Sargodha which is a combination of the words "Sar and Godha". "Sar", a Hindi word means a water pond while "Godha" was the name of the Hindu Faqir who lived near that pond. Upon the introduction of canal system in this area the settlements around the pond grew in importance and came to be called Sargodha after the pond and the name of the Hindu Faqir. The pond was later on filled up and is now included in the area of the district headquarters hospital Sargodha.

4.2 Project Area

The district lies form 31˚ -34' to 32˚-36' North latitudes and 72˚-10' to 73˚-18' East longitudes. The district is bounded on the North by Jhelum district, on the East by Chenab River beyond which lies the districts of Mandi Bah-ud-Din and Hafizabad, on the South by Jhang district and on the West by Khushab district, separating the two districts by the river Jhelum.

The total area of the district is 5,854 square kilometers comprising five tehsils viz Sargodha, Bhalwal, Sillanwali, Shahpur and Sahiwal. It has one metropolitan corporation, two municipal committees, ten town committees and one cantonment contributing 24.1 per cent of total population of the district. There are 832 villages in the district. The **Figure 4.1** shows view of the project area of Bhalwal Industrial Estate Sargodha Project.

4.3 Physical Environment

The physical environment includes the abiotic component of the environment on which biological life is dependent to survive. The environmental indicators that substantiate the physical environment within the project area are explained below:

4.3.1 Topography

The whole of Sargodha district is plain and lies between 150-200 meters above the sea level. The Jhelum river crosses this plain at the extreme West of the district while the Chenab at the extreme East of it. The land away from the river Chenab and

the Jhelum is higher than that near the two rivers. The land between the two rivers is known as Chej Doab.

The topography of the project site is flat having average elevation of 195.2 m and slop of 1%. Lower Jhelum Canal flows from the North-east of the project site and small canal flows from South to East of the project site.

4.3.2 Geology and Soils

The Sargodha district is a part of West Indus basin that has gradually been filled up by alluvium brought by the Indus and its tributaries form the North.

The alluvial deposit is generally more than 300 meters thick and extends down to several hundred meters at places. Towards the South of Sargodha this alluvium is locally interrupted by rock out crops of a buried hill range drown as Karana hill.

This is a range of Precambrian age which is known on Dehbi Shahpur ridge. The land occupying the area has their region between late Pleistocene and recent time. Consequently, three major geographical surfaces have been recognized. The youngest and the West are recent flood plains where deposition of fresh sediments is going on or has stopped only recently. The middle surface belongs to early and middle Holocene age. The recent and the sub recent flood plains are collectively called Jhelum flood plains. The highest and oldest (old river terrace) is most probably or Pleistocene age and comprises the highest strip of land locally known and Karana bar.

4.3.3 Soil Analysis of the Project Site

For evaluation of physical and engineering characteristics of the sub-soils, selected disturbed soil samples were tested in the laboratory. The laboratory testing was carried out at Berkeley Associates Testing Laboratory Facility, Lahore. The following laboratory tests were performed on selected soil samples.

- Particle size distribution
- Atterberg's limits
- Modified Proctor Compaction
- Chemical analyses of soil samples

Particle Size Distribution

For classifying the subsurface soils, thirty soil samples were subjected to sieve analyses during these studies. These samples were further subjected to hydrometer analyses. The sieve analyses were performed in accordance with the procedures specified in ASTM D 422 , with sample preparation by ASTM D 2217 (wet preparation method), Procedure B. The hydrometer analyses were carried out in accordance with procedure specified in ASTM D 422. Results of sieve and hydrometer analyses were plotted in the form of gradation curves.

Atterberg's Limits

For evaluating plasticity characteristics of cohesive soils, liquid and plastic limit tests were performed on thirty (30) soil samples. The tests were performed as specified in ASTM Designation D 4318. All the liquid limit tests were performed with at least three trials.

Modified Proctor Tests

In order to determine the moisture-density relationships of subgrade soils at site, eight (08) Modified Proctor compaction tests were carried out on the composite bulk samples recovered from the test pits.

Chemical Analyses

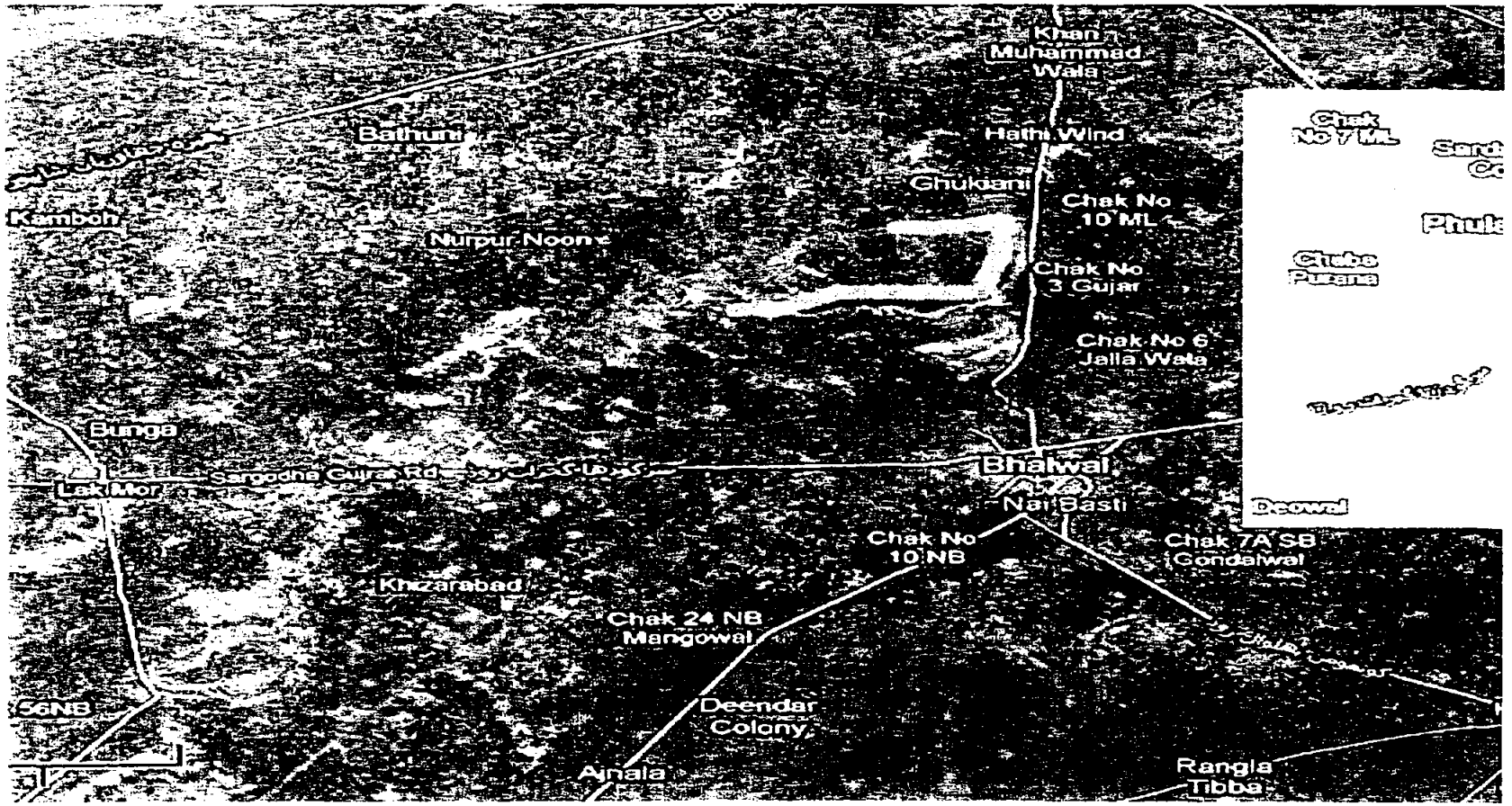
In order to determine the chemical characteristics of the subsoil, four selected soil samples were tested for estimation of chemical composition.

Sulphate Content: The sulphate content of the tested soil samples ranges from 0.165% to 0.206%

Chloride Content: The chloride content of the tested soil samples ranges from 0.080% to 0.100%

Organic Content: The organic content of the tested soil samples ranges from 1.250% to 1.400%.

Figure 4.1: A view of the Project area of Bhalwal Industrial Estate Sargodha Project



Source: Punjab industrial Estate

4.3.4 Minerals

After creation of Khushab district Sargodha district is virtually left with no minerals. Ordinary stone and sand are the only minerals available. Ordinary stone is quarried from Karana hills range near Shaheenabad. A number of stone crushers have come up all along the Sargodha-Chiniot road. The area has emerged as a big market for stones and stone crushing business. Every day hundreds of trucks and tractor trailers are engaged in carrying crush stone to various parts of the country for construction.

4.3.5 Land Use

Bhalwal is an old but fairly planned city based on the grid iron street pattern. The territory of city is surrounded by planned Chak. Noon Sugar mill is the largest industry in Bhalwal, which is situated along the Sargodha Road. Noor Dairies is the second sizable economic activity of Bhalwal, which is located on the same road.

Being a planned city, most of the institutional buildings including the Telephone Exchange, Civil Courts, and Administrative Offices etc. are all located in the center of the city, which may be called as Institutional Zone together with the commercial Zone which is also located in the city center. These zones divide the whole city into two parts in a V-shape. Additionally, Bhalwal has linear commercial corridors along major arteries. The city has only one graveyard. The main Fruit Market is located along Lahore-Sargodha Road. A Canal is passing through the city and an Open Drain traverses the boundary of Bhalwal city.

The project site is situated between Chak 11, 14, 13 and Chak 13 Rajgan village of Bhalwal. The area is almost barren and looks like a mini desert due to flooding during the monsoon season.

4.3.6 Surface water

Rivers

The Chenab River, locally known as the Chanhan, which forms the East-Southern boundary of the district, for a distance of 24 kilometers must at some comparatively recent period, flowed considerably to the West of its present bed. The deposit left by the annual floods of the Chenab are usually very sandy and much inferior to the silt brought down by the Jhelum and some other rivers flowing in Punjab. New alluvium has to worth cultivating and odd land is apt to deteriorate. Since the opening of the lower Chenab Canal, with its weir at Khanki, practically the river discharge is diverted.

On descending the Northern edge of the Bar, a bank some 3.1 or 4.6 meters high known as the Danda, there is the valley of the Jhelum, a tract somewhat similar in the character to the valley of the Chenab, but much more fertile, better cultivated, better wooded and more thickly inhabited, owing no doubt to the richer quality of the alluvial silt annually brought down by the Jhelum. This river, the Vedasta and hydaspes of the ancients is now locally known as the Jhelum or Vehat, the latter

name being more common towards the South of the district. It rises in Kashmir and debouches from the Hills at the town of Jhelum from which it takes its name. It then flows South West for about 160 kilometers as far as the town of Shahpur, where it takes a sharp turn and flows almost direct South to its junction with the Chenab. In winters, the river shrinks into a narrow channel, sometimes not more than 61 meters wide with a normal minimum discharge of about 255 cubic meters per second.

Lakes and Marshes

Only two lakes are situated in the districts which are called Nabi Shah lake Bhalwal Sub-division and Bud lake in Sargodha Sub-Division.

Marshes are situated in Mari and Dera Joor in Sargodha Sub-Division and Sillanwali Sub-Division. In Bhalwal Sub-Division Marshes are situated in Chak 11, Fatehabad Sher Muhammad Wala. Budnala of Yoda Jhawarian and Wagowal are marshy areas in Shahpur Sub-Division. The project site lies near Nabi Shah Lake.

4.3.7 Water Quality of the Project area

In order to examine the water quality of the area, water samples from different locations were collected and analyzed. Following is the brief description of methodology adapted for water sampling and analysis. Water sampling was carried out for following sources:

- Ground Water
- Surface Water

The sampling and analysis was carried out by SGS Pakistan in accordance to the internationally recognized methods including APHA and UESPA recognized methods.

Surface Water

One surface water samples were taken from lower Jhelum Canal. The sampling was carried out under standard procedures and protocols, the analytical trait of which is included as **Table 4.1.**

Table 4.1: Analysis of surface water quality parameters

(Date 19-07-12, Lower Jhelum Canal)

No	Parameters	Method	Unit	LDL	Test Results
1	Temperature (At the time of sample collection)	-	-		21.0
2	PH @ 28.1 C	Based on APHA-4500 H'B	mg/L	0.1	7.71
3	Biochemical Oxygen Demand (BOD5) @ 20 C	Based on ASTM 5210	mg/L	5.0	9.0
4	Chemical Oxygen Demand (COD)	Based on APHA-5220 D	mg/L	5.0	23.0
5	Total suspended solids (TSS)	Based on APHA-2540 D	mg/L	5.0	51.0
6	Total suspended solids (TDS)	Based on APHA-2540 C	mg/L	5.0	143.0
7	Grease & Oil	Based on USEPA-1664	mg/L	1.0	0.333
8	Phenolic comp. (As phenol	Base4d on APHA-5530 D	mg/L	0.01	0.043
9	Sulphate (SO^4)	Base4d on APHA-4500-SO^4 C	mg/L	5.0	7.203
10	Sulphide (S)	Base4d on APHA-4500 S^2 D	mg/L	0.1	< 0.1
11	Chlorine	Base4d on APHA-4500 Cl G	mg/L	0.1	< 0.1
12	Fluoride (F)	Base4d on APHA-4500 F-C	mg/L	0.01	0.0236
13	Cyanide (CN)	Base4d on APHA-4500 CN F	mg/L	0.01	< 0.01
14	Anionic Detergents (As MBAS)	Base4d on APHA-5540 c	mg/L	0.1	< 0.1
15	Chloride (Cl)	Base4d on APHA-4500 Cl B	mg/L	0.5	5.9
16	Ammonia (NH^3)	Based on APHA-4500 NH^3 B	mg/L	0.1	< 0.1

LDL: Lowest Detection Limit -: Not Defined <: Less Than
≤ Equal or Less Than

Ground Water

Ground water is available in the project area and depth of water table ranges from 20 to 80 ft. Analysis of the ground water quality parameters is given in the **Table 4.2.**

Table 4.2: Analysis of ground water quality parameters

(Date of Sampling: 19-07-12, Chak # 14, Bhalwal, District Sargodha)

No	Parameters	Method	Unit	LDL	Test Results	Limits as per NEQS
1	PH @ 28.1 C	Base4d on APHA-4500+B	-	0.1	7.27	6.50 – 8.50
2	Total Dissolved Solids (TDS)	Based on APHA-2540 C	mg/L	5.0	748.0	< 1000.0
3	Color	Visual	-	-	Colorless	≤ 15 TCU
4	Odor	In-house / Organoleptic	-	-	Colorless	-
5	Taste	In-house / Organoleptic	-	-	Tasteless	-
6	Turbidity	Based on APHA-4500 B	NTU	0.2	< 0.2	< 5.0
7	Chlorine	Based on APHA-4500-Cl G	mg/L	0.1	< 0.1	0.5 – 1.5
8	Nitrates (NO^3)	Based on APHA-4500 NO^3 D	mg/L	0.003	21.028	≤ 50.00
9	Nitrates (NO^2)	Based on APHA-4500 NO^2 B	mg/L	0.01	< 0.01	≤ 3.0
10	Phenolic comp. (As phenol)	Based on APHA-5530 D	mg/L	0.01	0.0645	-

LDL: Lowest Detection Limit *-: Not Defined* *<: Less Than*
≤ Equal or Less Than

Table 4.3: Microbial Analysis of Ground water

(Date of Sampling: 19-07-12, Chak # 14, Bhalwal, District Sargodha)

No	Parameters	Procedure	Permissible Limits	Results
1	Total Coli Forms	APHA: 9222 B	0/100 ml	30
2	Faecal Coli Forms (E.Coli)	APHA: 9222 D	0/100 ml	Absent

Source: *SGS Pakistan PVT (LTD)*

WHO/USEPA Guidelines for drinking water states that Total or faecal coliforms must be absent or not tolerable in portable water. But the results shows that ground water of the project area shows Total coliform count of 30 which should not be present. While coliforms are themselves not normally causes of serious illness, they are easy to culture and their presence is used to indicate that other pathogenic organisms of faecal origin may be present. Faecal pathogens include bacteria, viruses, or protozoa and many multicellular parasites.

4.3.8 Climate

The Sargodha district has extremes of climate. May, June and July are the hottest months when the mean maximum and minimum temperatures are 39 degree centigrade and 25 degree centigrade respectively. December, January and February are the coldest months. During this period temperature maximum and minimum temperatures are 21 degrees centigrade and 6 degree centigrade respectively. Most the rainfall is the months of July, August and September, East to South-West. The hill gets more rain than the plains.

The **Table 4.4** showing the mean maximum and minimum temperatures and the precipitation recorded at Sargodha is given below while **Table 4.5** shows the Meteorological data of Bhalwal Industrial Estate Site, Sargodha District.

Table 4.4: Climate data for Sargodha (1960-2012)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	20 (68)	22 (72)	26 (79)	32 (90)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32 (90)	26 (79)	22 (72)	[illegible]
Average low °C (°F)	8 (46)	11 (52)	15.5 (59.9)	19 (66)	25 (77)	27 (81)	26 (79)	26 (79)	25 (77)	20 (68)	14 (57)	9 (48)	18.8 (65.8)
Precipitation mm (inches)	18 (0.71)	36 (1.42)	24 (0.94)	13 (0.51)	17 (0.67)	48 (1.89)	82 (3.23)	87 (3.43)	43 (1.69)	9 (0.35)	11 (0.43)	12 (0.47)	400 (15.75)
Avg. precipitation days (≥ 1.0 mm)	5	4	5	4	3	3	7	7	4	1	1	1	45

Source: Pportal.punjab.gov.pk

Table 4.5: Meteorological data of Bhalwal Industrial Estate Site, Sargodha District **(Date of Sampling: 18-19 July 2012)**

Time	Temperature	Wind Direction	Wind Speed	Humidity	Pressure
	°C		m/s	%	(mm of Hg)
12:00	33	E	2.7	51	739.1
13:00	34	E	2.2	51	738.1
14:00	40	NE	7.2	41	748.1
15:00	41	NE	7.2	41	747.4
16:00	41	NE	6.7	42	746.7
17:00	39	NE	5.4	48	745.9
18:00	38	NE	7.2	54	745.6
19:00	37	NE	5.4	58	744.9
20:00	36	NE	8.0	67	746.3
21:00	35	NE	8.5	65	746.1
22:00	34	NE	7.2	64	745.2
23:00	32	NE	8.9	64	745.6
24:00	32	NE	6.2	63	745.9
01:00	30	NE	7.0	62	745.5
02:00	29	NE	6.2	62	746.1
03:00	30	NE	9.1	61	746.2
04:00	29	NE	2.7	58	745.3
05:00	28	NE	3.9	60	741.5
06:00	28	NE	4.5	49	744.3
07:00	31	NE	4.1	40	744.5
08:00	31	NE	3.5	45	744.5
09:00	30	NE	5.6	56	741.6
10:00	30	NE	5.9	60	743.6
11:00	30	NE	5.0	61	743.2

Source: *SGS Pakistan (Pvt.) Ltd Karachi*

Rainfall

Most of the rainfall occurs in the months of July, August and September, although some winter rain also occurs. The rainfall decreases as one goes from the Eastern and Northern part of the district, westwards. The average rainfall is about 30.4 centimeters but in 1960 the total recorded was 38.1 centimeters. There is a tendency for the rainfall to increase with the expansion of cultivation and vegetation. The winter rain falls mostly in January and February

Earthquakes

Earthquakes are not frequent. Shocks are felt occasionally, but they are very slight.

Cyclones

No regular cyclones pass over the district. Dust storms are common in summer, and some of them are of very considerable force, carrying away trees and thatched roofs before them. But on the whole, they are not very destructive. There is no record of un-usually severe dust storms. They begin early in April and continue more or less regularly until the rains set in.

Wind Storms

The wind-storms are not uncommon in this district. Strong wind continues to blow during the year, carrying away particles of sand other dust clouds before them.

Locusts

Locusts and swarms frequently visit the district, causing damage to the crops but no swarm of unusual intensity has been reported recently.

Hailstorms

Hailstorms are sometimes met with during February and March. Hailstones, as large and as hard as golf balls, sometimes fall in large quantity, and all the crops within the range of their course are totally destroyed.

4.3.9 Ambient Air Quality

There are no major anthropogenic sources of air pollution in the project area. There are limited emissions from households and traffic. The ambient air quality analysis was carried out at the project site. The results of ambient air quality monitored for 24 hours are given in **Table 4.6**.

The average concentration of carbon monoxide CO for 8 hours according to NEQS should not exceed from 5 mg/m^3 and that of one hour should be in the range of 10 mg/m^3. The value obtained at monitoring site for 24 hours average was 1.70 mg/m^3.

Figures 4.2 to **4.6** shows prevailing concentration of CO, NOx, NO, NO_2 and SO_2 at the project site during 24 hour monitoring respectively.

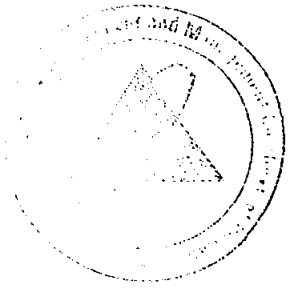
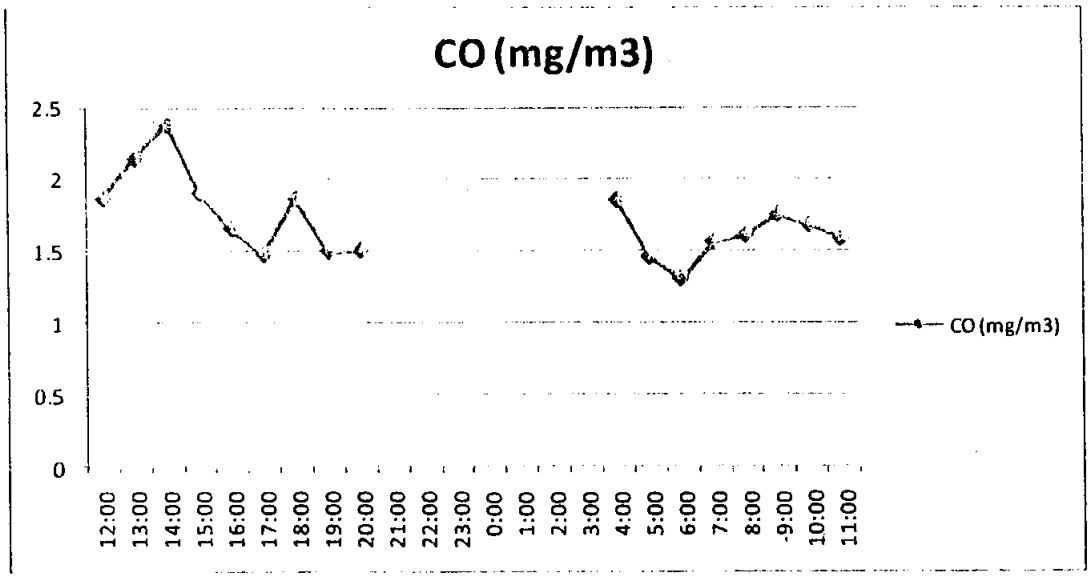


Table 4.6: Ambient Air Monitoring at Industrial Estate BHALWAL

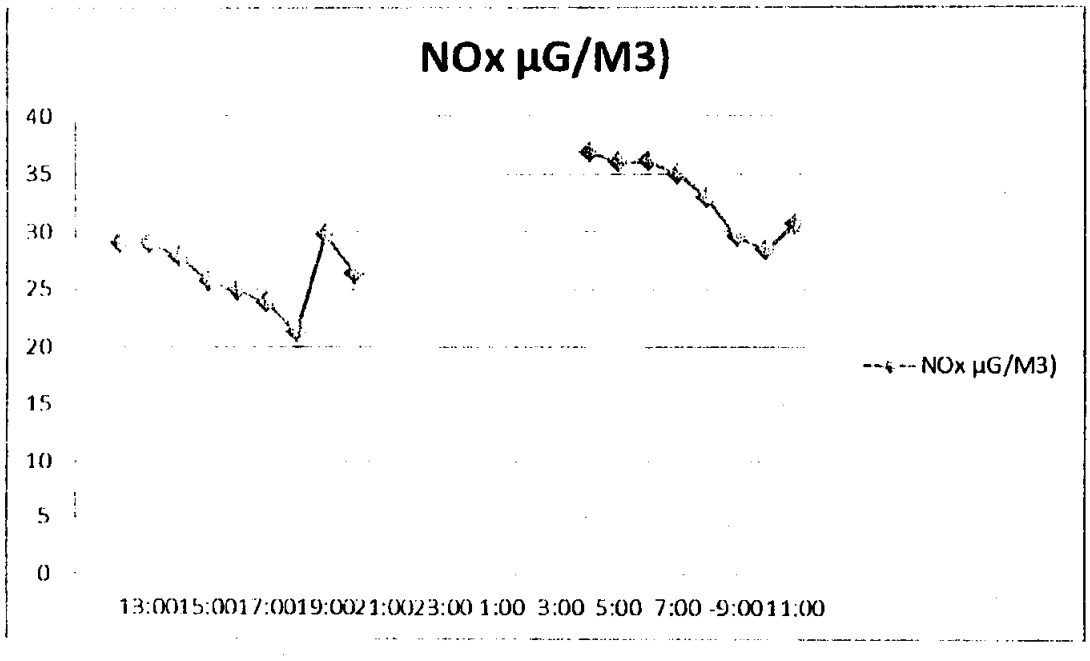
No	Time	CO (mg/m^3)	NOx $\mu G/M^3$)	N^O $\mu G/M^3$)	NO^2 $\mu G/M^3$)	SO^2 $\mu G/M^3$)
1	12:00	1.86	29.01	8.60	20.41	4.73
2	13:00	2.14	29.05	8.90	20.15	2.83
3	14:00	2.38	27.89	8.54	19.35	2.83
4	15:00	1.90	25.76	6.46	19.30	2.27
5	16:00	1.65	24.98	5.59	19.39	2.02
6	17:00	1.47	23.89	5.68	18.21	1.6
7	18:00	1.86	21.28	4.88	16.40	1.11
8	19:00	1.49	29.78	4.90	24.88	1.90
9	20:00	1.50	26.39	3.44	22.90	1.27
10	21:00					
11	22:00					
12	23:00					
13	24:00		Data Mission Because of Rain			
14	1:00					
15	2:00					
16	3:00					
17	4:00	1.85	36.91	6.76	30.15	1.97
18	5:00	1.45	36.03	6.89	29.14	1.80
19	6:00	1.30	36.14	6.70	29.44	1.63
20	7:00	1.56	35.0	5.40	29.60	1.70
21	8:00	1.60	32.9	5.36	27.54	1.88
22	-9:00	1.75	29.53	4.20	25.33	1.60
23	10:00	1.67	28.41	4.20	24.21	1.57
24	11:00	1.58	30.67	4.31	26.36	1.49
Average		**1.70**	**29.62**	**5.93**	**23.69**	**2.01**

Figure 4.2: CO concentration during 24 hour monitoring



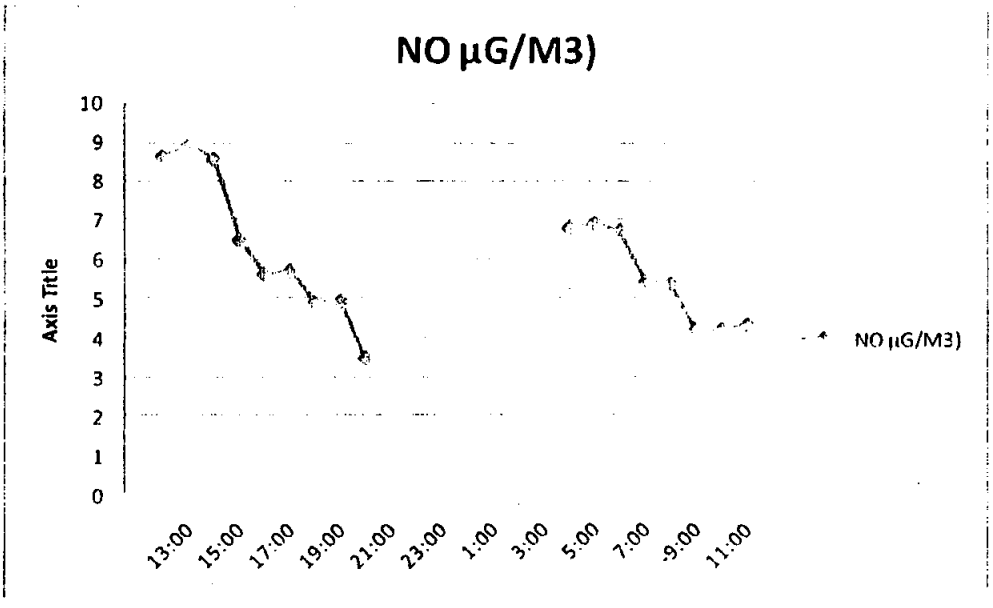
The standard value mentioned in NEQS for nitrogen dioxide NO_2 is 80 µg/m^3 and average concentrations for nitrogen dioxide measured during 24 hour monitoring was found 23.69 µg/m^3.

Figure 4.3: NO_x concentrations during 24 hour monitoring



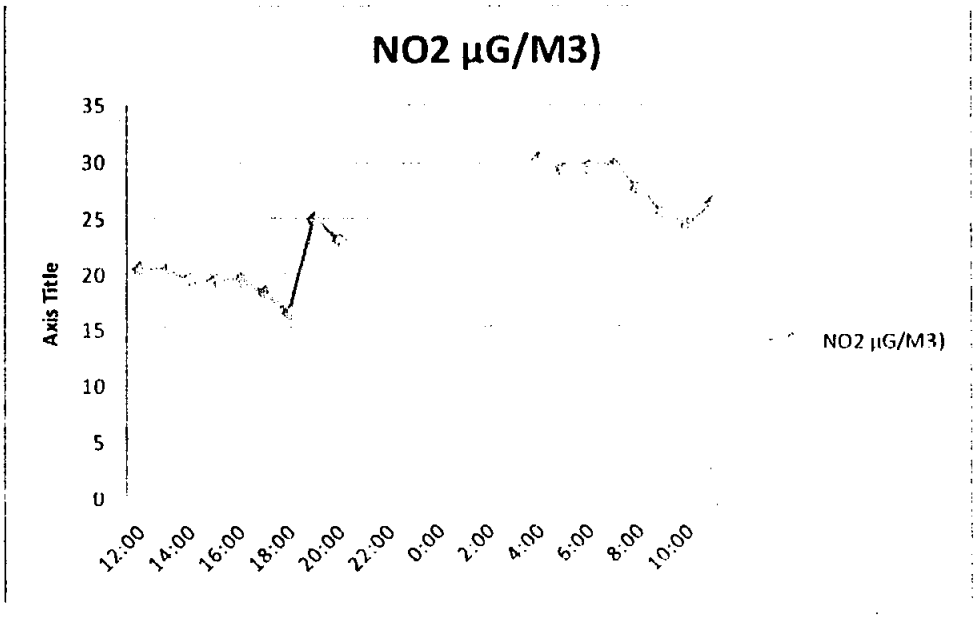
The standard value mentioned in NEQS for nitrogen oxide NO and average concentration of nitrogen oxide NO measured during 24 hours monitoring was found a 5.93 µg/m^3.

Figure 4.4: NO concentration during 24 hour monitoring



The standard value mentioned in NEQS for nitrogen dioxide NO_2 is 80 µg/m^3 and average concentrations of nitrogen dioxide NO_2 measured during 24 hour monitoring was found 23.69 µg/m^3

Figure 4.5: NO_2 concentration during 24 hour monitoring



According to standard the 24 hour concentration of sulpher dioxide SO_2 in ambient air should not exceed from 120 µg/m^3 while concentration obtained during monitoring was found at 2.01 µg/m^3.

Figure 4.6: SO_2 concentration during 24 hour monitoring

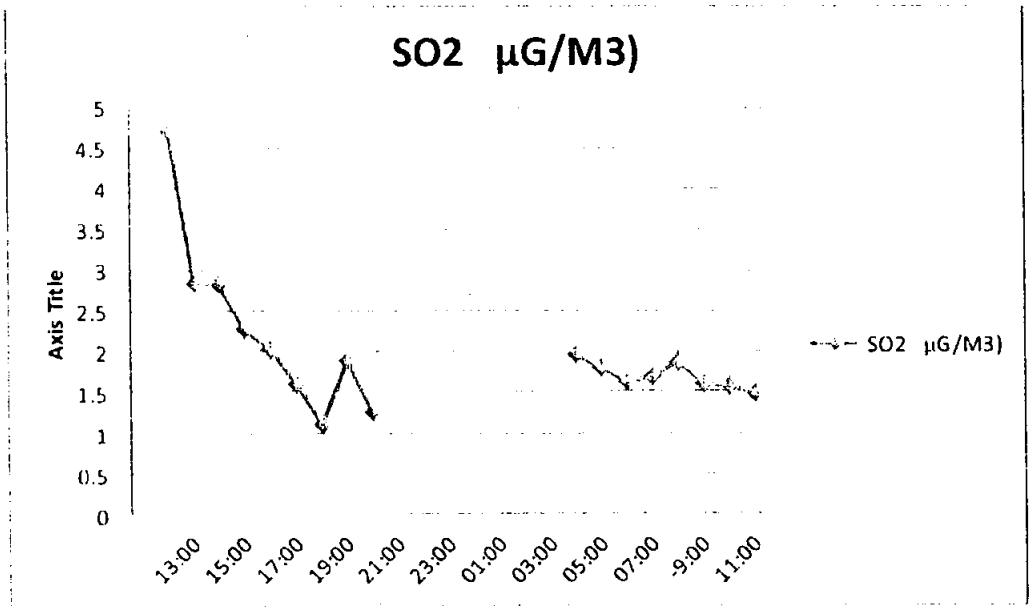


Table 4.7: Average obtained concentration of priority pollutants

Parameter	Unit	Duration	LDL	Average Obtained Concentration
Nitrogen Dioxide (NO2)	(µg/m^3)	24 Hours	0.01	23.69
Nitrogen Oxide (NO)	(µg/m^3)	24 Hours	0.01	5.93
Sulfur Dioxide (SO2)	(µg/m^3)	24 Hours	0.01	2.01
Carbon Monoxide (CO)	(µg/m^3)	24 Hours	1.00	1.70
Particulate Matter (PM10)	(µg/m^3)	24 Hours	2.00	176.11

Source: SGS Pakistan (Pvt.) Ltd

The analysis of ambient air monitoring shows that the criteria parameters of ambient air quality, like Nitrogen Oxides (NO_x), Oxides of Sulphur (SO_x), and Carbon monoxide (CO), in the area are well within the acceptable limits.

4.3.10 Noise and Vibration

The project area is peaceful in early morning and night time. The voices of birds are heard during sun rise and sun set. However movement of vehicles on Bhalwal Bhera road increases the noise level to maximum in peak hours of day in which most of the people travel for jobs and business. Despite of heavy traffic the noise level of the

project site does not exceed 80dB. The noise levels were monitored at the Project site for 24 hours and results are given in **Table 4.8.**

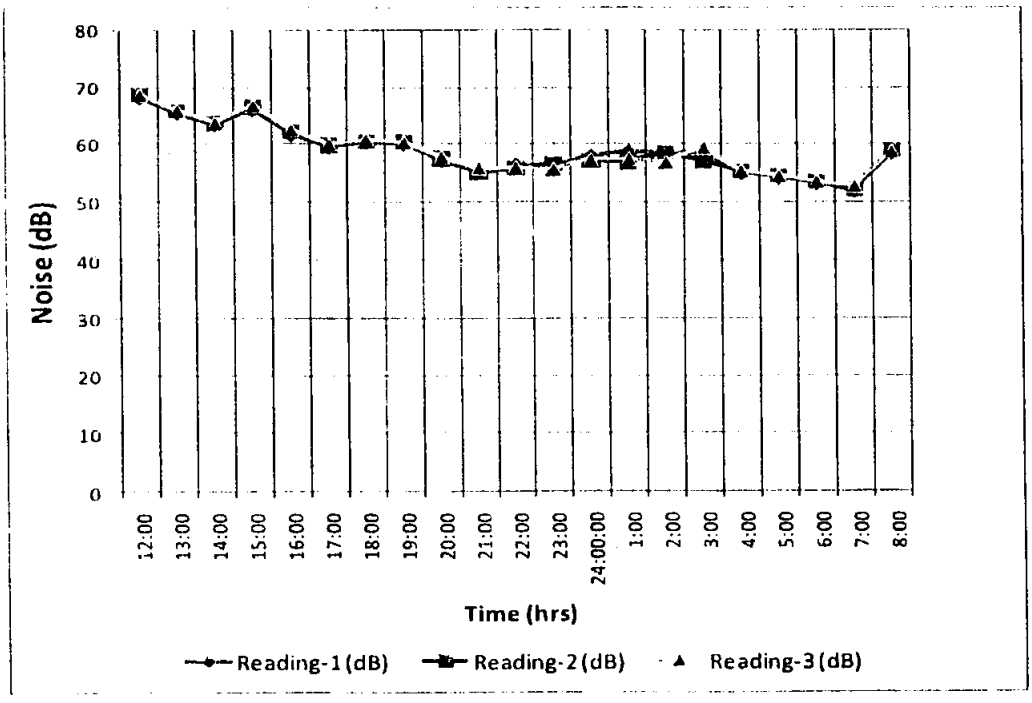
Table 4.8: Noise monitoring at the project site

No	Time	Reading-1 (dB)	Reading-2 (dB)	Reading-3 (dB)
1	12:00	68.3	68.7	68.8
2	13:00	65.6	65.9	66.0
3	14:00	63.5	63.7	63.8
4	15:00	66.2	66.6	66.9
5	16:00	61.8	62.3	62.6
6	17:00	59.6	59.9	60.1
7	18:00	60.4	60.5	60.9
8	19:00	60.1	60.4	60.4
9	20:00	57.3	57.5	57.9
10	21:00	55.2	55.1	56.0
11	22:00	56.5	55.8	56.1
12	23:00	56.1	56.6	55.8
13	24:00	58.0	57.2	57.4
14	1:00	58.8	57.0	57.6
15	2:00	58.5	58.5	57.0
16	3:00	58.4	57.2	59.5
17	4:00	55.1	55.4	55.5
18	5:00	54.3	54.5	54.6
19	6:00	53.4	53.6	53.7
20	7:00	52.1	52.3	52.9
21	8:00	58.6	58.8	58.9

Source: *SGS Pakistan (Pvt.) Ltd*

The Noise level monitoring was conducted at same site where ambient quality was monitored and found in range of 52.1 – 68.8 dB

Figure 4.7: Noise monitoring at the project site



4.3.11 Traffic and Transportation

Bhalwal-Bhera Road is a single carriageway rural road with metaled width of sixteen feet. So far the traffic on the road is very light but the traffic generated by the Bhalwal Industrial Estate will require its dualisation.

A traffic count was made of vehicles passing near the entrance of the Bhalwal Industrial Estate from 0600hr to 2100hr. The details of traffic count are given in the **Table 4.9**.

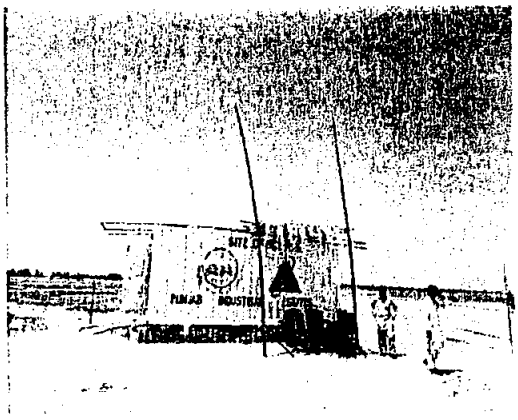
Table 4.9: Traffic Count at Industrial Estate BHALWAL

Incoming from BHALWAL to Bhera	0600 h to 0900 h	0900 h to 1200 h	1200 h to 1500 h	1500 h to 1800 h	1800 h to 2100 h	Total
Large vehicles (trucks, buses, tractor trolleys, minibuses)	123	133	122	117	128	623
Medium sized vehicles (Suzuki pickups, cars, jeeps, taxis)	254	266	235	242	233	1230
Small vehicles (Rickshaws, motorcycles)	274	262	296	297	197	1326
Slow Vehicles (Animal driven carts and tongas)	67	60	44	71	53	295
Total (A)	**718**	**721**	**697**	**727**	**611**	**3474**
Large vehicles (trucks, buses, tractor trolleys, minibuses)	187	180	210	149	128	854
Medium sized vehicles (Suzuki pickups, cars, jeeps, taxis)	249	301	358	267	228	1403
Small vehicles (Rickshaws, motorcycles)	257	362	287	288	213	1407
Slow Vehicles (Animal driven carts and tongas	58	60	138	72	112	440
Total (B)	**751**	**903**	**993**	**776**	**681**	**4104**

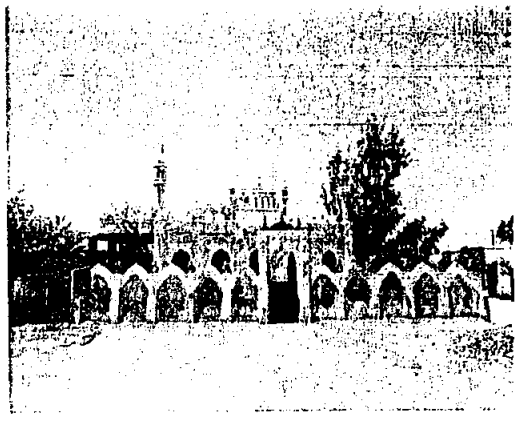
***Source:** PPI Field Data, 7th July 2012*

The traffic count shows that a total of 3,474 vehicles going from Bhalwal to Bhera and 4,104 vehicles going from Bhera to Bhalwal by Bhalwal Bhera Road in a day which shows that average 2.63 vehicles passes every minute which show a medium traffic.

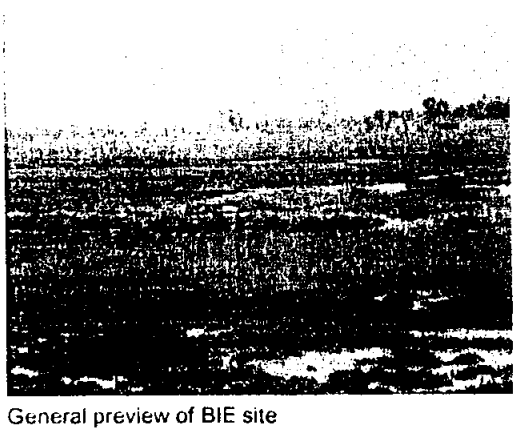
The Project Area



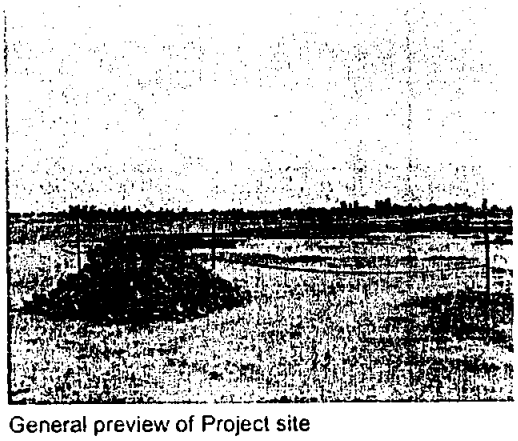
A view of PIE office at project site



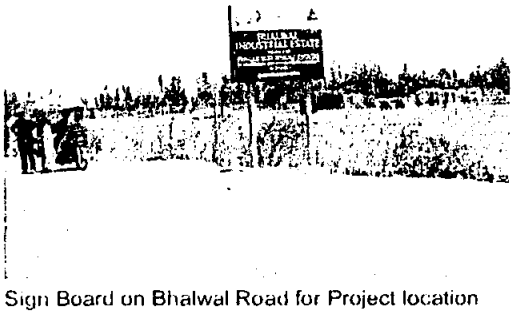
A view of mosque in Chak 11



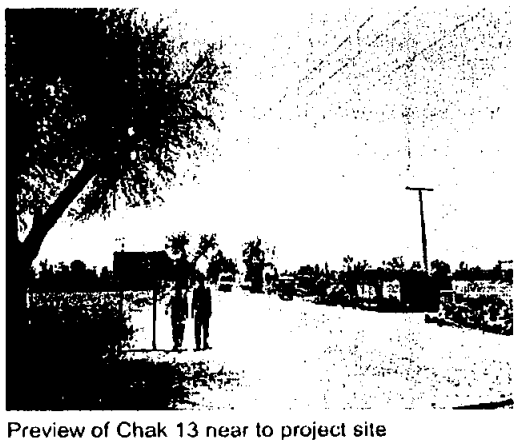
General preview of BIE site



General preview of Project site



Sign Board on Bhalwal Road for Project location



Preview of Chak 13 near to project site

Project area

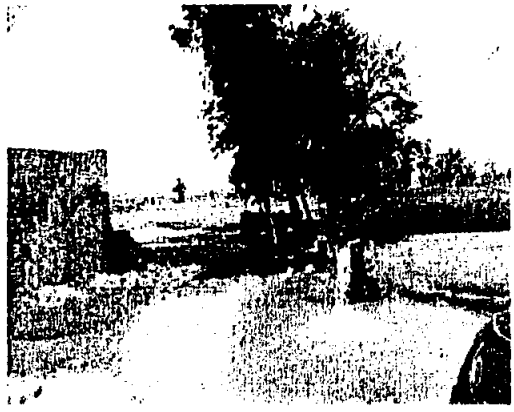
Shrine of Baba Halim Shah near project site

Nabi Shah Lake near project site

Tube well in chak 11

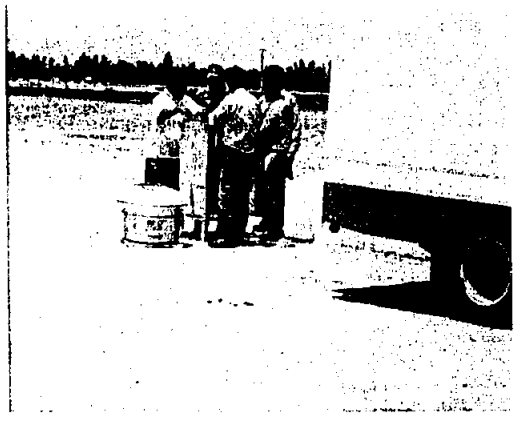
Solid waste collection in Chak 13

Main Bazar Bhalwal

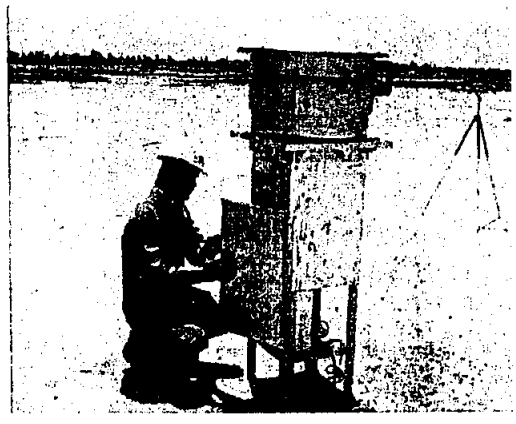


Tube well Water in Chak 11

Baseline Data Collection

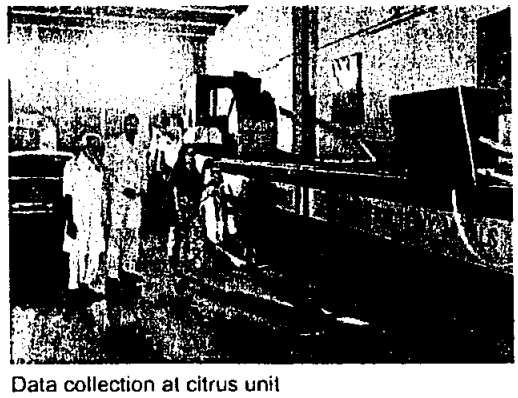


Ambient air quality monitoring a project site



Data collection at project site

Noise quality monitoring at project site



Data collection at citrus unit

Data Collection at project site

Data collection at Bhalwal

4.4 Biological Environment

4.4.1 Flora

The characteristic trees and shrubs of the district are the van (*Selvadora abeoides*), Kari (*Salsola fostids*), jand (*prosopis spicigera*) and malla (*Zizypluys nummularia*), together forming the jungle with which the uncultivated land are generally covered. The van or jal (*Salvadora obeoides*), with the leaves something like the mistletoe, often forms a dense bush.

In the riverine the most numerous trees are the Kikar (*Acacia arabicva*) and Thali (*Dalbergia sisoo*), which are very largely grown especially on cultivated land. The shirin or Sirin (*Albizzia lebbek*), with its fragrant flowers and rusting pods is found chiefly along the roadsides. The Uksh or Kash or Fareash (*Tamarix articulate*), with its gnarled trunk and needle like leaves, is fairly common and does not require so much moisture as most other trees. The Ber (*Zizyphus jujube*) is very common on the roads and in the fields, and its fruit is much appreciated. In the neighborhood of wells many be seen the sohanjna (*Morings ptergosperma*) with its rocky bark, pollard head and bunches of white flowers, the Lasura (*Cordia myxe*), with its right flowers and edible fruit, the mulberry or toot (*Morus alba*), the fruit of which also is much appreciated. The date-palm or Khajji (*Phonenix dactylifera*) is common only in a few places on the river Jhelum, and especially at Sada Kamboh, above shahpur and at Majhoka and Kahi near the Jhang border.

The area selected for the Bhalwal Industrial Estate is situated between Chak 11, Chak 13, Chak 14 and Chak 13 Rajgan village of Bhalwal. The area is almost barren and looks like a mini desert due to flooding during the monsoon season. Flooding occurs due to rising of water table and flooding from the surrounding areas. Major part of the area remains inundated from August to February. Salinity and overgrazing during late spring are other causes of denudation and absence of flora.

There are three palm trees and 16 other trees in the vicinity of project boundary. During the field visit, few plants of Sarkenda (sachrum spp), lawn grass (Cynodan dactylon), Dhab grass (desmostachya bipinnata) and sedges (in the depressions) could be seen at the project site. The details of flora of the project area are given in the **Figure 4.7**

However, the following indigenous flora could is found in the surrounding localities:

Prosopis juliflora (mesquet), *Acacia nilotica* (kikar), *Acacia modesta*, *Dalbergia sissoo* (shisham), *Ficus religiosa* (peepal) *Albizzia lebbek* (sirin), *Tamarix articulate* (frash), *Morus alba* (shetoot), *Zizyphus jujube* (ber), *Zizyphus nummularia* (ber),and shrubs like: *Euphorbia caducifolia, Salsola foetida, Salvadoraspp,* and *Calotropis aphhylla* (ok), etc. Whereas a limited number of *Melia azadrichta* (bakain), *bottle brush, bombox ceiba* (bamboo) and *seme l* are also found in the habitations. Common grasses are: *Sachrum spp, Cynodon dactylon, Heterpog contortu, desmostachyya bipinnata.*

4.4.2 Fauna

Wolves are common in the Sargodha district. Jackals are numerous everywhere, and do considerable damage to the crops, especially to maize and sugarcane. Foxes and wild cats also thrive in the district.

Among the birds Chikor and Sissi are very common. They grey partridges are found in many places but the black only here and there in the riverine. Ducks of many kinds are found on the river and on their ponds in the jungle. The real shoveller sand smaller kind of poachers come early and stay late in winter. The mallard, like the geese, turn up with the colder weather and some birds like the red-crested poached are seen usually at the end of the season only. Snipe and bitten are not very common. The hoobara bustard (Hoobara macqueenii) arrives before the sand grouse in fair numbers. The lesser bustard (Otis tetrax) is occasionally seen, and on rare occasions the Tog or great Indian bustard (Eupodite enwardsi) may be seen, but seldom shot. Allied to the hoobara is the lesser stone plover (Ocdicnemus crepitans), which lives in the same country. Quail come with the cranes at the end of August, in large numbers but in the night. They are almost the forest to come and the last to leave.

The details of fauna of the project area are given in the **Figure 4.8.** The following wildlife is found in the project area:

Mammals: Wild boar. Jackals, red fox, hares and rates.

b. **Birds**: Myna, house crows, sparrows, partridges, owl, quell, hoopoes, red vented bulbul, doves, eagles, kites, pigeons, bustards. Whereas the migratory birds include; water fowls, ducks, long legged buzzard, oriental white backed vulture, and cranes.

c. **Reptiles and amphibians**: turtles, lizards and snakes and toads

Game Reserve

A game reserve in Nabi Shah Lake near project site is present; it was established by the Government of Punjab covering area of 1674 acres and lies at a distance of about 2km, North of Project site. This area is declared as Game Reserve for all wild birds and animals for a period of five years on 09.02.2009.

The game reserve operates yearly from September to January especially during high monsoon years. Lots of birds and wildlife comes to Nabi Shah Lake and leave during end of the season i.e., January when the lake starts to become dry.

The project site of Bhalwal Industrial Estate Sargodha Project is outside the perimeters of Nabi Shah Lake at a distance of 2-4 km. A map showing location of the Bhalwal Industrial Estate and Nabi Shah Lake is provided in **Figure 4.9.**

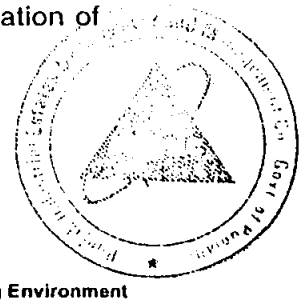
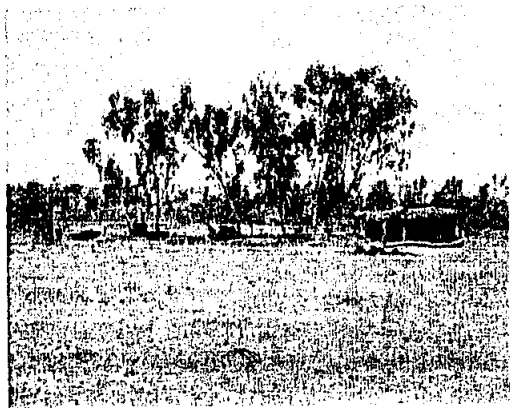


Figure 4.8: Flora of the project area

A view of Palm tree near project site

A view of kikar at project site



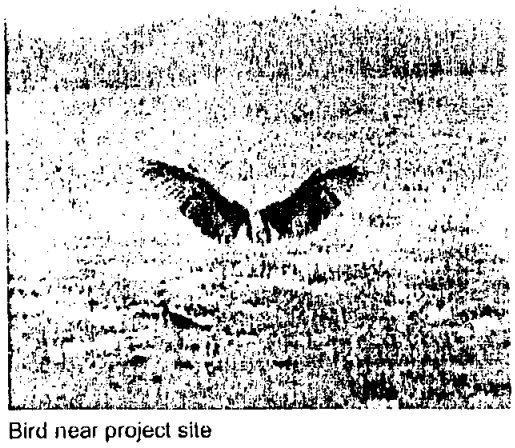
Eucalyptus tree near project site

A view of Citrus trees near project site

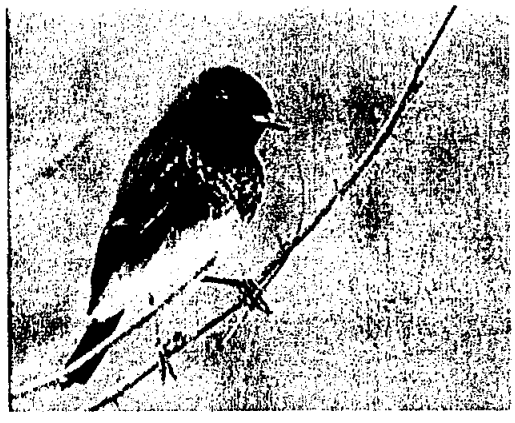
Tree near Project site

Tree near project site

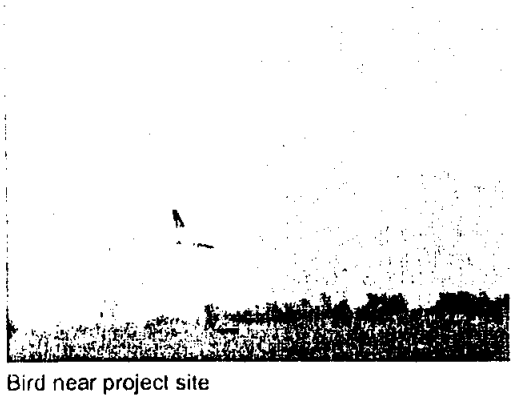
Figure 4.9: Fauna of the project area



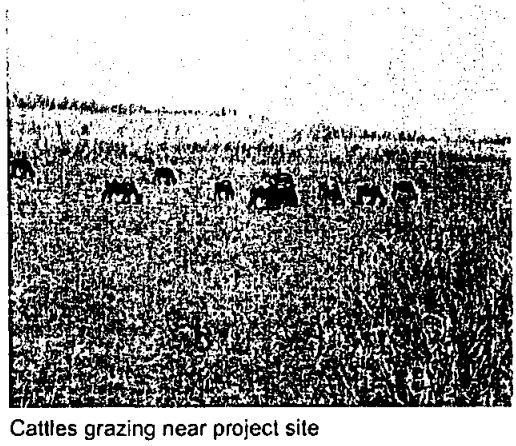
Bird near project site



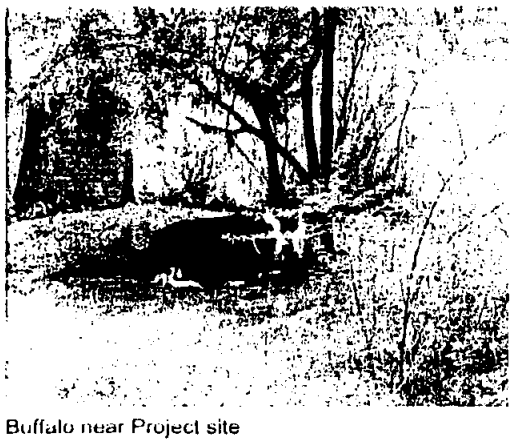
Bulubul at project site



Bird near project site



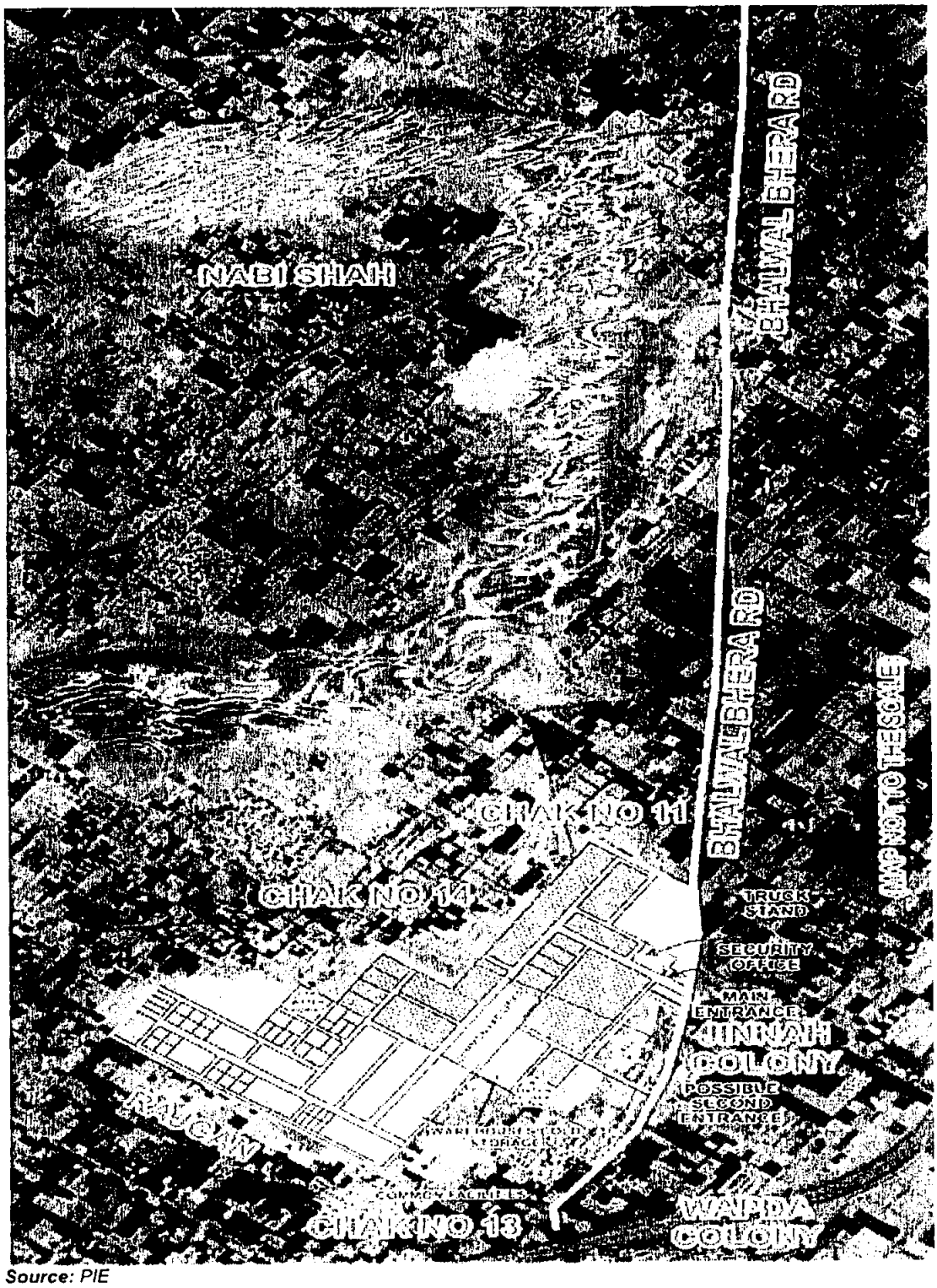
Cattles grazing near project site



Buffalo near Project site

Donkey near project site

Figure 4.10: Bhalwal Industrial Estate and Nabi Shah Lake



Source: PIE

4.5 Socio-cultural Environment

In order to assess the present socio-economic and socio-cultural conditions of local population of the Project area, a social survey was conducted. **Figure 4.10** Shown the socio cultural environment of project area.

4.5.1 Population

The villages were selected on the basis of their likelihood of getting any direct positive or negative impacts due to the project. The villages that were surveyed are Chak 11, Chak 13, Chak14 and Chak13 Rajgan. The **Table 4.10** shows the estimated population of villages and household number of each village visited.

Table 4.10: Population of villages affected by the Project

No	Village Name	Estimated Household	Estimated population
1	Chak 11	550	3,850
2	Chak 13	650	4,550
3	Chak 14	700	4,900
4	Chak 13 Rajgan	400	2,800
	Total	**2,300**	**16,100**

Source: Estimated by PPI team

4.5.2 Age Structure, Sex Ratio of Project Area

In the Project area, four villages were visited and 33 persons were interviewed during the EIA. The interviews ages ranged from between 20-60 years wherein 19 male and 13 female were interviewed. Gender wise table represented under. The **Table 4.11** gives an overview of age structure, sex ratio in the Project area.

Table 4.11: Overview of socio-economic survey

No	Village Name	Gender		
		Male	Female	Age
1	Chak 11	3	3	22-50
2	Chak 13	3	3	20-30
3	Chak 14	6	6	20-60
4	Chak 13 Rajgan	7	1	22-35
	Total	**19**	**13**	**22-60**

Source: Estimated by PPI team

4.5.3 Religion Ratio in Project Area

Punjabi society is structured around complex temporal and spiritual leadership dynamics. Tribal leadership in Punjab largely derives from temporal power, spiritual power, or from a combination of these. The spiritual power is either institutionalized

through claiming direct descent from Mohammad (PBUH), the Holy Prophet of Islam, or from a Sufi saint.

The custom of visiting Dargah (shrine) of saint is common among the Muslims and Non-Muslims. According to faith the people visit the Dargah during the time of trouble and misfortune and pray for safety and relief from the worldly affairs/problems. It is therefore the main cause that Pirs, Sayeds, Shaikhs are considered here as Mushed among uneducated masses.

There was one local non-significant Dargah/Shrine in the project area named as Baba Halim Shah which is approximately 150 years old. People celebrate a festival in Baba Halim Shah Shrine on 2nd July of every year.

4.5.4 Languages

Punjabi and Saraiki are most spoken languages in Sargodha district followed by Urdu speaking and very few people speak Phastu.

4.5.5 Tribal Distribution

The main tribes in the project area are Ranjahs, Gondals, Rajputs, dudhi, Sheikh, Khoda, Awan, Doader, Kokhar, and Pohar; based on the data collected from the sampled communities the key tribes of the sampled communities are presented in **Table 4.12.**

Table 4.12: Tribal Distribution of Project Area

No	Village Name	Major Tribes
1	Chak 14	Dudhi,Awan,Doder
2	Chak 13	Skeikh, Khoda
3	Chak 11	Pohar,Khokar,Gondals
4	Chak 13 Rajgan	Rajputs, Ranjahs,

***Source:** Estimated by PPI team*

4.5.6 Dress in the Project area

The most common and generally used male dress is shalwar and a long shirt (Qameez) and Dohti. However, on festival and special occasions this dress is of better quality and is worn by waist coat and others adorable. The Western dress trouser and shirt can be seen rarely but among educated persons and student.

The ladies wear is also shalwar and the long shirt both of light and fancy colors along with a headscarf (dopatta). Gharara and sari are also worn by the ladies on special occasions.

4.5.7 Main Occupation of the Project area

The people in the project area being illiterate use to work as tenants and earn wages by harvesting crops and fruit cultivated lands; the area is suitable for agriculture.

People are also engaged with business and small workshops. A small proportion of the population is engaged with brick kiln as labour.

4.5.8 Agriculture

The main crops during Rabi are wheat, barley, gram, oil-seeds, and masoor and in Kharif cotton, sugarcane, rice, bajar, Maize, Mung, moth and mash. In addition to these main crops there are subsidiary crops known as Zaid Rabi and Zaid Kharif in which tobacco, Vegetables, fodder, toria

4.5.9 Other Facilities of Life

The availability of basic amenities of life to community living in the Project area is indicator of its socio-economic condition. Some of the people in villages are living in harsh condition and does not have access to the basic amenities of life. The results of survey, conducted regarding the facilities, in the Project area are as follows;

Road Access: All four villages have direct access to metal road however road conditions in villages are not good.

Health Facilities: Health facilities and infrastructure is quite inadequate in the project area. There is a high incidence of infant and maternal death in rural areas which can be prevented by providing basic health facilities at the community level. There is a government hospital in Bhalwal. Several private hospitals and clinics have also been established in Bhalwal.

One Basic Health Unit (BHU) has been established in Bhalwal near to the project area at distance of approximately 3km. However this BHU do not have any emergency facility. All the villages visit this BHU in case of emergency.

Major diseases in the area include respiratory infections, skin disease, suspected malaria, acute diarrhea, unexplained fever, acute watery diarrhea, malaria and Typhoid.

Education Facility: There are few primary and middle school in the villages near project area. Each village has at least one Government primary school GPS for boys and girls. However there was only one middle school in Chak 13 new Abadi.

Source of Drinking Water: The villages use hand pump and lower Jhelum canal water for drinking purpose. Chak 14 and Chak 13 villages use Hand pump water for drinking purpose however water in Chak 14 is salty taste. Chak 13 Rajgan and Chak 11 villagers use lower Jhelum canal water as well as hand pump water for drinking purpose and water is sweet taste. Water is available at approximately 20ft from the surface. **Table 4.13** shows sources of drinking water nearby project area.

Table 4.13: Shows sources of drinking water in the Project area.

No	Village Name	Source of drinking water	
		Hand Pump	Canal
1	Chak 11	√	√
2	Chak 13	√	–
3	Chak 14	√	–
4	Chak 13 Rajgan	√	√

Source: *Estimated by PPI team*

Gas Availability: None of the villages has gas supply. In other villages people use wood or gas cylinder as fuel. The **Table 4.14** shows electricity and gas availability in the Project area.

Table 4.14: Electricity and gas availability in the Project area

Village	Electricity	Sui Gas
Chak 11	√	–
Chak 13	√	–
Chak 14	√	–
Chak 13 Rajgan	√	–

Source: *Estimated by PPI team*

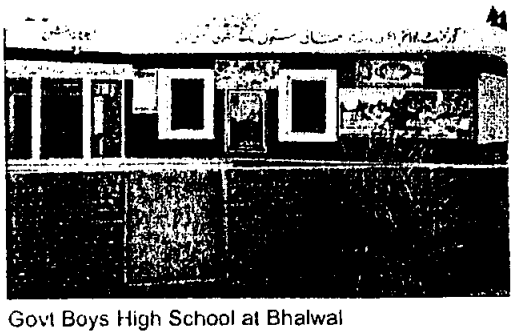
Religious Sites: The mosques and /or madrassas are present in 4 villages of the Project area.

Archaeological Sites:

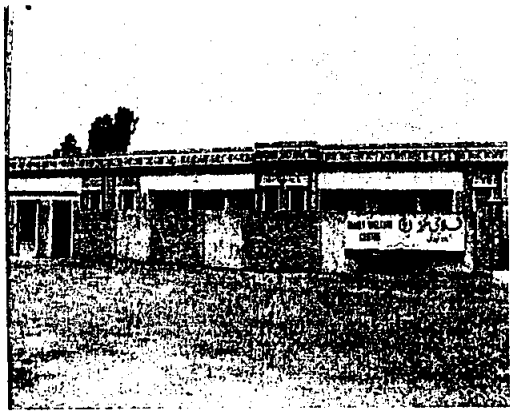
There is no site of archaeological, cultural, historical and religious significance (graveyard, shrine, mosque, archaeological site) within 1,000 meters of the Project.

However, there was one local insignificant Dargah/Shrine in the project area named as Baba Halim Shah which is approximately 150 years old. People celebrate a festival in Baba Halim Shah Shrine on 2nd July of every year. The estate will be made in such a way that the shrine will not be disturbed.

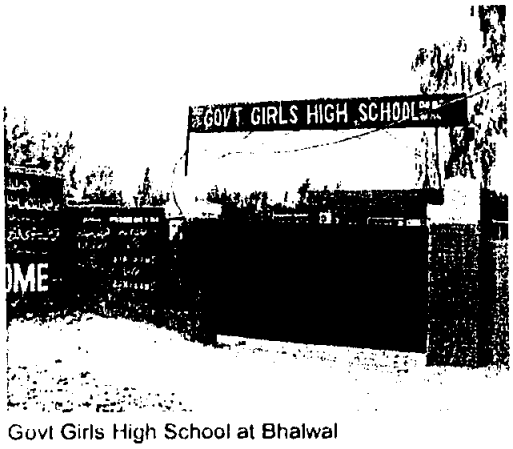
Figure 4.11: Socio-economic setting of the Bhalwal



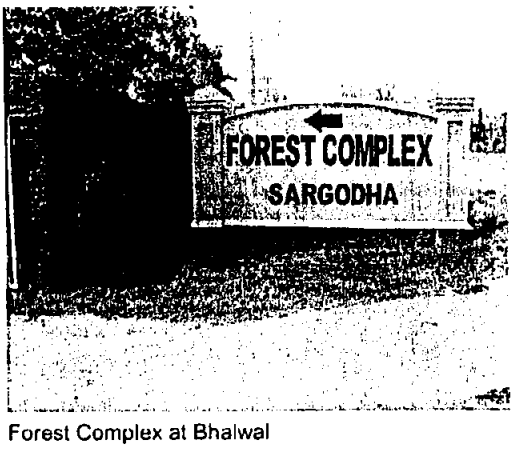
Govt Boys High School at Bhalwal



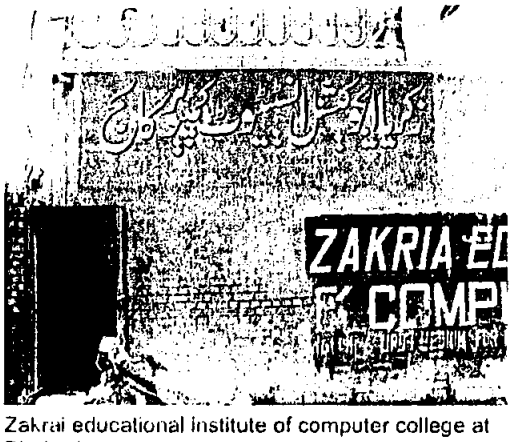
Basic Health unit at Bhalwal



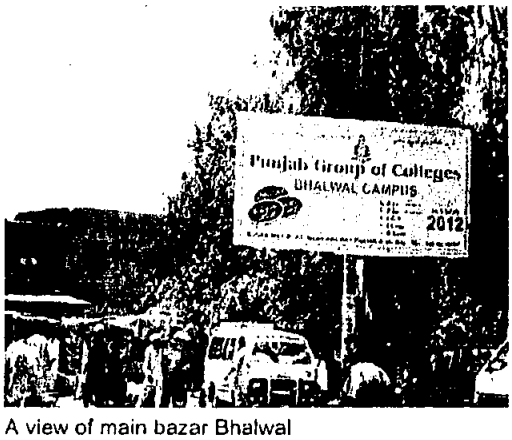
Govt Girls High School at Bhalwal



Forest Complex at Bhalwal



Zakrai educational institute of computer college at Bhalwal



A view of main bazar Bhalwal

5 Consultation with Stakeholders

5.1 Introduction

Bhalwal Industrial Estate Sargodha Project will impact local environment of the area as well as community living in and around the Project area.

Consultations were held with different stakeholders and community to discuss different aspects of the Project, including expected impacts on the physical, biological, and socio-economic environment of the Project area. The filled socio economic survey performs are attached as Annexure D.

This chapter provides details about consultation carried out with stockholders as well as community affected by the Project.

5.2 Objectives of Consultation

Public consultation plays a vital role in studying the effects of the Project on all the stakeholders and in the successful implementation and execution of the Projects and its activities. Public involvement is a compulsory feature of environmental impact assessment, which leads to better and more acceptable decision-making.

The main objectives of the consultation process are:

- Information dissemination, education, and liaison,
- Identification of problems and needs,
- Collaborative problem solving,
- Reaction, comments and feedback on Project,
- Documenting mitigation measures proposed by the stakeholders.

5.3 Meeting held with Stakeholders

All the stakeholders were given maximum project information verbally and were shown map of the area in detail. Different aspects of the project were discussed with stakeholders on establishment of Bhalwal Industrial Estate and expected impacts on the physical, biological, and socio economic environment of the project area. Stakeholders concern regarding various project aspects, existing environment, and impacts of industrial estate were noted and addressed in the EIA study.

Proceedings of the meeting with District Wildlife Officer Sargodha, the Divisional Forest Officer Sargodha, Program Coordinator IUCN, Islamabad, Head of WWF Islamabad, Inspector General of Forest Islamabad, General Manager Noon sugar Mills LTD Bhalwal, Project Director Mona Reclamation Experimental Project are given below.

5.3.1 District Wildlife Officer Sargodha

5.3.2 Mr. Nasar Hayat

The environmental specialist from PPI paid a customary visit to Mr. Nasar Hayat at his office. The project and the activities involved were explained to him with the help of map. Furthermore, he expressed certain concerns and suggested some action regarding the project, which are discussed as follows:

Comments:

- He appreciated the efforts of PPI for conducting stakeholder consultation meetings and also informed of other planned and on-going development activities in the area.
- The area selected for the Industrial Estate has been notified as Game Reserve, where game birds come during late autumn to spring and 2 permits are issued annually for shooting of water fowls.
- If the government intends to convert the area into an Industrial Estate, it has to be de-notified.
- Industries, in general, create pollution but it is crucial to know what types of industries will be establish to understand the nature impact on the biological environment
- In any case a proper system for disposal of industrial waste is crucial and proper drainage is imperative
- Physical, biological and socioeconomic aspects of the project area should be covered in detail in the EIA report as the data pertaining to the area is limited.
- Independent consultants should monitor the activities during the execution of the project and report EMP non-conformances to Punjab EPA.

5.3.3 Divisional Forest Officer Sargodha

Mr. Ghaffar Khan

Comments:

- The proposed activities should be planned in the manner to avoid causing any disturbance to the environment.
- Since there is salinity and area suffers from flooding, we have a limited choice of tree species for planting.
- A proper drainage system is necessary for planting trees to avoid water logging and stagnation.
- To overcome salinity problem big pits of 1 x 1 meter should be dug and filled with saline less soils mixed with compost.
- To avoid water stagnation mound planting should be done
- The Forest Department has plant nurseries and can supply saplings on the government rates

5.3.4 Program Coordinator IUCN, Islamabad

Mr. Hamid Surfaraz

Comments:

- He appreciated the stakeholder consultation process and made following suggestions
- IUCN provides technical support to government on formulation of strategies and policies and their capacity building on demand thus it is up to government to decide on whether it wants to retain the area as Game Reserve or an Industrial Estate.
- Industries, in most cases, create harm for biological environment therefore, environment friendly industries should be chosen for the area
- There are models that despite industries the biological environment can be maintained through proper system of solid and wastewater disposals and drainage systems.
- In any case the government should follow the international laws and abide by the national laws promulgated for protected areas.

5.3.5 Head of WWF, Islamabad

Dr. Ghulam Akbar

Comments:

- He expressed satisfaction that TOR of the study cover the environmental aspects associated with the proposed activities.
- He suggested that field survey should be conducted to gather primary data on physical, biological and socioeconomic environment as appropriate for the impact assessment.
- WWF will play its role if any department violates the rules formulated by the state.
- The industrial estate Bhalwal must treat the effluent prior to discharge in Nabi Shah Lake.
- The industrial estate should adopt proper mitigation measures to avoid air pollution.
- Industrialist should sign an undertaking that they will comply with environmental laws.

5.3.6 Inspector General of Forests. Islamabad

Mr. Nasir Mehmood

Comments:

- Industries are harmful for the biological environment in that area particularly

- The Punjab government should follow the national and international laws of protected areas.
- If the government de-notifies the area and declares as an Industrial Estate still strict measures would be needed to mitigate pollution.

5.3.7 General Manager Noon Sugar Mill Ltd Bhalwal

Engr Ehsan Ahmad

Comments:

- He appreciated the stakeholder consultation process.
- The industrial estate will help in development of the area.
- Facilities should be provided by the government for the treatment of effluent at the estate.
- In the particular case of Bhalwal Industrial Estate, land has been acquired easily as it was not an agricultural land.
- The industrial estate will accelerate development of the area and will be a source of employment and businesses opportunities.
- There should also be a vocational training center.
- For local population of the area so that so they can get proper training and get better employment.
-

5.3.8 Project Director Mona Reclamation Experimental Project

Engr Tanveer Ahmad Laghari

Comments

- He appreciated the stakeholder consultation process
- For industrial development, agencies with regulatory powers or responsibilities in relation to planning control, roads and traffic, waste disposal, discharge limits to fresh waters, emissions to air, historic monuments, and conservation of natural resources must be consulted.
- Proper reclamation of land should be done prior to construction of project because the project land is saline and can damage the industrial building if the reclamation is not done in time.
- Proper surface and sub-surface drainage should be provided.

5.3.9 DCO District Sargodha

Mr. Azmat Mahmood

Comments

- There is a long outstanding demand from industrialist for a state of art industrial Estate in Sargodha.
- He fully supports the establishment of Bhalwal Industrial Estate which will boost economic activities in Sargodha.

5.4 Community Consultations

A series of roadside and focus group discussions were carried out with local communities in the Project area to find out their opinion about the Project. Both male and female respondents were included in the consultation process. During the roadside and focused group discussion, the communities were informed about the salient features of the Project, its location, and its activities.

No major concern regarding the proposed operation was raised during the community consultations. People welcomed the idea of upcoming industrial estate activities sensing a relative increase in the localized economy and employments. The main concerns common to most communities are listed hereunder:

- Local villagers should be given priority during employment process for various construction-related works and activities.
- Quota for the local employment should be increased.
- The people living in adjoining villages should be provided access to the Industrial Estate.
- There should not be any interference/disturbance to women fetching water from wells, collecting firewood, grazing livestock and working in the fields.
- Increased traffic should not jeopardize the safety of the communities.
- The noise level should be kept to the minimal so that the local livestock does not get frightened and run away.
- It will also lead to providing other facilities for the residents of area; such as hospitals and high schools to the far away villages.
- They foresee the development of the area with provision of Sui gas supply and network of Telecommunication to locals.
- Majority of the people were of the opinion that the construction work should be started and completed as soon as possible.
- People emphasized that the proper mitigation measures should be implemented to control the water and solid waste pollution.
- Local people said that their privacy would be observed during construction and operational phases of the Project.

- The community emphasized that as water availability is a major concern in the Project area, so water conservation techniques should be considered. Equipment such as special showerheads, toilet system and rainwater harvesting systems should be installed at household level to conserve water.
- The Project can disturb the bio diversity and ecology of the area, thus proper mitigation measures should be taken.
- People emphasized that the proper mitigation measures should be implemented to control the water and solid waste pollution.
- Overall idea of the Bhalwal Industrial Estate Sargodha Project was appreciated by whole of the communities residing in the Project area and its vicinities.

Figure 5.1: Public Consultation with Primary and Secondary Stakeholders

Public consultation at Chak 13

Public consultation at Chak 13 Rajgan

Public consulataions at Chak 11

Public consultation at Chak 13

Stakeholder consultation at Noon Sugar Mills Bhalwal

Stakeholder Consultation at DFO Bhalwal

6 Impact Assessment and Mitigation Measures

6.1 Introduction

This section discusses the potential environmental and social impacts of the proposed activities, predicts the magnitude of the impact, assesses significance, recommends mitigation measures to minimize adverse impacts, and identifies the residual impacts of the project

6.2 Environmental Screening of the Project

During the environmental impact assessment process, the predicated impacts will be characterized. Various aspects of the impact characterization include:

- Nature (direct/indirect)
- Duration of impact (short term, medium term, long term)
- Geographical extent (local, regional)
- Timing (project phase)
- Reversibility of impact (reversible/irreversible)
- Likelihood of the impact (certain, likely, unlikely)
- Impact consequence severity (severe, moderate, mild)
- Signification of impact (High, medium, low).

The above aspects of environmental characterization are defined in **Table 6.1.**

For the Bhalwal Industrial Estate Sargodha Project, an environmental screening matrix was developed, as part of the present EIA, focusing on the potential environmental impacts of the project during pre-construction, construction and operation phases. The matrix examines interaction of the project activities with various components of the environment. The impacts are broadly classified as physical, biological and socio-cultural, and then each of these broad categories were further divided into different aspects. The potential impacts thus predicated are characterized as follows:

- High negative (adverse)impacts,
- Low negative impact,
- Insignificant impact,
- High positive (beneficial) impacts,
- Low positive impact, and
- No impact.

The environmental screening matrix (unmitigated) is provided in **Table 6.2.**

Table 6.1: Impact Characterization

Categories	Characteristics
Nature	Direct: The environmental parameter is directly changed by the project.
	Indirect: The environmental parameter changes as a result of change in another parameter
Duration of impact	Short-term: lasting only for the duration of the project such as noise from the construction activities.
	Medium-term: lasting for a period of few months to a year 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.
	Long term: lasting for period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical extent	Local, regional (spatial dimension)
Timing	Construction and Operation
Reversibility of impact	Reversible: when a receptor resumes its pre-project condition
	Irreversible: when a receptor does not or cannot resume its pre-project condition
Like hood of the impact	Almost Certain: Impact expected to occur under most circumstances
	Likely: Impact will probably occur under most circumstances
	Possibly: Impact may possibly occur at some time
	Unlikely: Impact could occur at some time
	Rare: Impact may occur but only under exceptional circumstances
Impact consequence severity	Major: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora or fauna; has long-term effects (period of years) on socioeconomic activities of significance or regional level.
	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; has short-term effects (period of months) on socioeconomic activities of significance on regional level.
	Minor: When an activity causes short-term (period of few months) reversible damage to an environmental feature; sight reversible damage to a few species of flora or faun within a population over a short period; has short term (period of months) effects on socioeconomic activities of local significance.
	Negligible: When no measurable damage to physical, socioeconomic, or biological environment above the existing level of public concern; and conformance with legislative of statutory requirements.
Significance of impact	Categorized as High, Medium, or Low
	Based on the consequence, likelihood, reversibility, geographical extent, and duration; level of public concern; and conformance with legislative of statutory requirements.

Table 6.2: Environmental Screening Matrix (Unmitigated)

	Soil Degradation	Air Quality Deterioration	Surface and Ground Water	Loss of vegetation	Damage to Wildlife	Traffic Congestion	Noise and vibration	Safety Hazard	Damage to Infrastructure	Gender Issues	Historical Archaeological Sites
Project Siting											
Visual Impacts	N	N	N	N	N	N	N	N	N	N	N
Cumulative Impacts	-2	0	-2	-2	-2	-2	-1	0	-1	N	N
Construction Phase											
Land acquisition	N	N	N	N	N	N	N	N	N	N	N
Contractor Mobilization	0	-1	0	N	-1	-2	-2	-1	-1	0	N
Construction Camp Establishment	-1	-1	-1	-2	-2	0	-1	-1	0	0	N
Construction Camp Operation	0	-1	-1	-1	-1	-1	-1	-1	0	-1	N
Site Preparation	-2	-1	-2	-2	-1	0	-2	-1	0	-1	N
Construction of Roads	-1	-1	-1	0	-1	0	-2	-1	0	0	N
Laying of Services	-1	-1	-1	-1	-1	0	-1	-1	0	0	N
Construction of Buildings	-1	-1	-1	0	-1	0	-1	-1	0	0	N
Construction Materials Supply	-1	-1	N	0	-1	-2	-1	-1	-1	0	N
Construction Crew Transportation	0	-1	N	0	-1	-2	-1	-1	-1	0	N
Solid Waste Disposal	-2	-1	-2	-1	-2	N	N	0	N	0	N
Waste Effluents Disposal	0	-1	-2	0	-1	N	N	-1	-1	0	N

	Soil Degradation	Air Quality Deterioration	Surface and Ground Water	Loss of vegetation	Damage to Wildlife	Traffic Congestion	Noise and vibration	Safety Hazard	Damage to Infrastructure	Gender Issues	Historical Archaeological Sites
Demobilization of Contractors	0	-1	0	0	-1	-2	-1	-1	-1	0	N
Operation Phase											
Operation of Bhalwal Industrial Estate	N	-1	0	-2	-2	0	-1	0	0	0	N
Solid Waste Disposal	-2	-1	-2	-1	-2	N	N	0	N	0	N
Effluents Disposal	-2	-1	-2	-1	-2	N	N	0	N	0	N

Key: -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible negative; +1: low positive impact; +2; High positive impact, N: no impact.

Subsequent to the characterization, appropriate mitigation measures were identified, in order to minimize if not completely eliminate the adverse impact associated with project activities. Finally, residual impacts were identified.

The impact characterization of the predicated impacts, mitigation measures and residual impacts are discussed below.

6.3 Pre-Construction Impacts

6.3.1 Project Siting Impacts

The impacts associated with the project siting are those which relate to its location at Bhalwal. These impacts are different from those which are associated with the project's construction and operation phases, in the sense that the construction and operation impacts are associated with the activities such as land clearing, waste disposal, whereas the sitting impacts relate to the mere presence of a facility at the given location.

For the proposed project, the following three aspects of the project sitting were considered:

- Project land use and design
- Visual Impacts (aesthetic value)
- Cumulative impacts

6.3.2 Project Site, Land Use design

The project site, land use and design should meet the criteria developed by Pakistan Environmental Protection Agency for establishment of Industrial Estates in Pakistan.

The unmitigated impact associated with the locating the project at an unsuitable location or its land use design does not meet the minimum requirement are characterized as fellows.

- Nature: Direct
- Duration: Long term
- Geo extent: Local
- Reversibility: Irreversible
- Likelihood: Possibly
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

Project site: Bhalwal Industrial Estate Sargodha generally meets the criteria developed by Pakistan Environmental Protection Agency's guidelines for establishment of industrial estates as follows:

- The project site is not located on the prime agricultural land rather located on barren land.
- The project site is located 2-4 km from Nabi Shah Lake which is a game reserve. The Forest. Wildlife and Fisheries Department of the Government of Punjab on 13th February 2009 declared that the Nabi Shah Lake having an area of 1,674 acres shall continue to exist as Game Reserve for all wild birds/animals for a period of 5 years with effect from 9 February 2009.

The game reserve operates yearly from September to January particularly during monsoon season. A lot of birds and wildlife comes to Nabi Shah Lake and depart during end of the season i.e., January when the lake starts to become dry. However, with the passage of time, the area of Nabi Shah Lake has been reduced up to 40%.

The Project consists of two components i.e., Master Planning of Industrial Estate and Land Reclamation. The land reclamation plan for the Project site will be implemented during construction phase. This will further reduce the area of Nabi Shah Lake.

The implementation of the project will be completed in a period of 18 months and by that time the Game Reserve status of Nabi Shah Lake will expire.

Therefore, the project site is not located within 25 km of any ecologically or otherwise sensitive area, including religious and historical places and archaeological monuments, National Parks and sanctuaries except Nabi Shah Lake whom status of Game Reserve will expire before start of operation of Bhalwal Industrial Estate.

- The project site is not within 25 km of any major settlements having a population of more than 3 million.

Therefore, the project do meet the sitting criteria of Pakistan Environmental Protection Agency for establishing an industrial estates in Pakistan.

Land Use: The Pakistan Environmental Protection Agency guidelines for industrial estates have stipulated a land use of an estate.

Bhalwal Industrial Estate Sargodha is being established at an area of 426 acres, out of which 300.5 acres are allocated for industrial plots, 17.28 acres for administrative and common buildings, 33.50 acres for utilities and 94.72 acres for roads and green area.

The comparison of land use of Bhalwal Industrial Estate Sargodha with the Pak EPA guidelines is shown in **Table 6.3.**

Table 6.3: Comparison of Land Use of Bhalwal Industrial Estate Sargodha with Pak EPA guidelines

Category	Pak EPA %	Bhalwal Industrial Estate Sargodha %
Factory Plots	60-65	71
Roads	Up to 20	25
Open Space – Green Area	Up to 20	
Administrative and other buildings	5-10	4
Total	**100**	**100**

Source: *Appendix II - Sectorial guidelines for Environmental reports – Industrial Estates, Pak EPA*

From the above comparison, it is evident that the existing land use of Bhalwal Industrial Estate Sargodha does meet the land use criteria developed by Pak EPA for establishment of an industrial estate in Pakistan.

Design: The PIE has designed of the industrial estate for 13 types of small and medium sized industries. The **Table 6.4** shows performance of various industries against their pollution loads.

Table 6.4: **Industries Performance against Pollution Loads**

Industrial Zone	Noise pollution	Air emission	Liquid waste	Solid waste	Hazardous solid waste
Citrus Processing			X	X	
Juices, Jams and Marmalade			X	X	
Food Processing			X	X	
Dairy and Milk			X	X	
Flour Mills			X	X	
Oil Mills	X		X	X	
Cold Storages			X	X	
Warehouses			X	X	
Handicraft and Furniture	X	X		X	
Engineering	X			X	
Pharmaceuticals			X	X	X
Sugar Mills		X	X	X	
Textile Mills		X	X	X	

The individual industries to be established at the Bhalwal Industrial Estate Sargodha will have to treat their air, wastewater, solid waste and noise pollution to meet the NEQS requirement of Pakistan.

All the industries located at Bhalwal Industrial Estate will have primary storage of their waste inside their plot as per PIE Bye-Laws. The estate will design and

implement Solid Waste Collection and Transportation System which will be comprised of i.e., recyclable, biodegradable, non-biodegradable and hazardous wastes. The recycling and biodegradable waste will be given to their respective contractors for further processing. The non-biodegradable will be disposed off at the exiting disposal sites at Sargodha and hazardous industrial materials will be disposed off in accordance with their standard disposal protocols.

All industrial units generating wastewater will install primary treatment plants in their respective industrial units. The effluent will be treated at the Combined Effluent Treatment Plant to be established at Bhalwal Industrial Estate. A piece of land for Combined Effluent Treatment Plant has already been allocated. The effluent of Combined Effluent Treatment Plant will meet NEQS of Pakistan for discharge of effluent to public water bodies.

The air polluting industries will install scrubbers in order to comply with the NEQS requirement for air emissions.

The PIE will encourage waste minimization techniques to reduce quantity of receiving waters. This can include:

- Recycling of water from one process and one industry to another inside the estate;
- Design systems that recycle water repeatedly for the same purpose i.e., cooling towers.

6.3.3 Visual Impact

The project will be able to maintain much of its natural landscape and vegetation, particularly in and around the project site. This natural landscape has an aesthetic value, although not very significant importance, but indeed is a valuable asset of the area. The project can potentially damage the natural landscape and visual look will be impacted.

The unmitigated impact associated with the aesthetic value of the area is characterized as follows:

- Nature: Direct
- Duration: Long term
- Geo extent: Local
- Reversibility: Irreversible
- Likelihood: Possibly
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

For the project, the visual impacts have been minimized at different levels, as described below.

- First of all, the design of the industrial estate will be adopted in a manner that minimizes the changes in the topography, landscape and damage to the natural vegetation.
- There will be a green belt along the entire road network at the estate. A plantation plan has been proposed for the estate which will be implemented.

Residual Impacts

As a result of the above mitigation measures, the visual impact of the project will be greatly reduced. There will be some residual impact; however, its significance is expected to be low.

6.3.4 Cumulative Impacts

There is a general apprehension that the project will become a precedent, and will open ways for further development in the area. In particular housing schemes for labour and staff may be proposed in the area in future. Such projects would then lead to:

- Large scale land clearing,
- De-vegetation,
- Damaged habitat
- Increased threat to wildlife
- Increased load on the natural resources of the area, and
- Population influx.

Mitigation Measures

Although the impacts of the industrial estate have been addressed in this EIA on individual basis, the mitigation measures proposed do not address the cumulative impacts. In the opinion of the Consultant, this issue should be addressed at the policy issue, and the district and provincial Government should issue policy guidelines in this respect. One of the tools available for such kind of environmental assessment is the Strategic Environmental Assessment (SEA).

In particular, such policy guidelines should ensure that;

- No haphazard housing colonies or industrial units are allowed on Bhalwal-Bhera Road without conducting IEE/EIA.
- Keeping in view of the potential increase in the traffic, it is recommended that dualisation of Bhalwal-Bhera Road should be carried out.

In addition to the above, such planning should also address the issues which result into additional pressures on the natural resources of the project area.

6.4 Construction Phase Impacts

Construction phase is likely to be the most significant part of the project with respect to environmental considerations, since most of the impacts are likely to take place

during this period. Various construction activities will invariably create environmental disturbances, which may have impacts on the biological resources of the area and nearby communities. Major potential impacts on physical, biological and socio-cultural environment of the area include the following:

- Physical Environment
  - Soil degradation
  - Air quality deterioration
  - Surface and Ground Water Contamination
- Biological Environment
  - Loss of vegetation
  - Damage to Wildlife
- Socio-Cultural Environment
  - Land Acquisition
  - Traffic congestion
  - Noise and vibration
  - Safety hazards, Public health and Nuisance Issues
  - Damage to infrastructure
  - Gender Issues
  - Sites of Archaeological or Historical Significances

These impacts and their respective mitigation measures are discussed below:

6.4.1 Soil Degradation

The soil-related issues include soil erosion, slope stability, and soil contamination. These may be caused by the land clearing, leveling and grading, excavation and filling, construction activities and maintenance of equipment/vehicles. In general, the estate is being planned in a manner that the road, industrial plots and other infrastructure is arranged in accordance with the existing contours, thus minimizing the need for leveling and grading.

Soil may be contaminated as a result of fuel/oils/chemical spillage and leakage, and inappropriate waste (solid as well as liquid) disposal.

Extraction of stone and gravel from the area may potentially lead to soil erosion especially nearby canal.

The unmitigated impacts related to soil erosion and contaminations are characterized below.

- Nature: Direct
- Duration: Long term
- Geo extent: Local
- Reversibility: Irreversible
- Likelihood: Certain
- Consequence: Moderate
- Impact significance: High.

Mitigation Measures

The followings mitigation measures will minimize the soil erosion and contamination:

- Land clearing, leveling and grading be minimized, and carried out in a manner to minimize any risk of soil erosion.
- Excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken as per the design (i.e. Stone pitching). Temporary measures, such as construction of temporary walls reinforced with brick lining bordering the construction areas to contain debris and spoil, will also be undertaken to avoid soil erosion and water contamination.
- The stone and gravel will not be extracted from the areas around Nabi Shah Lake.
- Vehicles and equipment will not be repaired at the project site. If unavoidable, impervious sheathing will be used to avoid soil any water contamination.
- For the domestic sewage from the contractor's camp, septic tanks and soaking pits will be constructed having adequate capacity. Waste oils will be collected in drums and sold to the recycling contractors.
- The recyclable waste from the project site (such as card board, drums, broken/used parts, etc.) should be sold to recycling contractors. The hazardous waste should be kept separate and handled according to the nature of the waste.
- Domestic solid waste will be disposed in a manner that does not cause soil contamination (one of the options available is to dispose the recyclable material, and the remaining waste at a suitable location).

Residual Impacts

Appropriate construction practices and management actions as listed above will greatly minimize the soil erosion and contamination. The significance of the residual impacts is therefore expected to be 'low'.

6.4.2 Air Quality Deterioration

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SOx), Oxides of Nitrogen (NO_x) and Particulate Matter (PM). These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such

as excavation, land leveling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

The unmitigated impacts related to air quality deterioration are characterized below.

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

Mitigation Measures

The following mitigation measures will minimize the hazardous emissions and their impacts:

- Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by spraying water on soil, where required and appropriate.
- The use of vapor recovery system will be encouraged where applicable, to control losses of the volatile organic compounds(VOCs) from storage tanks to achieve 90 to 100 percent recovery
- The use of low nitrogen oxide (NOx) burners in combustion system will be encouraged.
- Plants should be encouraged to use fuel with low sulfur content
- A sulfur recovery system will be employed, if feasible, in large facilities when the hydrogen sulfide concentration in the tail gases exceeds 230mg/Nm3

Residual Impacts

The above measures will reduce the magnitude of the adverse impacts on the ambient air quality. The significance of the residual impacts on the air quality is expected to be low.

6.4.3 Surface and Ground Water Contamination

The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include.

- Solid waste disposal
- Effluents disposal
- Equipment/vehicles maintenance
- Spillage/leakage of fuels, oils and chemicals

The unmitigated impacts of the proposed construction activities on the water resources of the area characterized below.

- Nature: Direct and indirect
- Duration: Short to medium term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Major
- Impact significance: High.

Mitigation Measures

- Storage of the liquid fuels and chemicals should be in areas where there is a provision for containment of spills.
- Cooling water should generally be recycled
- Sewage effluent should be segregated from wastewater containing heavy metals
- Waste water should be treated prior to discharge in Nabi Shah Lake. The effluents will meet the NEQS requirement for discharge into the public bodies.

The mitigation measures recommended to forestall soil contamination will also prevent surface and groundwater contamination.

Residual Measure

If the recommended mitigation measures are effectively employed, the residual impacts of the project activities on the water resources of the area will be negligible.

6.4.4 Loss of Vegetation

The project area is mostly barren and has some natural vegetation cover. The site preparation and construction activities may necessitate removal of the natural vegetation from the areas where road, culverts and other buildings will be constructed. Damage and/or loss of vegetation would include elimination of trees, and clearing of other indigenous and introduced species, as well as undergrowth comprising bushes, grass, etc.

There are three palm trees and 16 other trees within the project boundary. The PIE to take utmost care to avoid cutting of these trees, and pledge to realign the road, and adjust the location of buildings, if required, in case of any trees coming in the way.

The Construction crew can also indulge in tree/shrub cutting to obtain fuel wood.

The unmitigated impacts of the proposed activities on the floral resources of the area are characterized below.

- Nature: Direct
- Duration: Medium to long term
- Geo extent: Local
- Reversibility: Irreversible (reversible in medium to long term)
- Likelihood: Certain
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

The follows mitigation measures will further minimize any negative impacts on the floral resources of the area:

- Endeavors will be made to compensate the loss by enhancing the environment, through plantation of trees and ornamental plants.
- A plantation plan of appropriate trees /bushes will be raised within the open available spaces and along roads. Ornamental trees, bushes and climbers have been included to improve the scenic and aesthetic value of the estate. A mixture of shady trees with heavy foliage will be required to counter the air and noise pollution, possibly along the roads.
- Selection of species to be planted may not be strictly confined to the proposed plantation plan, as local factors such as available quantity of irrigation water and edaphic limitations will also govern the choice of plants. It is further recommended that a small nursery may be established in estate, to provide planting stock wherever demand arises.
- All preventive measures will be adopted to control the spillover of chemicals and other effluents on the ground to protect soil fauna and ensure microbial activity in accordance with NEQS promulgated under Environmental Protection Act 1997.
- Cutting of trees and other natural vegetation will be minimized as far as possible through astute planning.
- A record will be maintained for any tree cutting.
- If cutting of trees is unavoidable, tree plantation of local species will be undertaken at appropriate location. The number of trees thus planted will be at least five times the ones that are cut. The trees to be planted should be an appropriate mix of fast and slow growing trees.
- The construction crew will be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood will not be allowed.

Residual Impact

The proposed tree plantation will take some time to grow and mature, there will be therefore some reduction of trees and natural vegetation in the area. However, no vegetation will be possible on the built-up area. This impact cannot be fully mitigated, and the residual impact would be medium; at least in the medium term. In the longer

run, however, the planted trees and vegetation will more than compensate for any vegetation loss.

6.4.5 Damage to Wildlife

The project site is located at Bhalwal; a wildlife habitat. The loss of natural vegetation as discussed above and the other project activities will have potential adverse impacts on the faunal resources and habitats of the area as well. There is a game reserve near the project area in Nabi Shah Lake. The industrial effluent will be treated and then discharged into Nabi Shah Lake. If NEQS for waste water treatment are not checked regularly this may damage wildlife. In addition the noise from industries will disturb the birds' routine. Migratory birds will also stop visiting Nabi Shah Lake due to noise from industries.

The unmitigated impacts of the proposed activities on the faunal resources of the area are characterized below.

- Nature: Direct
- Duration: Medium to long term
- Geo extent: Local
- Reversibility: Irreversible (reversible in medium to long term)
- Likelihood: Certain
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Solid waste from the contractor's camp and construction waste will not be left in the open and be disposed off properly.
- The measures to restore natural vegetation loss in the area will benefit the area's fauna as well.
- The project staff will not be allowed to indulge in any hunting or trapping activities.
- Night time construction works not be undertaken.
- Illumination levels at the site will be minimized, as far as possible.
- Appropriate diffusers will be used to restrict the illumination within the project site.
- Blasting will not be undertaken at the site for excavation purposes.

Residual Impact

Despite the above mitigation measures, there will be some residual impacts of the project on the faunal resources of the area. The significance of these residual impacts is expected to be medium.

6.4.6 Land Acquisition

The PIE will be established on 426 acres. A total of 410 acres of land has already been acquired and with possession. The PIE is in a process to acquire remaining land of 16 acres.

The unmitigated impacts related to the land acquisition for the proposed project are characterized as follows.

- Nature: Direct
- Duration: Medium to long term
- Geo extent: Local
- Reversibility: Irreversible
- Likelihood: Certain
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

There is a need for appropriate compensation that should be paid to the land owners. The amount of compensation should be fixed according to the existing prices and land use.

The activities involved for this purpose would include:

- The Revenue Departments may determine a fair compensation for this land acquisition.
- Consultation and negotiation with the land owners regarding the compensation,
- Reaching an agreement for the compensation with the land-owners, and making the payment.
- Keeping complete documentary record of the entire process.

In addition to the above, employment and business opportunities should also be offered to the affected people. Furthermore, the community development initiative like provision of utility services, establishment of Vocational Training Centre and up-gradation of basic health facilities in Bhalwal should be supported by the PIE with the Government of Punjab. This will further decrease any social impacts of the project on the area, and in fact enhance the social value of the project.

Residual Impacts

The expectations of some of land owners may not be completely fulfilled even after the payment of a fair compensation. However, it is important to note that none of the land owners has taken their compensation so far, and as such there is a need to sort out this issue at the earliest. Hence, the significance of the residual impact will be high till it is resolved.

6.4.7 Traffic Congestion

Presently, the only access to the industrial estate is provided by the Bhalwal-Bhera Road which originates from the Motorway M2. The Bhalwal Industrial Estate Sargodha will potentially increase the traffic load on this road, thus adversely affecting its condition.

The vehicular traffic during the construction phase of the proposed project is expected to be 3-4 round trips during a day at peak construction period.

The unmitigated impacts associated with the vehicular traffic are provided below:

- Nature: Direct
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Certain
- Consequence: Mild
- Impact significance: Medium

Mitigation Measures

- The project vehicles will avoid the peak vehicular traffic times (evenings, particularly during weekends).
- The contractor's vehicular traffic will be staggered as far as possible, to avoid traffic congestion especially at the entrance of Bhalwal-Bhera road.
- The number of trips will be minimized through astute planning.

Residual Impact

With the implementation of the above mitigation measures, the residual impacts of the project-related vehicular traffic on the existing Bhalwal-Bhera road will be negligible.

6.4.8 Noise and Vibration

Noise and vibration will be generated by the construction machinery and vehicles during construction activities. The houses close to the project site mainly in Chak 12, Chak 13, Chak 11 and Chak 13 Rajgan will be impacted by noise and vibration.

The unmitigated impacts related to the noise and vibrations caused by the project are characterized as follows.

- Nature: Direct
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible

- Likelihood: Certain
- Consequence: Moderate
- Impact significance: High.

Mitigation Measures

- Noise abatement measures should be achieved be well-designed, well operated and well maintained pollution control systems
- Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Noise will be measured at the nearby houses. If found more than 55 dBA, appropriate sound reduction mechanism (such as a noise barrier) will be put in place.
- Construction activities will not be carried out during the night.
- Blasting will not be allowed as part of the proposed construction activities.

Residual Impact

With the implementation of above mitigation measures, the residual noise impact will be low to medium.

6.4.9 Safety Hazards, Public Health and Nuisance

The project being located close to the communities may pose some safety hazards to the local population living mainly near project site i.e. Chak14, Chak13 Chak11 and Chak13 Rajgan. Various project components/activities pose a varying degree of safety hazard to the local population. The construction machinery poses a hazard to the local population, particularly children; and increased vehicular traffic may pose safety hazards along the Bhalwal-Bhera road.

The public health issues related to the project location include: the possibility of contamination local drinking water resources, and dust emissions during the construction phase. The project area encompasses open grassland and isolated crop cultivated region. People living here are enjoying good health as they receive fresh vegetables and fruits. The anticipated health impacts are classified into the following categories:

Dust and Pollen Allergy: One of the main problems people are facing here is of dust and pollen allergy. Smoke exhaust from the brick lanes also leads to the problem of difficult breathing among the labour.

Eye and Respiratory Diseases: Construction workers may be susceptible to eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on site. These effects could possibly be mitigated through routine health screening and training of contractor's employees.

Physical Injures: Injuries could happen primarily by occupational-related accidents, animal bites, etc. Activities such as land clearing, tree felling, earthworks, and construction of facilities present various occupational hazards to the workers on site.

These risks can be mitigated through the provision of appropriate training and emergency response procedures.

Psychological Disorders: Some workers may suffer from depression and anxiety disorders due to working and accommodation conditions, and their relationship with fellow workers. The psychological wellbeing of some members of the communities may be affected due to disturbances created by the project activities. Mitigation measures for workers include the devotion to standards regarding working conditions.

Excessive illumination at the construction site may potentially cause light pollution, creating public nuisance.

The unmitigated impacts related to the safety hazards; public health and nuisance are characterized follows.

- Nature: Direct and indirect
- Duration: Short to medium term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Major
- Impact significance: High.

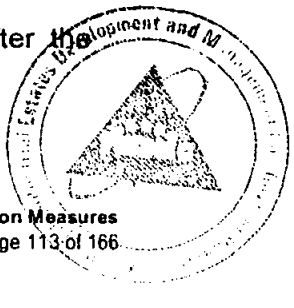
Mitigation Measures

- Protected fencing will be fixed around the construction site. Unauthorized access within the construction area will not be allowed.
- The local community will be educated regarding the safety hazards at the site.
- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Defensive driving practices will be inculcated in the project drivers through trainings, posters and other similar measures.
- Vehicle speeds of 50 km/hr. at the project site will be implemented.
- Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.

Residual Impacts

There will be a moderate level of residual impact of safety hazard associated with the vehicular traffic and construction activities.

The residual public health and nuisance issues will be quite negligible after the effective implementation of the mitigation measures.



6.4.10 Damage to Infrastructure

The construction activities and associated vehicular traffic may damage the existing infrastructures in the area, such as roads and culverts. These unmitigated impacts are characterized as follows.

- Nature: Indirect
- Duration: Medium term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Possibly
- Consequence: Moderate
- Impact significance: Medium.

Mitigation Measures

- The project vehicles will not be overloaded
- Infrastructure damaged by the project activities will be restored to original or better condition.

Residual Impact

- The residual impact on infrastructure will be low after the effective mitigation measures.

6.4.11 Gender Issues

The construction activities and vehicular traffic may cause some hindrance to women mobility in the area.

These unmitigated impacts are characterized as follows.

- Nature: Indirect
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Possibly
- Consequence: Moderate
- Impact significance: Medium.

Mitigation Measures

- Contractor's camp location will be decided in consultation with the PIE staff
- Construction crew will avoid entering the villages and settlements as much as possible.

- Moral code of conduct will be observed by the construction crew.

Residual Impacts

Despite the implementation of the above mitigation measures, there will be a moderate level of residual impact associated with the gender issues.

6.4.12 Sites of Archaeological or Historical Significance

There are no significant reported sites of archeological or historical significance at the land being acquired for the project at Bhalwal. However, in case any artifact of such significance is found during the construction activities, the Archeology Department, Government of Punjab, will be contacted. Whereas there is a local non-significant shrine named as Baba Halim Shah Shrine situated at project site.

6.5 Operational Phase Impacts

The Bhalwal Industrial Estate Sargodha operation activities will interact with different components of the environmental. This interaction may result into the following adverse impacts:

- Damage to flora and fauna
- Soil Contamination
- Surface and Ground Water Contamination
- Traffic congestion
- Safety hazards, public health and nuisance

However, the magnitude of some of the above impacts is likely to be higher as compared to the construction phase impacts.

To ensure harmony of the project with the environmental, the PIE will implement sound environmental management practices to effectively handle the basic environmental issues, including:

- Treatment of effluents from the industries as per NEQS requirement of Pakistan for discharge of effluent into water bodies.
- Hazardous and municipal waste management
- Landscaping and plantation
- Noise and other public nuisance abatement.
- Air quality management

The potential environmental impacts of the Bhalwal Industrial Estate Sargodha during operation phase are discussed below.

6.5.1 Damage to Flora and 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.

The potential impacts include cutting of trees by the estate for fuel wood.

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.

The unmitigated impacts of the estate operation on the biological resources of the area are characterized as follows.

- Nature: Direct and indirect
- Duration: Medium to long term
- Geo extent: Local
- Reversibility: Mostly irreversible (at least in the short term)
- Likelihood: Likely
- Consequence: Severe
- Impact significance: High.

Mitigation Measures

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:

- Cutting of trees and other natural vegetation at individual industrial plots by the entrepreneurs will be minimized as far as possible through industrial environmental awareness booklets to be prepared by the PIE.

Residual Impact

With the help of the mitigation measures listed above, the impact of the estate operation on the biological resources of the project area will be greatly reduced and the residual impacts are expected to be low to medium.

6.5.2 Soil Contamination

The soil may be contaminated as a consequence of inappropriate waste (solid as well as liquid) disposal at the estate or Combined Effluent Treatment Plant is not constructed by the PIE.

Their impacts are characterized as follows.

- Nature: Indirect
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Like
- Consequence: Major
- Impact significance: High.

Mitigation Measures

The mitigation measures recommended under above-mentioned sections apply to the operation phase of the project also. These essentially comprise of the following:

Effluent from industries

- All the wastewater polluting industries must construct Primary Treatment Plants.
- The PIE will transport the effluent from industries by underground pipe network rather than open drains.
- Properly designed Combined Effluent Treatment Plant will be installed in the estate to ensure that the requirement of NEQS of Pakistan is met for discharge of liquid effluent to water bodies.
- The PIE has already reserved a plot for the construction of Combined Effluent Treatment Plant.
- Wherever possible generation of sludge should be minimized and treated. It should be stabilize if toxic material is present.

Solid Waste

All the industries located at Bhalwal Industrial Estate will have primary storage of their waste inside their plot as per PIE Bye-Laws. The estate will design and implement Solid Waste Collection and Transportation System which will be comprised of i.e., recyclable, biodegradable, non-biodegradable and hazardous wastes. The recycling and biodegradable waste will be given to their respective contractors for further processing. The non-biodegradable will be disposed off at the exiting disposal sites at Sargodha and hazardous industrial materials will be disposed off in accordance with their standard disposal protocols.

Residual Impact

The residual impacts after the implementation of the above measures will be low if the PIE construct and operate Combined Effluent Treatment Plant and a Sanitary Landfill for Solid Waste Treatment and Disposal.

6.5.3 Surface and Ground Water Contamination

The nature of impact of the project's operation activities on the surface and ground water quality is expected to be quite similar to those predicated for the construction phase, except that the magnitude is likely to be larger, owing to the presence of industries at the estate.

The unmitigated impacts on the surface and groundwater resources of the area are characterized below.

- Nature: Direct
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Major
- Impact significance: High.

Mitigation Measures

The mitigation measured against soil contamination discussed above for the operation activities will forestall any possible water contamination as well.

Residual Impact

After the effective implementation of the above measures, the residual impacts of the operation of the estate on the water resources of the area will be negligible.

6.5.4 Traffic Congestion

The vehicular traffic associated with the estate operation is expected to be growing with the passage of time as industries starts production

The characterization of the unmitigated impacts associated with the vehicular traffic is provided below.

- Nature: Direct
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Certain
- Consequence: Mild
- Impact significance: Medium.

Mitigation Measures

- The vehicular traffic will be staggered as far as possible, to avoid traffic congestion.

- THE PIE should propose to the Government of Punjab for the dualization of Bhalwal Bhera Road for smooth and safe flow of traffic.

Residual Impact

The nature implementation of the above mitigation measures, the residual impacts of the project-related vehicular traffic on the existing road will be low.

6.5.5 Safety Hazard, Public Health and Nuisance

The nature impacts of the project's operation activities relating to safety hazards, public health and nuisance is expected to be quite similar to those predicated for the construction phase. These unmitigated impacts are characterized below.

- Nature: Direct and indirect
- Duration: Short term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely/possible
- Consequence: Moderate
- Impact significance: High to medium.

Mitigation Measures

The following mitigation measures will forestall any possible impact during the operation phase:

- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Appropriate waste disposal mechanisms will be implemented, as described earlier.
- Appropriate light diffusers and reflectors will be used where required to minimize the public nuisance caused by light pollution.
- Provision of firefighting arrangements at the estate
- Provision of emergency health facilities

Residual Impact

After the effective implementation of the above-mentioned measures, the residual impacts of the estate operation activities relating to safety hazards, public health and nuisance will be negligible.

6.6 Positive Impacts of the project

The operation of the Bhalwal Industrial Estate, Sargodha will accelerate the business activity in the area and will provide employment to locals that will have positive impact on the local economy thereby increasing the quality of life.

In addition the establishment of industrial estate will accelerate the export of citrus from the region which will further increase business in the area.

6.6.1 Social Benefits

BIE will be able to concentrate dedicated infrastructure in a delimited area to reduce the per-business expense of that infrastructure. Such infrastructure includes roadways, railroad sidings, ports, high-power electric supplies, high-end communications cables, large-volume water supplies, and high-volume gas lines.

6.6.2 Employment and Business Opportunities

The operation of the BIE, will accelerate the business activity in the area and will provide employment to locals that will have positive impact on the local economy thereby increasing the quality of life.

6.6.3 Import of Products

This Project will facilitate the production and import of the citrus products and other food goods grown in the Project area to national and international markets.

6.6.4 Other Benefits

- Increase government revenues.
- Reduce increasing ratios of poverty and regional disparities.
- Enhance the volumes of textiles production and exports in the days to come.
- It would increase province's role in national exports.
- Bhalwal is likely to be the first Special Economic Zone of Punjab/Pakistan.

7 Environmental Management Plan

7.1 Introduction

This chapter outlines the implementation mechanism for Environmental Management Plan (EMP) and defines the institutional arrangements required for the implementation of the plan. The EMP provides the implementation mechanism for the mitigation measures identified during the EIA.

7.2 Environmental Management Plan

The environmental management plan (EMP), one of the outcomes of the EIA, identifies key areas requiring attention during the project, in particular, (a) what is to be managed and monitored; (b) when and where; (c) by whom; (d) the expected cost for management; and (e) whom to report and follow up if there is an issue that may raise at any stage of the project. Based on these guiding principles, the EMP so prepared for the effective implementation and management of the mitigation measures and monitoring requirements, satisfies the requirement of the Pakistan's environmental regulations.

7.3 Purpose and Objectives of EMP

The Environmental Management Plan (EMP) will provide a delivery mechanism to address the adverse environmental impacts of Bhalwal Industrial Estate Sargodha Project during its execution and operation, to enhance project benefits and to introduce standards of best practices to be adopted for all phases of the project.

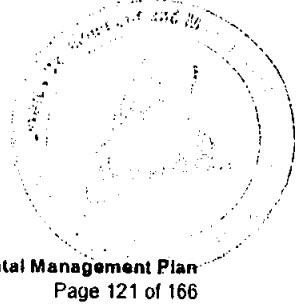
The primary objectives of the EMP are to:

- Facilitate the implementation of the earlier identified mitigation measures.
- Develop a proper monitoring mechanism and identify requisite monitoring parameters to confirm effectiveness of the proposed mitigation measures.
- Define the responsibilities of the project proponent PIE, engineers and contractors, and provide a means of effectively communicating environmental issues among them.

7.4 Structure of the EMP

The EMP consists of the following parts:

- Roles and Responsibilities (Management Approach)
- Impact Mitigation Management Matrix
- Environmental Monitoring Plan
- Change Management Plan
- Communication and documentation
- Training Programme



7.5 Management Approach

7.5.1 Pre-Construction and Construction Phase

Roles and Responsibilities of BIE

The overall responsibility for compliance with the Environmental Management Plan of Bhalwal Industrial Estate Sargodha Project rests with Punjab Industrial Estates Development and Management Company.

Roles and responsibilities of Engineers, Contractors/Sub-contractors

The contractors will carry out field activities as part of their contract agreement. The contractors will be responsible to implement various mitigation actions prescribed in the EIA report. The contractors will also be subject to certain liabilities under the environmental laws of Pakistan, and under their contracts with the PIE. Furthermore, the PIE will implement Environmental Monitoring Plan which has been prepared for the construction phase.

The Project Manager, Bhalwal Industrial Estate Sargodha Project will monitor the contractors and ensure implementation of the EMP and the EIA.

7.5.2 Operation Phase

The magnitude of environmental impacts during the operational phase will be significant therefore; the PIE will have to implement various mitigation actions as described in the EIA during operation phase. Furthermore, keeping in view of magnitude of environmental impact, an Environmental Monitoring Plan has been proposed.

7.6 Organizational Structure and Responsibilities

7.6.1 Primary Responsibilities

- The Director, Punjab Industrial Estates Development and Management Company or his representative will be over all responsible to ensure that EMP is properly implemented throughout the project.
- The Project Manager, Bhalwal Industrial Estate Sargodha Project, PIE will be responsible to supervise/ monitor and ensure the implementation of the EMP and the EIA.
- The PIE should establish an Environmental Protection Cell within the PIE which should look after the environmental issues of all industrial estates and ensure the implementation of remedial measures.
- The engineering contractor(s) will be responsible for the implementation of the EMP and EIA on the ground.

7.6.2 Field Management and Quality Control

Carrying out construction activities in an environmentally sound manner during the construction phase will be the responsibility of the Project Manager, Bhalwal Industrial Estate Sargodha Project. He will be responsible for implementing the IEE and EMP recommendations.

7.6.3 Approvals

The PIE and project contractor will have to obtain all the relevant clearances and necessary environmental approvals required by the Environmental Protection Agency, Punjab Pakistan.

7.6.4 Contractual Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and thus EMP will form part of their contracts with The PIE. The contractor shall be responsible for implementing the mitigation measures and monitoring of various environmental parameters. The PIE shall monitor the contractor's performance with respect to EMP implementation.

7.7 Impact Mitigation and Management Matrix

An Impact Mitigation Management Matrix has been provided at **Table 7.1**. This matrix will be used as a management and monitoring tool for implementation of the mitigation measures required by the EIA. The matrix includes:

- The mitigation measures recommended in the EIA.
- The person/organization directly responsible for adhering to or executing the required 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.

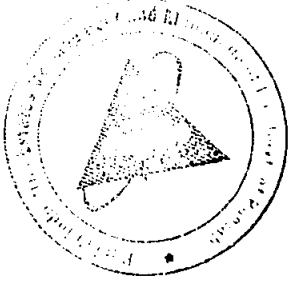


Table 7.1: Impacts Mitigation and Management Matrix for Bhalwal Industrial Estate Sargodha Project

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
Design and Pre-Construction Stage					
ALIGNMENT and SHOULDER WIDTH OPTIONS					
SAFETY					
Design of main and approach roads to standards with special reference to local dangers	Uneasy traffic flow, congestions.	Improve road geometry Provide markings for centre and edge lines and stop lines at junctions and bus stops All signs, markings and bridge plates must be refectories. Improve junction layouts In built-up areas, consider widening on one side of carriageway only, and explore possibility to incorporate service lane.	At the Project site	Engineering Consultant	PIE
STRUCTURES					
Cross-drainage and accessory structures	Flash flows may damage structures or cause drainage problems in urban areas	Adequately design cross-sections of drainage structures based on hydraulic studies, taking regional/local lessons learned into consideration All structures will be constructed with reasonable safety against seismic acceleration	At the Project site	Engineering Consultant	PIE

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures	Implementation Supervision
	Seismic activities may damage structures	Adequately design all structures based on material/ construction studies that take into account activities up to the seismic scales indicated in the seismic maps.	At the Project site	Engineering Consultant	PIE
ROADSIDE VEGETATION and PLANTATION					
Loss of vegetation	Loss of plants in an area with biodiversity	Incorporate technical design to minimize removal of plantation. Apply flexibility in decision as which side to be widened, or in reducing locally the shoulder width. Plan for compensatory planting program, i.e. plants of similar floral function, at least 1 m high. Discourage the introduction of exotic species or species with known environmental setbacks (e.g. *Eucalyptus spp*).	All along the Proect site	Engineering Consultant	PIE
WILDLIFE and ADJACENT ECOLOGICAL SENSITIVE AREAS					
Disturbance to ecologically sensitive areas adjacent to or the near the estate	Accidents with wildlife	Incorporate cautionary signage to raise attention of people for wildlife protection in area at risk.	Disturbance to ecological sensitive areas adjacent or the near the estate	Engineering Consultant	PIE

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
MAINTAINING AIR QUALITY and NOISE LEVELS					
Increase of traffic intensity	Increase of air and noise pollution and associated health risks for roadside residents	Incorporate technical design features that enable continual traffic flux and avoid congestions (e.g. signboards, speed limits, speed bumpers, bays); Include design measures to prevent blockage of bus stands and carriageways by street vendors, particularly near villages. Consider noise barriers in sensitive areas	At the Project site	Engineering Consultant	PIE
Creation and burning of wastes at or near camp site	Air pollution associated with burning garbage	Disallow setting for worker camp , including waste dump sites, in distances closer than 5 km to any inhabited areas; Incorporate technical design features for refuse collection containers at sites that would minimize burning impacts; Devise plan for safe handling, storage and disposal of harmful materials.	At camp site	Engineering Consultant	PIE
SOIL and BORROW MATERIAL					
Excavation of earth from borrow areas	Change of soil characteristics; loss of topsoil; impact on agriculture	Agricultural areas will be avoided for burrowing of materials, confining to already defined barrow pits. Contractor needs to obtain approval from PPP Unit for excavation and for plan of rehabilitating the site after excavation.	Where applicable	Engineering Consultant	PIE

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures	Implementation Supervision
Acquisition of conglomerate and rocky sub-base material	Degradation of existing river beds, alteration of surface and groundwater regime, land-use conflicts	Excavation in farmlands, Riverbed and embankment vicinity will be prohibited.	Where applicable	Engineering Consultant	PIE
EXISTING PUBLIC UTILITIES					
Public utilities	Public utilities to be affected may create disruption of public services and economics	Timely notifications and consultations with respective agencies; All public utilities (e.g. water pipes, power/ telephone and Sui-gas lines) are likely to be impacted by the carriageway widening need be re-located well ahead work commencement.	Where applicable	Engineering Consultant	PIE
Construction STAGE					
CAMP SITE					
Site clearing and preparation, and re-installation work after contract completion	Loss of vegetation and assets on the selected land, and dissatisfaction on rehabilitation measures after completion	All efforts during the design phase should be made to minimize the removal of existing plantation at camp site. Contractor will provide plan for removal & rehabilitation of site upon completion Photographical and botanical inventory of vegetation before clearing the site Compensatory plantation to be scheduled when construction work near to end; for each tree removed new shall be planted	Through the construction site	Contractor	Engineering Consultant
Sanitation &waste disposal	Health risks to work force and	The Contractor will provide a proper waste management plan.	At waste collection and latrine sites of	Contractor	Independent Monitoring Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
facilities at camp	public if not properly managed	The sewerage system for the camp will be properly designed (pit latrines) and built so that no water pollution takes place.	camp		
CONSTRUCTION WORKS					
Work safety and hygienic conditions	Health risks if work conditions provide unsafe and/or unfavorable work conditions	Obligatory insurance against accidents to work labourers Providing basic medical training to specified work staff, and basic medical service and supplies to workers Layout plan for camp site, to be approved by the IEC indicating safety measures taken by the contractor, e.g. fire fighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers; Protection devices (ear muffs) will be provided to the workers in the vicinity of high noise generating machines. Provision of adequate sanitation, washing, cooking and dormitory facilities, including light up to the satisfaction, approved by PPP Unit. Proper maintenance of facilities for workers will be monitored by the Independent Monitoring Consultant Regarding pest control measures in the camp.	Valid for entire construction area Throughout operation of work camp	Contractor	Engineering Consultant

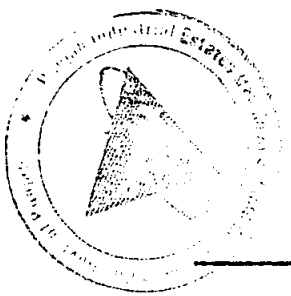
Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
Camp site security	Security hazards and related conflicts	Proper storage and fencing/locking of storage rooms containing hazardous material Employment of guard for storage rooms. Provision of adequate security against sabotage and petrol theft.	At Construction camp	Contractor	Engineering Consultant
Wages and Work Regulations	Inequities in wages, underpayment and gender-biased wages	The Contractor will agree to pre-defined minimum wages in Pakistan Women must receive wages equal to the wage paid to men for equal works Wages shall be made public to all workers Child labour will be strictly ruled out; Contractor has to respect local festivals and religious customs that would temporarily interfere with work performance; Sub-Contractors have to adhere to the same wage principles	Construction sites	Contractor	Engineering Consultant
Creation of construction waste material	Contamination of soil from construction wastes and quarry materials	All spoils will be disposed off as desired and the site will be restored back to its original conditions before handing over. Non-bituminous wastes from construction activities will be dumped in sites approved by the PPP Unit in line with the legal prescriptions for dumpsites, and covered with a layer of the conserved topsoil. Bituminous wastes will first be recycled if it is not possible then be disposed off in an identified dumping site.	All construction sites and entire Project area	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
Movement of vehicles in the construction site and along the haulage routes	Soil compaction and alteration of percolation and vegetation pattern; Damage to properties and utilities	Construction vehicles, machinery and equipment will move, or stationed in the designated ROW, to avoid unnecessary compaction of soil. Damages will be instantly repaired and/or compensated at Contractor's obligation Water and soil quality will be monitored as envisaged in the Environmental Monitoring Plan.	Throughout the Project site	Contractor	Engineering Consultant
Movement, maintenance and fuelling of construction vehicles	Contamination of soil and groundwater from fuel and lubricants	Slopes of embankment leading to water bodies will be modified and screened so that contaminants do not enter the water body Construction vehicles and equipment will be properly maintained and refuelled in such way that oil/diesel spillage does not contaminate the soil. Fuel storage and refuelling sites will be kept away from drainage channels. Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. Unusable debris shall be dumped in nearest landfill sites. Waste oil and oil soaked cotton/ cloth shall be sold off to authorized vendors Water quality will be monitored as envisaged in the Environmental Monitoring Plan.	Throughout the Project alignment.	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
Embankment works: Excavation of earth, cutting operations, embanking, clearing of vegetations	Soil Erosion, Loss of vegetation and habitat	In areas with strong sheet flow, high embankments will be provided with chutes and drains to minimize soil erosion. Stone pitching and retaining walls will be made at high embankments in critical areas (> 40% gradient) As applicable and needed, plantation of grasses and shrubs will be carried out for slope protection. Soil erosion-checking measures such as the formation of sediment basins, slope drains, etc, will be carried out. Soil erosion along the road shall be visually checked as given in the environmental monitoring plan.	Where applicable	Contractor	Engineering Consultant
Borrow pit land lease agreement	Land disputes, Soil erosion, loss of potential crop land, loss of vegetation and landscape degradation	The Contractor must obtain any necessary permits for borrow pits from the competent authorities, including Provincial Highway Department, Government of Pujab.	Where applicable	Contractor	Engineering Consultant
Borrow pit excavation activities	Soil Erosion, damage to road embankment and public health risks	No excavations are allowed within 100 m to ROW In borrow pits the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4. Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands. In case burrowed pits fill with water, measures shall be taken to prevent the creation of	All borrow sites in entire Project area	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
		mosquito-breeding sites.			
Provisions for rehabilitation of borrow pit	Soil Erosion, derelict land-uses, conflicts, visual sores in the landscape, public health risks due to development of mosquito-breeding pits	Abandoning borrow areas without proper rehabilitation measures will be disallowed. The Contractor's agreement with the landowner must determine the options and appropriate measures for rehabilitation of the borrow pit as approved by the Independent Consultant, such as reshaping the borrow site into a desired land-use plot (e.g. irrigation field, fishpond), re-plantation aiming at double amount of trees removed from the site.	All borrow sites in entire Project area	Contractor	Engineering Consultant
WATER					
Use of water for construction and consumption	Conflict with local water demand	The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. For construction purposes, water shall be drawn from surface water bodies on priority and as available.	Throughout the Project Area	Contractor	Engineering Consultant
Earth- and stonework and other construction activities affecting water resources	Contamination of water due to construction waste	Construction work close to the streams or other water bodies will be avoided, especially during monsoon period. All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity. Wastes must be collected, stored and taken to an approved disposal site.	Throughout the Project Area	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
AIR POLLUTION CONTROL					
Vehicular movement and running of machineries	Emission from construction vehicles and machinery, causing public health risks, nuisance and other impacts on the bio-physical environment	Diversion roads in built-up areas will be established and scheduled to minimize traffic congestion Diversion roads will be black-topped to prevent excessive dust development All temporary service and access roads will be regularly water-sprayed to minimize the dust generation: Schedules will be adjusted to actual needs, determined by the PPP Unit or Independent Monitoring Consultant. All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the NEQS. Air quality parameters will be monitored at determined sites and schedule determined by the PPP Unit or then by Consultant.	Include all diversions in populated areas of the three districts	Contractor	Engineering Consultant
Running of asphalt mix plants, crushers, etc.,	Dust generation from construction machineries causing health risks to operating workers, impact on bio-physical environment	Ensure precautions to reduce the level of dust emissions from, hot mix plants, crushers and batching plants will be taken up, e.g. providing them, as applicable, with protection canvasses and dust extraction units. Mixing equipment will be well sealed and equipped as per existing standards. Water will be sprayed on the lime/ cement and earth mixing sites. Work safety measures like dust masks shall be provided by the contractor to ensure no health risks for operators.	At sites of hot mix plant	Contractor	Engineering Consultant



Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
NOISE CONTROL					
Running of construction machinery	Noise from vehicles, asphalt plants and equipment	The plant and equipment used for construction will strictly conform to noise standards specified in the NEQS. Vehicles and equipment used will be fitted as applicable, with silencers and properly maintained. In urban settlements, construction activities will be restricted to be carried out between 6 a.m and 8 p.m. In accordance with the Environmental Monitoring Plan, noise measurements will be carried out at locations and schedule specified to ensure the effectiveness of mitigation measures.	During construction	Contractor	Engineering Consultant
FAUNA and FLORA					
Access to sensitive areas and fragile ecosystem	Wildlife poaching, collection of wild plants, disturbance of ecosystem.	The use of fire wood for cooking and execution of works will be prohibited No open fires will be allowed Restoration of vegetated areas damaged Strict instructions from the Contractor to work staff (particularly the cooks) with respect to poaching local wildlife Patrolling and enforcement. A record should be maintaned for tree cuttings. Cutting of tress and other natural vegetation will be minized as far as possible through astute planning including diversion of road at sensitive location.	Near sensitive areas	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
ROAD SAFETY and COMMUNITY LIFE					
Vehicular movement at construction sites and access/ service roads	Accident risks, particularly inflicting local communities who are not familiar with presence of heavy equipment	Timely public notification on planned construction work. Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity & social links Seeking cooperation with local education facilities (school teachers) for road safety campaigns Provision of proper safety signage, particularly at urban areas and at sensitive/ accident-prone areas. Setting up speed limits in close consultation with the local stakeholders Ensure proper lighting at auxiliary facilities such as bus stands, taxi stands, passengers waiting sheds etc. If identified, consider guard rails at accident-prone stretches and sensitive locations (schools).	Throughout Project Road, particularly near the settlements and sensitive locations	Contractor	Engineering Consultant
SOCIAL BALANCE and PUBLIC RELATIONS					
Cultural differences between contractor and locals	Local residents may resist Contractor attitudes; Cultural clashes particularly when international	Timely and full public consultation and announcement of mobilizing equipment Establishment of formal links with affected communities, Plan for social grievance redress mechanisms including the Nazim and community leaders.	Project Area	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
	Contractor is engaged	Seek assistance from and cooperation with local NGOs			
Conflicts arising due to the mix of local & migratory job seekers	Social disturbance because of dissatisfaction with employing outsiders	Aim at obliging the Contractor to employ an agreed ratio (>75%) local community (unskilled) labour for construction works; An agreed minimum unskilled labour employment rate for women, at equal pay like men, will be negotiated at early stage.	Project Site	Contractor	Engineering Consultant
ARCHAEOLOGICAL SITES					
Encountering archaeological sites during earth works	Impacts of historically important sites and damage to fossils, arte-facts, tombs, structure etc. as defined in Antiquity Act, 1975	In case of detecting any archaeological artefact, structure, tomb etc., and the Contractor needs immediately halt all works at the find site and brief within shortest time possible the Archaeological Department in Sargodha. In the event of such finding, the Contractor has the duty to secure the site against any intrusion until the archaeological expert will decide on further action.	Throughout/ entire Project area, including borrow sites	Contractor	Engineering Consultant
OPERATIONAL STAGE					
WATER and SOILS					
Vehicular movement and industrial operations	Contamination from operation and spills etc	Wastewater will be treated prior to entering in Nabi Shah lake	Throughout the Project Area	Contractor	Engineering Consultant
AMBIENT AIR QUALITY					
Vehicular movement and industrial	Emission from industries causing public health risks,	Plantations as applicable and feasible under harsh climatic conditions; plants should be selected in accordance to their ability to	Adjoining villages and at sensitive spots along the road	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
operations	nuisance and other impacts on the bio-physical environment	absorb emissions Regular road maintenance to ensure good surface condition Speed limits in areas sensitive Monitoring air quality at defined schedule Regular vehicle check to control/ensure compliance with NEQS Enforcement and penalties against traffic rules violators			
NOISE LEVEL and VIBRATIONS					
Vehicular movement and industrial operations	noise pollution and vibrations from industries	Noise measurements will be carried out at locations and schedule specified by the Provincial Highway Department to ensure the effectiveness of mitigation measures, e.g. speed limits and noise control plantations at sensitive spots. According to monitoring results, additional sound barriers in form of trees and hedges will be discussed with the affected public and planted if agreed. Signs for sensitive zones (health centers / educational institutions etc.) will be headed to prohibit the use of pressure horns. Enforcement and penalties against rules violators.	As applicable at Sensitive spots along the road	Contractor	Engineering Consultant
FAUNA and FLORA					
Vehicular movement	Accidents with wildlife	Setting up speed limits. Provision of proper safety signage.	Throughout the Project site	Contractor	Engineering Consultant

Activities and Actions	Environmental Issue/ Component	Proposed Mitigation Measures	Approximate Location	Institutional Responsibilities for Implementing Mitigation Measures Implementation Supervision	
		Setting up speed limits Proper lighting arrangements at petrol stations, bus truck stops Display of signboards alerting drivers' attention on wildlife and environmental issues related to safe driving and wildlife encounters. Special education signboards at times when migratory birds tend to approach the highway; inform school masters			
Plantation	Maintenance of Flora	Monitoring of survival of trees at the rate of 75 % should be done in the first year of the operational phase and suitable mitigation measures should be taken to protect the trees Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics	Throughout Project area	Contractor	Engineering Consultant
ROAD SAFETY					
Vehicular movement	Accidents involving hazardous materials	In case of spillage, the report to relevant departments will be made. Efforts will be made to clean the spills of oil, toxic chemicals etc. as early as possible.	At any location where accident occurs	Contractor	Engineering Consultant
Vehicular movement	General road safety issues	Traffic management plan will be developed, especially along congested locations Traffic control measures including speed limits will be enforced	Throughout Project area	Contractor	Engineering Consultant

7.8 Environmental Monitoring Plan

Environmental Monitoring is normally undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures. In order to respond to unanticipated environmental concerns at an early stage and to determine the accuracy of impact, predictions are also required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements.

The cost estimates for Environmental Monitoring of the Project during construction phase by an Independent Environmental Consultant is provided in **Table 7.4**.

Table 7.2: Cost Estimates for Environmental Monitoring of the Project

Description	Frequency	Unit Cost in Rs	Amount in Rs
Surface water and Ground Water parameter analysis	At the start of construction activities, Quarterly and at the end of the Project	18,000	252, 000
Ambient air quality and Noise monitoring		40,000	280,000
Fee of Independent Engineering Consultant		125,000	1,050,000
		Total	**1,582,000**

An Environmental Monitoring Plan during construction phase is provided in **Table 7.3** and an Environmental Monitoring Plan during operational phase is provided in **Table 7.4.**

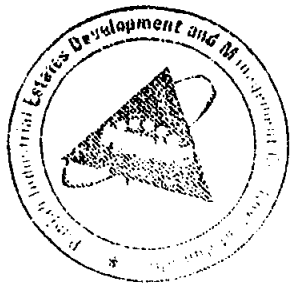


Table 7.3: Environmental Monitoring Plan during construction phase for Bhalwal Industrial Estate Sargodha Project

Environmental Component	Parameters	Locations	Frequency	Standards	Implementation	Supervision
Air Quality	PM10, SOx, NOx, CO, dust, smoke	At the center of the estate	PM10, for continuous 8 hours, on quarterly basis	WHO/USEPA guidelines, NEQS	Independent Monitoring Consultant	PIE
Water Quality	pH, BOD, COD, TDS, TSS, DO, NHx, coliforms hardness, nitrate, hydrocarbon, Pb	Nearest surafce water At nearest bore hole near Contractor's camp	Quarterly basis	WHO and NEQS	Independent Monitoring Consultant	PIE
Noise Levels	dBA	At the site where air quality analysis are carried out.	Twice in 8 hours at selected sites at 1 m, 7.5 m, 15 m, and 50 m from right-of way, Quarterly basis	EPA Ambient Noise standards	Independent Monitoring Consultant	PIE
Erosion	Visual inspection of erosion prevention measures and occurrence of erosion	Side slopes of the embankments and material storage sites	At the end of filling activity		Independent Monitoring Consultant	PIE
Solid waste from Contractor's camp	Visual checks to assess the situation.	At contractor's camp site	Once in a month	Monitoring that solid waste disposal off property.	Independent Monitoring Consultant	PIE
Top soil conservation	Depth of top Soil	At all Project sites.	Beginning of earth filling works	USEPA guidelines	Independent Monitoring Consultant	PIE

Environmental Component	Parameters	Locations	Frequency	Standards	Implementation	Supervision
Hydrocarbon and chemical storage	Visual Inspection of storage facilities	Construction camps	Monthly	Monitoring that Chemicals should stored carefully	Independent Monitoring Consultant	PIE
Traffic Safety	Visual inspection to see whether proper traffic signs are placed and flag man for traffic management are placed	Roads	Monthly		Independent Monitoring Consultant	PIE
Health Safety of contractor staff	Visual checks to assess the situation.	Workers of the contractor	Once a month	Monitoring of the health and safety of workers	Independent Monitoring Consultant	PIE
Flora &Fauna	Visual checks to assess the situation.	All along the Right of Way of the Project	Once a month		Independent Monitoring Consultant	PIE
Plantation Plan implementation	Visual inspection of plant species survival rate and status of maintenance	(1) At sites where plantation was carried out (2) At site within right of-way	(1) One month after plantation (2) One year after plantation 1 month, 3 months 6 months, and 12 months after Planting	75 % survival rate	Independent Monitoring Consultant	PIE

Table 7.4: Environmental Monitoring Plan during operational phase for Bhalwal Industrial Estate Sargodha Project

Environmental Component	Project Stage	Parameters	Locations	Frequency	Standards	Implementation	Supervision
Plantation Plan Implementation	Operation	Visual inspection of plant species survival rate and status of maintenance	At sites where plantation was carried out	(1) 2.5 years after plantation	75% survival rate	BIE	PIE
Safety and Traffic Rules Compliance	Operation	(1) Faulty, overloaded and speeding vehicles (2)Inspection of signage	All along Bhalwal Industrial Estate Sargodha Project with spot check at accident-prone black spots	Quarterly basis,for 3 years	To be determined	BIE	PIE

7.8 Change Management Plan

The EIA for Bhalwal Industrial Estate Sargodha Project recognizes that changes in the EMP may be required and therefore provides a Change Management Plan to manage such changes. Overall responsibility for the preparation of change management statements will lie with the Project Manager, PIE.

7.9 Post Project Environmental Monitoring

The Project Manager, PIE or his representative shall prepare a brief Post Project Environmental Monitoring Report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to, any damages to the environment and the mitigation or compensation provided, and monitoring information.

7.10 Communication and documentation

Meetings

Two kinds of environmental meetings will take place during the Project:

- Kick-off meeting
- Monthly meetings

The purpose of the kick-off meeting will be to present the EMP to Project Staff and discuss its implementation.

A monthly meeting will be held during construction operations at the camp. The purpose of this meeting will be to discuss the conduct of the operation and environmental issues, and their management. The proceedings of the meeting will be recorded in the form of a monthly environmental report.

Reports

Environmental Monitoring Reports will be prepared on quarterly basis during construction phase of the Project.

7.11 Training Programme

Environmental training will form part of the environmental management system. The training will be directed towards raising the awareness of all personnel on key environmental issues related to the project activities and the importance of adopting mitigation measures to minimize these impacts.

7.12 Objectives

The key objective of training programme is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The training of the

staff will help in communicating environmental restrictions specified in the EIA and EMP.

7.13 Roles and Responsibilities

The contractors will be primarily responsible for providing environmental training to all project personnel on potential environmental issues of the project. The contractors will be responsible to arrange trainings and ensure the presence of the relevant staff.

7.14 Training Programme

The environmental awareness, EIA and EMP training will be carried out for key staff involved during different phases of the project.

7.15 Training Log

The project contractors will be required to maintain a training log that must include the following:

- Topic discussed.
- Date, Time and location.
- Trainer.
- Participants / Attendees.

7.16 Training Needs Assessment

In addition to the training specified in the training log, special/additional trainings will be provided during the project activity. The criteria to assess the need of such special training will be based on the following:

- When a specified percentage of staff is newly inducted in the project.
- When any non-compliance is repeatedly reported, refresher training will be organized addressing the particular issue.
- When any incident/accident of minor or major nature occurs
- Arrival of new contractor/sub-contractor
- Start of any new process/activity

7.17 Plantation Plan

At this stage it is not known that how much area would be available for planting trees thus the following planting plan and estimates are made for one acre land basis.

A. Soil working: No tree can survive in an area which remains waterlogged for 7 to 8 months and where salinity is high. Thus a proper drainage system is crucial for

planting trees. To overcome the problem of salinity, big pits of 1x I should be dug and filled with soil that contains compost or high organic matter.

B. Selection of Species: To create a desirable biological environment, 3 planting strips would be advisable. Keeping in mind the salinity, flooding and the ornamental aspect, the following species are recommended

i. **Ist Strip**: Tall trees along the boundary: depending on the availability of land for planting one or two row of Eucalyptus, Shesham, Peepal, Sirin and Mulberry can be established.

ii. **2nd Strip**: In the next row medium sized tress with spreading crowns like, Neem, Bakain, Jaman, and kacnar, alternated with of tall boles like: bamboo and dates or small trees of high ornamental value, like Tecoma, Pilken, Kachnar, Gravellia and Bottle brush, etc.

iii. **Third Strip**: Around building small sized ornamental trees/ shrub (like bottle brush Chinese shoe flower, lagustrum, kanir, Sukh chane, and weeping Ashok, etc) and fruit plants like Dates, Anar (pome granate), Citrus, Chiko, and Amroot (guava).

C. Spacing: For Ist and 2nd strip 3 m x 3 m spacing are recommended due to big size of trees, thus these strips will occupy 75% land (6 knal out of an acre). Whereas spacing for small trees and shrubs would be 2m x 3m (3 m from row to row and 2 m for plant to plant)

D. Planting methods: As stated earlier, a proper drainage system is necessary prior to planting trees. Having installed the drainage system, small mounds of earth should be created in the low lying spots / depressions. In the rest of the land big sized planting pits should be dug.

E. **Planting time:** Planting should be carried out in the fall or early spring.

F. No of saplings for 1 acre land

i. Ist and 2nd strip will occupy 75% land (6 kanals) = 3035 sq.m = 337 saplings
ii. Strip 3 will occupy 25% land (2 kanals) = 1012 sq.m = 169 saplings
Total = 506

Table 7.5: Cost Estimates for Plantation (1 acre land)

Activity	Estimated Cost Plan	
	Per Sapling/ Plant	Total
Digging of pits, replacing saline soil and planting saplings	50 per sapling 506x 50	Rs 25,300
Cost of 337 big sized tree saplings	@Rs 10 per plant	Rs 3, 370
Cost of ornamental 85 tree saplings	@Rs 30 per plant 85 x 30	Rs 3, 370
Cost of 85 fruit sapling	@Rs 100 per plant = 85x100	Rs 8,500
Transportation and cost of maintenance of saplings (lump sum)		Rs 5,000
Tools and Implements (lump sum)		Rs 2,000
Wages for 1 guard/ gardener	@Rs 90000 per month for 1 year	Rs 108,000
Total cost of plantation on 1 acre land for the Ist year		**Rs 154,720**

7.18 Disaster Management Plan

A disaster is a natural or man-made (or technological) hazard resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the environment. A disaster can be defined as any tragic event stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions. It is a phenomenon that can cause damage to life, property and destroy the economic, social and cultural life of people.

7.18.1 Aim and purpose

The Plan is a document describing the Disaster Risk Management Plan and approach to disaster operations in support of the guiding principles and objects of the Act.

All events, whether natural or caused by human acts or omissions, should be managed in accordance with the Plan. The Plan is supported by supplementary hazard specific plans, functional plans and disaster management guidelines.

7.18.2 Legislative requirements

The Act forms the legislative basis for disaster management activities across all levels of government in BIE in accordance with the Provincial Disaster Management Commissions and Provincial Disaster Management Authorities established in all provinces in accordance with the National Disaster Management Ordinance 2006.

National Disaster Management Authority (NDMA) has developed the guidelines on the planning process and outcome.

7.18.3 BIE Flood Disaster Plan

Pakistan is no stranger to floods or havocs they wreck, thanks to its geographical location. It falls in the arid zone with irregular rain pattern. The total area of Punjab Province is 51 million acres of which 7.7 million acres fall in the active flood zone. As

per 1998 Census, of the total population 14.5 million falling in the active flood zone. It has a tremendous water source in the shape of Indus River System which drains bulk of its fertile land.

BIE is located in lower Jhelum Canal area. The Jhelum River after flowing though Wular lake and collecting water from the Neelum and Kunhar rivers enters Punjab through Mangla Dam from where Upper Jhelum Canal originates to feed the Chenab River upstream Khanki Barrage. From Rasul Barrage on the Jhelum River, Rasul –Qadirabad Link and Lower Jhelum Canal are taken out. The JR then opens into the Chenab River at Trimu H/W, from where Trimu-Sidhnai Link, Haveli and Rangpur Canals are taken out.

This area falls under less and intermittent flood area but if flood comes it can affect the lower Jehlum canal area.

Preventive Action

Once the likelihood of a disaster is suspected, action has to be initiated to prevent a failure. Engineers responsible for preventive action should identify sources of repair of equipment, materials, labour and expertise for use during emergency.

Reporting Procedures

The level at which a situation will be termed a disaster shall be specified. This shall include the stage at which the surveillance requirements should be increased both in frequency and details. There is a need to notify the following information:

- Exit points for the public,
- Safety areas in the
- Nearest medical facilities.

Communication System

An efficient communication system is absolutely essential for the success of any disaster management plan. This has to be worked out in consultation with the BIE. More often, the entire communication system gets disrupted when a disaster occurs. The damage areas need to be clearly identified and provided with temporary and full proof communication system.

Emergency Action Committee

To ensure coordinates action, an Emergency Action Committee will be constituted. Emergency Action Committee will prepare the evacuation plan and procedures for implementation based on individual industries needs and facilities available. The plan should include:

- Demarcation of the areas to be evacuated with priorities,
- Safe area and shelters,
- Functions and responsibilities of various members, and
- Setting up of joint control action.

All personnel involved in the Emergency Action Plan should be thoroughly familiar with all the elements of the project site and their responsibilities. The staff at the site should be trained for problem detection, evaluation and emergency remedial measures. Individual responsibility to handle the segments in emergency plan must be allotted.

Success of an emergency plan depends on public participation, their response to warning notifications and timely action. Public has to be educated on the hazards and key role in disaster mitigation by helping in the rescue operations. It is essential to communicate by whom and how a declared emergency will be terminated. There should be proper notification to the public on de-alert signals regarding termination of the emergency. The notification should be clear so that the evacuees know precisely what to do when re-entering or approaching the affected areas.

Here are the steps some of which can be taken to avoid massive damage in any disaster especially flood.

Pre-Flood Arrangements

I. *Coordination; collaboration and consultation:* The BIE identifies roles of officers that lead the activities and decisions at the State, district and local level.

II. Across all levels of the BIE, effective management of any disaster relies on strong coordination arrangements; consultative decision making, collaboration and shared responsibility achieved through supporting relationships, trust and teamwork between individuals, agencies and the community.

III. Evacuation of the marooned people to already selected safer places is planned. Relief camps should set up and roads are checked for pliability to ensure the supply of relief goods when needed. Rehearsals are made without creating false alarm. Everything is double checked and double ensured.

IV. The joint teams of Irrigation Department, Pakistan Army and District Governments carry out the inspection of protection embankments, head works, barrages and breaching sections and submit their reports to the Relief Department.

V. The relief equipment including boats, OBMs, life jackets, tents, blankets, and de-watering sets etc., owned by the Relief Department, should place at the disposal of the Army troops.

The Livestock Department according to the scheduled program completes its pre-flood vaccination in second week of May and they are under the obligation to keep ample dosages of these vaccines for use in case of any emergency and are also directed to keep sufficient quantity of fodder and animal feed as reserve stock.

An emergency Centre of Provincial Health Department should set up in the BIE main office

Food Department maintains sufficient stock of wheat at safer places near the flood prone areas.

All the concerned departments are mobilized to prepare a holistic all-encompassing Flood Disaster Management Plan to tackle any contingency arising out of floods. Nothing is left to chance or taken for granted. Every measure to be taken in case of any eventuality is well considered and well-rehearsed.

During-Flood Arrangements

I. During floods many people get stranded and marooned in inundated areas and may have to be safely and immediately evacuated. The District Governments evacuate the flood affected to the pre-arranged safer areas with the help of Army.

II. After evacuation, the flood victims are shifted to Relief Camps where they get food, medicines and temporary shelter.

III. The Mobile Teams constituted by the Health and the Livestock Departments should come into operation immediately for the purposes of vaccination, inoculation, treatment and cure. The affectees should provide with the chlorine tablets to ensure the provision of safe drinking water. Cholera vaccination, anti-venom serum and other medical help are ensured. ORS is supplied regularly, and emergency beds are arranged in the hospitals. The cattle are also vaccinated.

IV. Tents, blankets and de-watering sets should provide immediately. After temporarily ensconcing the affectees in the camps, the rehabilitation work including repair of roads and irrigation channels, and restoration of electricity, telecommunication and gas etc is started immediately so as to repatriate them to their home and hearth.

Post-Flood Arrangements

When the flood waters recede and the danger is sub-sided, the most difficult of all the flood-disaster management stages begins.

All the concerned departments coordinate for the restoration of services and the rehabilitation of the flood affectees. The roads and water channels should be opened and repaired on priority basis, because these are the life lines of the rural population. The Irrigation Department should get busy in replenishing the affected embankments and irrigation infrastructure.

The Relief Department oversees the working of the area administration in implementation of relief and rehabilitation schemes and the social Welfare Department coordinates the efforts of NGOs for re-settlement and rehabilitation of the affected people.

The Post-Flood Disaster Management is the most sensitive and arduous task and has to be implemented with patience and indulgence. This stage completes the Flood Disaster Management Plan.

Emergency Measures

The emergency measures are adopted to avoid any failure in the system such as lights, fire, means of escape, ventilation shafts etc. The aim of Emergency Action Plan is to identify areas, population and structures likely to be affected due to a catastrophic event of accident. The action plan should also include preventive action, notification, warning procedures and co-ordination among various relief authorities. These are discussed in following sections.

Emergency Lighting

The emergency lights operated on battery power should be provided at appropriate locations. The battery system should supply power to at least 25% of the lights at those locations for a period of 2 hours. Both the transformers need to be kept energized and should feed independently alternate rows of lights so that in case of failure of one transformer, there will not be complete darkness.

Prevention and Safety Measures

Fire prevention measures will be designed and implemented to minimize the risk of outbreak of fire by appropriate choice, location and installation of various materials and equipment. The potential sources of fire can be reduced by:

Fire Prevention

- Use of non-combustible or smoke retardant materials where possible,
- Provision of layout which permits ease of maintenance for equipment and its cleaning,
- Provision of special storage spaces for combustible materials such as paint and oil,
- Prohibition of smoking in fire prone areas,
- Provision of cigarette and litter bins, and
- Good housekeeping

Fire Alarm and Detection System

A complete fire detection system with equipment complying with the requirements of Fire Fighting Department of the BIE shall be provided throughout the project site and ancillary buildings to give visual and audible indication of alarm conditions actuated by the operation of break glass contact or fire sensors e.g. detector heads, linear heat detecting cables etc. The system shall be operated from 24 V DC Power sources.

Manually operated call points shall be provided at every hydrant and nose reel points, station head wall, tail wall and other locations. Alarm bells shall be installed in each plant room complex at both platform and concourse level and shall be clearly audible at all points in the room/area.

Beam detector or heat detector shall be installed at roof level, ceiling and floor cavity, whilst linear detecting cables shall be installed in under platform cable ducts and cable shafts.

Fire Control Measures

Control of the spread of fire and smoke will be achieved by containment of fire risk areas, planning for smoke extraction, and arrangement for smoke containment.

Visual and audible indication of alarm conditions actuated by the operation of break glass contact or fire sensors e.g. detector heads, linear heat detecting cables etc. The system shall be operated from 24 V DC Power sources.

Manually operated call points shall be provided at every hydrant and nose reel points, station head wall, tail wall and other locations. Alarm bells shall be installed in each plant room complex at both platform and concourse level and shall be clearly audible at all points in the room/area.

Beam detector or heat detector shall be installed at roof level, ceiling and floor cavity, whilst linear detecting cables shall be installed in under platform cable ducts and cable shafts.

Smoke probe units shall be installed in rooms/compartments. When an alarm point is operated, the fire pump shall start to operate automatically. A station fire control and indicating panel shall be provided an installed in the station controllers room, for the control, indication and monitoring of the whole detection and firefighting systems.

7.19 General Recommendations

Keeping in view the landscape of the Industrial Estate, it is recommended that a water pond should be created at one corner of the lowest end of the area and a strip of bushes and shrubs be established around the pond. The pond will create a habitat and attract migratory birds. Moreover, the pond will drain out an ample amount of water from the plantation and building subjected to flooding. The water can also be filtered/ treated for different uses.

8 Conclusions and Recommendations

8.1 Introduction

This Chapter presents the assessment of the possible environmental impacts of Bhalwal Industrial Estate Sargodha Project. The study presents the purpose of the EIA, the description of the site, the impacts of the project during and after implementation, the mitigation measures and residual impacts.

The EIA also includes the justification and detailed description of the project, with an evaluation of the potential impacts and effects on the environment including economic and social consequences. This Chapter describes the conclusion and recommendation of the EIA study of the project.

8.2 Conclusions

8.3 The major conclusions of the EIA are:

- The Bhalwal Industrial Estate Sargodha site was examined considering the Pakistan Environmental Protection Agency guidelines for industrial estate, and was found to be in line with the criteria developed.
- The project construction and operation activity can potentially impact the natural resources of the area. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures which have been discussed in this report.
- The project siting is likely to result into some aesthetic issues which can be reduced with the help of astute planning.
- The base line data for ambient air, Surface and Ground water, noise has been established for the project site.
- The potential impacts during construction phase include loss of natural vegetation, increased threat to wildlife, increased traffic load on Bhalwal Bhera Road, soil erosion and contamination, water contamination, deterioration of ambient air quality caused by the exhaust emission and kicked up dust, noise pollution, damaged infrastructure, safety hazards and public health concerns for the nearby communities.
- The significant environmental management issues during operation phase include air pollution, effluent disposal, solid waste and noise pollutions, vehicular traffic.
- The mitigation measures have been identified in the Chapter 6 for impacts expected during the different phases of the project.
- Based on the recommended mitigation measures in Chapter 6, the impacts identified in Table 6.2 will be reduced with residual impacts having insignificant levels. Table 8.1 presents the assessment of the residual impacts (mitigated).

- On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that Bhalwal Industrial Estate Sargodha Project is unlikely to cause any significant, lasting impacts on the social, physical and biological environment of the area, provided that the proposed activities are carried out as suggested in the report, and the mitigation measures recommended in this report are completely and effectively implemented.
- There are no remaining issues that warrant further investigation. This EIA is considered as adequate for the environmental and social justification of the project.

8.4 Recommendations

- A plantation plan has been proposed in the EIA report which will be developed and implemented for Bhalwal Industrial Estate Sargodha Project.
- The PIE should ensure that every industrial unit must keep a minimum of 10 % of their plot as green area.
- The PIE intends to construct open drains for transportation of effluents from industries up to the final disposal point. It is recommended that PIE should transport the effluent from industries up to the final disposal point through underground pipe network rather than open drains.
- The PIE will ensure that all wastewater polluting industries do install Primary Treatment Plant at the earliest.
- All the industries located at Bhalwal Industrial Estate will have primary storage of their waste inside their plot as per PIE Bye-Laws. The estate will design and implement Solid Waste Collection and Transportation System which will be comprised of i.e., recyclable, biodegradable, non-biodegradable and hazardous wastes. The recycling and biodegradable waste will be given to their respective contractors for further processing. The non-biodegradable will be disposed off at the exiting disposal sites at Sargodha and hazardous industrial materials will be disposed off in accordance with their standard disposal protocols.
- Regarding cumulative impacts of the project, there is a need that District and Provincial Government of Punjab should issue policy guidelines to the future development of the area to ensure that;
  - No haphazard housing societies or industrial units are allowed on Bhalwal Bhera Road without conducting IEE/EIA.
  - Keeping in view the potential increase in the traffic, the dualization of Bhalwal Bhera Road may be carried out, when feasible. However, in the meantime its Right of Way should be increased to cater for its future expansion.

Table 8.1: Impact Matrix – Residual Impacts (Mitigated)

	Soil Degradation	Air Quality Deterioration	Surface and Ground Water	Loss of Vegetation	Damage to Wildlife	Traffic Congestion	Noise and vibration	Safety Hazard	Damage to Infrastructure	Gender Issues	Historical Archaeological Sites
Project Siting											
Visual Impacts	N	N	N	N	N	N	N	N	N	N	N
Cumulative Impacts	Need to be addressed at policy level. An SIA should be carried out in the area to address cumulative impacts.										
Construction Phase											
Land acquisition	N	N	N	N	N	N	N	N	N	N	N
Contractor Mobilization	0	0	0	N	-1	-1	-1	0	0	0	N
Construction Camp Establishment	-1	0	0	-1	-1	0	0	0	0	0	N
Construction Camp Operation	0	0	0	0	-1	0	0	0	0	0	N
Site Preparation	-1	0	0	-1	-1	0	-1	0	0	0	N
Construction of Road	0	0	0	0	0	0	-1	-1	0	0	N
Laying of Services	0	0	0	0	0	0	-1	-1	0	0	N
Construction of Common Buildings	0	0	0	0	-1	0	-1	-1	0	0	N
Construction of Chalets	-1	0	-1	0	-1	0	-1	-1	0	0	N
Construction Materials Supply	0	0	N	0	-1	-1	-1	-1	0	0	N
Construction Crew Transportation	0	0	N	0	-1	-1	-1	-1	0	0	N
Solid Waste Disposal	-1	0	-1	-1	-1	N	N	0	N	0	N

	Soil Degradation	Air Quality Deterioration	Surface and Ground Water	Loss of Vegetation	Damage to Wildlife	Traffic Congestion	Noise and vibration	Safety Hazard	Damage to Infrastructure	Gender Issues	Historical Archaeological Sites
Waste Effluents Disposal	-1	0	-1	-1	-1	N	N	0	N	0	N
Demobilization of Contractors	0	0	0	0	-1	-1	-1	0	0	0	N
Operation Phase											
Operation of Bhalwal Industrial Estate	N	0	0	0	-1	0	0	0	0	0	N
Solid Waste Disposal	-1	0	-1	-1	-1						
Waste Effluents Disposal	-1	0	-1	-1	-1	N	N	0	N	0	N

***Key:** -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible negative; +1: low positive impact; +2; High positive impact, N: no impact.*

9 References

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Annexure–A: Persons consulted during the study

No	Name	Gender	Occupation	Village
1	Mr. Mazhar Abbas	Male	Farmer	Chak 14 North
2	Mr. Shabaan	Male	Farmer	Chak 14 North
3	Mr. Mohammad Nazir	Male	Farmer	Chak 14 North
4	Mr. Sana Ullah	Male	Student	Chak 14 North
5	Mr. Abdul Qam	Male	Farmer	Chak 14 North
6	Mr. Abdul Hafeez	Male	Police	Chak 14 North
7	Mrs Mussarat	Female	House wife	Chak 14 North
8	Mrs Sana Rehman	Female	House wife	Chak 14 North
9	Mrs Naseer	Female	House wife	Chak 14 North
10	Miss Marai Rehman	Female	Student	Chak 14 North
11	Mrs Bushra	Female	House wife	Chak 14 North
12	Mrs Sana Aziz	Female	House wife	Chak 14 North
13	Mrs Rahila	Female	House wife	Chak 11 - Adda
14	Mr. Sajjad Hussain	Male	Shop keeper	Chak 11 - Adda
15	Mr. Mukhtar Hussain	Male	Shop keeper	Chak 11 - Adda
16	Mr. Mohammad Yar	Male	Shop keeper	Chak 11 - Adda
17	Mrs Kalsoom	Female	House wife	Chak 11 - Adda
18	Mrs Maraim Bibi	Female	House wife	Chak 11 - Adda
19	Mr. Abdul Rauf	Male	Shop keeper	Chak 13 - Rajgaan
20	Mr Qabla-e- Abbass	Male	Shop keeper	Chak 13 - Rajgaan
21	Mrs Gulam Ruqaya	Female	House wife	Chak 13 - Rajgaan
22	Mrs Parveen	Female	House wife	Chak 13 - Rajgaan
23	Mrs Shehnaz	Female	House wife	Chak 13 - Rajgaan
24	Mr Azar Iqbal	Male	Student	Chak 13 - Rajgaan
25	Mr. Qaiser Iqbal	Male	Self Employed	Chak 13 New Abadi
26	Mr. Mirza Khan	Male	Shop keeper	Chak 13 New Abadi
27	Mr. Mushtaq Ahmed	Male	Farmer	Chak 13 New Abadi
28	Mr. Mohmmad Safdar	Male	Labourer	Chak 13 New Abadi
29	Mr. Mulzim Hussain	Male	Labourer	Chak 13 New Abadi
30	Mr. Mohammad Asif	Male	Labourer	Chak 13 New Abadi
31	Mr. Faisal	Male	Labourer	Chak 13 New Abad
32	Mrs Anwar Bibi	Female	House wife	Chak 13 New Abadi
33	Mr Afzal Ahmed	Male	Labour	Chak 13 New Abadi

No	Name	Gender	Occupation	Village
34	Mr. Nasar Hayat	Male	District Wildlife Officer	Sargodha
35	Mr. Ghaffar	Male	Divisional forest officer	Sargodha
36	Mr Hamid Srafraz	Male	Program Coordinator IUCN	Islamabad
37	Dr. Ghulam Akbar	Male	Head WWF	Islamabad
38	Mr Nasir Mehmood	Male	IG Forest	Islamabad
39	Engr. Ehsan	Male	GM Noon Sugar Mill Ltd	Bhalwal
40	Engr Tanveer Ahmad	Male	Project Director Mona Reclamation Experimental Project	Bhalwal

Annexure–B: List of Fauna of the Project Area

List of Birds

No.	Scientific Name	Common Name	Status			Occurrence		
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	*Coturnix coturnix*	Common Quail		X				X
2	*Columba livia*	Pigeon		X				X
3	*Pycnonotus cafer*	Red vented, Bulbul			X			X
4	*Acridotheres ginginianus*	Myna		X				X
5	*Streptopelia decaocto*	Collared dove		X				X
6	*Corvus splendens*	House Crow	X					X
7	*Passer domesticus*	House Sparrow	X					X
8	*Acridotheres tristis*	Indian Myna		X				X
9	*Streptopelia senegalensis*	Little Brown Dove		X				X
10	*Ardeola grayii*	Paddy Bird/Indian Pond Heron			X			X
11	*Bubulcus ibis*	Cattle Egret			X			X
12	*Eudynams scolopacea*	Common Koel			X		X	X

Source: *PPI field data*

List of Mammals

No.	Scientific Name	Common Name	Status			Occurrence		
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	*Sus scrofa*	Indian Wild Boar		X				X
2	*Mus booduga*	Little Indian field mouse		X				X
3	*Mus musculus*	House mouse		X				X
4	*Rattus rattus*	Common Rat		X				X
5	*Mus musculus*	House mouse		X				X
6	*Rattus rattus*	Common Rat		X				X
7	*Canis aureus*	Asian Jackal		X				X
8	*Canis lupus*	Wolf		X				X
9	*Lepus nigricollis*	Indian Hare, Wild Hare		X				X
10	*Felis chaus*	Jungle Cat		X				X
11	*Rattus rattus*	Rat		X				

Source: *PPI field data*

List of Reptiles

No.	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	*Calotes versicolor*	Garden Lizard		X				X
2	*Bufo stomaticus*				X			
3	*Uromastyx hardwickii*			X				X
4	*Hemidactylus flaviviridis*				X			X
5	*Varanus bengalensis*	Indian Monitor		X				X

Source: *PPI field data*

Annexure-C: List of Flora in the Project Area

No.	Botanical Name	Local Name	Family	Life Form						
				Herb	Shrub	Grass	Tree	Sedge	Climber	Creeper
1	*Acacia nilotica*	Kikar	Mimosaceae				x			
2	*Acacia modesta, Dalbergia sissoo*	shisham	Malvaceae		x					
3	*Ficus religiosa*	peepal	Amaranthaceae	x						
4	*Tamarix articulate*	frash	Amaranthaceae	x						
5	*Albizia lebbek*	Shreen	Mimosaceae				x			
6	*Morus alba*	*shahtoot*	Papilionaceae	x						
7	*Zizyphus jujube*	beri	Poaceae			x				
8	*Zizyphus nummularia*	*ber*	Boraginaceae	x						
9	*Euphorbia caducifolia.*		Asteraceae	x						
10	*Salsola foetida*		Amaranthaceae	x						
11	*Calotropis aphhylla*	Oak	Meliaceae				x			

Source: *PPI field data*

Annexure–D: Filled Socio Economic Survey Performa's

EIA of Bhalwal Industrial Estate, Sargodha

Socio-Economic Survey

Year: 2012 No.: 01

1. Location/Settlement:

1.1 Village: Chak 11 1.2 Tehsil: Bhalwal

1.3 District: Sargodha

2. Biographical Data :

2.1 Name: Sana Aziz

2.2 Father's Name: Sajjad Hussain

2.3 Age: 24 2.4 Sex: F

2.5 Caste : Dudhi

2.6 Marital Status:

( ) Married ..... ( ) Single ..... ( ) Widow ..... ( ) Divorced

2.7 Literacy Status:

(✓) Literate ..... ( ) Illiterate

2.8 If literate:

( ) Primary ... ( ) Secondary ..... ( ) Matric ..... (✓) Bachelors ..... ( ) Higher

2.9 Occupation: ( ) Agricultural..... (✓) Non Agricultural out of Assembly

2.10 Monthly Income: 35,000/-

3. Household:

3.1 Size of household: 5 (Childs)

3.2 How long have you lived in this area: Since Birth

3.3 Ownership status of your house:

Self-owned: ✓ Rented:

3.4 Type of construction of your house:

Pacca: ✓ Semi-pacca: Kacha:

3.5 Transport Sources: ( ) Motor Bike ..... ( ) Car ... ( ) Other No Car

3.6 Which of the following facilities are available at your house:

Electricity: ✓ Water supply: ✓

Gas: ✓ Telephone: ✓

4. **Land Use:**

4.1 Depth of Water Table (Feet): 28 - 30

4.2 Is any working Tube well present: ( ) Yes..... ( ) No .....

4.3 If yes, Type of Tube Well: ( ) Diesel Tube Well ..... ( ) Electric Tube Well.....

4.4 Type of Vegetation in area: Barani

4.5 Orchards / Fruit Tree in area: Fruit -/vees - Mangoes -

5. **Project:**

5.1 Do have information about Project: (✓) Yes..... ( ) No

5.2 Perception about Project:

-ive

5.3 Negative effects of Project:

5.4 Any Suggestion to improve Environment

Employment -/o Local -

Interviewer Signature: Sabz

EIA of Bhalwal Industrial Estate, Sargodha

Socio-Economic Survey

Year: 2012 No. : 19

1. Location/Settlement:

1.1 Village: Chak 13 Rajgan 1.2 Tehsil: Bhalwal

1.3 District: Sargodha.

2. Biographical Data :

2.1 Name: Ghulam Rubyya

2.2 Father's Name: G. Ali

2.3 Age: 17-18 year 2.4 Sex: M

2.5 Caste : Arain

2.6 Marital Status:

( ) Married ..... ( ) Single ..... ( ) Widow ..... ( ) Divorced

2.7 Literacy Status:

(✓) Literate ..... ( ) Illiterate

2.8 If literate:

( ) Primary ... ( ) Secondary ..... (✓) Matric ..... ( ) Bachelors ..... ( ) Higher

2.9 Occupation: (✓) Agricultural..... ( ) Non Agricultural

2.10 Monthly Income: 30 - 40,000/-

3. Household:

3.1 Size of household: 7

3.2 How long have you lived in this area: Local Native

3.3 Ownership status of your house:

Self-owned: ✓ Rented: ____

3.4 Type of construction of your house:

Pacca: ____ Semi-pacca: ✓ Kacha: ____

3.5 Transport Sources: (✓) Motor Bike ..... ( ) Car ... ( ) Other ____

3.6 Which of the following facilities are available at your house:

Electricity: ✓ Water supply: ✓

Gas: ✓ Telephone: Mobile

4. Land Use:

4.1 Depth of Water Table (Feet): 60 - 70

4.2 Is any working Tube well present: (✓) Yes..... ( ) No .....

4.3 If yes, Type of Tube Well: ( ) Diesel Tube Well ..... (✓) Electric Tube Well.....

4.4 Type of Vegetation in area: Barani

4.5 Orchards / Fruit Tree in area: Mango, Shesham

5. Project:

5.1 Do have information about Project: (✓) Yes..... ( ) No

5.2 Perception about Project:

Positive

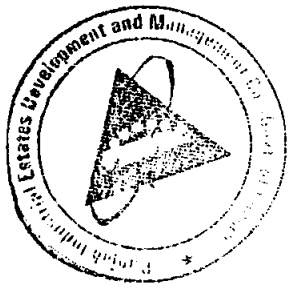
5.3 Negative effects of Project:

Pollution will cause if SW is not Managed.

5.4 Any Suggestion to improve Environment

increase the Employment opportunities for local

Interviewer Signature: _____



EA Consulting Private Limited
Al 9,15th Lane, Off Khi-e-Hilal
DHA 7, Karachi 75500
Tel: 021 111 111 584, Fax: 021 351825

XII

ENVIRONMENT PROTECTION DEPARTMENT

Government of the Punjab

National Hockey Stadium, Ferozepur Road, Lahore

NO DD(EIA) EPA/F-129(EIA)/2607/2012 /797
Dated 21 / 08 / 2013

To

Mr. Naveed Mushtaq Gill,
General Manager (Technical),
Punjab Industrial Estate (PIE),
Commercial Area (North),
Sunder Industrial Estate, Raiwind Road
Lahore

Subject: **ENVIRONMENTAL APPROVAL**
(Under Section 12 of PEP Act, 1997 read with IEE/EIA Regulations, 2000)

1	Description of Project:	Establishment of Bhalwal Industrial Estate over an area of 426 acres. The industrial plots of 0.5, 1 and 2 acres will be allocated for warehousing, cold storage and other industrial units. BIE will have facilities of a roads, electrical network, sewerage system, Combined Effluent Treatment Plant, Sanitary Landfill Site etc.
2	Location of Project:	The project is located at 04-km away from Bhalwal Town at Bhalwal – Bhera Road, Sargodha
3	Date of receiving of case:	26.12.2012

4 After review of the Environmental Impact Assessment (EIA) Report, District Officer (Environment) Report and other relevant record, the Environmental Protection Agency, Punjab accord approval for construction of the above mentioned project to safeguard the environmental issues subject to the following conditions:

i) The proponent shall ensure compliance of National Environmental Quality Standards (NEQS).

ii) Mitigation measures suggested in the EIA Report and Environmental Management Plan (EMP) shall be strictly adhered to minimize any negative impacts on soil, ground water, air and biological resources of the project area.

iii) Monitoring shall be carried out during the entire period of the project activities. Monitoring reports of the whole operation shall be submitted to EPA, Punjab on monthly basis.

iv) The proponent shall install wastewater treatment plant in compatible with NEQS and shall obtain separate Environmental Approval for the construction / installation of combined wastewater treatment plant and sanitary landfill site. The wastewater treatment plant and sanitary landfill site shall not be constructed near the residential area.

v) The proponent shall dispose off wastewater after proper wastewater treatment and shall not discharge treated / untreated wastewater into surface / subsurface water body which may be used for drinking purpose.

vi) The proponent shall obtain prior permission from the concerned authority for effluent disposal and shall lay down a pipe line for safe disposal of treated wastewater into the channel.

vii) The proponent shall use maximum water conservation techniques to save water.

viii) Arrangements shall be made for safe disposal of solid waste. The solid waste will be retained within the unit boundary / premises and will be disposed off in an environment friendly way at a suitable disposal facility.

ix) The proponent shall also take measures to control the air emissions.

x) The proponent shall take effective measures to control odour.

xi) The proponent shall ensure that strict and efficient health and safety measures are in place for protection of workers backed by a comprehensive emergency response system.

xii) The proponent shall be responsible for adopting appropriate mitigation measures for controlling anticipated environmental hazards.

xiii) Compensation shall be provided to the inhabitants in case of loss of agricultural land, crop or property, etc. in accordance with the rates that are agreed upon. All conflicting issues regarding compensation etc. shall be settled amicably before or during the project activities.

xiv) The proponent shall allocate two rooms in office building for camp office of EPA.

xv) The proponent shall bind every owner of the unit to obtain separate environment approval from EPA before establishment of their unit.

P.T.O.

xvi) The proponent shall plant at least 20,000 trees of minimum height 06 to 07 feet especially of indigenous species on available space in and around the project area in consultation with District Officer (Environment), Sargodha within one year. A thick layer of trees will be planted inside and outside the boundary wall.

xvii) The proponent shall do proper landscaping after completion of the project i.e., flowers and grass may be planted inside / outside the premises of the project for beautification purpose.

xviii) At least 90% unskilled and to the extent possible skilled jobs shall be given to locals after providing them proper training.

xix) The proponent shall obtain approval / NOC of all other concerned departments including EMA before commencement of work.

xxi) The proponent shall care about noise issues during construction and operational phases.

xxii) The proponent shall address the grievances of stakeholders on priority basis (if any).

xxiii) The provisions of the PEPA-97 and regulations made there under shall strictly be abided by.

xxiv) The proponent shall convey the name of the Environmental Manager (having at least qualification of BS Environmental Sciences) of the project along with his complete Mailing Address and Phone Numbers.

xxv) The proponent will provide a copy of EIA report and copy of this letter to the contractors also for this information and compliance of conditions / measures suggested in this document.

5. The proponent shall be liable for correctness and validity of the information supplied by the environmental consultant.

6. The proponent shall be liable for compliance of Sections 17 and 18 of IEE/EIA Regulations, 2000, regarding confirmation of compliance, entry, inspections and monitoring.

7. This approval is accorded only for the construction phase / installation of the project. The proponent will obtain approval for operational phase of the project in accordance with Section 13(2)(b) and Section 18 of the IEE / EIA Regulations, 2000.

8. Any change in the approved project shall be communicated to EPA, Punjab and shall be commenced after obtaining the approval.

9. This approval shall be treated as null and void if all or any of the conditions mentioned above are not complied with. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law in force and is subjudice to legal proceedings in any legal forum / court.

10. The approval shall be valid (for commencement of construction) for a period of three years from the date of issue under Section 16 of IEE / EIA Regulations, 2000.

11. This approval can be withdrawn at any time without any prior notice if deem necessary in public/national interest.

Salman Aslam

(SALMAN ASLAM)
ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab
Ph # (042) 99232228

NO & DATE EVEN

A copy is forwarded for information to:

i) The Director, Industries Department, Lahore.

ii) The District Officer (Environment), Sargodha w.r.t. his letter No. 122-DOE/EPA/SGD dated 31.02.2013. He is requested to ensure compliance of the above mentioned conditions under information to this office.

Salman Aslam

(SALMAN ASLAM)
ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab

CERTIFICATE OF INCORPORATION

No. [illegible] of 200 - 200

I hereby certify that " PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY, "15- FANE ROAD, LAHORE."

is this day incorporated under the Companies Ordinance of 1984, and that the company is limited by Guarantee without addition of the word "Limited" to its name.

Given under my hand at LAHORE

this [illegible] *day of* SEPTEMBER, 2003.

Two Thousand THREE

Fee . Rs. [illegible] (TWENTY FIVE THOUSAND ONLY).

REGISTRAR JOINT STOCK COMPANIES

(ATIQ UR REHMAN)
District Officer
For Registrar
Joint Stock Companies
CITY District Government.
Lahore.

No. [illegible]
Dated. 18.09.2003

ATTESTED TO BE TRUE COPY

PUNJAB INDUSTRIAL ESTATES
DEVELOPMENT AND MANAGEMENT COMPANY
OWNED BY: GOVT. OF PUNJAB

Company Secretary

Certificate for Commencement of Business

(Pursuant to section 146 of the Companies Ordinance, 1984)

Certified that the [illegible] ESTATE DEVELOPMENT AND MANAGEMENT CO. (...), 13- [illegible] ROAD, LAHORE.

Which was incorporated under the Companies Ordinance, 1984, on the 18th

day of [illegible], *2003*

and which has this day filed a duly verified declaration in the Prescribed form that the conditions of section 69 and 146 of the said Act, been complied with, is entitled to commence business.

Given under my hand at LAHORE

This 24 *day of* JAN 2004

~~*One thousand nine hundred and*~~ TWO THOUSAND FOUR.

REGISTRAR JOINT STOCK COMPANIES LAHORE

(ATIQ-UR-REHMAN)
DISTRICT OFFICER
ENTERPRISE & INVESTMENT PROMOTION
LAHORE
FOR JOINT STOCK COMPANIES
LAHORE REGION.

[illegible]

Company Secretary

[illegible]

(THE COMPANIES ORDINANCE, 1984)

A COMPANY LIMITED BY GUARANTEE
HAVING A SHARE CAPITAL

Memorandum

and

Articles of Association

of

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT
AND MANAGEMENT COMPANY

THE COMPANIES ORDINANCE, 1984

(A COMPANY LIMITED BY GUARANTEE HAVING A SHARE CAPITAL)

ESTABLISHED UNDER SECTION 42
OF THE COMPANIES ORDINANCE, 1984

MEMORANDUM OF ASSOCIATION

OF

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY

1. The name of "The Company" is Punjab Industrial Estate Development and Management Company, having a share capital, (hereinafter referred to as "The Company").

2. The registered office of "The Company" shall be situated in the Province of the Punjab, city of Lahore.

3 "The share capital of "The Company" will be as follows:

(i)	Authorized Capital	Rs.150.00 Million (Rupees One Hundred and Fifty Million).
(ii)	Paid-up Capital	Rs.50.00 Million (Rupees Fifty Million).

The Capital is divided into Five (05) Million Ordinary Shares of Rupees Ten (10) each.

4. The objects for which "The Company" is established are as follows:

i. "The Company" is an association of non profit organization, within the meaning of section 42 of the Companies Ordinance, 1984 and is being formed as a public company;

ii. organized and established for orderly, planned and rapid industrialization of Punjab, headed by a Chairman from private sector, a Board of Directors and a General Body as per Articles of Association, all to be nominated by Government of the Punjab, (hereinafter referred to as Government);

iii. to establish new Industrial Estate(s) as defined in Articles of Association of "The Company" and to upgrade those existing Industrial Estate(s) as may be assigned to "The Company" by Government, in financially sustainable

ATTESTED TO BE TRUE COPY

Company Secretary

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT & MANAGEMENT COMPANY
OWNED BY GOVT. OF PUNJAB

manner and to undertake such related functions as may be entrusted by Government to "The Company" from time to time;

iv. to select/acquire/lease/purchase appropriate site(s) for the development of new Industrial Estate(s) and to make ancillary arrangements related thereto for establishing such Estate(s) including but not limited to creation of charge, lien, mortgages, encumbrances etc.;

v. to develop infrastructure within the Industrial Estate(s). However, "The Company" shall not engage in real estate business;

vi. to appoint Board of Management (BOM) for each of the Industrial Estate;

vii. to identify support services required by each Industrial Estate(s) and to establish a linking mechanism with all the industries to increase productivity;

viii. to form/incorporate/manage/administer/dispose of corporate entity(ies) as subsidiary(ies) with prior approval of the Government including but not limited to power generation/distribution/transmission/purchase/sale and/or any other purpose deemed expedient for the fulfillment of the objects of the Company, and/or to co-operate with any other company or association having similar objects;

ix. to facilitate the provisions of utilities like electricity, gas, telephone and medical facilities and ancillary services for the units established or to be established within the industrial estate(s);

x. To generate eclectic power through any means of generation developed or to be developed in future and to deal in transmission, transforming, conversion, switching, gridding, sale, purchase, distribution of electric power and other utilities in all its forms and perspectives and to undertake all such activities as are connected, linked or associated therewith and seek necessary approvals/registrations/licences from relevant authorities and to do all such acts, deeds or things as would be required for effective discharge of these objects;

xi. to provide common facilities for the Industrial Estate(s) and to enter into financial transactions in furtherance thereof;

xii. to identify the environment preservation requirements for the benefits of the Industrial Units;

xiii. to create zoning restrictions within the Industrial Estate(s);

ATTESTED TO BE TRUE COPY

Company Secretary

PUNJAB INDUSTRIAL DEVELOPMENT AND MANAGEMENT COMPANY (PVT.) LTD.

xiv. to promote creation of jobs by capitalization on strengths of each region by prioritizing the type(s) of industry, already prevalent in that particular area;

xv. to collect statistical data from within the Industrial Estate(s) for undertaking future improvements;

xvi. to promote interaction between the industrialists and Government to create an over all conducive industrial environment in the Industrial Estate(s);

xvii. to arrange workshops and meeting points for creating interaction with international investors, government regulators, non government organizations (NGOs) and various similar services organizations and bodies for creating a highly conducive local/international investment environment;

xviii. to arrange interaction between academia and industry for creating platform to initiate research projects for the benefits of all concerned;

xix. to provide the platform for the financial institutions to meet the stake holders and create specific products and services to solve the financial requirements of SMEs and the fiscal requirements of the financial institution(s) to create healthy loaning environment with a reduced risk of failure and to arrange systematic recovery/closure of such units;

xx. to take necessary steps to attract industrialists to set up units in the Industrial Estate(s);

xxi. to borrow or raise money by all legal means/instruments, with the specific permission of Government;

xxii. to open and operate banking account(s) and to draw, make, accept, endorse, discount, execute and issue promissory notes, bills of exchange, bills of lading, warrants, drafts, cheques, bonds, debentures and other negotiable or transferable instruments subject to compliance of relevant prudential regulations;

xxiii. to undertake and execute such agency agreement(s) which may promote directly the objects of "The Company";

xxiv. to print and publish any periodicals, books or leaflets in furtherance of "The Company's" objectives;

xxv. to invest the monies of "The Company" not immediately required in short term secured investment;

xxvi. to enter, with permission of Government into any arrangements with any government(s) and authority(ies), municipal, local or otherwise or any

ATTESTED TO BE TRUE COPY

Company Secretary

PUNJAB INFORMATION TECHNOLOGY BOARD
DEVELOPMENT MANAGEMENT COMPANY
OWNED BY GOVT. OF PUNJAB

person or company that may seem conducive to all or any of the objects of "The Company" and to obtain from any such government(s), authority(ies), person or company any rights, privilege, contracts, license and concessions which "The Company" may think is desirable to obtain and to carry out exercise and comply therewith;

xxvii. to accept from any government(s) or agencies or authorities, public/private/civic bodies, corporations, companies, persons or any other source in Pakistan and abroad for use in work and to raise funds, accept any grants or money, moveable or immoveable property, donations, gifts, subscriptions, devices, bequests and other assistance with a view to promoting the objects of "The Company" and in receiving any gift or property to take the same either conditionally or unconditionally or subject to any special conditions which may be prescribed by the donor in writing and accepted by the BOD subject to such procedure prescribed by Government from time to time;

xxviii. acquire, take over, accept by way of gift, the assets of any other organization, body or society with similar objects or undertake and accept the management of any endowment or trust fund set up with similar objects as that of "The Company", subject to such procedure as may be prescribed by Government from time to time;

xxix. to take such steps by personal or written appeals or otherwise as may from time to time be deemed expedient, for the purpose of procuring contributions to the funds of "The Company" in the shape of donations or annual subscriptions;

xxx. to cooperate with any company or association having objects similar to the objects of "The Company" and any company or association the objects of which are calculated either directly or indirectly to benefit "The Company" in attainment of any of its objects;

xxxi. to propose to Government amendments in statutes, rules, orders for enabling "The Company" to carry any of its objects into effect; and

xxxii. to do all such other lawful and charitable things as are incidental or conducive to the attainment of the above described objects;

5. The liability of the members is limited.

6. The income of "The Company" when so ever derived shall be applied solely towards the promotion of the objects of "The Company" as set forth in the Memorandum of Association and no portion thereof shall be paid or transferred directly or indirectly, by way of dividend, bonus, remuneration or grant in the

ATTESTED BY DIRECTOR

PUNJAB BOARD OF INVESTMENT & DEVELOPMENT

Company Secretary

shape of other benefits, by way of profit, or otherwise howsoever, to the members of "The Company"; provided that nothing therein contained shall prevent the payment in good faith of remuneration to any officers or servants of "The Company" or any other person including Legal Advisor, except a Member in return for any services actually rendered to "The Company", nor prevent the payment of interest on money borrowed or rent out any property leased or hired from any person other than a Member of "The Company". No member of BOD of "The Company" shall be appointed to any salaried office of "The Company", or any office of "The Company" generating fee and that no remuneration shall be given by "The Company" to its members of BOD, but the Chairman/BOD shall be provided with the facilities for boarding, lodging and/or travel domestic or abroad undertaken for furtherance of the objects of "The Company".

7. No addition, alteration or amendment shall be made to or in the provisions or regulations contained in the Memorandum and/or Articles of Association, for the time being in force, except in accordance with the Companies Ordinance, 1984 and with the prior approval of the Government and thereafter the same shall be submitted to and approved by the Registrar of Companies, Lahore Region.

8. Patronage of any government or authority, express or implied, shall not be claimed unless such government or authority has signified its consent thereto in writing.

9. Each member of "The Company" undertakes to contribute to the assets of "The Company" in the event of its being wound up, while he is a member, or within one year afterwards for payment of the debts and liabilities of "The Company" contracted before he ceases to be member, and of the costs, charges and expenses of winding up. The sum to be contributed by the Members shall be as follows.

   All Members of "The Company" shall individually contribute a sum not exceeding Rs.1000.00 (Rupees one thousand only).

   If the total sum required on winding up for payment of the debts and liabilities of "The Company" and of the said costs and expenses shall be less than Rs.1000.00 then the Member shall contribute thereto in proportion to their maximum specified liability.

10 Notwithstanding what is stated herein, if upon the winding up or dissolution of "The Company" there remains, after the satisfaction of all its debts and liabilities, any property whatsoever, the same shall be given or transferred to Government.

ATTESTED TO BE TRUE COPY

Company Secretary

PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY OWNED BY GOVT. OF PUNJAB

We, the several persons whose names and addresses are hereunder subscribed, are desirous of being formed into a company in pursuance of this Memorandum of Articles of Association

Name and surname (present and former) in full and block letters	Father's/Husband's Name in full	Nationality (with any former nationality)	Occupation	Residential address in full	Signature
Mansoor M. Syed	Syed M. Musa	Pakistani	Engineer	71-L Defence Phase II, Lahore Cantt	[signature]
Dr. Pervaiz Bashir	Bashir Ali [illegible]	Pakistani	Secretary Industries Commerce & Investment	7-Aikman Road, GOR-I, Lahore	[signature]
Mr. Khawaja Muhammad Owais	Khawaja Khadim Bakhsh	Pakistani	Industrialist	House No. [illegible], [illegible] Colony, [illegible] Gulberg, Lahore	[signature]
Mr. [illegible] Mustafa Khan	Bashir A. Khan	Pakistani	Chairman TEVTA	House No. 36-C, Sarwar Road, Lahore Cantt, Lahore	[signature]
Dr. [illegible] Chohan	Dr. M. A. Chohan	Pakistani	Engineer	House No. [illegible], St. [illegible], Sector F-7/3, Islamabad	[signature]
Mr. [illegible] Syed	Dr. S. M. [illegible]	Pakistani	Businessman	House No. [illegible] Gulberg III, Lahore	[signature]
Mr. Syed Nadeem Hashmi	Syed Ghulam Ali Shah	Pakistani	Chief Executive [illegible] Industries (Pvt) Ltd	House No. [illegible], [illegible] Township, Lahore	[signature]
Mr. [illegible] Khan	[illegible] Barkat Ali	Pakistani	Chief Executive Comfort Footwear (Pvt) Ltd	[illegible], Gulberg [illegible], Lahore	[signature]
Major (R) Shahnawaz Badar	S. M. Badar	Pakistani	Secretary Labour and Human Resources	House No. [illegible], Shadman, Lahore House No. 224 F-10/3 Islamabad	[signature]
Mr. Kamran Lashari	Sardar Abdul Majeed Khan Lashari	Pakistani	Secretary Environment Protection	House No. 15 Fateh Sher Road, Mozang, Lahore	[signature]
Mr. Zaheer Ahmad Khan	Naseer Ahmad Khan	Pakistani	Engineer	122-H, Phase-I, Lahore	[signature]
Dr. Raza Bar[illegible]	Abdul Rab	Pakistani	Economist	House No. [illegible] Chauburji Road, Karachi, [illegible] Baghbanpura Lahore	[signature]

Dated the ___ day of ___

WITNESS TO ABOVE SIGNATURES

Full Name

Father's Name

Full Address

Nationality

ATTESTED

Signatures CH. MUHAMMAD [illegible]
Occupation OATH COMMISSIONER
Advocate High Court Lahore

MUHAMMAD [illegible] OATH COMMISSIONER HIGH COURT LAHORE

Company Secretary

PUNJAB [illegible] ESTATES
[illegible]

THE COMPANIES ORDINANCE, 1984

ARTICLES OF ASSOCIATION

OF

PUNJAB INDUSTRIAL ESTATES DEVELOPMENT AND MANAGEMENT COMPANY
(A COMPANY LIMITED BY GUARANTEE HAVING A SHARE CAPITAL)

PRELIMINARY

1. **WHEREAS IT HAS BEEN** agreed by several persons whose names are hereunto subscribed to establish and incorporate a Company Limited by Guarantee having a Share Capital under the provisions of the Companies Ordinance, 1984 in the name of Punjab Industrial Estate Development and Management Company (hereinafter referred to as "The Company") in accordance with the provisions of the Memorandum of Association hereto annexed and subject to several regulations hereinafter contained which shall be the regulations for management of "The Company" and for the observance of Members thereof and their representatives and the same shall subject to exercise powers of "The Company", in reference to the repeal or alteration of or addition to, its regulations by Special Resolution as prescribed by the "Ordinance", be such as are contained in "These Presents".

INTERPRETATION

2. The marginal notes hereto shall not affect the construction hereof, and in "These Presents" unless there be something in the subject or context inconsistent therewith:

   I. "Attorney" includes an attorney duly constituted or appointed under power of attorney or any other authority in writing.

   II. "Board of Directors" means the Board of Directors (BOD) of "The Company" as constituted under provisions of "These Presents".

   III. "Board of Management" mean representatives of occupiers of each Industrial Estate, nominated and appointed as such by BOD subject to Article 22 hereof. For the purposes of this clause an "occupier" means an owner in possession of an industrial unit in industrial estate(s).

   IV. Chairman" means Chairman of "The Company" duly nominated from time to time by "Government" under the provisions of "These Presents".

   IV-a "Chief Executive Officer" means the contractual employee, selected through an open competitive selection process by BOD to perform functions within the meaning of section 2(6) of the Companies Ordinance, 1984 and appointed as such in accordance with the terms and conditions to be determined by BOD.

   V. "Federal Government" means Government of Pakistan.

Company Secretary

VI. "Fund" means initial amount to be provided by "Government" on loan basis on mutually agreed terms and conditions including mark-up rate with repayment period.

VII. "General Body" means General Body of "The Company" as constituted under the provisions of "These Presents".

VIII. "Government" means Government of the Punjab through Industries Department.

IX. "Industrial Estate" means an Industrial Estate managed or to be established by "The Company" anywhere in the Province of Punjab.

X. "Independent Director" means a director who is nominated by "Government" and shall have the same meanings as ascribed thereto respectively by the "Rules".

XI. "Legal Advisor" means an Advocate entitled to appear before any of the High Court of Pakistan or Supreme Court of Pakistan and shall be appointed by the Chief Executive Officer and approved by BOD on retainer basis.

XII. "Local Government" means a Local Government as defined in the Punjab Local Government Ordinance, 2001 (XIII of 2001).

XIII. "Member" means Member of "The Company" whose name appears and/or is borne on the Register, as envisaged by Section 2(21) of the "Ordinance".

XIV. "Month" means English calendar month.

XV. "Office" means the registered office of "The Company".

XVI. "Ordinance" means the Companies Ordinance, 1984 and every statutory modification thereof for the time being in force.

XVII. "Prescribed" means as prescribed by BOD from time to time.

XVIII. Rules" means the Public Sector Companies (Corporate Governance) Rules, 2013 and every statutory modification thereof for the time being in force.

XIX. "Register" means the Register of Members to be kept pursuant to the "Ordinance".

XX. "Seal" means the common Seal of "The Company".

XXI. "Secretary" means any individual appointed to perform the secretarial, administrative or other duties ordinarily performed by the secretary of a company.

XXII. "Special Resolution" and "Ordinary Resolution" have the same meanings as assigned thereto respectively by the "Ordinance".

XXIII. "These Presents" means and include Articles of Association and any modification or alteration thereof for the time being in force.

XXIV. Words importing singular number only include the plural number.

XXV. Words importing plural number only include the singular number.

Company Secretary

XXVI. Words importing masculine gender only include the feminine gender.

XXVII. Words importing feminine gender only include the masculine gender.

XXVIII. Words importing persons include bodies corporate and otherwise, firms, registered or un-registered associations, and non-government, semi-government and government organizations.

XXIX. Words of expressions in "These Presents" shall, except where it is repugnant to the subject or context, bear the same meanings as in a Standard English Dictionary.

XXX. "Written" and "In Writing" includes printing, lithography, type-writing, telex, tele-facsimile (fax) and other modes of representing or reproducing words in a visible form.

BUSINESS OF "THE COMPANY"

3. The business of "The Company", its affairs and/or functions shall comprise of achieving the objects given in the Memorandum and include undertaking of all or any of the several objects, and any act, deed or thing done in pursuance thereof, ancillary and/or incidental thereto as expressed in, and authorized by the Memorandum of Association hereto annexed, and can be commenced immediately after incorporation of "The Company" as BOD may think fit.

SHARE CAPITAL OF "THE COMPANY"

4. The Equity of "The Company" which shall be provided by the "Government" as follows:

- Authorized Capital Rs. 150.00 Million (Rupees One Hundred and Fifty Million)
- Paid up Capital Rs. 50.00 Million (Rupees Fifty Million)

The Capital shall be divided into Five (05) Million Ordinary Shares of Rupees Ten (10) each. "The Company" may from time to time, by Special Resolution, increase, consolidate, subdivide, reduce or otherwise reorganize the Share Capital, subject to the "Ordinance" and with prior approval of the "Government".

TRANSFER AND TRANSMISSION OF SHARES

5. The "Government" shall have the exclusive right to transfer any share.

No shares can be mortgaged, pledged, sold, hypothecated, transferred or disposed of by any Member without previous sanction of Government.

In case of death of any Member, his share shall automatically stand transferred to Government, which shall have the exclusive right to allot the same to any other person/institution/entity.

MEMBERSHIP

6. The subscribers to "These Presents" and to the Memorandum of Association hereunto annexed shall be admitted to the Membership of "The Company" from time to time and shall be deemed to have agreed to become a "Member" of "The Company" in

Company Secretary

accordance with and in pursuance to "These Presents" and whose names appear in the Register, shall be the "Member" of "The Company".

7. The total number of members of BOD of "The Company" shall be fifteen (15), who shall be nominated by "Government". Nine (09) members including the Chairman shall be the Independent Directors nominated by "Government". Six (06) members of the BOD shall be the Secretaries to the "Government" for Industries Department, Finance Department, Labor & Human Resource Department Chairman TEVTA., Chief Executive Officer of "The Company" and Chief Executive Officer of Punjab Board of Investment & Trade (PBIT) shall be appointed *ex-officio*.

   Subsequent vacancies arising thereafter of members of BOD shall be filled in accordance with "These Presents". Due regard shall be given to skills and discipline in the composition of "General Body". Any person, who is a loan defaulter, or is a sponsor of a company which is in loan default, or otherwise ineligible to hold any such post under or by any law cannot be a member of BOD.

8. Any person/industrial estate/organization interested in the promotion of good governance and engaged in any voluntary activity with a proven record of industrial experience is eligible to become a "Member" of "General Body" on invitation by BOD and approval of "Government", except a person/ industrial estate/organization who is a loan defaulter, or is a sponsor of company which is a loan defaulter, or otherwise ineligible to hold any such post under or by any law. Such person/industrial estate/organization may be associated with a voluntary organization or a private individual having record of community service but his/its Membership of "The Company" will be in his/its individual capacity.

9. "The Company" shall maintain a Roll of "Members", clearly indicating their full names, addresses and occupations and every "Member" shall sign the same. If a "Member" of "The Company" changes his address, he shall forthwith notify his new address to "Secretary" of "The Company", who shall thereupon cause the new address to be put on the Rolls of "Members". Where, however, a "Member" does not notify any change of address to the "Secretary", the address appearing on the Rolls of the "Members" shall be deemed to be correct address of the "Member". The said Roll of "Members" also called "Register" shall be maintained at the Office of "The Company".

10. Membership of "The Company" may be terminated on the happening of any of the following events:

    I. On the "Member's" death, resignation, insolvency, lunacy or conviction for an offense involving moral turpitude.

    II. When a "Member" does not attend three consecutive General Meetings of "The Company" without prior leave of absence granted by BOD.

    III. When "The Company" in General Meeting, by a simple majority, decides to terminate the Membership of any person who acts in a manner prejudicial to the interests of "The Company", fails to fulfill any obligation required by "The Company" or acts in a manner as is not conducive to the objects of "The Company".

Company Secretary

11. Subject to the foregoing and/or other provisions, Membership of "The Company" shall be open to all Pakistani citizens.

12. If a vacancy occurs, among the "Members", such vacancy shall be filled in as provided in Article (08) supra.

13. When a "Member" desires to resign from his Membership of "The Company", he shall forward his letter of resignation to the Chairman and such resignation shall take effect only from the date of its acceptance by BOD.

14. "The Company" shall function notwithstanding any vacancy in any of its bodies and no act, direction or proceeding of "The Company" shall be rendered invalid merely by reason of such vacancy or because of any defect in the appointment of any of the officers of "The Company".

15. The Chairman and the members of BOD will not be paid any remuneration but will be provided traveling, boarding, lodging traveling and transportation facilities on such terms as decided by BOD.

16. "Members" of "The Company" shall not be paid any remuneration or dividend.

OFFICERS OF "THE COMPANY"

17. "The Company" shall comprise the following:-

I. General Body

II. BOD

III. Chairman

IV. Chief Executive Officer

V. Secretary

VI. Board of Management for specific Industrial Estates, exercising such powers as may be specifically "Prescribed" by BOD.

GENERAL BODY

18. There shall be a "General Body" of "The Company", which shall comprise of all the shareholders.

19. The Chairman shall preside over all meetings of "General Body".

20. The Chairman may invite any person other than a Member to attend a meeting of "General Body". Such invitee to be known as special invitee, shall not, however, be entitled to vote at the meeting.

21. "General Body" shall have the following powers and functions, namely:

a. to give overall policy guidance and direction for the efficient functioning of "The Company";

b. to approve the annual budget;

c. to consider the balance sheet and audited accounts for the previous year;

Company Secretary

d. to consider the annual report prepared by BOD;

e. to amend "These Presents", if deemed necessary, by way of addition, alteration, modification or substitutions, in accordance with the "Ordinance" and with prior approval of the "Government" only after which the same shall be submitted to and approved by the Registrar Companies, Lahore Region.

f. to appoint auditors except the First Auditors to be appointed by BOD.

POWER OF NOMINATION AND/OR TERMINATION

22. The power to nominate and/or terminate the Chairman, any Director or the "Member" of "General Body" shall vest with the "Government". The "Government" may also supersede BOM of industrial estates or appoint or remove member(s) thereof.

GENERAL MEETINGS

23. The First Annual General Meeting of "The Company" shall be held at such time not more than eighteen (18) months after the incorporation of "The Company", and at such time and place as BOD may determine.

24. Subsequent Annual General Meetings of "The Company" shall be held at least once every year at such time and place as may be determined by BOD, within fifteen calendar months after the holding of the last preceding General Meeting and within four months from the closing of the annual accounts.

25. The above named General Meetings shall be called Annual General Meetings. All other meetings of "The Company" shall be called Extraordinary General Meetings.

26. BOD may at any time call for an Extraordinary General Meeting and shall, on the requisition of the Members representing not less than one-third of the voting power on the date of deposit of requisition, proceed to call an Extraordinary General Meeting.

27. Any such requisition shall specify the objects of the Meeting and shall be signed by the makers, and shall be deposited at the Office. The meeting must be convened for purposes specified in the requisition only.

28. If BOD does not proceed to cause a meeting to be held within twenty one days from the date of requisition being deposited, the makers or a majority of them may themselves convene a meeting to be held not more than three months, from the date of deposit of the requisition.

29. Any meeting convened through requisition shall be convened in the same manner, as nearly as possible, as that in which meeting is convened by BOD.

30. Subject to the provisions of the "Ordinance", relating to Special Resolutions, twenty one days notice, at least (exclusive of the day on which the notice is served or deemed to be served, but inclusive of the day on which the notice is given), specifying the place, the day and the hour of the meeting, and in case of special business, the general nature of such business, shall be given of every General Meeting whether Annual or Extraordinary to the "Members" in the manner in which notices

Company Secretary

are required to be served in accordance with the provisions contained herein below. Notwithstanding anything contained herein before, a meeting may be convened by such shorter notice and in such manner as those "Members" may think fit with the consent of all the "Members" entitled to receive notice thereof and the permission of the Registrar Companies, Lahore Region.

31. The accidental omission to give any such notice to or the non-receipt of notice by any of the "Member" shall not invalidate the proceedings of any such meeting.

PROCEEDING AT GENERAL MEETINGS

32. The business of an Annual General Meeting shall be to receive and consider the income and expenditure account and balance sheet, the Annual Report of BOD and of the Auditors, if required or found necessary, and the appointment of the Auditors and fixation of their remuneration and to transact any other business which may be transacted at an Annual General Meeting. All other business transacted at Annual General Meeting and all business transacted at an Extraordinary General Meeting shall be deemed special.

33. Two third (2/3) of the voting power of "Members" of "The Company" present personally, shall be a quorum for a General Meeting for all purposes. No business shall be transacted at any General Meeting unless the quorum is present at the commencement of business.

34. If within an hour of the time appointed for the meeting a quorum is not present, the meeting if called on the requisition of "Members", shall be dissolved. In any other case, it shall stand adjourned to the same day in the next week at the same time and place, and if at the adjourned meeting, a quorum is not present within half an hour from the time appointed for the meeting, "Members" being not less than one fourth (1/4) of the total voting power of "Members" of "The Company", shall be a quorum.

35. The Chairman shall be entitled to take the chair at every General Meeting of "The Company". If the Chairman is unable due to sickness or some other unavoidable reasons, BOD may elect one of the Director's to preside.

36. The Chairman may, with the consent of any meeting at which a quorum is present (and shall if so directed by the meeting), adjourn the meeting from time to time and from place to place, but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place. When a meeting is adjourned for ten days or more, notice of the adjourned meeting shall be given as in the case of an original meeting. Save as aforesaid, it shall not be necessary to give any notice of an adjournment or of the business to be transacted at an adjourned meeting.

37. At any General Meeting a resolution put to the vote of the meeting shall be decided on a show of hands, unless a poll (before or on the declaration of the result of the show of hands) demanded in accordance with the provisions of the "Ordinance" and unless a poll is so demanded, a declaration by the Chairman that a resolution has, on a show of hands, been carried or carried unanimously or by a particular majority

Company Secretary

and an entry to that effect in the book of the proceedings of "The Company" shall be conclusive evidence of the fact, without proof of the number or proportion of the votes recorded in favor of, or against, that resolution.

38. If a poll is duly demanded, it shall be taken in such manner as the Chairman shall direct, and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded.

39. In the case of an equality of votes, whether on a show of hands or on a poll, the Chairman of the meeting at which the show of hands takes place, or at which the poll is demanded, as the case may be, shall be entitled to a casting vote.

40. The demand of a poll shall not prevent the continuance of a meeting for the transaction of any business other than the question on which a poll has been demanded.

VOTES OF MEMBERS

41. On a show of hands and on a poll, every Member present in person shall have vote(s) according to the shareholding. Voting by proxy is allowed as envisaged by the "Ordinance".

42. Any corporation or body corporate which is a Member of "The Company" may by resolution of its directors or other governing body, authorize such person as it thinks fit, to act as its representative at any meeting of "The Company". The persons so authorized shall be entitled to exercise the same powers on behalf of the corporation which he represents as that corporation could exercise if it were an individual Member of "The Company" present in person. A corporation or body corporate, as the case may be, attending a meeting through such representative shall be deemed to be present at the meeting in person.

BOARD OF DIRECTORS (BOD)

43. The BOD shall comprise of fifteen (15) members of which nine (09) members including the Chairman shall be the Independent Directors. The remaining six (06) members shall be the following

Secretary Industries

Secretary Finance

Secretary Labor and Human Resource Development

Chairman TEVTA

Chief Executive Officer of "The Company"

Chief Executive Officer PBIT

44. The affairs of "The Company" shall be managed by BOD, which shall have the responsibility to determine the direction and scope of the activities of "The Company" in accordance with the objectives specified in Memorandum of Association. It shall also have the responsibility to approve projects and assignments as well as providing technical assistance as may be mutually agreed upon, to the "Local Governments" and to approve and administer the annual and supplementary budgets.

Company Secretary

45. The term of office of a member of BOD shall be three years, unless he resigns earlier or becomes disqualified from being a Director or otherwise ceases to hold office.

46. No member of BOD shall serve for more than three (03) consecutive terms of three (03) years each except *ex officio* members.

47. Members of BOD shall function in their individual capacity exercising individual judgment under the Chairman, and shall not be subjected to or be bound by instructions or orders of the office, organization or agencies with which they may be associated, except *ex officio* members.

48. No action or decision by BOD shall be rendered invalid or inoperative on account of any vacancy or vacancies in the composition of BOD.

49. The meetings of BOD shall be held in the following manner:

a. The BOD shall hold at least six regular meetings every year and shall be called by notice under the signature of "Secretary".

b. All meetings of BOD shall be presided over by the Chairman or in his absence, by a Director to be elected by BOD.

c. Minutes of the meetings of BOD shall be recorded by "Secretary" or in his absence by a member of BOD, appointed by the Chairman. The minutes shall be duly approved or corrected at the following regular meeting and filed in the permanent records of "The Company".

d. Members of BOD shall not receive any compensation for their services to "The Company" and/or any profit out of the business of "The Company".

50. Every notice calling for a meeting of BOD shall state "In Writing" the date, time and place of the meeting and shall be sent to every member of BOD ordinarily seven clear days before the day appointed for the meeting.

51. Any inadvertent omission to give notice or the non-receipt or late receipt of a notice by any member shall not invalidate the proceedings of the meetings.

52. At least 1/4th of the members of the BOD shall constitute a quorum provided at least one Director shall be the representative of the "Government".

53. Each member of BOD shall have one vote. All questions at meetings of BOD shall be determined by a vote of members present, provided that in case of equality of votes, the Chairman shall have a casting vote.

54. Subject to the "Ordinance" any business which BOD may consider necessary to perform, except such as may be required to be placed before "General Body" in general meeting, may be performed by a resolution in Writing circulated among all members of BOD, and any such resolution so circulated and approved by a majority of the members signing, shall be as effectual and binding as if a resolution had been passed at a meeting of BOD.

55. The proceedings of the meeting of BOD and resolution passed by the circulation shall be recorded in a book which shall be maintained by "The Company" for this purpose.

Company Secretary

56. BOD shall exercise all executive and financial powers of "The Company", subject to such direction as may be issued by "General Body" from time to time.

57. The BOD shall be responsible for developing the policy guide lines for over-all management and administration of "The Company" and in particular and without prejudice to the generality of the foregoing provisions, BOD shall have the powers, subject to the provisions hereof, *inter alia:*

I. establish byelaws and service rules of "The Company";

II. to constitute or to reconstitute Board of Management(s) for the industrial estates established, developed or managed by "The Company" and appoint members, fill casual vacancy(ies) and to remove any or all member(s) thereof;

III. to devise eligibility criteria and to establish operational policies including those relating to finance(s) for "BOM" of the Industrial Estate(s) established, developed or managed by "The Company";

IV. prepare and execute detailed plans and programs for the furtherance of the objects of "The Company";

V. consider the annual and supplementary budgets placed before it and pass them with such modification as may be deemed necessary for being submitted to "General Body";

VI. prepare annual report and cause the preparation of accounts of "The Company" for consideration of "General Body";

VII. create posts and appoint such contractual staff as may be required for efficient management of affairs of the "The Company" and regulate the recruitment and terms and conditions of their services;

VIII. receive and to have custody of Funds and resources of "The Company", operate "The Company" and manage the properties of "The Company";

IX. incur expenditures subject to the provisions of the approved budget;

X. enter, for and on behalf of "The Company", into agreements including those containing arbitration clauses;

XI. establish, maintain, amalgamate and/or close down 'the company" offices etc. as may be deemed appropriate;

XII. to propose investment scenarios relating to Industrial Estate(s) development to Government;

XIII. to promote the establishment of common technical facility centers for up gradation of technologies used by the occupier(s) of Industrial Estate(s);

XIV. appoint boards, committees, sub-committees and panels, consisting of persons who may or may not be Members of "The Company" or employees of "The Company" to deal with any specific task as may be determined from time to time and to confirm the appointment of Legal Advisor appointed by the Chairman;

Company Secretary

xv. to impose and recover fees and charges for the services rendered by "The Company"; and

xvi. to contract out operational and management functions as and when required, to reputable firms or companies;

58. BOD may by resolution delegate such administrative, financial and other powers to the Chairman, Chief Executive, committees, sub-committees, panels and boards or any other officer of "The Company" as it may consider necessary and proper, subject to the condition that action taken by them under the powers so delegated, shall have to be confirmed and/or ratified in the next meeting of BOD.

CHAIRMAN

59. A. The Chairman shall be nominated by the "Government".

B. The Chairman shall not be paid any remuneration for his services, but shall be provided all secretarial/material/ technical support in order to facilitate the efficient handling of "The Company". He will also be provided boarding, lodging, traveling and transportation facilities and shall be reimbursed for out of pocket expenses.

60. The Chairman shall be responsible *inter alia* for:

I. coordinating and exercising general supervision over all activities of "The Company"; and

II. any other task as may be delegated by BOD.

CHIEF EXECUTIVE OFFICER (CEO):

60 A. a. The CEO shall be a contractual employee to be hired for a period of three years renewable term. He shall be duly selected through an open competitive selection process by the BOD from private sector having engineering/management qualification and experience of at least 10 years managing industrial projects, and appointed as such in accordance with terms and conditions of his appointment to be determined by BOD.

b. The CEO shall work under the directions of the BOD through Chairman and he shall be responsible for day-to-day management and administration of "The Company". Without prejudice to the generality of the foregoing, he shall be responsible:

I. to determine powers, duties and fix salaries or emoluments of the managers, secretaries, officers, clerks and employees, either permanent or temporary and to require security in such instances and to such amount as deemed appropriate;

II. to prescribe duties of all employees and staff of "The Company";

III. to make, draw, endorse, sign, accept, negotiate and give cheques, bills of lading, drafts, orders, bills of exchange, promissory notes and other negotiable instruments in the amount(s) and manner as allowed/approved by BOD;

Company Secretary

IV. to institute, conduct, defend or abandon any legal proceedings by or against "The Company" in consultation with Legal Advisor or otherwise concerning the affairs of "The Company" and also to compound and allow time for payment or satisfaction of any debt due and of any claim or demand by or against "The Company";

V. proper administration of the affairs, "Funds" and resources of "The Company";

VI. to secure fulfillment of any contract, agreement or engagement entered into by "The Company" by mortgage or charge of all or any of the properties of "The Company" from time to time or in such manner as he may think fit in the interest of "The Company";

VII. to appoint and to remove or suspend managers, secretaries, officers, clerks and employees, either permanent or temporary, and to determine their powers, duties and fix their salaries or emoluments and to require security in such instances and to such amount as deemed appropriate;

VIII. to refer any claims or demands by or against "The Company" to arbitration and observe and perform the awards, in consultation with Legal Advisor;

IX. to exercise supervision and disciplinary control over the work and conduct of all employees of "The Company" in accordance with Human Resource and Administration Policy/Rules or Regulations approved by the BOD;

X. to delegate any of his functions to any officer of "The Company" with permission of the BOD;

XI. any other task assigned by BOD.

POWERS AND DUTIES OF BOD

61. The business of "The Company" shall be managed by BOD, who may exercise all such powers of "The Company" as are required by the "Ordinance".

RESOURCES OF "THE COMPANY"

62. The resources of "The Company" shall consist of the following;

I. grants made by "Government";

II. fee and charges imposed by "The Company" for services rendered by it; and

III. income and receipt from other sources;

63. "The Company" may in furtherance of its objectives;

I. invest and deal with "Funds" and monies of "The Company" according to "These Presents";

II. borrow and raise resources for "The Company" according to "These Presents";

Company Secretary

III. draw, accept, make, endorse, sign, negotiate, deposit, promissory notes, bills of exchange, cheques or any other negotiable instruments; and

IV. create, with the permission of "Government", a reserve company, sinking company, insurance company or any other special company whether for depreciation, repair, improvement, extension or maintenance of any of the properties or rights of "The Company" and/or for recouping wasting assets and for any other purposes for which "The Company" deems it expedient or proper to create or maintain any such company or companies.

64. All properties of "The Company", moveable or immovable, shall vest in "The Company" and shall be administered by Chief Executive Officer, on behalf of "The Company" within the parameters set by "The Company" in its General Meeting or otherwise as directed by BOD.

65. "The Company" may purchase, hire, lease, exchange or otherwise acquire property, moveable or immovable, tangible or intangible (including copyrights, patents and intellectual properties) which may be necessary or convenient for the purpose of "The Company" and construct, alter and/or maintain such buildings and works as may be necessary for carrying out the objects of "The Company", provided that for acquisition or disposal of immovable property through any mode, prior permission of "Government" shall be mandatory.

66. The income and the property of "The Company", however derived, shall be applied towards the promotion and furtherance of the objectives of "The Company" as set forth in the Memorandum of Association hereto annexed. Save as otherwise provided elsewhere, no portion of the income and property of "The Company" shall be paid or transferred directly or indirectly by way of dividend, or by way of profit to persons who at any time are or have been "Members" of "The Company" or to any of them or to any person claiming through them provided that nothing herein shall prevent the payment in good faith any remuneration to any employee or other person in return for services rendered to "The Company" or for traveling allowance, and other similar out of pocket expenses.

67. A. All funds should be paid into "The Company's" account(s) with the bankers) of "The Company" and shall not be withdrawn except by cheque signed by authorized representatives in accordance with the procedure to be "Prescribed";

B. Unless otherwise authorized by BOD, no new account in the name of "The Company" shall be opened.

THE SEAL

68 The "Seal" shall not be affixed to any instrument except by the authority of a resolution of the BOD and in the presence of at least two members of BOD or such other persons as BOD may appoint for the purpose and they shall sign every instrument to which the "Seal" is affixed in their presence.

Company Secretary

ACCOUNTS

69. The BOD shall cause to be kept proper books of accounts as required under section 230 of the "Ordinance".

70. The books of account shall be kept at the "Office" or at such other place as BOD shall think fit and shall be open to inspection by the members of BOD during business hours.

71. BOD shall from time to time determine whether and to what extent and at what time and places and under what conditions or regulations, the accounts and books or papers of "The Company" or any of them shall be open to the inspection of Members not being members of BOD and no Member (not being a member of BOD) shall have any right of inspecting any account and book or papers of "The Company" except as conferred by law or authorized by BOD or by "The Company" in General Meeting.

72. BOD shall cause to be prepared and to be laid before "The Company" in General Meeting such profit and loss accounts or income and expenditure accounts and balance-sheets duly audited and reports as are required by sections 233 and 236 of the "Ordinance".

73. A balance-sheet, profit and loss account, income and expenditure account and other reports referred to in Article 69 supra shall be made out in every year and laid before "The Company" in the Annual General Meeting and made up to a date not more than four (04) months before such meeting. The balance sheet and profit and loss account or income and expenditure account shall be accompanied by a report of the Auditors of "The Company" and the report of BOD.

74. A copy of the balance-sheet and profit and loss account or income and expenditure account and reports of BOD and Auditors shall, at least twenty one days preceding the meeting be sent to the persons entitled to receive notices of General Meetings in the manner in which notices are to be given hereunder.

75. BOD shall in all respects comply with the provisions of sections 230 to 236 of the "Ordinance".

AUDIT

76. The appointment and duties of the auditor(s) shall be regulated in accordance with the "Ordinance".

77. A. "The Company" at each Annual General Meeting shall appoint an auditor(s) being chartered accountant(s) to hold office until the next Annual General Meeting and the following provisions shall have effect, that is to say:

If an appointment of an auditor(s) is not made at an Annual General Meeting, the Securities and Exchange Commission may appoint an auditor(s) as per provisions of the "Ordinance".

I. A member of BOD or an officer of "The Company", or a partner of or person in the employment of such member of BOD or officer or any person, indebted to "The Company" shall not be appointed auditor of "The Company".

Company Secretary

Part II of 15

II. If any person after being appointed auditor becomes indebted to "The Company", his appointment shall thereupon be terminated.

III. The First Auditor(s) of "The Company" may be appointed by BOD within 60 days of the date of incorporation and auditor(s), if so appointed, shall hold office until the first Annual General Meeting, unless previously removed by a resolution of "The Company" in General Meeting in which "Member" of "The Company" may appoint auditor(s) at such a meeting.

IV. Retiring auditor(s) shall be eligible for re-appointment.

V. No person other than a retiring auditor(s) shall be capable of being appointed to the office of the auditor at the Annual General Meeting unless notice of an intention to nominate him be given to "The Company" not less than fourteen days before the day fixed for the holding of such Annual General Meeting and upon receipt of such notice, the provisions of the "Ordinance" shall be complied with.

B. Any other audit of "The Company" shall be conducted as provided in the "Ordinance".

78. The remuneration of the auditor(s) shall be fixed by "The Company" in the General Meeting except that the remuneration of any auditor(s) appointed before the first Annual General Meeting or to fill any casual vacancy may be fixed by BOD.

79. Every auditor of "The Company" shall have a right of access at all times to the books, assets and accounts and vouchers of "The Company" and shall be entitled to require from the members of BOD and officers of "The Company" such information and explanation as may be necessary for the performance of duties of the auditor(s) and auditor(s) shall make a report to Members of "The Company" on the accounts examined by them, and on every balance-sheet, income and expenditure account laid before "The Company" in the General Meeting, during their tenure of office and the report shall state whether or not they have obtained all information and explanations they have required and whether or not in their opinion the balance-sheet, is in conformity with the law and whether or not such balance-sheet, and income and expenditure account, exhibit true and correct view of the state of "The Company's" affairs according to the best of their information and explanations given to them as shown by the books of "The Company" and whether or not in their opinion the books of accounts have been kept by "The Company" as required by the "Ordinance"; where any of the matters referred to herein above and answered in the negative or with a qualification, the report shall state the reasons for such answers and the report shall be attached to the balance sheet, income and expenditure account and such report shall be read before "The Company" in a General Meeting and shall be open to inspection by any "Member".

80. The auditor(s) shall be entitled to receive notice of and to attend all General Meetings of "The Company".

81. Every account when audited and approved by the General Meeting shall be conclusive except as regards any error discovered therein within three months after t

Company Secretary

approval thereof. Whenever any such error is discovered within that period, the account shall forthwith be corrected and henceforth shall be conclusive.

NOTICE

82. A notice may be given by "Secretary" to any "Member" either personally or by sending it by post to him to his registered address.

83. Where a notice is sent by post, service of the notice shall be effected by properly addressing, pre paying and posting a letter containing the notice and unless the contrary is proved, notice shall be deemed to have been effected at the time at which the letter would be delivered in the ordinary course of post.

84. Notice of every General Meeting shall be given in a manner described supra to every "Member".

INDEMNITY

85. Every "Member" of "The Company" and BOD, the Chairman, Chief Executive Officer or any other officer or employee of "The Company" shall be indemnified by "The Company" against all costs, losses which they may incur or become liable to pay by reason of any contract entered into or act or deed done by them in discharge of their duties in good faith and any loss occasioned by any error of judgment, damage or misfortune which may happen in the execution of their duties in connection with affairs of "The Company".

POWER OF GOVERNMENT

86. Power to authorize the development, and up-gradation of existing or new "Industrial Estate(s)" shall vest in the "Government".

AMENDMENT

87. "These Presents" may, subject to clause 7 of the Memorandum of Association, be amended, modified, substituted, altered or repealed by a three fourth majority of the voting strength of the "Members" present and voting on a Special Resolution for the purpose in an Extraordinary General Meeting of the "Members", provided that a notice "In Writing" specifying the intention to propose the resolution as a Special Resolution shall have been served on "Members" of "The Company" at least twenty one days prior to the meeting.

DISTRICT OFFICE
For Registrar of Companies

Company Secretary

We, the several persons whose names and addresses are hereunder subscribed, are desirous of being formed into a Company in pursuance of these Articles of Association.

Name and surname (present and former) in full and block letters	Father's/Husband's name in full	Nationality/Former Nationality	Occupation	Residential address in full	Signature
Mohsin M. Syed	Syed M. Musa	Pakistani	Engineer	71-S, Defence Phase-II, Lahore Cantt	[signature]
Mr. Parvez Rashid	Bashir Ahmad	Pakistani	Secretary Industries Commerce & Investment	7-Aikman Road, GOR-I, Lahore	[signature]
Mr. Khawaja Muhammad Owais	Khawaja Khuda Bakhsh	Pakistani	Industrialist	House No. 2, Nisar Colony, Kashmir Da[illegible], Lahore	[signature]
Mr. Sikandar Mustafa Khan	Bashir A. Khan	Pakistani	Chairman [illegible]	House No. 30-C, Sarwar Road, Lahore Cantt., Lahore	[signature]
Mr. Sabir F. Chohan	Dr. M. A. Chohan	Pakistani	Engineer	House No. 16, St. No. 53, Sector F-7/3, Islamabad	[signature]
Mr. Almas Hyder	Dr. S. M. Naq[illegible]	Pakistani	Businessman	House No. L-41, Gulberg-II, Lahore	[signature]
Mr. Syed Nadeem Hashmi	Syed Quwat Ali Shah	Pakistani	Chief Executive Thermosole Industries (Pvt) Ltd	House No. 695 Block-3 Sector C-I, Township, Lahore	[signature]
Mr. M. I. Khurram	[illegible] Barkat Ali	Pakistani	Chief Executive [illegible] Footwear Ltd	45-B/II, Gulberg-II, Lahore	[signature]
Major (R) Shahnawaz Badar	S. M. Badar	Pakistani	Secretary Labour and Human Resources	House No. 85 GOR II, Shadman, Lahore House No. 204 F-10/3 Islamabad	[signature]
Mr. Kamran Lashari	Sardar Abdul Wadood Khan Lashari	Pakistani	Secretary, Environment Protection	House No. 16 Fateh Sher Road, Mozang, Lahore	[signature]
Mr. Zaheer Ahmad Khan	Naseer Ahmad Khan	Pakistani	Engineer	122-R, Phase I, Lahore	[signature]
Dr. Faisal Bari	Abdul Bari	Pakistani	Economist	House No. 79 Ghazi Road, Karachi, Mohallah Saddar Bazar, Lahore	[signature]

Dated the day of

WITNESS TO ABOVE SIGNATURES

Full Name

Father's Name

Full Address

Signature

Occupation

ATTESTED

Company Secretary

District Officer,
Enterprises & Investment Promotion
[illegible] Registrar Joint [illegible]

TECHNICAL PLAN /PROPOSAL FOR OPERATION & MAINTENANCE

1. ELECTICAL CONNECTIONS

PIEDMC provide temporary and permanent electrical connections to Resident Industrialists for construction and operation purpose. A temporary electric connection or any other emergent requirement of temporary nature will be given to consumer on first stage. A temporary electric power supply connection for the construction shall be provided by PIEDMC initially for a period of six months which is further extendable on three months' basis up to connection of the specific job/project for which the temporary connection was obtained. The sanctioning officer ensured that the temporary connection is utilizing for temporary purpose only. After the construction work has been completed at site, the permanent connection will be given to resident industrialist basis upon their load requirement on different Tariffs as per kind of connection.

One window Operations are established in PIEDMC offices wherein all types of application for connection are received from the consumers who are given acknowledgement of the same.

2. PREVENTIVE/SCHEDULE MAINTENANCE

To keep the electrical power system in safe, stable and reliable operating condition, it is necessary that the system should be operated and maintained properly to retain its each component in or restore it to a state in which it can perform a required function.

Hence, the preventive maintenance is used to be carried out in accordance with an established time schedule. Scheduled maintenance covers all measures aimed at retaining the design state of the technical equipment belonging to a system and may take place as and when required or in regular/fixed interval of time. Scheduled maintenance includes such activities as cleaning and washing, conservation, lubrication and where necessary amending or replacing parts subject to wear and tear. Scheduled maintenance also involves preparation of maintenance schedules, carrying out the specified work and dealing with feedback relating to this work. It is worth mentioning that an effective preventive maintenance program always minimizes emergency maintenance breakdowns and damages of infrastructure / grid station equipment.

3. TROUBLE SHOOTING/NON-SCHEDULED MAINTENANCE

PIEDMC is doing the Non-scheduled or corrective or emergency maintenance is often not in accordance with an established time schedule and usually needs as result of malfunction or unexpected defect. Non-scheduled maintenance covers all

measures aimed at restoring the designed state of the technical equipment belonging to a system. Repair work and part replacement are typical types of corrective maintenance. It also involves planning, handling requests for performing/checking and evaluating the necessary measures (functional tests etc.). To identify the fault in case of Power Failure, the troubleshooting is done through test instruments and corrective measurements which can be used to help narrow the problem area and identify the problem components. Once the equipment is repaired/replaced, the power is restored.

4. COMPLAINT HANDLING

The compliant in respect of electric supply failures, quality of poor, meter reading and billing, and other matters relating to supply of electric power services has been handled by PIEDMC expeditiously (usually every compliant regarding restoration of power supply is attended within 20 Minutes). One window Operations are established in PIEDMC offices wherein all types of complaints are received from the consumers who are given acknowledgement of the same with definite dates for their replies according to time frame for handling and redressal of such complaints. These complaint offices shall work on 24-Hours basis even during holidays. The working of these complaints is to be supervised by higher officers of Electrical Department PIEDMC. The Customer Feeder back is also monitored and their grievances are readdressed as well.

make available record of snapshots for twelve months for presenting before any competent forum if required for settlement of billing dispute, raised by any consumer i.e. NEPRA/Energy Department.

Meter Readers shall also check the irregularities/discrepancies in the metering system at the time of reading meters / taking snapshots and report the same in the reading book/discrepancy book or through meter change order /meter checking report or any other appropriate method as per the practice. The concerned officer/official will take corrective action to rectify these discrepancies.

On all permanent connection PIEDMC install the back meter mandatory as in case of any meter display wash /meter burnt or any other relevant issue. The back meter will be considered is billing meter and the accuracy of reading and billing is being assured in this way for customer satisfaction and to avoid the conflict as well.

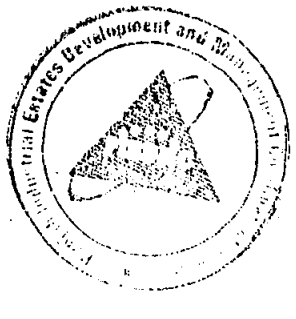
Moreover, in case of any customer compliant regarding billing. PIEDMC install back-up meter on all industrial connections having sanctioned load of 25KW and above on request of the consumer. The cost will be borne by the consumer if meters provided/arrange by PIEDMC on consumer's request. In case of any defect in the billing meter, the back-up meter will be converted into billing meter and the bill shall be charged on the basis of the consumption recorded on the back-up meter. Upon replacement of the impugned meter, the same will be treated as back-up meter.

PIEDMC will be also adopted GSM Based Energy Meter In their Industrial Estates (Already adopted in Sundar Industrial Estate). It reduces human intervention required in keeping track of the total power consumption of the users. An SMS is sent directly to the user indicating the consumption and bill without the need of any individual from the Electricity Department to physically visit the site to note down the readings by the use of GSM module. This automation not only reduces the labor cost but also makes the system more efficient and accurate.

Follow up duties are also scheduled for combing and to reduce the pilfering for the effective curtailment of the losses.

Any detection bill is charged as per SOP's approved by NERPA in customer service manual.

Dispute resolution committee is also formed for the amicable settlement of the billing conflict before the matter to be taken on the third party forum.

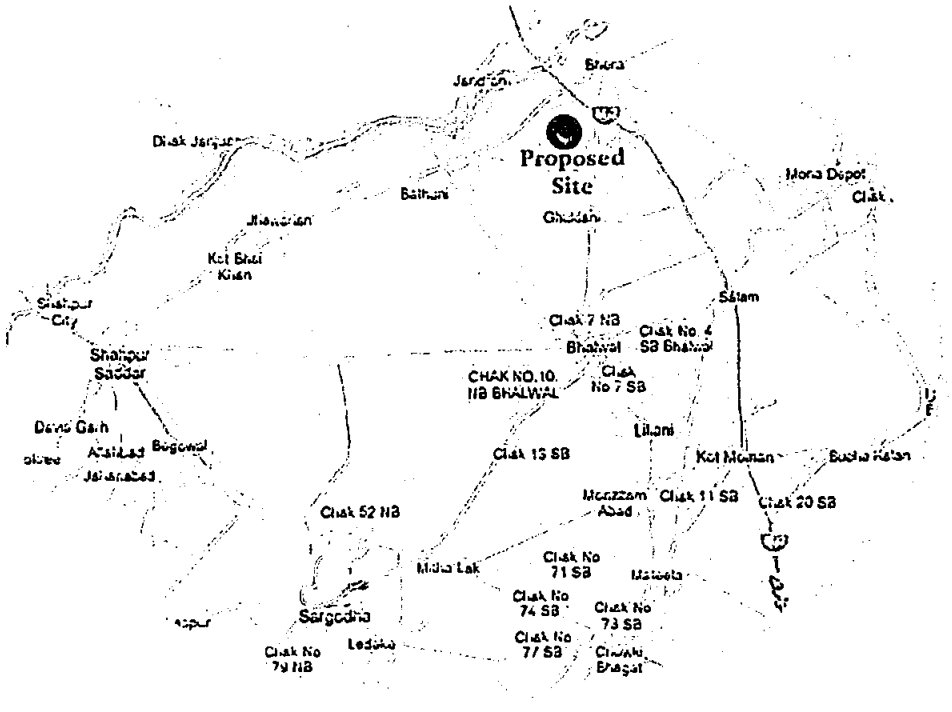


B-1 IX

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE AND LAND RECLAMATION WORKS FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, DISTRICT SARGODHA



FEASIBILITY STUDY

FINAL REPORT

OCTOBER 2012

EA Consulting (Pvt.) Ltd.
Engineering | Architecture | Project Management

BHALWAL INDUSTRIAL ESTATE

BHALWAL INDUSTRIAL ESTATE

LAND RECLAMATION WORKS

FINAL REPORT

Contents

Figures:

Fig. 1.2: Project Location Plan
Fig. 3.3.1: Location of Test Pits and Bore Holes
Fig. 3.4: Location of Tube Wells in the vicinity of the Project Site.

Tables

Table 3-1: Summary of Laboratory Test Results on Bore Hole Samples
Table 7.2: Cost Estimate for Option 1
Table 8.2: Cost Estimate for Option 2

Annexure:

A: Bore Logs showing Existing Water Table
B: Information about Tube Wells
C: Pictures of Existing Tube Wells
D: Chemical Analysis of Water Samples
E: Preliminary Geotechnical Investigations Report
F: Factual Report on Geotechnical Investigations
G: Draft Design of Land Reclamation Works
H: Final Design of Land Reclamation Works
I: Summary of the Specifications

Executive Summary

The Punjab Industrial Estate Development and Management Company (PIEDMC) is in a process of establishing a state-of-the art Industrial Estate at Bhalwal, in District Sargodha and has awarded the Consultancy Services for its Master Planning and design of Infrastructures Design to E. A. Consulting Pvt. Ltd. A location plan of the project is shown in Fig. 1.2.

The project site is spread over an area of about 394 acres and land acquisition of some additional area is also in progress as shown in the site plan in Fig. 2.3. A low lying section of the project site often becomes ponded during the rainy season. Although it gets dried completely once the rainy season is over, in the inundated condition it looks like an unworkable area requiring an additional expenditure on earthwork to reclaim it for construction purposes thereby decreasing its market potential. However, no solution could be devised without a proper study of the site. As such Design and Supervision for reclamation of the piece of land at the infrastructure development stage was included as an integral component of the contract for the Consultancy Services for the project.

The Consultants studied the problem vis-à-vis land reclamation works required to develop the said low lying section of the project site into a workable area in an economical and environment-friendly manner. Based on the site visit of the Geotechnical Expert soon after the initiation of the project and the subsequent sub-soil investigations and ground water study, Options, methodology and cost estimates were prepared for the said works. The options include a do-nothing case also besides two other options. Drawings and cost estimates were also prepared for these two options in order to study the cost impact.

The existing ground water table was observed to be at a depth of about 1.53m showing that the inundation of site is only during the rainy season primarily due to the lower ground levels in the area. Ground water study is presented Section 3 of the Report.

BHALWAL INDUSTRIAL ESTATE

LAND RECLAMATION WORKS

FINAL REPORT

The Geo-technical investigations at the site (presented at Section 4 & 5) show that the existing sub-soil in the affected area consists of mostly silty –clay with sand and silty sand classified on the basis of Laboratory Tests as A-4 type. No significant difference was observed in the engineering characteristics of the sub-soil in this area as compared with the entire project site.

Draft Tender Documents for Land Reclamation Works covering the entire low-lying area were included in the earlier submitted package for the external works. However, cost consideration and budgetary constraints called for excluding the reclamation works from the contract package for external works and for considering it at a later stage. Thereafter, the Land Reclamation Works have been further economized and limited to the area under road infrastructure falling in the low-lying section of the Project Site as per Final Master Plan of the Project. Accordingly the work has been included in the Contract package for the Internal Infrastructures Development Works in Phase-I as per discussion during the review process of Draft Detail Design of the project. This eliminates the need for issuance of any separate Tender Documents for the Land Reclamation Works.

The Studies including the Geotechnical / Sub-soil investigations and Ground Water Study, Land Reclamation Works Options & Methodology, Drawings and Estimated Cost of the Works and important conclusions and recommendations based on the Study have been presented in this Final Report on Land Reclamation Works covering all the project deliverables in this respect.

1 INTRODUCTION

1.1 Project Background

The Punjab Industrial Estates Development and Management Company (PIEDMC) has been established by the Govt. of Punjab in order to achieve a well-conceived, orderly and rapid industrialization in the province by developing a chain of industrial estates in a dynamic and innovative manner, and thereby fostering socio-economic development in the region, providing employment opportunities to the people, and alleviating poverty. Led by private sector, the organization has a strong and effective representation from different sectors of the economy and from all over Punjab. It is flexible enough to respond to the changing economic conditions and is financially self-sustainable to maintain the desired impetus of development works. In addition to the successfully completed industrial estates at Lahore (Sundar & Kot Lakhpat), Multan and Rahimyar Khan, the proposed Industrial Estate at Bhalwal in District Sargodha is another important project being undertaken by the PIEDMC. The proposed Estate is envisioned to be an "Island of Facilitation" for the prospective investors & industrialists and upon its completion is expected to contribute as much as Rs.10Billion to the Gross National Product, directly creating over 50,000 new jobs and indirectly providing work & business opportunities to around 2.5million people.

1.2 Location

Bhalwal Industrial Estate (BIE) is located on Bhalwal – Bhera Road some four kilometer away from Bhalwal Town and 36 Km from Sargodha city. The site is accessible from the Lahore-Islamabad Motorway from Salam Interchange (16 Km) or Bhera Interchange (19 Km). The railroad connection is through Bhalwal Railway Station at a distance of about five kilometer from the site. Project location plan is attached as Fig. 1.2.

1.3 Objectives & Scope

The main objectives of the project are:

- To provide a structured platform at Bhalwal in District Sargodha for setting up industries,
- To develop the required infrastructure and thereby facilitate the entrepreneurs in setting up industries, generate economic activities and provide employment opportunities,
- To draw economic benefits from the proper utilization of available skilled and unskilled manpower and the agricultural products of the region,
- To provide all support services and utilities at an easily accessible and well planned site,
- To provide a relatively secure environment for the industries and
- To ensure compliance with the environmental regulations.

The scope of work for the Consultancy Assignment consists of the following two main components:

- Design of Master Planning & Infrastructure for the Development of Bhalwal Industrial Estate
- Land Reclamation Works in a low-lying area of the Project Site which often gets inundated during the rainy season. The following items of work were mainly included in this component:
  - Preliminary Design including Reconnaissance Survey, Ground Water Study, Geotechnical Investigation, Proposed Land Reclamation Works Options, Methodology & estimated cost of the Land Reclamation Works.
  - Detail Design including Detailed Survey, Ground Water & Sub-soil Study.
  - Preparation of BOQs and Tender Documents with Specifications and Construction Drawings.

1.4 Approach & Methodology

The approach to the design of Land Reclamation Works was developed on the basis of direct field observations of the Geotechnical Expert during his visit to the project site, the sub-soil / geotechnical investigations and ground water study carried out at the project

site and a comparison of the sub-soil conditions at the inundated / reclamation area with those observed at the entire project site.

The methodology adopted for the design of Land Reclamation Works involved study of the existing sub-soil conditions through a program of investigations including excavation of test pits, in-situ testing, collection of soil samples for laboratory testing, laboratory testing of the soil samples as per relevant standards of the American Society for Testing Materials (ASTM), and observations on the existing ground water table. After comparing the conditions observed at the area to be reclaimed with the entire project site, the options for land reclamation were developed keeping in view the project objectives and the need for an economical and environment-friendly solution to the problem. Cost comparison of the options was also done besides studying technical parameters including the practicality of their implementation at site in an effective manner.

1.5 Surveys & Investigations

In addition to the direct field observations during the reconnaissance survey of the site by the Geotechnical Expert, the Geotechnical investigations included:

- Excavation of a total of 15 Nos. test pits down to a depth of about 1m (3ft) below the existing ground level (EGL) including 02 Nos. test pits in the area to be reclaimed and 13 Nos. spread all over the project site.
- In-situ testing in the test pits including Field Density Tests
- Collection of 2 Nos. soil samples from each pit for laboratory testing as per relevant ASTM standards,
- Performance of Laboratory Tests on the selected soil samples including:
- Particle Size Distribution
    - Atterberg's Limits
    - Modified Proctor Compaction
    - 3-point soaked CBR tests
    - Chemical Analysis of the Soil Samples including estimation of Sulphate content, Chloride content and Organic content.
- Drilling of 4 Nos. Bore Holes down to a depth of 6.0m below the NSL and
- Preparation of Bore Logs for each bore hole.

- Preparation of a Preliminary Geotechnical Investigations Report
- Preparation of a Factual Geotechnical Investigation Report upon completion of Field and Laboratory Testing.
- Observations on the existing ground water table and
- Preparation of a Ground Water Study Report.

1.6 Organization of the Report

This report is organized in a professional format covering the various elements for the design of Land Reclamation Works as per scope of work stated earlier at para 1.3 above. It includes the following sections:

Section	Description
1	*Introduction*
2	*Site Reconnaissance*
3	*Ground Water Study*
4	*Preliminary Geo-technical Investigations*
5	*Detailed / Factual Report on Geotechnical Investigations*
6	*Options and Methodology*
7	*Draft Design & Estimated Cost*
8	*Final Design and Cost of Land Reclamation Works*

The Final Tender Documents for Internal Infrastructure Development Works package also include the economized Land Reclamation Works finally proposed for the project.

1.7 Acknowledgements

The Consultants acknowledge with deep gratitude the kind cooperation of the PIEDMC officials during the reconnaissance visit, the inception / kick-off meeting especially for providing the available information and historical data and later at every stage of the work.

2 SITE RECONNAISSANCE

2.1 Coordination with PIEDMC

Following the signing of agreement and the initial desk study, a team of professionals from EA visited the PIEDMC Office at Sunder Industrial Estate, Lahore on June 4, 2012. The team held an initial meeting with the General Manager (Technical) and Manager Technical regarding the proposed development works at the Project site, the methodology and timelines for the various items of work. After the meeting, the team visited the Sunder Industrial Estate and Kot Lakhpat Industrial Estate along with the Officials of PIEDMC to study the existing operational conditions and the various features of the recently developed Industrial Estates and the lessons learnt therefrom.

2.2 Visit to the Project Site

A visit to Bhalwal Industrial Estate Site was made on June 5, 2012 and the area was reconnoitered in detail.

The EA team included the following members:

Engr. Syed Muhammad Tayyab	Team Leader
Plnr. Masood Ahmed Jafri	Planning Expert
Engr. Jamshed A. Danish	Geo-technical Expert

In addition, the survey staff of E.A. was also available at site to start the verification of the Topographic Survey immediately.

The Manager Technical, PIEDMC, accompanied the team during the visit. The GM (Technical) also visited the site and the priorities and vision of the PIEDMC were discussed with respect to the proposed development and the existing site conditions. The PIEDMC had also called in the relevant local staff of the Punjab Revenue Department (Local Patwari) in addition to the representatives of the Survey of Pakistan to show the survey control points / and the site boundary to the Surveyors from E.A. and help demarcate the additional area acquired being acquired by PIEDMC.

2.3 Existing Site Conditions

The site measuring about 394 acres is in irregular shape having a zig-zag boundary. North-western part of the site is low lying area and experience ponding over a large area. Some water logged area in the north east was draining on the low lying area creating a large pond. The drainage from north east in the site has now been blocked and the ponding areas are planned to be reclaimed. For the purposes of master planning the ponding area has been assumed as reclaimed and fit for development. When visited on June 05, 2012 the whole site was dry though the top layer of soil showed the signs of water inundation in this area. The area is shown in Drawing No. EA-775-BIE-LR-01.

The site originally had no frontage or access from the main Bhalwal-Bhera road. Punjab Industrial Estates Development and Management Company (PIEDMC) have acquired additional land near the Janazagah to provide direct access from the Road. In order to further improve site's connectivity and traffic circulation, it would be desirable to acquire land west of Jinnah Colony in continuation with the existing temporary metalled road built for the foundation stone laying ceremony.

All the necessary utility services are available within a distance of about 1.5 kilometer viz:

- Electric Power Supply (FESCO 132 KV grid station);
- Water Supply (Lower Jhelum Canal);
- Main Sui Gas line and
- PTCL exchange.

2.4 Topography of the Site

The Topography of the site shows generally mild variation in surface levels. The natural slope at the site is South to North and East to West. A depression (2-3 ft.) exists in the North-East part of the site. As stated above, a Pseudo-Lake was formed in this area during previous rains/floods. However, presently the area has dried out, apparently due to percolation of ponding water into the subsoil. A katcha drain exists from the depressed area unto the nearby Nabi Shah Lake which is towards North outside the boundary of the site.

2.5 Ground Water Availability at Site

The presence of a number of tube wells around the project site shows that ground water is available at site and is being used for drinking and other human consumption and agriculture.

Pictures of some of the tube wells are also annexed at the end of the report.

2.6 Existing top soil

The existing top soil at the project site in general and at the depressed area in particular consists of mostly silty clayey material.

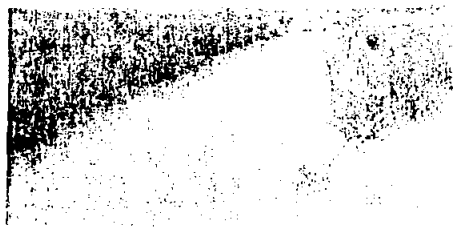
2.7 Existing Drainage Pattern

The existing drainage pattern of the site follows the existing slopes from South to North and East to West. It appears that the existing sem nullahs drain out in the nearby Nabi Shah Lake. However, due to growth of weeds and grass, the nullahs get silted and the flow is restricted resulting in the ponding of water at site. Therefore, there is need for regular cleaning and dredging of these nullahs for efficient site drainage.

2.8 Agricultural Fields

There are agricultural fields in the vicinity of the project site especially around the ponded area where Land reclamation is being sought as a part of the proposed site development works. It would therefore be preferable to provide a lined channel / interception drain on the outer periphery to arrest flow of water from the surrounding areas / agricultural fields across the Estate boundary.

A View of Nabi Shah Lake



2.9 Land Reclamation Needs

As mentioned earlier at paras 1.3 and 1.4 above, the existing low lying area which was ponded during the last rains may need some treatment for an economical land reclamation prior to offering it for sale to the prospective buyers / potential investors or else its apparent condition, especially during the rainy season, would not attract any potential investors due to their perception of a higher land fill cost / construction cost. It might also affect the sale of the plots in the surrounding area.

Notwithstanding the above consideration, even for the construction of internal roads passing through the area according to the project master plan, the existing top soil shall have to be improved / replaced with granular material to provide a good road foundation.

3 GROUND WATER STUDY

3.1 Objectives of Ground Water Study

The Ground Water Study presented in this report has been undertaken with the following main objectives:

- To determine the level of existing ground water table at the site in connection with infrastructure design of the project,
- To identify and locate the sources of water supply for the project needs,
- To examine the quality of water available from the tube wells in the vicinity of site.

3.2 Scope of Ground Water Study

The Ground Water Study presented in this report included:

- Study of existing water table at the project site through excavation of 15 Nos. Test Pits to a depth of about 1m (about 3ft) below the existing ground level (EGL),
- Drilling of 04 Nos. exploratory boreholes down to 6m (about 20ft) depth below the EGL,
- Collection of information regarding the location, depth and discharge rate of the existing 9 Nos. tube wells in the immediate vicinity of the site and
- Chemical analysis of the water samples collected from these tube wells.

3.3 Ground Water Observations

3.3.1 Observation in Test Pits

Ground water table (GWT) was not encountered in any test pit showing that the existing ground water is below 1.0m (3ft) from the existing ground level, EGL. The location of Test Pits excavated at site is shown in Fig. 3.3.1.

3.3.2 Observation in Bore Holes

Ground water table (GWT) was encountered at a depth of about 1.53m below the EGL in all bore holes during the investigations. The location of Bore Holes drilled to a depth of

6.0m below the EGL is also shown in Fig. 3.3.1 while the Bore Logs showing the existing water table are presented at Annexure "A".

3.4 Information about Tube Wells

During the Ground Water Study, information about the location, depth and discharge rate of Tube Wells (9 Nos.) existing in close vicinity of the project site was also collected. The location of Tube Wells is shown in Fig. 3.4 while the information about each Tube Well is appended at Annexure "B". Pictures of the tube wells are appended at Annexure "C".

The tube wells in the vicinity have suctions ranging from 4in to 7in and depths from 60ft-100ft while the discharge rates vary from 0.75 cusecs to 1.25 cusecs.

3.5 Chemical Analysis of Water Samples

Water Samples collected from the Tube Wells in the vicinity of the Project Site were sent for Chemical Analysis at the Central Material Testing Laboratory of Pakistan Water and Power Development Authority (WAPDA), Lahore. The results of the chemical analysis are appended at Annexure "D" showing that the values of various parameters examined in the laboratory are not within safe side even though the people in the adjoining areas are using the water extracted from the tube wells for all domestic purposes.

3.6 Need for Detailed Hydro-geological Study

While the quality and availability of sub-surface water has been established through the Ground Water Study, detailed hydro-geological study of the site is strongly recommended at a later stage to assess the capacity of the existing aquifer vis-à-vis the actual water requirement at site for the industries established at site. The study would essentially include Aquifer Characterization, Electrical Resistivity Survey to understand variations in water quality in the vertical extent, Reservoir Yield Analysis and quantification of the existing sub-surface water sources besides studying the impact of continuous pumping of water at the project site on the yield of existing tube wells in its vicinity.

4 PERLIMINARY GEO-TECHNICAL INVESTIGATIONS

The Preliminary Report on Geotechnical Investigations is presented at *Annexure "E"*. The investigations comprised drilling of 4 Nos. boreholes down to a depth of 6m below the existing ground level, performance of in-situ tests in boreholes, collection of disturbed soil samples from boreholes, performance of laboratory testing on selected soil samples and submission of geotechnical investigations report on the basis of field geotechnical investigations and laboratory testing.

A summary of the Laboratory Test Results is presented hereunder:

Borehole No.	Sample No.	Depth (m)	Grain Size Analysis			Atterberg Limits		Soil Classification (USCS)	
			Concre-tion %	Sand %	Fines %	LL %	PI %	Group Symbol	Group Name
BH-1									
	SPT-1	1.0	0.3	81.0	18.7	Non-Plastic		SM	Silty Sand
	SPT-2	2.0	1.0	81.5	17.5	Non-Plastic		SM	Silty Sand
	SPT-3	3.0	21.0	72.5	6.5	Non-Plastic		SM	Silty Sand
	SPT-6	6.0	0.0	94.6	5.4	Non-Plastic		SP-SM	Poorly graded sand with silt
BH-2									
	SPT-1	1.0	4.6	69.6	25.8	Non-Plastic		SM	Silty Sand
	SPT-2	2.0	1.0	82.5	16.5	Non-Plastic		SM	Silty Sand
	SPT-4	4.0	0.0	88.1	11.9	Non-Plastic		SP-SM	Poorly graded sand with silt
	SPT-6	6.0	0.0	97.9	2.1	Non-Plastic		SP	Poorly graded sand
BH-3									
	SPT-1	1.0	0.0	59.4	40.6	Non-Plastic		SM	Silty Sand
	SPT-2	2.0	0.0	87.2	12.8	Non-Plastic		SM	Silty Sand
	SPT-3	3.0	0.0	92.9	7.1	Non-Plastic		SP-SM	Poorly graded sand with silt
	SPT-6	6.0	0.0	72.6	27.4	Non-Plastic		SM	Silty Sand
BH-4									
	SPT-1	1.0	0.0	69.5	30.5	Non-Plastic		SM	Silty Sand
	SPT-2	2.0	6.9	77.3	15.8	Non-Plastic		SM	Silty Sand
	SPT-4	4.0	0.0	89.1	10.9	Non-Plastic		SP-SM	Poorly graded sand with silt
	SPT-6	6.0	0.4	98.5	1.1	Non-Plastic		SP	Poorly graded sand

Source: Table 3-1, Report on Preliminary Geo-technical Investigations

5 FACTUAL REPORT ON GEO-TECHNICAL INVESTIGATIONS

The Detailed Factual Report on Geotechnical Investigations is presented at **Annexure "F"**.

The investigations comprised:

- Manual excavation of fifteen (15) test pits down to 3 ft depth below EGL along with the collection of bulk composite sample from each test pit.
- Performance of Field Density Tests (hereinafter referred to as FDTs) in each test pit.
- Performance of laboratory tests on selected soil. The following laboratory tests were performed on selected soil samples.
    - Particle size distribution
    - Atterberg's limits
    - Modified Proctor Compaction
    - 3 Point Soaked CBR tests
    - Chemical analyses of soil samples

- Preparation of a Factual Geotechnical Investigation Report upon completion of field and laboratory testing.

6 OPTIONS & METHODOLOGY

6.1 General

Land reclamation is basically a process of improving disturbed land to achieve land capability equivalent to the pre-disturbed condition and reclamation works include a wide range of solutions often adopted at construction sites to improve the existing site conditions which are deemed to be unsuitable for their intended use. Their nature and extent vary from site to site and so is the technology and costs involved. When working on land, the various soil stabilization techniques like mechanical stabilization (through compaction, for instance), chemical stabilization (through mixing of chemical agents / soils of higher strength) and the replacement of the poorer soil are often used to reclaim and improve an otherwise unusable site.

A similar condition was observed in the low-lying area at the project site in its North – Eastern periphery where, due to natural topography and presence of clayey material underneath, a Pseudo lake was formed during the rainy season. Due to the presence of standing water at site for a long time, reclamation of the ground was thought to be necessary before starting any construction work in this section of the project site. As such studies were undertaken to propose a suitable option and methodology for the land reclamation works required at the project site.

Keeping in view the existing site conditions, the comparative study of the engineering characteristics of the soil at the project site in general and in the area to be reclaimed in particular, and the focus on economical and environment-friendly solutions, the following three options were considered for the Land Reclamation Works required at the Bhalwal Industrial Estate site:

Option-1: *Reclamation of the entire inundated area*

Option -2: *Reclamation of the inundated area only under road foundation as per approved Master Plan of the project.*

Option -3: *Do nothing option..... No Land Reclamation at the Developmental Stage*

The above options are further discussed in the following section.

6.2 Option-1

The Option-1 is appended at Annexure "G". It involved reclamation of the entire affected area within project limits that remained ponded during the rainy season and was presented as a draft design for the Land Reclamation Works along with the draft submission of the External Works contract package.

The methodology proposed for this option required removal of the top layer of the soil / ground clearance and subsequent filling and compaction of the area with specified fill material to achieve the design surface levels.

6.3 Option-2

The Option-2 is appended at Annexure "H". It involves reclamation of area only under the roads falling in the affected section of the project site and has been presented as the Final Design for the Land Reclamation Works along with the Final submission of the Internal Infrastructure Development Works contract package. It is therefore more economical and would also serve as a foundation work for the construction of roads through the affected area.

6.4 Option-3

It is the do-nothing option and is based on the consideration that no land reclamation work may be carried out at the developmental stage leaving it to be undertaken as per conditions prevailing at the time of construction.

7 DRAFT DESIGN & ESTIMATED COST

7.1 Draft Design

A draft design was presented along with the earlier submitted Draft Submission of Tender Documents package for the External Works including the Boundary Wall, Approach Road and Gate Office. However, later it was communicated that Land Reclamation Works would be included in the construction package for the Internal Infrastructure Development Works.

The design is presented at Annexure "G". It is based on the Option1 and takes into consideration the land reclamation for the entire inundated area within project limits that remained ponded during the rainy season.

The methodology proposed for reclamation of the area mainly involves the following activities:

1. Dewatering of the site in an environment-friendly manner, in case the site is inundated at the time of construction. This would require disposal of the water removed from site in such a way that it does not degrade the environmental condition of the disposal site. A disposal site is available in the close proximity of the project area in the form of Nabi Shah Lake which already receives discharges from the existing sem nullahs running off the site.

2. Removal of existing top soil and the vegetation growing therein to a depth of about 0.15m (top 6") ensuring proper clearing & grubbing of the reclamation site.

3. Filling up the area with selected fill material (granular / sandy material as specified) in layers of 0.3m thickness and

4. Compacting it to 85% mdd as per AASHTO specifications until the design levels for the reclaimed site are achieved.

7.2 Estimated Cost

The cost of the above Land Reclamation Works (Option I) was estimated to be around Rs.44.006 million based on the market rates in September 2012. The cost estimate is presented in Table 7.2.

8 FINAL DESIGN & COST OF LAND RECLAMATION WORKS

8.1 Final Design

The final design of the proposed Land Reclamation Works is shown in the drawings presented at Annexure "H" while a summary of the specifications for the works is also presented at Annexure "I".

The design is based on the approved Master Plan of the project and is mainly proposed in a limited area under road foundation thereby economizing on the cost of the works as against full-scale land reclamation of the affected area.

The proposed design involves dewatering of the site as in the case of option 1, removal of the top soil along the road formation width unto a depth of about 0.15m (6") proper compaction of the excavated ground and thereafter providing compacted layers of suitable granular material as specified. Through the use of this simple approach the land would be reclaimed in an economical and environment-friendly manner.

The proposed cross section takes into account the need for effective drainage of the roadbed soil, particularly in this area.

8.2 Estimated Cost

The total cost of the reclamation works based on the proposed option has been estimated to be around Rs. 19.017 million as shown in Table 8.2.

Figures:

Tables

Annexure:

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Figures

EA Consulting (Pvt.) Ltd.
Engineering | Architecture | Project Management

BHALWAL

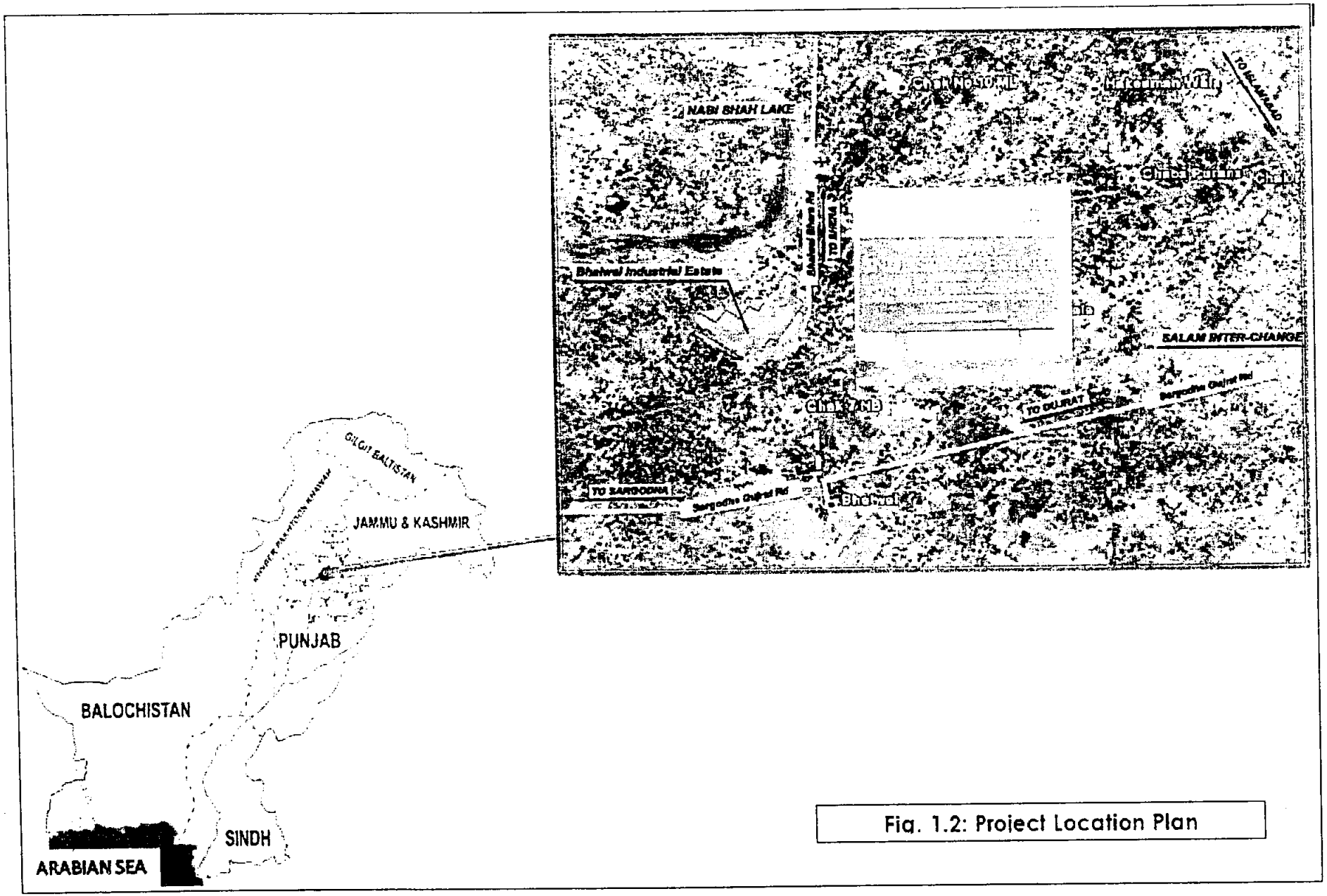
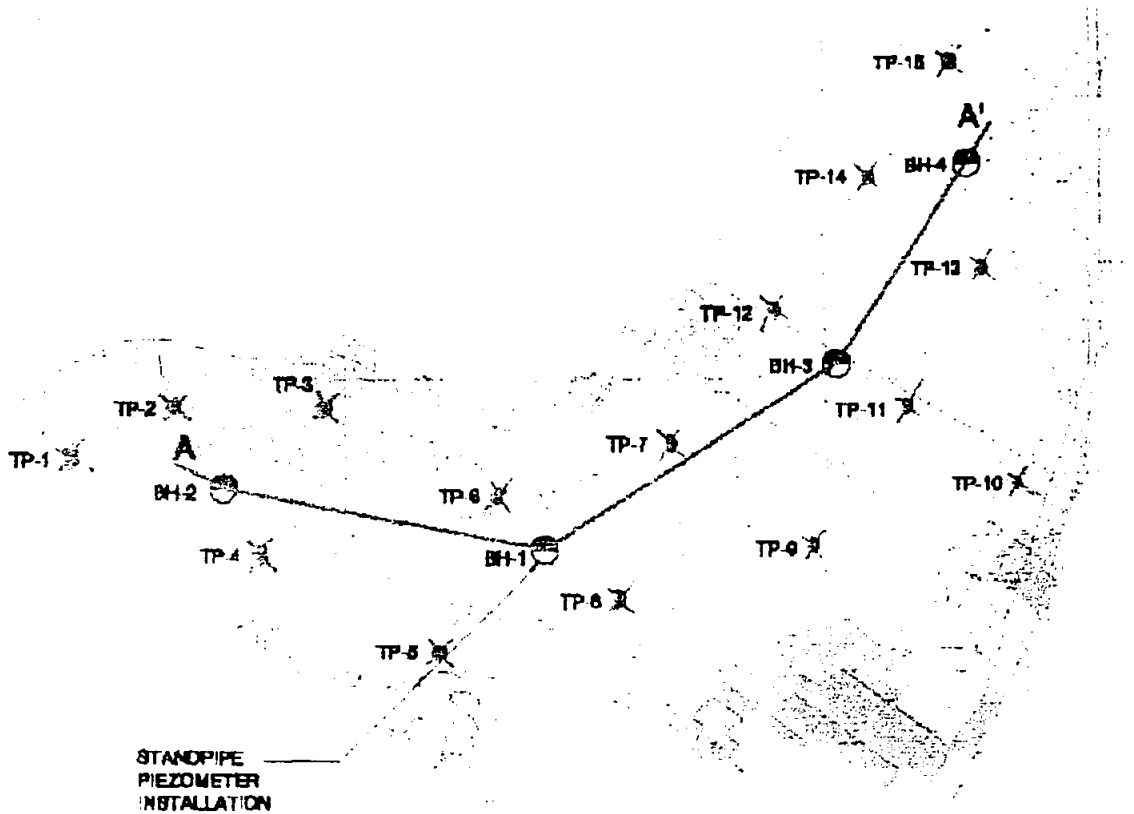


Fig. 1.2: Project Location Plan

Fig. 3.3.1: Geotechnical Investigations Plan - Location of Test Pits and Bore Holes



LEGEND:

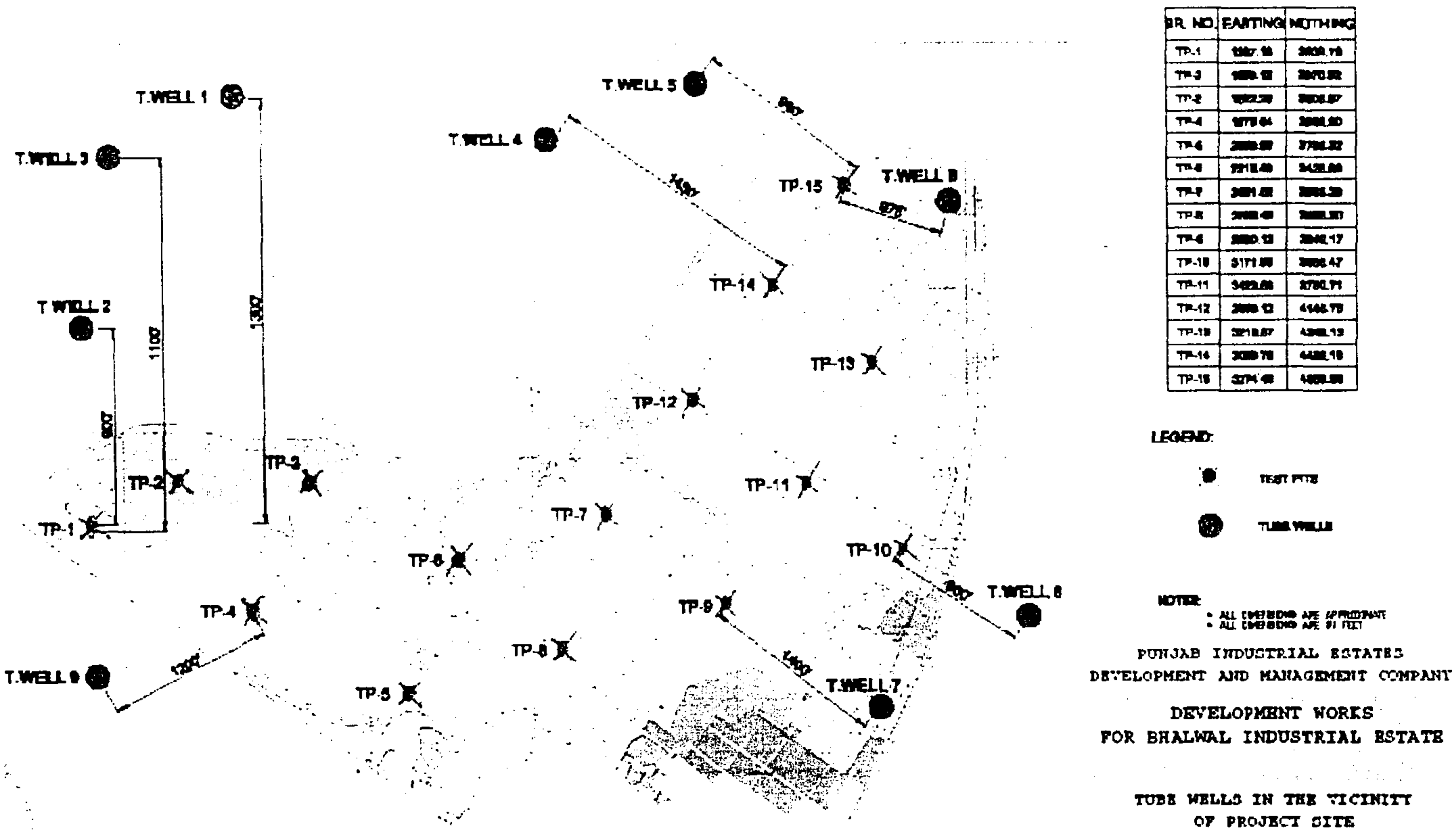
TEST PITS

BORE HOLES

NOTES:

- ALL DIMENSIONS ARE APPROXIMATE
- ALL DIMENSIONS ARE IN FEET

PROJECT CONSULTANT:	EA Consulting Pvt Ltd, Karachi
PROJECT:	SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE
TITLE:	GEOTECHNICAL INVESTIGATION PLAN
DRAWN BY:	[illegible] Associates
CHECKED BY:	[illegible]
DATE:	[illegible]
SCALE: N.T.S	JOB NO. J-527 / PAGE NO. 2-1 / REV. 00



BR. NO.	EASTING	NOTHING
TP-1	[illegible]	[illegible]
TP-3	[illegible]	[illegible]
TP-2	[illegible]	[illegible]
TP-4	[illegible]	[illegible]
TP-5	[illegible]	[illegible]
TP-6	[illegible]	[illegible]
TP-7	[illegible]	[illegible]
TP-8	[illegible]	[illegible]
TP-9	[illegible]	[illegible]
TP-10	[illegible]	[illegible]
TP-11	[illegible]	[illegible]
TP-12	[illegible]	[illegible]
TP-13	[illegible]	[illegible]
TP-14	[illegible]	[illegible]
TP-15	[illegible]	[illegible]

Fig. 3.4: Geotechnical Investigations Plan - Location of Tube Wells in the vicinity of the Project

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Tables

BHALWAL INDUSTRIAL ESTATE
LAND RECLAMATION WORKS

TABLE 7.2

ENGINEER'S ESTIMATE

BILL NO. 1: LAND RECLAMATION WORKS OPTION I

Item #	Item Description	Unit	Quantity	Rate	Amount
106a	Excavate Unsuitable Common Material	Cu.m	80,700	91.10	7,352,092.80
SP-2	Land Reclamation using river chenab sand fill in 0.3 m layers	Cu.m	194,150	188.79	36,653,811.48
TOTAL BILL NO. 1 : LAND RECLAMATION WORKS					**44,005,904**

BHALWAL INDUSTRIAL ESTATE
LAND RECLAMATION WORKS

TABLE 8.2

ENGINEER'S ESTIMATE

BILL NO. 1: LAND RECLAMATION WORKS OPTION II

Item #	Item Description	Unit	Quantity	Rate	Amount
106a	Excavate Unsuitable Common Material	Cu.m	18,440	91.10	1,679,957.76
108c	Formation of Embankment from borrow Excavation in common material	Cu.m	37,600	314.65	11,830,840.00
108ci	Formation of Embankment from borrow Excavation in sandy material	Cu.m	15,000	314.65	4,719,750.00
108cii	Formation of Embankment from borrow Excavation in A4 Clayey material	Cu.m	2,500	314.65	786,625.00
TOTAL BILL NO. 1 : LAND RECLAMATION WORKS					19,017,173

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure A

Bore Logs showing Existing Water Table

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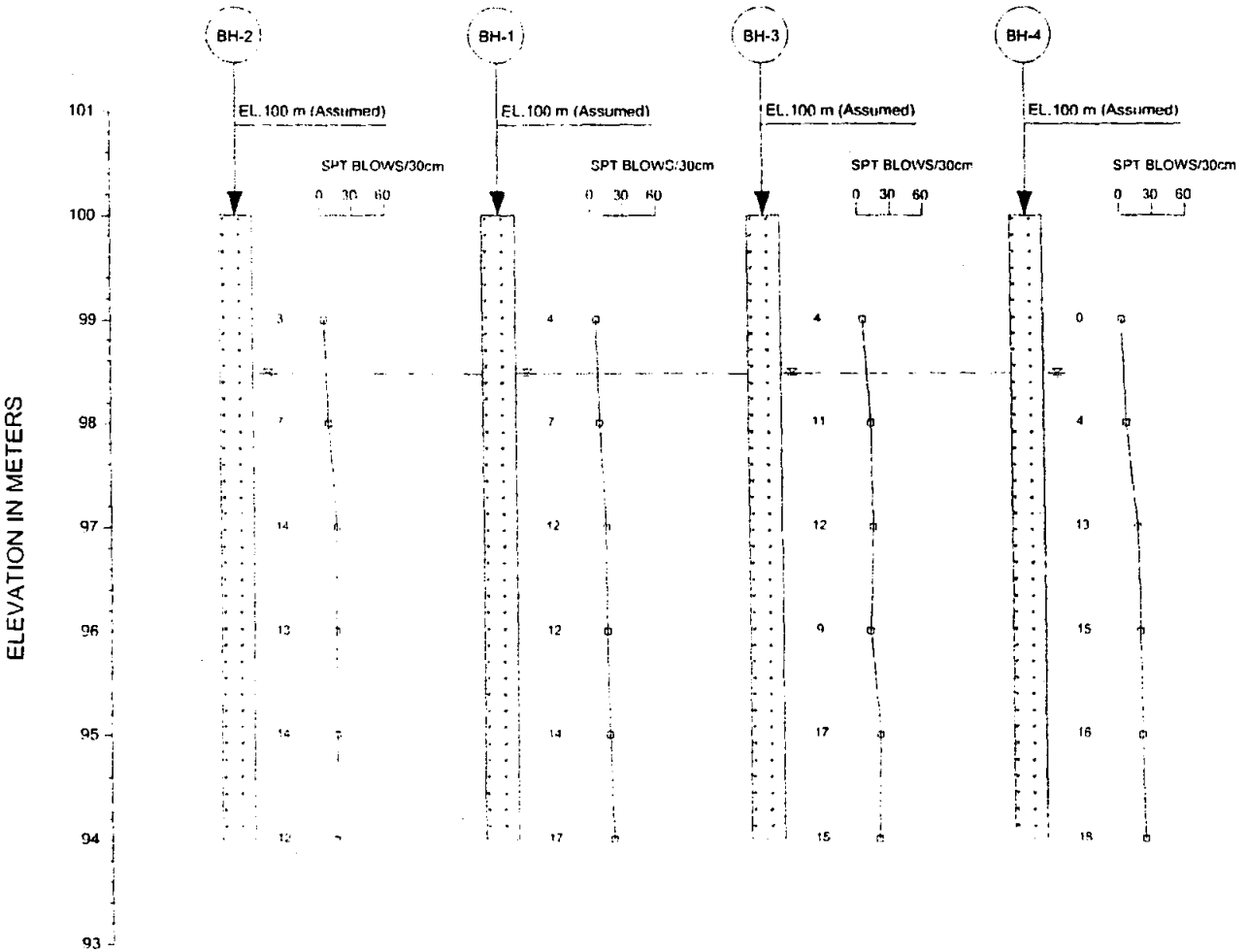
BHALWAL

FIG. 4-1



LEGEND:

- SILTY SAND / POORLY GRADED SAND WITH SILT/ POORLY GRADED SAND
- WATER TABLE
- SPT

NOTES:

- ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE MENTIONED

PROJECT CONSULTANT
EA Consulting Pvt Ltd. Karachi

PROJECT
SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE

TITLE
LINEAR SUBSURFACE PROFILE A-A'

DRAWN BY: AZHAR	Berkeley Associates
CHECKED BY: ALI GILL	315-D,DPE Housing Society, Rawind Road, Lahore. Contact: +92-42-35323312-15 Fax: +92-42-35323316 E-mail: berkgee@brain.net.pk
DATE: 27-05-2012	COPYRIGHT © THIS DRAWING REMAINS THE PROPERTY OF BERKELEY ASSOCIATES AND MAY NOT BE COPIED IN ANY WAY EXCEPT FOR FURTHERING THE SPECIFIC PURPOSE FOR WHICH IT IS ISSUED
SCALE: N.T.S	JOB NO: J-527 / FIG NO: 4-1 / REV: 00

Berkeley Associates

PROJECT: J 527 SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE.
STRUCTURE:
COORDS. E: N:
GROUND ELEV: 100m (Assumed)

BOREHOLE NO: BH-01
DEPTH OF W.T: 1.53 m
BORING STARTED ON: 22-06-2012
LOGGED BY: Mr. M Ali Chughtai

SHEET 1 OF 1
FINAL DEPTH: 6m
ENDED ON: 22-06-2012
CHECKED BY: Mr. Ali Gill

DEPTH, m	REDUCED LEVEL, m	DRILLING DETAILS	SAMPLES	LEGEND	DESCRIPTION OF MATERIAL	DEPTH, m	SPT BLOWS FOR LAST 30 cm PENETRATION	STANDARD PENETRATION TEST PROFILE
								30 60
0	100				Grey, Loose to Medium Dense, Silty Sand (SM), trace clay, trace mica, Moist from 1-1.5 m			
1	99		SPT-1				4	
2	98		SPT-2				7	
3	97		SPT-3				12	
4	96		SPT-4				12	
5	95		SPT-5				14	
6	94		SPT-6		(BOTTOM OF BOREHOLE)		17	

CLIENT:
EA Consulting Pvt Ltd, Karachi

Berkeley Associates

PROJECT: J-527 SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE
STRUCTURE:
COORDS. E: N:
GROUND ELEV: 100m (Assumed)

BOREHOLE NO: BH-03
DEPTH OF W.T: 1.53 m
BORING STARTED ON: 23-06-2012
LOGGED BY: Mr. M Ali Chughtai

SHEET 1 OF 1
FINAL DEPTH: 6m
ENDED ON: 23-06-2012
CHECKED BY: Mr. Ali Gill

DEPTH, m	REDUCED LEVEL, m	DRILLING DETAILS	SAMPLES	LEGEND	DESCRIPTION OF MATERIAL	DEPTH, m	SPT BLOWS FOR LAST 30 cm PENETRATION	STANDARD PENETRATION TEST PROFILE (30 / 60)
0	100				Grey, Loose to Medium Dense, Silty Sand (SM) to Poorly Graded Sand with Silt (SP-SM), trace mica, Saturated in Top1.5m			
1	99		SPT-1				4	
2	98		SPT-2				11	
3	97		SPT-3				12	
4	96		SPT-4				9	
5	95		SPT-5				17	
6	94		SPT-6		(BOTTOM OF BOREHOLE)		15	

CLIENT:
EA Consulting Pvt Ltd, Karachi

PROJECT: J-527 SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE
STRUCTURE:
COORDS. E: N:
GROUND ELEV: 100m (Assumed)

BOREHOLE NO: BH-02
DEPTH OF W.T: 1.53 m
BORING STARTED ON: 22-06-2012
LOGGED BY: Mr. M Ali Chughtai

SHEET 1 OF 1
FINAL DEPTH: 6m
ENDED ON: 22-06-2012
CHECKED BY: Mr. Ali Gill

DEPTH, m	REDUCED LEVEL, m	DRILLING DETAILS	SAMPLES	LEGEND	DESCRIPTION OF MATERIAL	DEPTH, m	SPT BLOWS FOR LAST 30 cm PENETRATION	STANDARD PENETRATION TEST PROFILE (30 / 60)
0	100				Grey, Very Loose to Medium Dense, Silty Sand (SM), trace mica.			
1	99		SPT-1				3	
2	98		SPT-2				7	
3	97		SPT-3				14	
4	96		SPT-4		Grey, Medium Dense, Poorly Graded Sand with Silt (SP-SM) to Poorly Graded Sand (SP), trace mica.		13	
5	95		SPT-5				14	
6	94		SPT-6		(BOTTOM OF BOREHOLE)		12	

CLIENT:
EA Consulting Pvt Ltd, Karachi

PROJECT: SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE
STRUCTURE:
COORDS. E: N:
GROUND ELEV: 100m(Assumed)

BOREHOLE NO: BH-04
DEPTH OF W.T: 1.53 m
BORING STARTED ON: 23-06-2012
LOGGED BY: Mr. M Ali Chughtai

SHEET 1 OF 1
FINAL DEPTH: 6m
ENDED ON: 23-06-2012
CHECKED BY: Mr. Ali Gill

DEPTH, m	REDUCED LEVEL, m	DRILLING DETAILS	SAMPLES	LEGEND	DESCRIPTION OF MATERIAL	DEPTH, m	SPT BLOWS FOR LAST 30 cm PENETRATION	STANDARD PENETRATION TEST PROFILE (30 / 60)
0	100				Grey, Very Loose to Medium Dense, Silty Sand (SM), trace concretion, trace mica, Saturated in Top 1.5m			
1	99		SPT-1				0	
2	98		SPT-2				4	
3	97		SPT-3		Grey, Medium Dense, Poorly Graded Sand with Silt (SP-SM) to Poorly Graded Sand (SP), trace mica.		13	
4	96		SPT-4				15	
5	95		SPT-5				16	
6	94		SPT-6		(BOTTOM OF BOREHOLE)		18	

CLIENT:
EA Consulting Pvt Ltd, Karachi

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure B

Information about Tube Wells

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BHALWAL
INDUSTRIAL ESTATE

SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE

INFORMATION ABOUT TUBE WELLS IN VICINITY OF SITE

Tube well No 1

Name	Tanveer Hussain
Father Name	Nazir Ahmed
CNIC Number	38401-3571544-3
Chak # 14 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	4 Inch
No of Small Bores	4
Delivery	4 Inch
Depth of Well	65 ft
Ground Water	12 ft-15 ft
Discharge Rate	1- Cusec
For Location see Fig - 1	

Tube well No 2

Name	Abdul Rauf
Father Name	Abdul Rehman
CNIC Number	38401-4989074-1
Chak # 14 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	4 Inch
No of Small Bores	6
Delivery	5 Inch
Depth of Well	65 ft
Discharge Rate	1- Cusec
For Location see Fig - 1	

Tube well No 3

Name	M. Ijjaz
Father Name	M. Sultan
CNIC Number	38401-0288629-1
Chak # 14 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	5 Inch
No of Small Bores	4 Inch
Delivery	4 Inch
Depth of Well	60 ft
Ground Water	9 ft – 12 ft
Discharge Rate	1.25 Cusec

For Location see Fig - 1

Tube well No 4

	(DERA RAJA NASIR)
Name	Zafar Iqbal
Father Name	M. Buksh
CNIC Number	38401-0368988-3
Chak # 11 M. L	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	4 Inch
No of Small Bores	6
Delivery	4Inch
Depth of Well	60 ft
Discharge Rate	1- Cusec

For Location See Fig - 1

Tube well No 5

	(DERA LALL KHAN)
Name	Shah Muhammad
Father Name	Lal Khan
CNIC Number	38401-8204047-9
Chak # 14 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	4 Inch
No of Small Bores	5
Delivery	3Inch
Depth of Well	85 ft
Discharge Rate	0.75 - Cusec

For Location see Fig - 1

Tube well No 6

	(DERA RAJA ASAD)
Name	Muhammad Mumtaz
Father Name	Muhammad Ameer
CNIC Number	38401-8204047-9
Chak # 13 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.
Suction	7 Inch
No of Small Bores	1
Depth of Well	100 ft
Delivery	5 Inch
Discharge Rate	1- Cusec

For Location see Fig -1

Tube well No 7

(DERA MR BASHIR)

Name	Zaheer Abbas
Father Name	Bashir Ahmed
CNIC Number	3801-8446028-7
Chak # 13 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.

Suction	6 Inch
No of Small Bores	1
Depth of Well	90 ft
Delivery	5 Inch
Discharge Rate	1- Cusec

For Location see Fig -1

Tube well No 8

(DERA RAJA GHAZANFAR)

Name	Nazir Ahmad
Father Name	Gahira Gondal
CNIC Number	28401-2867619-1
Chak # 13 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.

Suction	5 Inch
No of Small Bores	1
Depth of Well	100 ft
Delivery	4 Inch
Discharge Rate	0.75 - Cusec

For Location see Fig -1

Tube well No 9

(DERA MUSAB KHAN)

Name	CH. Malik Khan
Father Name	Ch. Kalo Khan
CNIC Number	233-41-132287
Chak # 13 Shamali	Post Office Bhalwal, Tahseel Bhalwal Zila Sargodha.

Suction	4 Inch
No of Small Bores	7
Depth of Well	60 ft
Delivery	5 Inch
Discharge Rate	0.75 - Cusec

For Location see Fig 1

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

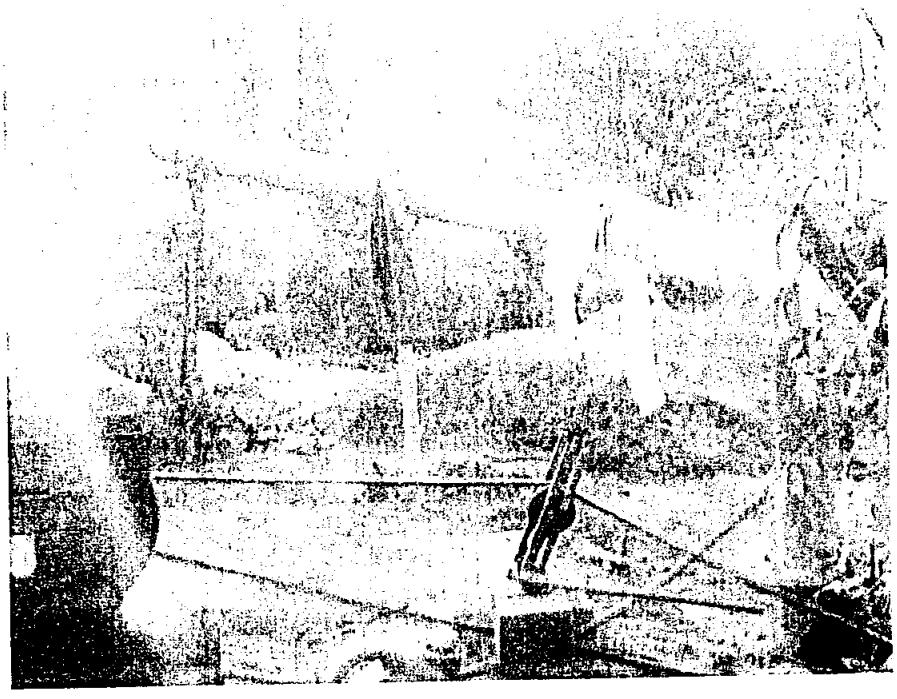
LAND RECLAMATION WORKS
FINAL REPORT

Annexure C

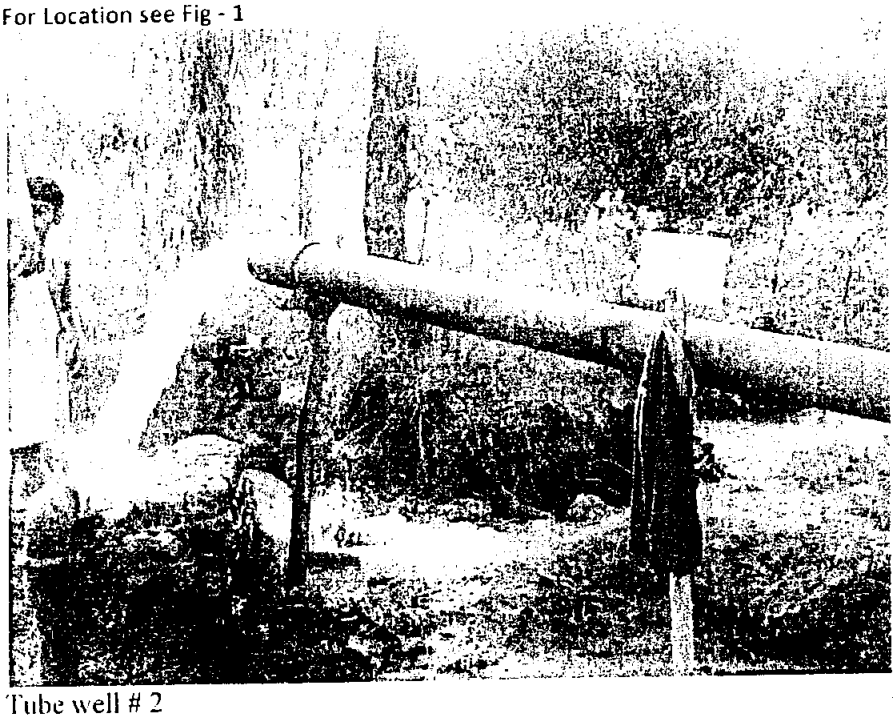
Pictures of Existing Tube Wells

Tube well # 1
For Location see Fig - 1

Tube well # 1
For Location see Fig - 1



Tube well # 2
For Location see Fig - 1



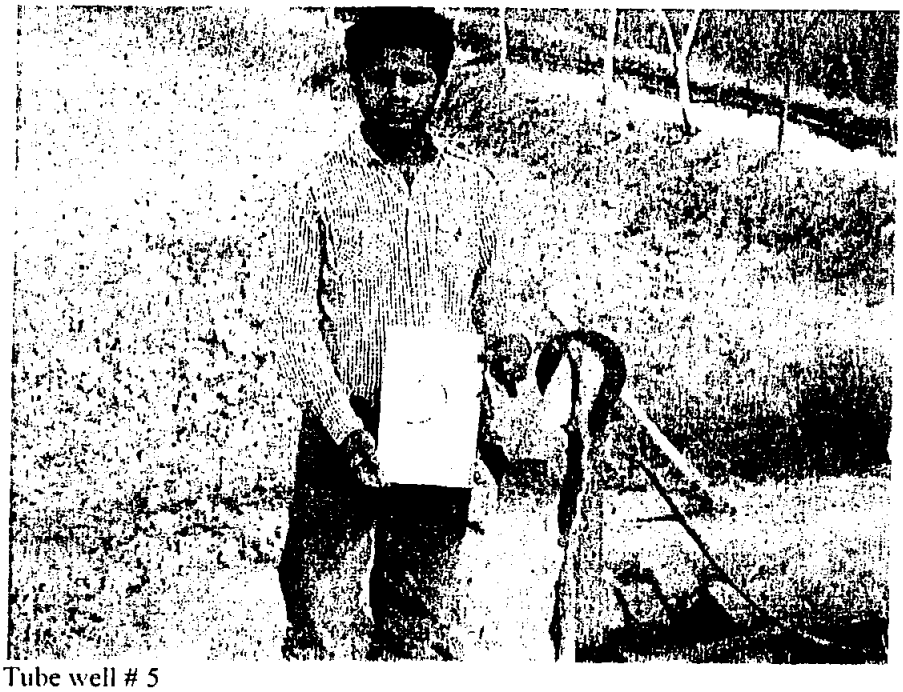
Tube well # 2
For Location see Fig - 1

Tube well # 3
For Location see Fig - 1

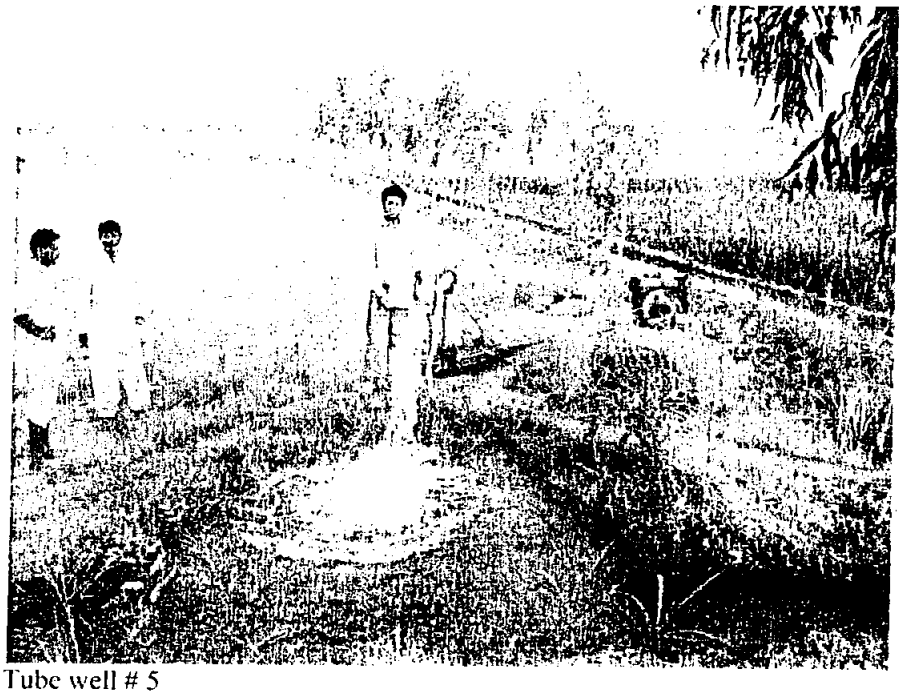
Tube well # 3
For Location see Fig - 1

Tube well # 4
For Location see Fig - 1

Tube well # 4
For Location see Fig - 1



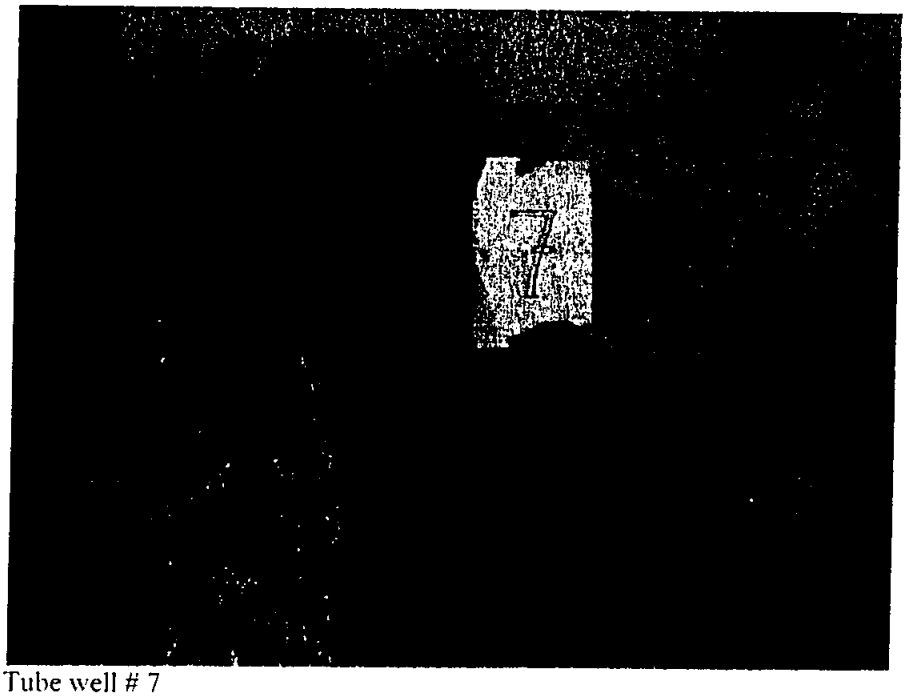
Tube well # 5
For Location see Fig - 1



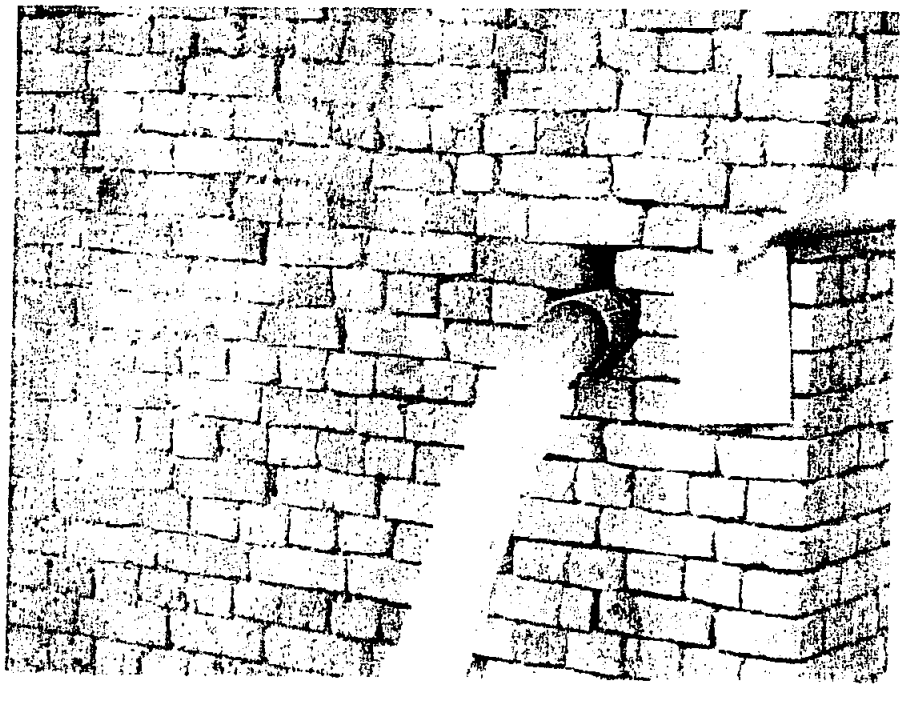
Tube well # 5
For Location see Fig - 1

Tube well # 6
For Location see Fig - 1

Tube well # 6
For Location see Fig - 1



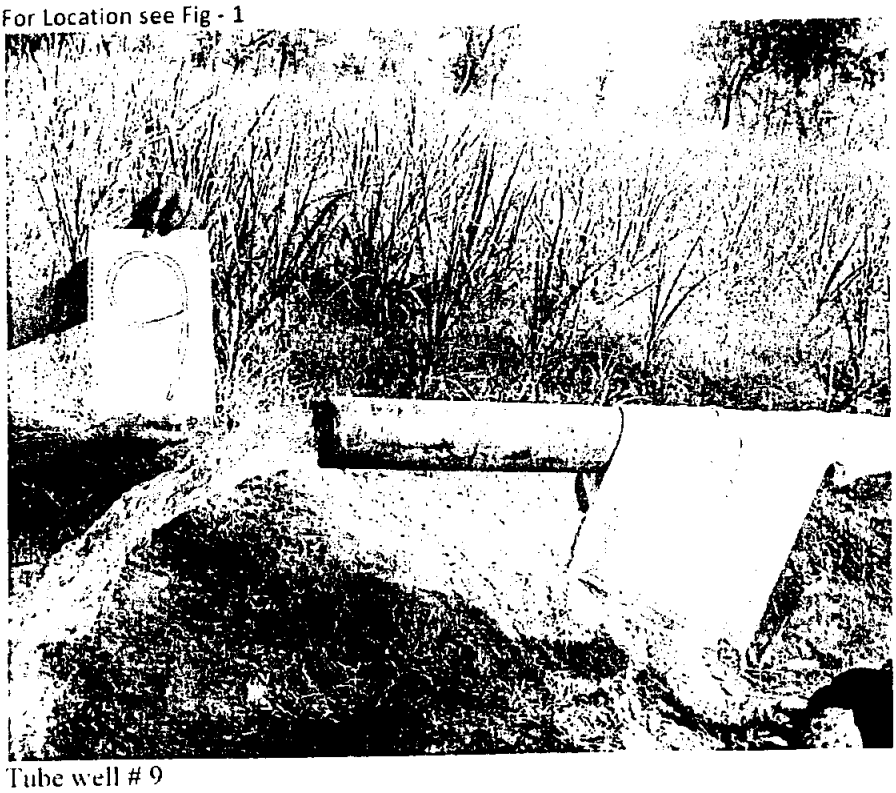
Tube well # 7
For Location see Fig - 1



Tube well # 8
For Location see Fig - 1

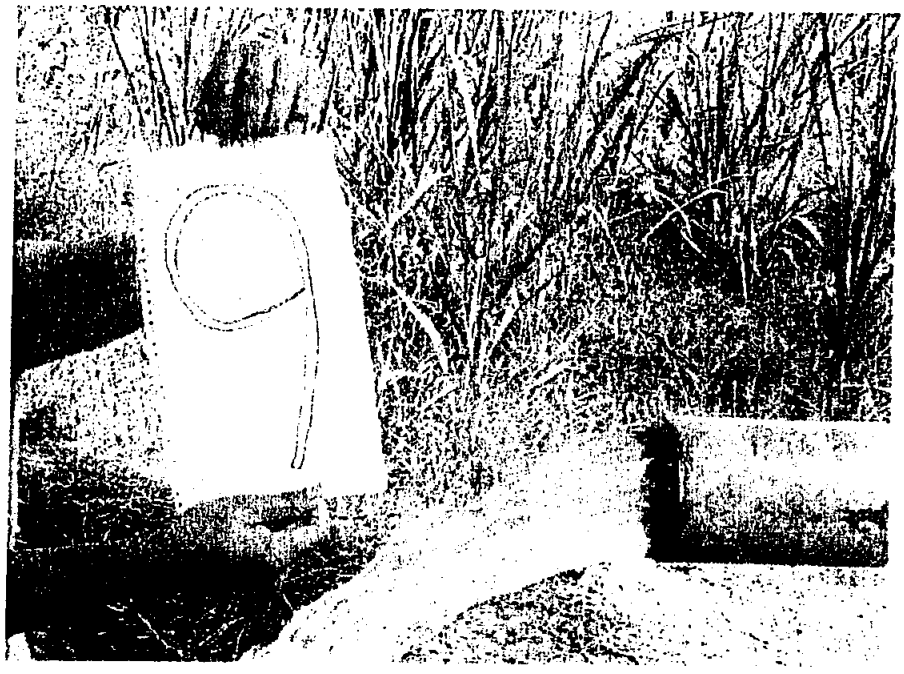
Tube well # 8

For Location see Fig - 1



Tube well # 9

For Location see Fig - 1



Tube well # 9
For Location see Fig - 1

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure D

Chemical Analysis of Water Samples

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BHALWAL

PAKISTAN

WATER AND POWER DEVELOPMENT AUTHORITY

CENTRAL MATERIAL TESTING LABORATORY

CHEMICAL ANALYSIS OF WATER SAMPLES FOR BHALWAL INDUSTRIAL ESTATE

AS PER PROGRAMME

AGENCY: LAB [illegible] BERKELEY ASSOCIATES 216-D, OPF HOUSING COLONY RAIWIND ROAD, LAHORE

REF. BA-12-3-42/[illegible] DATED 25-06-2012

PROJECT. **SITE DEVELOPMENT AT BHALWAL INDUSTRIAL ESTATE.**

LAB NO 285 SAMPLES RECEIVED ON 26-06-2012

SOURCE OF WATER SAMPLES TUBEWELL.

LOCATION OF WATER SAMPLES NOT PROVIDED

DEPTH OF WATER SAMPLES. NOT PROVIDED.

NOs. of SAMPLES. 4

Sr. NO.	Parameters	Sample NO.1 TW-2	Sample NO.2 TW-5	Sample NO.3 TW-6	Sample NO.4 TW-9	Unit
1	pH 30°C	7.52	8.10	8.0	8.[illegible]	
[illegible]	TDS	1570.0	1206.0	[illegible]	[illegible]	ppm
[illegible]	Total Hardness [illegible]	316	84	[illegible]	[illegible]	ppm
[illegible]	Calcium Hardness [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ppm
[illegible]	Magnesium Hardness [illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	Ca	[illegible]	[illegible]	[illegible]	[illegible]	ppm
[illegible]	Mg	54.5	[illegible]	[illegible]	[illegible]	ppm
[illegible]	SO_4	368.0	[illegible]	[illegible]	[illegible]	ppm
[illegible]	Cl	270.0	[illegible]	[illegible]	[illegible]	ppm

NOTE: This test report is issued solely on the particular samples supplied by the agency

Remarks. Above highlighted values of water samples are not within safe side.

Analyst

[illegible]

[illegible]

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE AND LAND RECLAMATION WORKS FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure E

Preliminary Geotechnical Investigations Report

EA Consulting (Pvt.) Ltd.
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BHALWAL

PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure F

Factual Report
on Geotechnical Investigations

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PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure G

Draft Design of Land Reclamation Works

EA Consulting (Pvt.) Ltd.
Engineering | Architecture | Project Management

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PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure H

Final Design of Land Reclamation Works

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PUNJAB INDUSTRIAL ESTATES

DEVELOPMENT AND MANAGEMENT COMPANY

DESIGN OF MASTER PLANNING, INFRASTRUCTURE
AND LAND RECLAMATION WORKS
FOR DEVELOPMENT OF BHALWAL INDUSTRIAL ESTATE, SARGODHA

LAND RECLAMATION WORKS
FINAL REPORT

Annexure I

Summary of the Specifications

EA Consulting (Pvt.) Ltd.
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BHALWAL INDUSTRIAL ESTATE

ITEM 106 EXCAVATION OF UNSUITABLE OR SURPLUS MATERIAL

106.1 DESCRIPTION

The work shall consist of excavation and disposal of unsuitable or surplus material arising from roadway excavation, which is declared in writing by the Engineer to be unsuitable for use or surplus to the requirements of the project. When excavation of unsuitable material requires special attention for a known condition on a specific project, construction requirements and payment shall be covered under relevant Provisions.

106.2 CONSTRUCTION REQUIREMENTS

All suitable material excavated within the limits and scope of the project shall be used in the most effective manner for the formation of the embankment, for widening of roadway, for backfill, or for other work included in the contract.

Any material surplus to these requirements or any material declared in writing by the Engineer to be unsuitable shall be disposed of and levelled in thin layers by the Contractor outside the right of way within 7 Km of excavation. The Engineer shall decide regarding the unsuitability of the material by conducting appropriate laboratory tests.

When unsuitable materials are ordered to be removed and replaced, the soil left in place shall be compacted to a depth of twenty (20) cm to the density prescribed under Item 108.3.1. Payment for such compaction shall be included, in the contract prices for the excavation materials.

If the unsuitable material, which is to be removed, is below standing water level and the replacement material is gravel or a similar self-draining material of at least thirty (30) cm in depth, the compaction may be dispensed with if approved by the Engineer.

Rock excavation shall be classified as under:

a) Hard Rock

Any rock which can not be removed with Ripper of a 200 H.P. Bulldozer and constitutes a firm and continuous bed of rock only.

b) Medium Rock

Any rock which can not be removed with the blade of 200 H.P. Bulldozer but can be removed by the ripper, will be termed as Medium Rock, irrespective of the fact that it is removed by blasting.

c) Soft Rock

Any rock which can be removed with the blade of a 200 H.P. Bulldozer. This item will be termed as Soft Rock, irrespective of the fact that it is removed by blasting.

106.3 MEASUREMENT AND PAYMENT

106.3.1 Measurement

When the contractor is directed to excavate unsuitable material below the surface of original ground in fill areas, the depth to which these unsuitable materials are to be removed will be determined by the Engineer. The contractor shall schedule his work in a such a way that authorized cross sections can be taken before and after the material has been removed. Only material which is surplus to the requirements of the project or is declared in writing by the Engineer to be unsuitable will qualify for payments under pay item No. 106a, 106b, 106c, and 106d as the case may be.

The cost of excavation of material which is used anywhere in the project shall be deemed to be included in the pay item relating to the part of the work where the material is used.

The under mentioned Pay Item Nos. 106a, 106b, 106c, and 106d shall include the cost of obtaining the consent of the owner or tenant of the land where the disposal of surplus or unsuitable material is made.

Unsuitable or surplus material shall be measured in its original position and its volume shall be calculated in cubic meters using end area method.

106.3.2 Payment

The quantities determined as provided above shall be paid for at the contract unit price respectively for each of the particular pay items listed below and shown in the Bill of Quantities which prices and payment shall constitute full compensation for all costs involved in the proper completion of the work prescribed in this item.

Pay Item No.	Description	Unit of Measurement
106a	Excavate Unsuitable Common Material	CM

SP-2 LAND RECLAMATION USING RIVER CHENAB SAND FILL

2.1 Description

The work shall consist of excavation of unsuitable material in the top layer of impounded area and its disposal outside the project boundary, which is declared in writing by the Engineer to be unsuitable for use to the requirements of the project. The impounded area has to be filled with Chenab River sand up to the design levels in 30cm /12inch layers as specified in the drawings or as instructed by the Engineer.

2.2 Material requirement

Material for fill shall consist of River sand of Chenab or any other equivalent suitable material excavated from borrow, roadway excavation or structural excavation and shall include all lead and lift. The material under this item shall conform to the following specification.

a) In areas subject to flood and prolonged inundation of the fill, such as at bridge sites, the material used in fill, unless rock, shall be AASHTO Class A1 (a), A1 (b) and A 2 4, soils. Other soils may be used only with the written consent of Engineer.

b) CBR of the material shall not be less than ten (10) percent, determined in accordance with AASHTO TA 93. CBR value shall be obtained at a density corresponding to the degree of compaction required for the corresponding layer.

c) Swell value of the material for fill formation shall not exceed five tenth (0.5) percent. However, while establishing the swell value, surcharge weights representing the overburden will be used. In case sandy material is used for filling, it shall be properly confined at no extra payment with a material and to the extent as approved by the Engineer and sandy material shall not be used on slopes of fill.

2.3 CONSTRUCTION REQUIREMENTS

Material for fill, obtained and approved as provided above, shall be placed in horizontal layers of uniform thickness of 30cm or 12 inches and in conformity with the lines, grades, sections and dimensions shown on the Drawings or as required by the Engineer.

The material placed in layers and that scarified to the designated depth for formation of fill shall be compacted to the density specified below:

Depth in centimeters below subgrade level	Percent of Maximum Dry Density as determined by AASHTO T-180.*
0 to 30	95
30 to 75	93
Over 75	90

In place density determinations of the compacted layers shall be made in accordance with AASHTO T 191 or other approved methods. For all soils, with the exception of rock fill materials, containing more than 10% oversize particles (retained on 3/4 inch/ 19 mm sieve), the in place density thus obtained shall be adjusted to account for such oversize particles or as directed by the Engineer. Subsequent layers shall not be placed and compacted unless the previous layer has been properly compacted and accepted by the Engineer.

The compaction of the fill shall be carried out at the designated moisture content consistent with the available compacting equipment.

Fill material that does not contain sufficient moisture to obtain the required compaction shall be given additional moisture by means of approved sprinklers and mixing. Material containing more than the optimum moisture may not, without written approval of the Engineer, be incorporated in the fill until it has been sufficiently dried out. The drying of wet material may be expedited by scarification, disking or other approved methods.

Side slopes shall be neatly trimmed to the lines and slopes shown on the drawings or as directed by the Engineer, and the finished work shall be left in a neat and acceptable condition.

2.4 Measurement and Payment

Measurement

The quantities to be paid for shall be the number of cubic meters calculated on theoretical designed lines and grades and the ground levels as established under clause 100.9, compacted in place, accepted by the Engineer.

Payment

The quantity to be paid for shall be the number of cubic meters placed in Fill, measured as provided above for material from borrow excavation/Chenab River Sand and such a payment will be deemed to include cost of excavation, material, payment of royalty, levies and taxes of Local, Provincial and Federal Government, cost of hauling including all lead and lift, spreading, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

Pay Item No.	Description	Unit of Measurement
SP-2	Land Reclamation using river chenab sand fill in 30cm /12 in layers.	Cu.m

SCHEDULE III

BIE INTRODUCTION & GEOGRAPHICAL FEATURES

Bhalwal Industrial Estate is located Bhera Road, Bhalwal. The geographical location map is attached.

The Electrification System had been designed by M/S EA, Consulting Engineering Firm duly registered with Pakistan Engineering Council and FESCO / WAPDA. This proposal, prepared by the Consultant, deals with the design aspects of Electrification System and source of Power Supply for the Industrial Estate. The total area of the Industrial Estate is about 427 Acres with Plot sizes ranging from 1/2, 1, 2 Acres. The Current application is for 60 MW.

Project Technical Description

1. **Distribution System Configuration, service territory, right of way, feeder maps.**
   The Distribution system consists of 12 feeders, 10 feeders feeding system in open ring & 2 Nos. feeders are standby express feeders to cater for any emergency. Service territory is Bhalwal Industrial Estate for which land has been acquired and right of way has been procured, FESCO has been approached to PIEDMC to take distribution license / NOC from NEPRA in favor of Bhalwal Industrial Estate for Power distribution within its territory.

2. **Voltage Levels and Regulation**
   415V LV and 11 KV HV feeders are supplying power to loads as per WAPDA / FESCO standards DDS-71 2004 and P - 13:66 for regulation 2.5%, -5%, -7.5%.

3. **Type of Distribution System**
   'Underground/Over Head Ring Main Cable/Conductor Distribution System' has been laid down providing electricity to all consumers in the premises of Bhalwal Industrial Estate.

4. **Line Equipment Characteristics**
   The State-of-The-Art Equipment for Power Supply' has been selected as designed, like Aluminum (AL), Cross Linked Poly Ethylene (XLPE) armored cables of 500 mm^2 for HT and Al, PVC cables for LT, ACSR Bear, ACSR Goat and Ant Conductor, 5 Way 11 KV ring main units/switches for connecting feeders & Pad Mounted Transformers of capacity 500 KVA. The under-ground cable structure is good enough up-to 80 MW.

5. **Power Quality Control**

In Bhalwal Industrial Estate, 132 KV grid station within Bhalwal Industrial Estate is being made through M/S Barqaab Pvt Ltd Lahore (WAPDA/FESCO approved consultant) which insures the quality power. Also all the equipment is placed in 'Insets' along the boundary wall of the Industrial Units and underground Power Supply Lines to insure good quality control on the delivered Power. PIEDMC will do the O&M for the Distribution System at BIE and the electric system will be operated by PIEDMC, the O&M through a 'Central Operation Room' where all 'Open Points' of feeders & day-to-day changes in their positions are marked. The Manager Electrical along-with his team supervise the overall operation of the system. The electrical team will issues all the work orders for any electrical work. No work on any equipment is allowed, for the Distribution System without proper pre-arranged shut down. Safety measures are ensured by providing earthing of the equipment and issuance of PTW (Permit to Work) that is coordinated by the Chief Engineer Electrical PIEDMC.

Back up / Express feeder provision

Two 11 KV feeders have been constructed to be used as backup/ express feeders (See the attached drawings) in case of main feeders' failure.

7. **Accident protection / prevention procedures**

A well experienced and educated distribution staff has been hired by PIEDMC, who are working under well-qualified supervisors on three (3) shifts per day basis. Proper use of protective gears by staff and hanging / displaying of warning signs are ensured at two tiers-one by RIE electrical team second ensured by CE Electrical PIEDMC. The task risk analysis and detailed procedure have been prepared by the Consultant and adopted by the P I E D M C for its line staff.

8. Maintenance Plans and Procedures

Routine maintenance of equipment is carried out by Bhalwal Electrical team after a work order is issued by the approval of CE Electrical PIEDMC as per manufacturer's recommendations. Maintenance charts for each equipment are maintained and updated on regular basis. The procedure has been developed by the qualified consultant as per international standards and maintenance practices.

'Earth Fault Indicators' have been installed in FESCO area to help in quick identification and then isolation of faulty portion. Cable Fault Localization Equipment has been procured by the PIEDMC for finding the fault to help

In early repair where a work order is raised by the RIE electrical team accomplishes the same. The troubleshooting procedures have been developed as per international standards.

9. Fault location / trouble shooting procedure

At each ring main station earth fault indicators have been installed which indicate any cable fault in the respective section, then the exact fault point will located through standard fault locators and faulty cable will repair. This procedure has minimized the Power outage time.

10. Emergency Provisions

To cater for emergency express/ back up feeders have been provided, sufficient spares and Line Material is available with the RIE Store in inventory procured and provided by the PIEDMC.

11. Patrolling and inspection procedures

The PIE electrical staff at BIE patrol the area and carry out visual inspection of equipment for any physical damage or fault and reported to Central Operation Control Room. The same then is handed over to the required staff to do the needful under the supervision of qualified Supervisors. For this purpose, proper procedures have been prepared and implemented.

12. Customer services data / manuals

Separate Customer Services Section is taking care of all the requirements from the time of Customers' complain regarding electricity Applications for power supply till the electric connection is provided. The idea of 'One Window Services' has been adopted in its true spirit.

13. Billing and collection procedures

The meter readers of BIE will take the readings and record the KHW energy meter on 01st of each month as the date fixed by the PIEDMC Electrical Department with the help of 'PIE Chief Financial Controller'. Bills will properly distributed and the consumers will deposit the dues in the designated bank or PIE finance section up to 10th of every month.

14. Protection, Control & Measuring instrument

Sensitive earth fault and overload protection relays have been provided on each 11KV Feeder at BIE Grid Station. Where in all individual pad mounted distribution transformers are fuse protected. The active power meters, energy

meters, ammeters, Volt meters have been installed at individual 11KV Electrical feeders. All the distribution ring mains are fuse protected.

15. Metering and Testing Facilities

Meters are provided by the PIEDMC electrical section after the same are tested / certified for accuracy. However, the doubtful meters are tested at site with testing equipment. In case of any dispute with the customer indigenous laboratory or M&T Wapda for testing in utilized. The factory tested and calibrated standard energy meters are installed at each individual consumer premises that are tested as per manufacturer's recommendation for routine testing or on the complaint/dispute with the consumer/s.

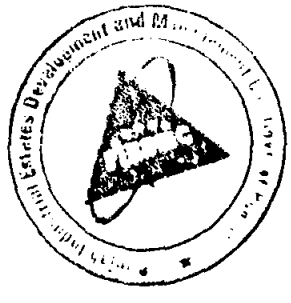
16. Communication System

Communication between Central Control / Operation Room and the field staff has been established through "cell phones" and walki talkies.

17. Training and Development

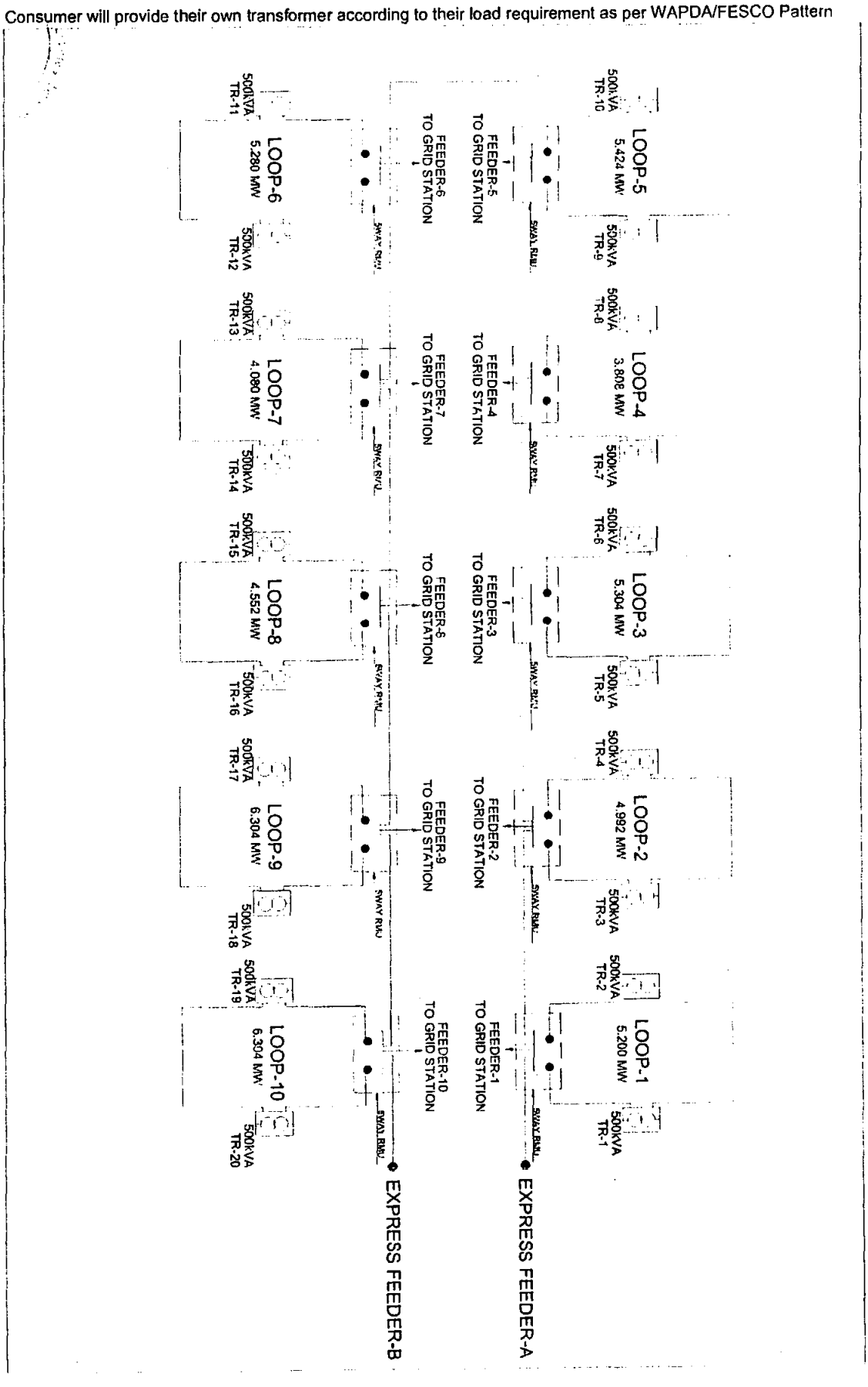
PIEDMC has hired the services of Concerned Manufacturers of Equipment, Lahore that have trained staff for fault localization, Metering, Operation & Maintenance of the BIE Distribution System.

Regulation #	Criteria / Requirements	Information / Documents submitted by
4(3)	The load of applicant's existing / proposed distribution network shall not be less than 20 MW.	Already attached as Annex- 3(5)(g)(b)(iii)
	Applicant shall have its own 132 KV grid station.	PIEDMC has own 132 KV grid station at Bhalwal Industrial Estate. Therefore PIEDMC intends to hire constructor for Design, supply, installation, Testing commissioning and civil work of grid station. The consultant M/S Barqaab Pvt Ltd. would provide the consultancy services for construction of 132 KV grid station.
4(5)	In addition to the requirements provided in sub-regulation (1), the application for grant of a distribution license shall be accompanied by:	
	i. Evidence of adequate and necessary technical, financial and organizational capability to construct, develop, manage and maintain the proposed distribution network;	PIEDMC is the only department responsible for establishing medium and large size Industrial Estates in the province of Punjab. For all Industrial Estates Grid Station and Power Distribution is mandatory requirement. Already attached in application as Annex-3(5)(c) and 3(5)(d)(iv)
	ii. Evidence demonstrating applicant's ability to fulfill the requirement of Section 21 the Act, NEPRA Licensing (Distribution) Rules, 1999 and other provision of the applicable law.	PIEDMC has established by Government of Punjab, with the main objective to develop a chain of new industrial estate along with upgrading the existing ones in a dynamic and innovative manner, making ancillary arrangements related to the development of infrastructure. From last 10 years PIEDMC is doing electrical distribution in Sundar Industrial Estate successfully with the entire satisfaction of consumers.



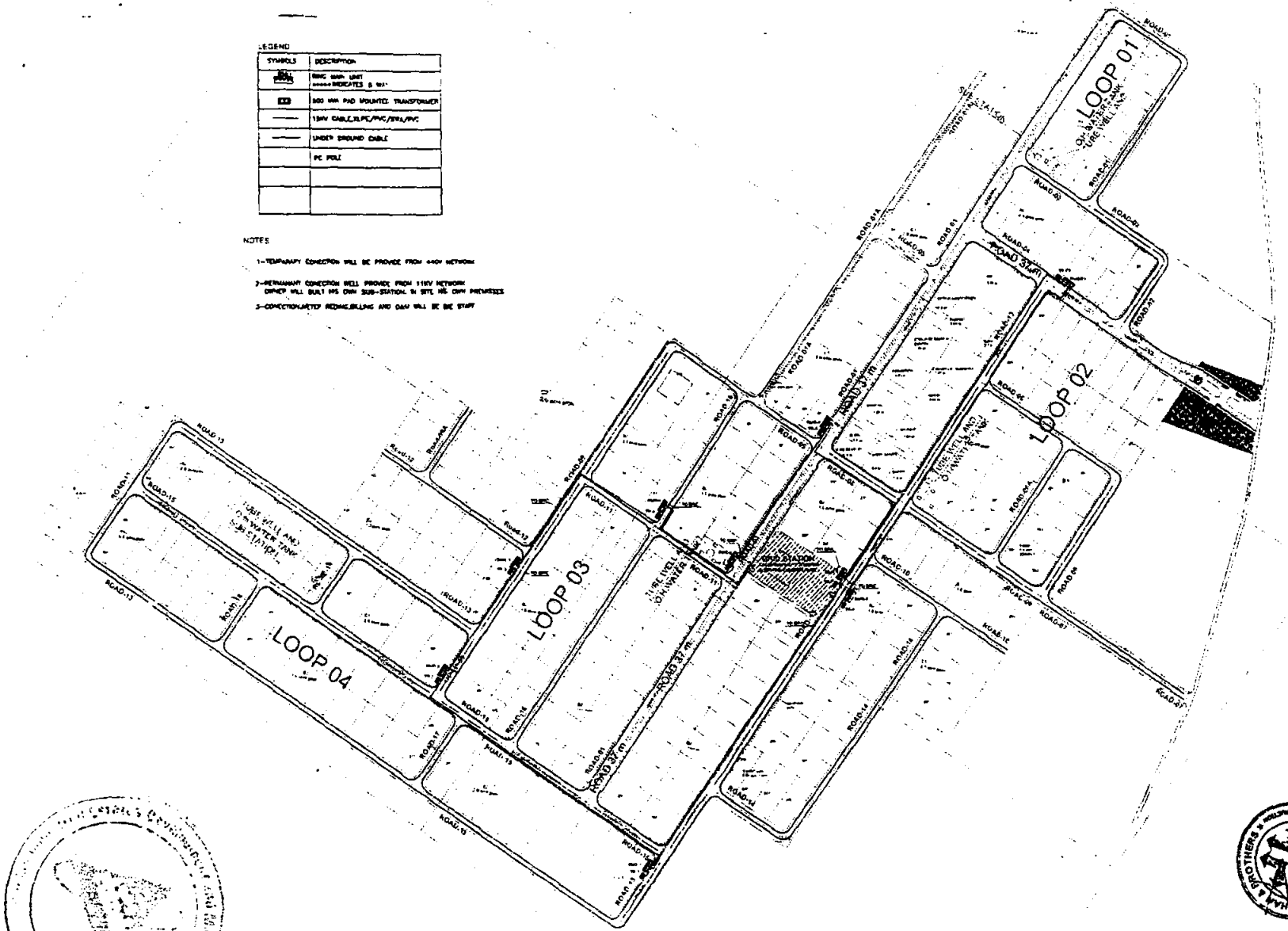
Phase-I Feeders Single Line Diagram of the Distribution Facility of the Licensee / Bhalwal Industrial Estate.

Note: Consumer will provide their own transformer according to their load requirement as per WAPDA/FESCO Pattern



IX

ELECTRIC SUPPLY AND DISTRIBUTION SYSTEM INCLUDING STREET LIGHTING



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0	AUG.12	PRELIMINARY DESIGN	J.A	S.H	J.I.S

CLIENT

PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY LAHORE

CONSULTANT

EA Consulting (Pvt.) Limited

CONSULTING ENGINEERS ARCHITECTS ECONOMISTS & PLANNING EXPERTS

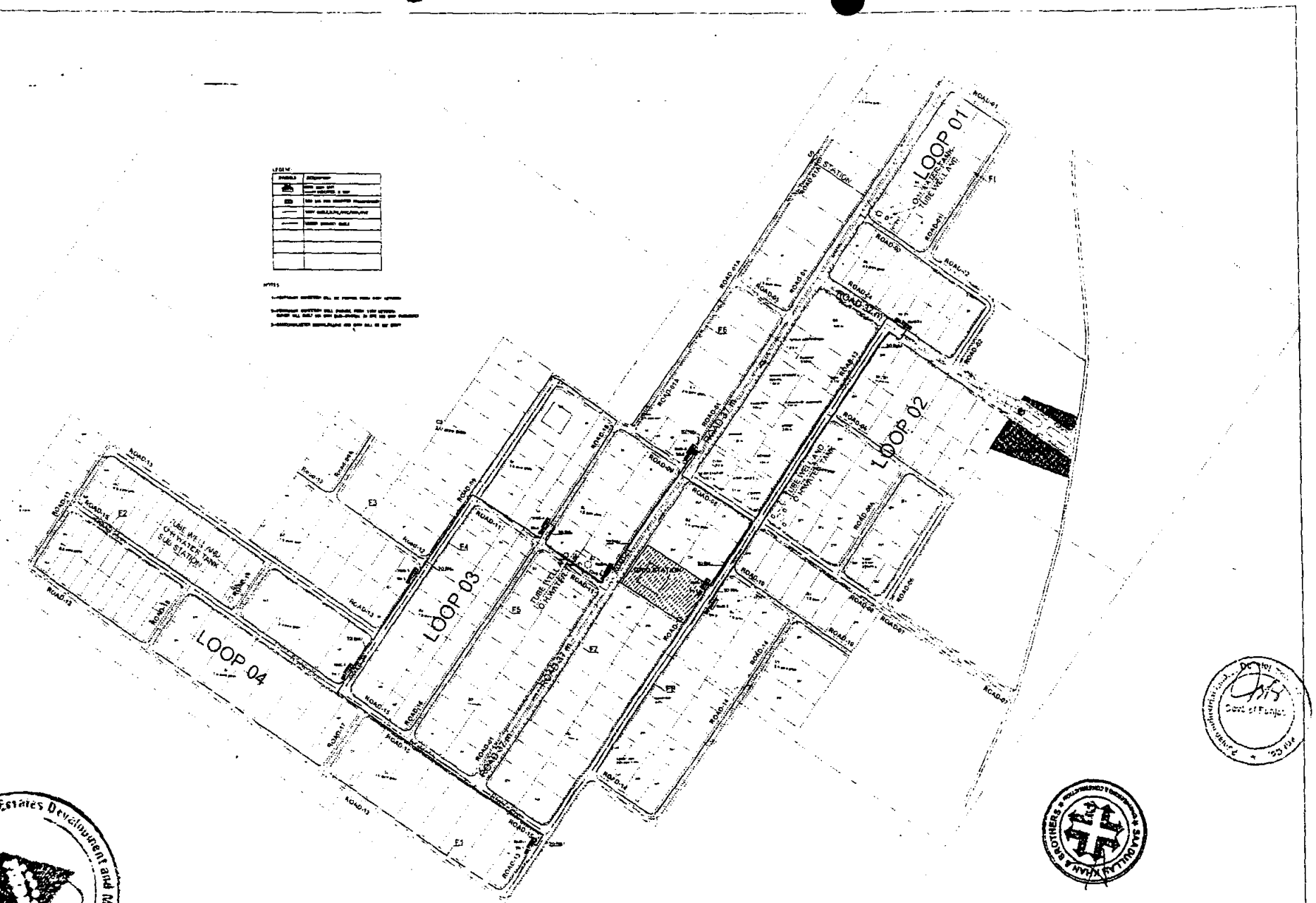
BHALWAL INDUSTRIAL ESTATE
CONTRACT PACKAGE I
CONSTRUCTION OF APPROACH ROAD, BOUNDARY WALL, GATE HOUSE AND LAND RECLAMATION

DRAWN BY	J.A
DESIGNED BY	M.S
CHECKED BY	S.H
APPROVED BY	J.I.S

TITLE: 11KV OVER HEAD NETWORK LAYOUT PLAN

SCALE: 1:4000

DWG NO: EA-775-E-101



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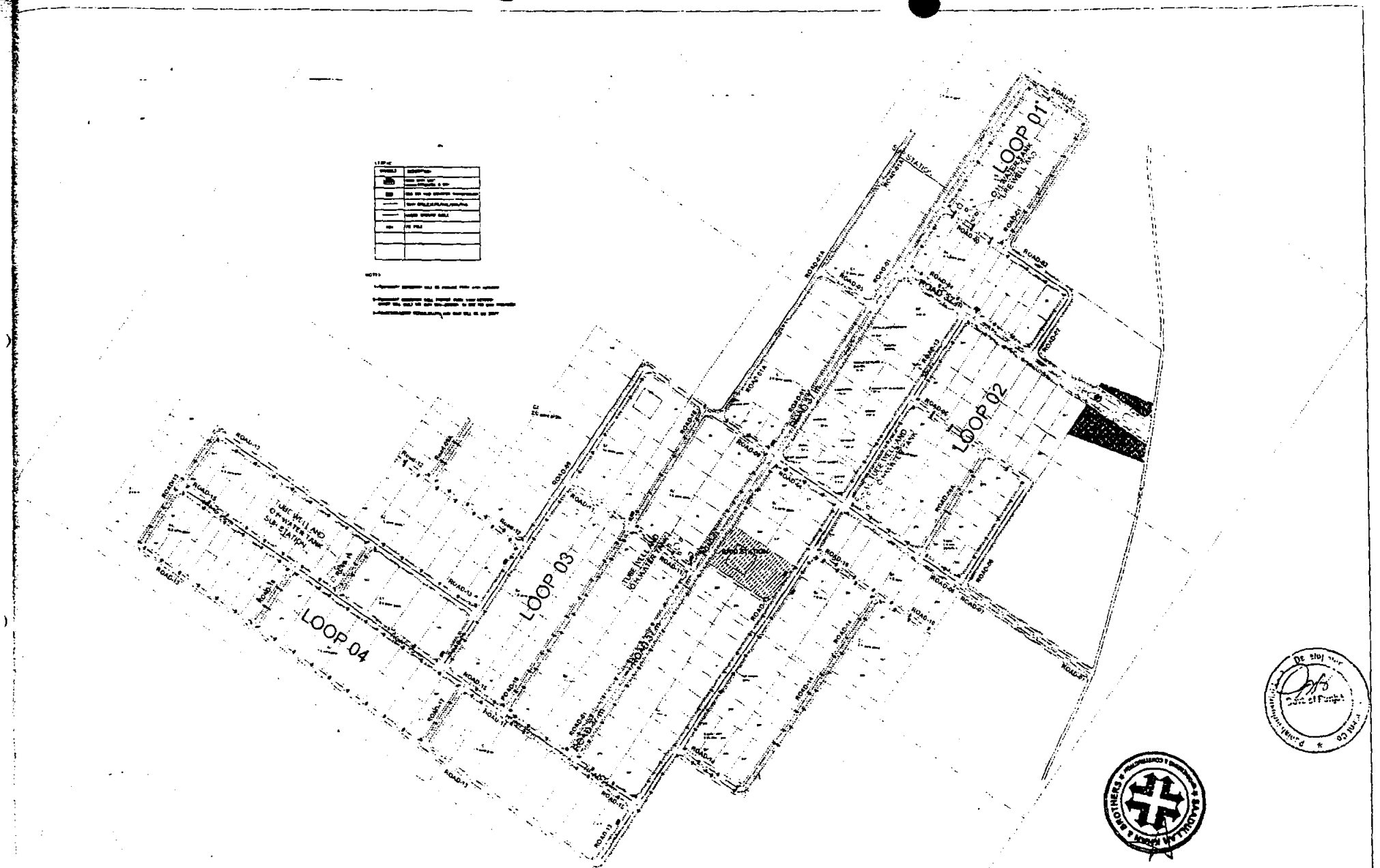
CLIENT:
PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY LAHORE

CONSULTANT:
EA Consulting (Pvt.) Limited
CONSULTING ENGINEERS ARCHITECTS, ECONOMISTS & PLANNING EXPERTS

BHALWAL INDUSTRIAL ESTATE
CONTRACT PACKAGE I
CONSTRUCTION OF APPROACH ROAD,
BOUNDARY WALL, GATE HOUSE AND LAND RECLAMATION

DRAWN BY	J.A	TITLE:	11KV OVER HEAD NETWORK LAYOUT PLAN
DESIGNED BY	M.S		
CHECKED BY	S.H	SCALE:	DWG. NO:
APPROVED BY	J.I.S	1:4000	EA-775-E-102



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CLIENT:
PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY
LAHORE

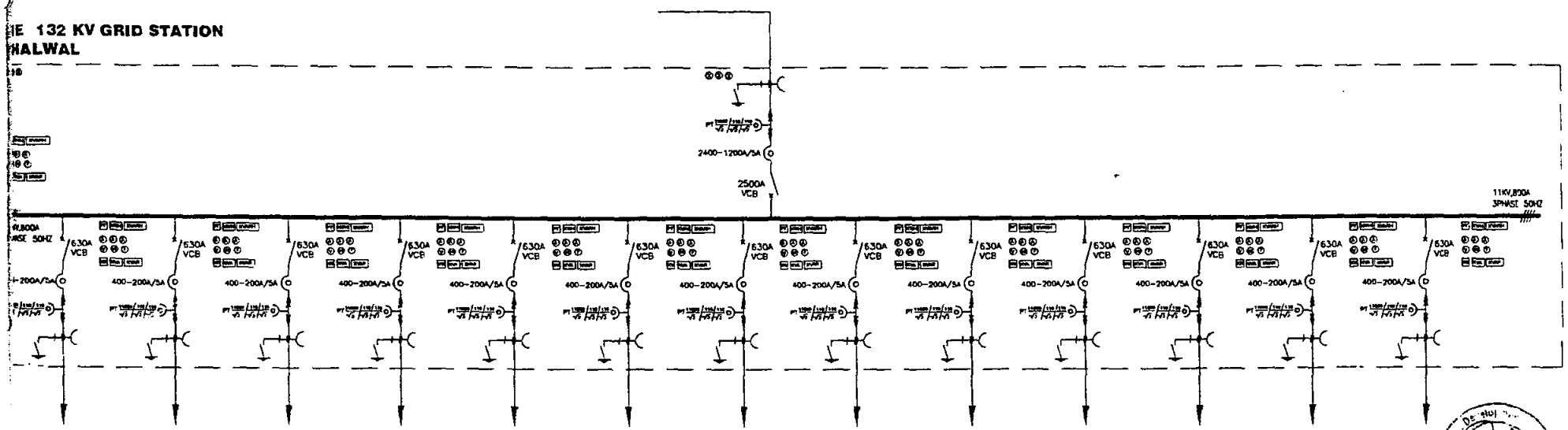
CONSULTANT:
EA Consulting (Pvt.) Limited
CONSULTING ENGINEERS ARCHITECTS, ECONOMISTS & PLANNING EXPERTS

BHALWAL INDUSTRIAL ESTATE
CONTRACT PACKAGE I
CONSTRUCTION OF APPROACH ROAD,
BOUNDARY WALL, GATE HOUSE AND LAND RECLAMATION

DRAWN BY	J.A
DESIGNED BY	M.S
CHECKED BY	S.H
APPROVED BY	J.I.S

TITLE: 11KV OVER HEAD NETWORK LAYOUT PLAN
SCALE: 1:4000
EA-775-E-103

E 132 KV GRID STATION
HALWAL



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CLIENT:
PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY LAHORE

CONSULTANT:
EA Consulting (Pvt.) Limited
CONSULTING ENGINEERS, ARCHITECTS, ECONOMISTS & PLANNING EXPERTS

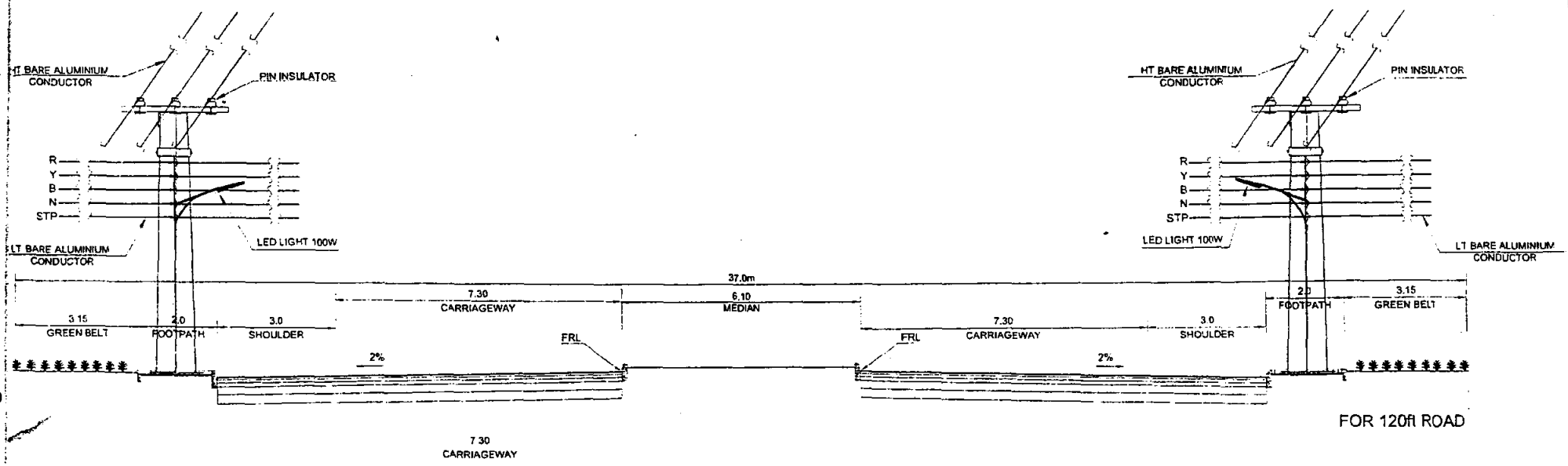
PROJECT:
BHALWAL INDUSTRIAL ESTATE
CONTRACT PACKAGE I
CONSTRUCTION OF APPROACH ROAD,
BOUNDARY WALL, GATE HOUSE AND LAND RECLAMATION

DRAWN BY	J.A
DESIGNED BY	M.S
CHECKED BY	S.H
APPROVED BY	J.I.S

TITLE: SINGLE LINE DIAGRAM GRID STATION

SCALE: 1:4000

DRAWING NO: EA-775-E-104



FOR 120ft ROAD

ED.NO	DATE	DESCRIPTION	BY	CKD	APPRO
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0	AUG.12	PRELIMINARY DESIGN	J.A	S.H	J.I.S

CLIENT -
PUNJAB INDUSTRIAL ESTATE DEVELOPMENT AND MANAGEMENT COMPANY LAHORE

CONSULTANT -
EA Consulting (Pvt.) Limited
CONSULTING ENGINEERS, ARCHITECTS, ECONOMISTS & PLANNING EXPERTS

BHALWAL INDUSTRIAL ESTATE
CONTRACT PACKAGE I
CONSTRUCTION OF APPROACH ROAD, BOUNDARY WALL, GATE HOUSE AND LAND RECLAMATION

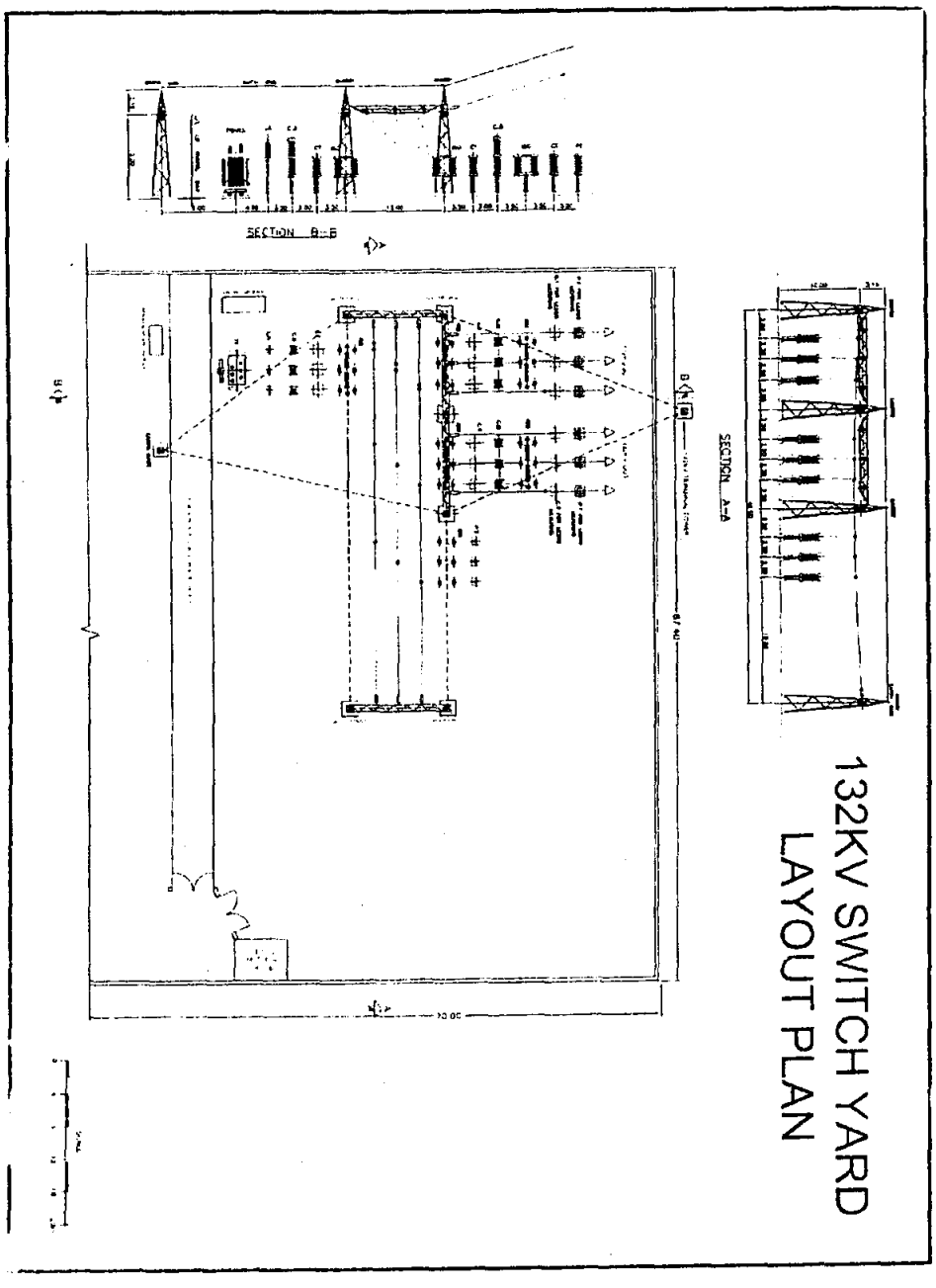
DRAWN BY	J.A
DESIGNED BY	S.H
CHECKED BY	S.H
APPROVED BY	J.I.S

TYPICAL CROSS SECTION LIGHTING POLE PLAN

SCALE - N.T.S

EA-775-E-106

Switchyard Layout of the Grid Station of the Licensee/ Bhalwal Industrial Estate



SCHEDULE-II

The Details of the Distribution Facilities [including length of feeder(s), feeder type (underground/overhead] and other specific details pertaining to the Distribution System linked with the Licensee/Bhalwal Industrial Estate.

(vii).	Regulation	Voltage Level	11 KV/400V/220V with permissible Limit of±2.5%
		Frequency Level	50 Hz± 3%

DETAILS OF DISTRIBUTION SYSTEM

A. General Information

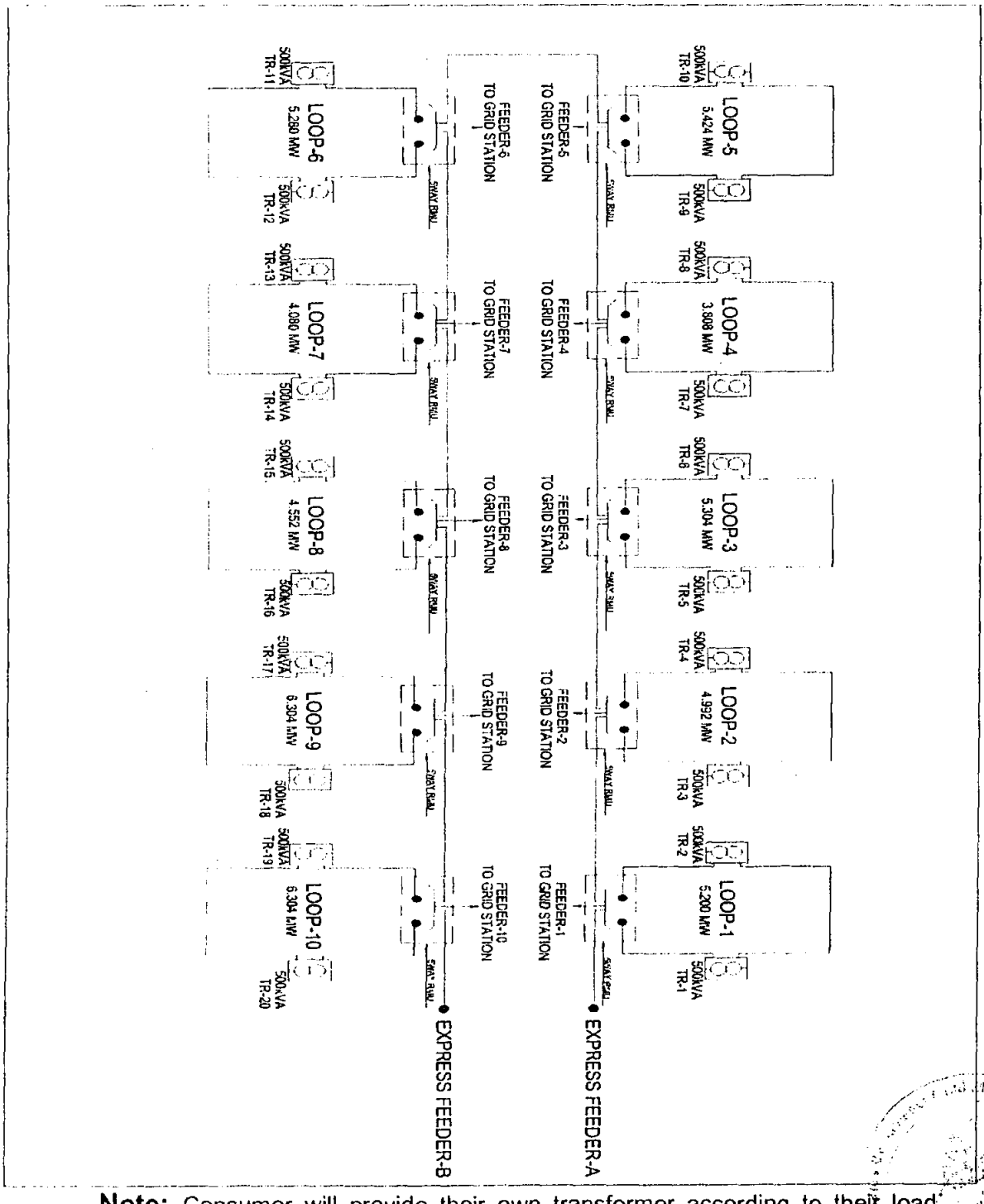
(i).	Name of Company	Punjab Industrial Estates Development and Management Company
(ii).	Registered/Business Office of the Company	PIEDMC Head Office North Commercial Area Sundar Industrial Estate Raiwind Road Lahore
(iii).	Location of the Distribution Facilities	Bhalwal Industrial Estate, Near 13 Chak Shamali Bhalwal (District Sargodha)

B. Distribution Network System

(a). Phase I & Phase II

(i).	Type of Distribution System	Semi Underground (Feeder Distribution is Underground and Loop Distribution for Connection is Overhead)	
(ii).	Voltage level	11 KV	
(iii).	Type of HT Cable	500 mm sqr 1-C Al/XLPE/PVC/AWA/PVC Cables and Goat Conductor	
(iv)	Type of LT Cable	240 mm sqr 1-C Al /PVC/AWA/PVC Cable, 16 mm sqr 1-C Al/PVC/AWA/PVC Cable, Ant Conductor	
(v).	No. of Feeders	Twelve (12)	
(vi).	Length of each Feeder	Feeder No.	Length in KM
		1	1.102
		1A	1.086
		2	1.057
		3	1.644
		4	4.663
		5	3.115
		6	2.196
		7	0.942
		8	2.451
		9	2.183
		10	3.812
		10A	3.847

Phase-I Feeders Single Line Diagram of the Distribution Facility of the Licensee / Bhalwal Industrial Estate.



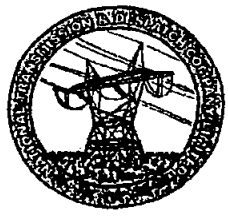
Note: Consumer will provide their own transformer according to their load requirement as per WAPDA/FESCO Pattern

SCHEDULE-I

The Details of Territory (i.e. Geographical Boundaries) of the License within which the Licensee is authorized to conduct its Distribution Business.

XII

National Transmission and Despatch Company Limited (NTDCL)



System Study
For Supply of Power to Bhalwal Industrial Estate (BIE)

Planning (Power) Department
4th Floor, PIA Tower, Egerton Road, Lahore.

April 2016

Executive Summary

1. M/s Punjab Industrial Estates (PIE) Development and Management Company is planning to establish an industrial estate at Bhalwal. The location of Bhalwal Industrial Estate (BIE) which is 5 km from Bhalwal – Bhera Road and 2.5 km from the existing Bhalwal 132 kV substation.

2. M/s Barqaab Consulting Services (Pvt.) Limited, the consultant of M/s PIE, has requested Planning Power department of NTDC to carry out system study to propose transmission scheme to feed BIE through a new 132kV substation for BIE.

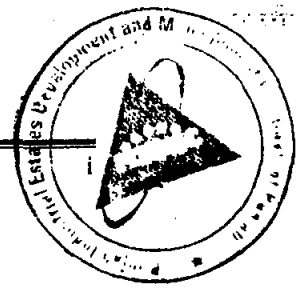
3. The proposed interconnection scheme to feed BIE is as follows:

   - A new 132kV substation (BIE) with 2x40MVA, 132/11 kV transformers. (1st 40 MVA transformer would be required in the initial stage and the 2nd 40MVA transformer would be required in later stage depending on load demand of BIE)
   - 24 MVAR capacitor at 132 kV BIE substation.
   - A 132 kV double circuit transmission line, approx. 1.5 km long on Rail conductor for looping In/Out of existing 132 kV S.P.Noon – Bhalwal single circuit line at 132 kV BIE substation.
   - A 132kV double circuit transmission line, approx. 7 km long on Rail conductor for looping In/Out of existing 132 kV Ludewala – Bhera Industrial single circuit line at 132 kV BIE substation.

   The scope of this study report involves transmission system and is limited up to 132/11kV bus of BIE. The load of BIE is represented at 11 kV bus bar of BIE 132kV substation.

4. This is system study report in which the results of load flow and short circuit studies have been presented for the 9MW/10MVA load with one 40MVA 132/11 kV transformer in 2018 and extended to 45MW/50MVA load with two 40MVA 132/11 kV transformers at BIE substation. The load flow analysis has been carried out for the stressed system scenarios in summer 2018 and 2022 in order to evaluate the adequacy of the proposed interconnection scheme with the extended load in the light of NEPRA grid code.

5. In order to conduct this study, the basic information has been provided by M/s Barqab Consulting services(Pvt.) Limited to NTDC including location of 132 kV Bhalwal Industrial Estate substation, its distances from existing 132 kV substation and the transmission line near/around 132 kV BIE substation. NTDC has used the latest load forecast and expansion plans to conduct system studies.



6. The proposed 132 kV interconnection scheme has been found adequate to feed total 45MW/50 MVA load in year 2022 and there will be no overloading or any network constraints at/around 132 kV BIE substation under normal and N-1 contingency condition.

7. Short circuit studies have also been carried out to propose the rating of the switchgear equipment at 132 kV substation of BIE. The short circuit level at 132 kV BIE substation is 10.96 kA in year 2022. In consideration of future developments in NTDC and/FESCO networks in the surrounding of BIE in long term perspective, the short circuit levels of BIE substation are expected to rise. Therefore, it is suggested to design 132 kV switchgear equipment of BIE substation with short circuit ratings of 40 kA.

8. The comments of project sponsor are welcome. Since, the proposed 132 kV BIE substation lies in the jurisdiction of FESCO, the comments of FESCO on this study report should also be taken and communicated to NTDC Planning Power.

Table of Contents

1. Introduction

Punjab Industrial Estates (PIE) Development and Management Company is planning to establish an Industrial Estate at Bhalwal. Initially the load demand for BIE is 9MW/10MVA in year 2018 and will be extended to 45MW/50MVA by year 2022.The location of Bhalwal Industrial Estate is 5km from Bhalwal – Bhera Road and 2.5km from 132kV Bhalwal substation. The co-ordinates of BIE as sought from Google Map are as follows; Latitude = 32.3046488N, Longitude= 72.8823664E.

This is system study report in which the results of load flow studies have been presented for the 9MW/10MVA load in 2018 and extended to 45MW/50MVA load in 2022 for BIE. The load flow analysis has been carried out for the stressed system scenarios in summer 2018 and 2022 in order to evaluate the adequacy of the proposed interconnection scheme with the extended load in the light of NEPRA grid code.

2. Proposed Connection Scheme

In view of the location of 132 kV substation at Bhalwal for BIE and the surrounding system network, the following interconnection scheme has been proposed for reliable supply of power to BIE,

- A new 132 kV substation (BIE) with 2x40MVA, 132/11 kV transformers. (1st 40 MVA transformer would be required in the initial stage and the 2nd 40MVA transformer would be required in later stage depending on load demand of BIE)
- 24 MVAR capacitor at 132 kV BIE substation.
- A 132 kV double circuit transmission line, approx. 1.5 km long on Rail conductor for looping In/Out of existing 132 kV S.P.Noon – Bhalwal single circuit line at 132 kV BIE substation.
- A 132kV double circuit transmission line, approx. 7 km long on Rail conductor for looping In/Out of existing 132 kV Ludewala – Bhera Industrial single circuit line at 132 kV BIE substation.

The above scheme is proposed not only for reliable evacuation of power to BIE but also improve FESCO network at/around the proposed substation of BIE in N-1 contingency condition in year 2018 and 2022.

It is worth mentioning that due to FESCO network constraints in year 2018 there will be no N-1 contingency provision in single circuit line from 132 kV Bhalwal substation to Hear Faqiran, but with the induction of 220/132 kV Head Faqiran Substation station and the proposed interconnection scheme for 132 kV substation of Bhalwal Industrial Estate will enable FESCO to feed this area not only in normal condition but also in N-1 contingency condition.

3. Study Assumptions and Criteria

3.1. Study Assumption

The assumptions for the load flow studies are as under:

- Latest load forecast.
- Latest generation expansion plan.
- Latest transmission expansion plans of NTDC and FESCO.
- The existing and planned shunt capacitors as proposed by FESCO have also been incorporated in the studies.
- The power factor at 11kV side of 132 kV Bhalwal Industrial Estate is assumed as 0.9 lagging as per industrial connection standards of DISCOs.

3.2. Study Criteria

The load flow studies have been carried out keeping in view of the following system operating criteria/limits in accordance with Substation Code:

Voltage Limits:	±5% under normal and ±10% under contingency conditions.
Transmission Line and Transformer Loading Limits:	100% of rating under normal and N-1 contingency conditions.

4. Load Flow Studies

Load flow studies have been carried out for the stressed system scenarios in summer season (Peak load conditions of Aug/ Sept 2018 and Aug/ Sept 2022) to assess the adequacy of the proposed interconnection scheme of 132kV substation of Bhalwal Industrial Estate with the total load of 9MW/10MVA in year 2018 and 45MW/50MVA in year 2022 and to analyze its impact on the system networks of FESCO and NTDC.

The results of the load flow studies with proposed interconnection scheme for 132kV substation of BIE are described as under;

4.1. Peak Load Aug/ Sept 2018

The load flow studies have been carried out without and with 132 kV substation of BIE with its proposed interconnection scheme. The results of the studies are described as under:

4.1.1. Without 132kV substation of Bhalwal Industrial Estate (BIE)

Load flow study for the peak load Aug/Sept 2018 under normal system condition without 132kV substation of BIE has been carried out and is attached as Exhibit #1. It is worth mentioning that due to FESCO network constraints in year 2018 there will be no N-1 contingency provision in 132 kV doubles circuit line from Ludewala to Bhabra and Ludewala to Phalia, which come under jurisdiction of FESCO.

4.1.2. With 132kV substation of Bhalwal Industrial Estate (BIE)

Load flow study for the peak load Aug/Sept 2018 has also been carried out with the interconnection scheme for 132kV substation of BIE and the study result under normal system condition is attached as Exhibit #2. As per load flow study it depicts that the system would be operating well within limits and there would be no transmission system constraints in feeding the load of 9MW/10MVA through the proposed interconnection scheme in year 2018.

The load flow studies have also been carried out for the single line contingency (N-1) analysis in the vicinity of the proposed 132 kV substation of BIE and are attached as Exhibit #3-6. The results of contingency studies have been summarized as under;

Exhibit #	Circuit Outage	Remarks
3	Ludewala – Bhalwal 132 kV single circuit out	Power flows on the other transmission lines and transformers as well as the voltage profile of the system remain within limits.

Exhibit #	Circuit Outage	Remarks
4	Ludewala – S.PR.Noon 132 kV single circuit out	-do-
5	S.PR.Noon – BIE 132 kV single circuit out	-do-
6	BIE – Bhalwal 132 kV single circuit out	-do-

It is worth mentioning that due to FESCO network constraints in year 2018 there will be no N-1 contingency provision in single circuit line from 132kV Bhalwal to Head Faqiran substation.

4.2 Peak Load Aug/ Sept 2022

Load flow study has also been carried out for future system scenario, i.e., peak load Aug/ Sept 2022 with a total load of 45MW/50MVA at 132 kV substation of BIE through the proposed 132 kV interconnection scheme and the study result under normal system condition is attached as Exhibit #7. The area problem will be resolved with the induction of 220/132 kV Head Faqiran substation and the proposed interconnection scheme for 132kV substation of BIE will enable FESCO to feed this area not only in normal condition but also in N-1 contingency condition.

As per load flow study, the power flow over the proposed 132 kV interconnection lines for 132kV substation of BIE and the other lines & transformers in the system are within their capacity under normal conditions. In general, the study depicts that the system would be operating well within limits, i.e., the voltage profile at 132 kV substation of BIE and of the surrounding system network and there would be no transmission system constraints in feeding a total load of 45MW/50MVA to 132 kV BIE substation through the proposed interconnection scheme.

The load flow studies have also been carried out for the single line contingency (N-1) analysis in the vicinity of the proposed 132 kV substation of BIE and are attached as Exhibit #8-15. The results of contingency studies have been summarized as under:

Exhibit #	Circuit Outage	Remarks
8	Ludewalan – Bhalwal 132 kV single circuit out	Power flows on the other transmission lines and transformers as well as the voltage profile of the system remain within limits.

Exhibit #	Circuit Outage	Remarks
9	Ludewalan – S.PR.Noon 132 kV single circuit out	-do-
10	S.PR.Noon – BIE 132 kV single circuit out	-do-
11	BIE – Bhalwal 132 kV single circuit out	-do-
12	Bhalwal - Bhera Industrial 132 kV single circuit out	-do-
13	Bhera Industrial – Head Faqiran 132 kV single circuit out	-do-
14	Head Faqiran – Phalia 132 kV single circuit out	-do-
15	Bhalwal – Bhabra 132 kV single circuit out	-do-

4.3 Conclusion of Load Flow Analysis

The power flow over the proposed 132 kV interconnection lines for 132 kV substation of BIE and the other lines & transformers in the system are within their capacity under normal conditions. In general, the study depicts that the system would be operating well within limits, i.e., the voltage profile at 132 kV substation of BIE and of the surrounding system network and there would be no transmission system constraints in feeding a total load of 45MW/50MVA to BIE through the proposed interconnection scheme.

It is worth mentioning that due to FESCO network constraints in year 2018 there will be no N-1 contingency provision in Single circuit line from 132 kV Bhalwal to Head Faqiran, but with the induction of 220/132 kV Head Faqiran Substation station and the proposed interconnection scheme for 132 kV substation of BIE will enable FESCO to feed this area not only in normal condition but also in N-1 contingency condition.

5. Short Circuit Studies

Short circuit studies have been carried out to compute three phase and single phase fault levels at 132 kV substation of Bhalwal Industrial Estate fed through the proposed interconnection scheme.

5.1. Methodology and Assumptions

The methodology of IEC 909 has been applied in the short circuit analysis in this report for which provision is available in the PSS/E software which is used for these studies.

The maximum fault currents have been calculated with the following assumptions under IEC 909:

- Set tap ratios to unity
- Set line charging to Zero
- Set shunt to zero in positive sequence
- Desired voltage magnitude at bus bars set equal to 1.10 P.U. to compute maximum the short circuit levels.

5.2. Fault Current Calculations

The short circuit studies have been carried out with proposed interconnection scheme for the future scenario of year 2022. The results of the short circuit studies are summarized as under:

Name of Substation	Voltage (kV)	Maximum Short Circuit Levels (kA)	
		Three Phase	Single Phase
BIE– 132Kv	132	10.96	7.57
BIE-1 11kV	11	20.73	21.87
BIE-II 11kV	11	20.73	21.87

Although, the maximum short circuit level is around 10.96 kA at 132kV substation of Bhalwal industrial estate in year 2022, however, in consideration of future developments in NTDC and FESCO networks in its surrounding in long term perspective, the short circuit levels of 132 kV substation of BIE are expected to rise. Therefore, it is suggested to design 132 kV switchgear equipments of BIE substation with short circuit ratings of 40

kA. Short circuit study for the peak load Aug/ Sept 2022 under normal system condition is attached as Appendix-2.

6. Conclusions and Recommendations

a) The following interconnection scheme has been studied and proposed for reliable supply of power to Bhalwal Industrial Estate;

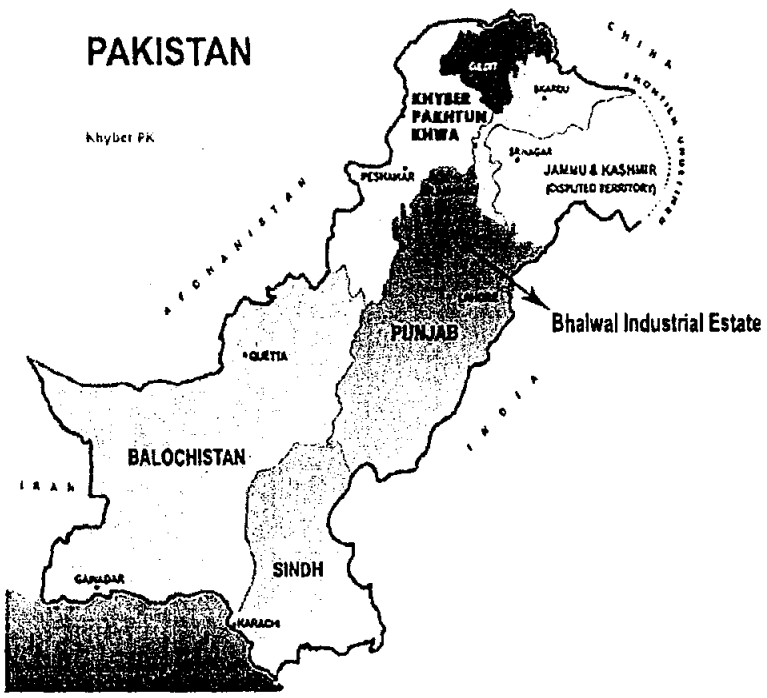
- A new 132 kV substation (BIE) with 2x40MVA, 132/11 kV transformers. (1st 40 MVA transformer would be required in the initial stage and the 2nd 40MVA transformer would be required in later stage depending on load demand of BIE)
- 24 MVAR capacitor at 132 kV BIE substation.
- A 132 kV double circuit transmission line, approx. 1.5 km long on Rail conductor for looping In/Out of existing 132 kV S.P.Noon – Bhalwal single circuit line at 132 kV BIE substation.
- A 132kV double circuit transmission line, approx. 7 km long on Rail conductor for looping In/Out of existing 132 kV Ludewala – Bhera Industrial single circuit line at 132 kV BIE substation.

b) The proposed 132 kV interconnection scheme has been found reliable for 132 kV substation of Bhalwal industrial estate for 9MW/10MVA load with one 40MVA 132/11 kV transformer in year 2018 and 45MW/50MVA load with two 40MVA 132/11 kV transformer in year 2022 and there will be no overloading and/or any network constraints at/around BIE under normal and N-1 contingency conditions.

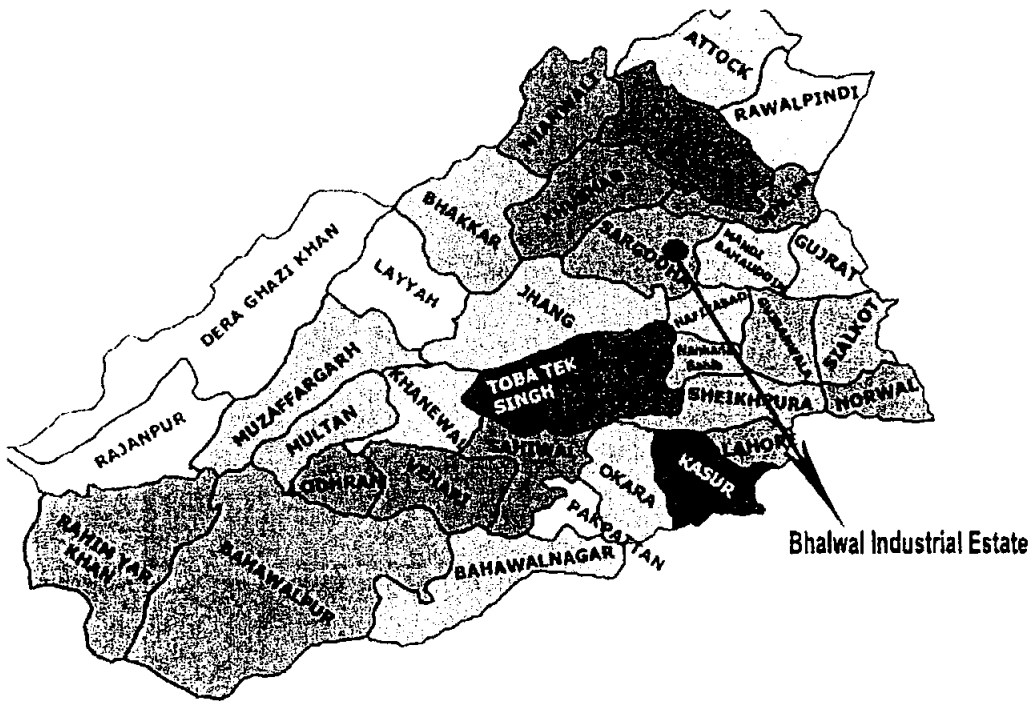
c) The maximum short circuit level is around 10.96 kA at 132 kV substation of Bhalwal industrial estate; however, in consideration of future developments in NTDC and FESCO networks in its surrounding in long term perspective, the short circuit levels of 132 kV switchgear of BIE are expected to rise. Therefore, it is suggested to design 132 kV substation equipment of BIE substation with short circuit ratings of 40 kA.

Distribution License
For Punjab Industrial Estates Development and Management Company Lahore
Bhalwal Industrial Estate
Near 13 Chak Shamali, Bhalwal district Sargodha
, in the province of Punjab

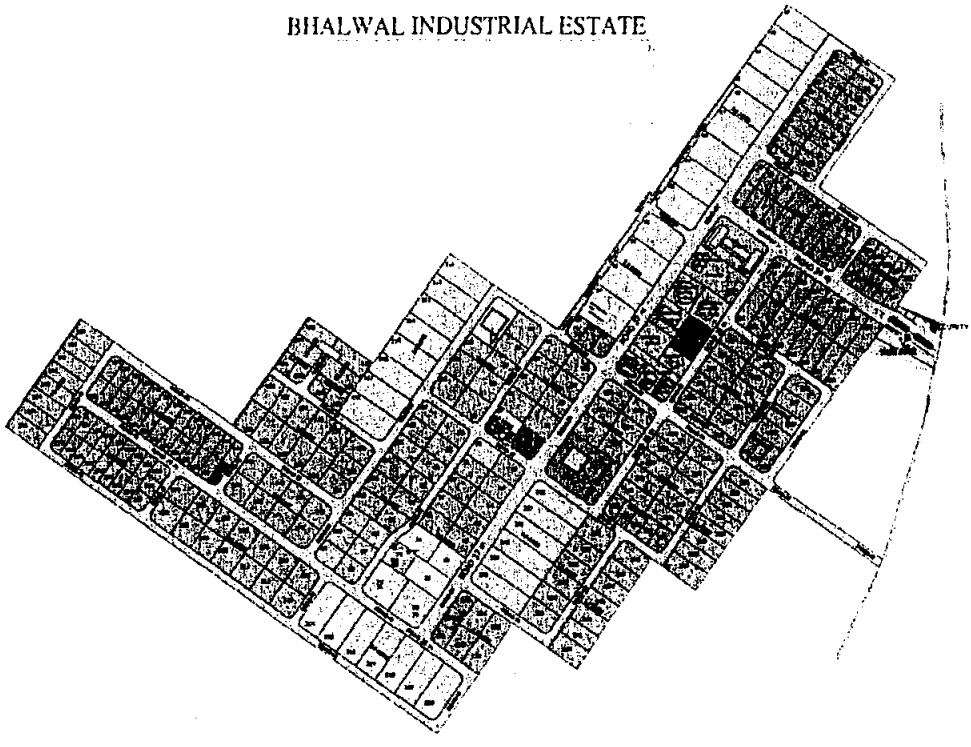
Location of the Licensee/ Bhalwal Industrial Estate on the Map of Pakistan



Location of the Licensee/ Bhalwal Industrial Estate on the Map of the Province of Punjab



Territorial Map of the Distribution Facility of the Licensee/ Bhalwal Industrial Estate



Site Plan of the Distribution Facility of the Licensee/Bhalwal Industrial Estate