Initial Environmental Examination

April 2017

PAK: Punjab Intermediate Cities Improvement Investment Project
Sialkot City

Prepared by the SaafConsult B.V., Netherlands, Joint Venture with Dev-Consult, Pakistan and NEC Consultants Private Limited, Pakistan, and M J Edge for the Asian Development Bank.

INITIAL ENVIRONMENTAL EXAMINATION

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PAK: Punjab Intermediate Cities Improvement Investment Program (PICIIP) - Sialkot City

i) Water Supply Improvement
ii) Sewerage and Drainage Improvement
iii) Transport Routes Improvement
iv) Green Spaces Development

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ABBREVIATIONS

µg/m^3	Microgram per Cubic Meter
AC	Asbestos Cement
ADB	Asian Development Bank
AP	Affected Person
BOD	Biochemical Oxygen Demand
CAP	Corrective Action Plan
CCMR	Community Complaint Management Register
CDIA	Cities Development Initiative for Asia
CI	Cast Iron
CO	Carbon monoxide gas
CO_2	Carbon dioxide gas
COD	Chemical Oxygen Demand
CPEMP	Construction Phase Environmental Mitigation Plan
DEO	District Environment Officer
DG	Director General
DNI	Distribution Network Improvement
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
FGD	Focal Group Discussion
GI	Galvanized Iron
GoP	Government of Pakistan
GoPb	Government of Punjab
GRS	Grievance Redress System
GRC	Grievance Redress Cell
Ha	Hectare
IEE	Initial Environmental Examination
IFC	International Finance Corporation (World Bank Group)
KM	Kilometer
LARP	Land Acquisition and Resettlement Plan
LGO	Local Government Ordinance
m^3/d	Cubic meter per day
M&E	Monitoring and Evaluation
MCU	Motor Control Unit
mg/l	Milligram per liter
MGD	Million Gallon per Day
mm	Millimeter
NEQS	National Environmental Quality Standards
NGO	Non-Government Organization
NOC	No Objection Certificate
°C	Celsius Centigrade
OHR	Over Head Reservoir
OHS	Occupational Health and Safety
Pak	Pakistan
PC	Public Consultation
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standard
PICIIP	Punjab Intermediate Cities Improvement Investment Program
PK	Pakistan
PMU	Project Management Unit

PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
REA	Rapid Environmental Assessment
RH	Relative Humidity
RTA	Rapid Transit Authority
SCADA	Supervisory Control And Data Acquisition
SMC	Sialkot Municipal Corporation
SPS	Safeguard Policy Statement
TDS	Total Dissolved Solids
TMA	Tehsil Municipal Authority
TOC	Total Organic Compound
TSS	Total Suspended Solids
UC	Union Council

Local Terminology

Chak:	Village
Koel:	Cuckoo
Nullah:	Natural water body, drain

Units

1 Marla	= 225 square feet	= 0.005165 acres
1 Square foot	= 0.0929 square metres	
1 Acre	= 43,560 square feet	= 0.404685642 hectares
1 Square metre	= 10.76391 square feet	= 0.0002471 acres
1 Hectare	= 2.4710538 acres	= 10,000 square metres
1 Inch	= 25.4 mm	= 2.54 cm
1 Mile	= 5,280 feet	= 1.609344 kilometres
1 Kilometre	= 0.62137 miles	= 3,280.84 feet
1 Gallon (Imperial)	= 4.54609 litres	= 0.0045461 cubic metres
1 Cubic metre	= 1,000 litres	= 219.96925 gallon (imperial)
1 Cubic metre/second	= 3,600 cubic metres/hour	= 35.31467 cusec
1 Cusec	= 101.941 cubic metres/hour	

Currency Conversion

1 US$ = 104 PKR

I. INTRODUCTION

A. Punjab Intermediate Cities Improvement Investment Program

1. The Asian Development Bank (ADB) and the Cities Development Initiative for Asia (CDIA) are partnering with the Government of Punjab Province (GoPP), to undertake the Punjab Intermediate Cities Improvement Investment Program (PICIIP). The PICIIP aims to improve the quality of urban services available in five selected cities in Punjab Province, the most populous province in Pakistan, with city populations between 250,000 and 1,000,000. Urban infrastructure development is an important component of the PICIIP. The duration of the program will be six years. The PICIIP's overall budget is US$500 million, to be disbursed in phases. The first phase will fund investments in the intermediate cities of Sialkot and Sahiwal. Major projects planned for Sialkot city during Phase 1 of PICIIP are water supply improvement, sewerage and drainage improvement, and urban development improvements, including transport routes and green spaces.

2. This IEE study examines the environmental implications of all of the subprojects.

B. Subproject Types Identified for Implementation

3. The prefeasibility study of Sialkot city, carried out under PICIIP in April 2016, has identified three projects under transport, water supply and sewerage improvement, as given in Table-1.1.

i. Water Supply Improvement Project: Rehabilitation of water supply tube wells, overhead reservoirs and water distribution pipelines will be carried out at different parts of the city. These projects will improve water quality and water supply situation in the city. At some places, new water supply infrastructure will also be installed. The Supervisory Control and Data Acquisition (SCADA) system implementation and bulk metering of water supply will also be the part of water supply improvement project.
ii. Sewerage and Drainage Improvement Project: Rehabilitation of sewerage and drainage network and disposal stations will be carried out at different parts of the city. At some places the sewers will be replaced.
iii. Transport Routes Improvement Project: Improvements and upgrades to 3 KM Kashmir Road and one general bus stand will be carried out under this part of the project.
iv. Green Spaces Development: Rehabilitation of existing parks and development of green belts at different parts of the city will be the green spaces development projects.

C. Environmental Assessment

4. The ADB requires the consideration of environmental issues in all aspects of the Bank's operations. The requirements for environmental assessment are described in the ADB's Safeguard Policy Statement (SPS), 2009. This Initial Environmental Examination (IEE) study was carried out based on a prefeasibility study and conceptual engineering designs. The IEE was prepared during the project feasibility stage and may be updated during the implementation stage to reflect any required changes related to the latest sub-project designs.

Table-1.1: Subprojects for Sialkot under PICIIP

Sector	Projects
Transport Routes	3 KM Kashmir Road improvement/upgrades
	General bus stand, improvement/up-gradation
Water Supply	Rehabilitation of overhead reservoirs
	Efficiency improvement of tube wells
	Replacement of water supply pipelines
	Provision of disinfection units at tube wells and overhead reservoirs
	Provision of bulk metering, pressure gauges and Supervisory Control and Data Acquisition (SCADA) system at selected water production facilities
	Development of DNI zones
	Rehabilitation of Fateh Garh Scheme water distribution system
Sewerage and Drainage	Replacement of sewers (27.9 KM)
	Provision of accessories for sewerage improvement and health and safety equipment for municipal corporation staff
	Rehabilitation of disposal stations (8)
Green Spaces Development	Rehabilitation of Gulsha-e-Iqbal and Qila Park
	Green belt along the drain

5. An environmental assessment using ADB's Rapid Environmental Assessment (REA) checklists for urban development, sewerage and water supply was conducted and results of the assessment show that the projects are unlikely to cause significant adverse impacts (refer to Annexure-1). The water supply improvement, sewerage and drainage improvement, and urban development improvement projects are classified as Category B. This initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subprojects.

6. The environmental assessment requirements of the Punjab Environmental Protection Act, 1997 (Amended 2012) are different from those of the ADB. The Government of Punjab's environmental regulations categorize development projects into two schedules, according to their anticipated potential environmental impact. The proponents of the projects with the potential for more adverse environmental impacts (Schedule II) are required to submit an Environmental Impact Assessment (EIA). While, for the proponents of projects with the potential for less environmental impact (Schedule I), must submit an IEE with the respective environmental protection agency (EPA). There is no requirement from the GoPb for the above-mentioned projects of water supply, sanitation and urban development for submitting EIA or IEE report.

7. The field studies were undertaken by a team with experience of environmental assessment for development projects in Pakistan. This team conducted the preliminary scoping, survey and assessment activities, public consultations and coordinated the field sampling and analysis.

8. The study process began with scoping and field reconnaissance during which a RRTAid Environmental Assessment was carried out to establish the potential impacts and categorization of project activities. The environmental impacts and concerns requiring further study in the environmental assessment were then identified. The methodology of the IEE study was then elaborated in order to address all interests. Subsequently, both primary and secondary baseline environmental data was collected from the proposed works and the intensity and likely location of impacts were identified with relation to the sensitive receivers; based on the work expected to be carried out. The significance of impacts from the construction and operation of the projects was then assessed and, for those impacts requiring mitigation, measures were proposed to reduce impacts to within acceptable limits.

9. Many Public Consultations (PCs) were carried out during prefeasibility and feasibility stages in line with ADB guidelines. Under ADB requirements the environmental assessment process must also include meaningful public consultation during the completion of the draft IEE. The PC process included verbal disclosure of the subproject as a vehicle for discussion. Interviews were conducted with local families and communities. The results of these PCs have been incorporated in this report.

D. Executing Agency

10. The Sialkot Municipal Corporation (SMC) under Local Government will be the executing agency of the proposed projects. The executive branch of SMC is divided into five departments and a Municipal Officer (MO) heads each of the departments (Finance, Planning and Coordination, Regulation, Infrastructure and Services) to carry out its functions. The MO Infrastructure and MO Services are responsible for water, sewerage, drainage, sanitation, roads, streets and street lighting, firefighting and park services.

C. Structure of Report

11. This IEE reviews information on existing environmental attributes of the study area. Geological, hydrological and ecological features, air quality, noise, water quality, soils, social and economic aspects and cultural resources are included. The report predicts the probable impacts on the environment due to the proposed subproject. This IEE also proposes various environmental management measures. Details of all background environmental quality, environmental impact/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided in this report. References are presented at the end of the report. Following this introduction the report generally follows ADB guidelines and includes:

- Policy, Legal and Administrative Framework
- Description of the Subprojects
- Description of the Environment
- Assessment of Potential Environmental Impacts and Mitigation Measures
- Institutional Arrangements and Environmental Management and Monitoring Plans
- Information Disclosure, Public Consultation and Participation
- Findings and Recommendations
- Conclusions

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

12. Several statutes contain direct legislation on environmental protection, namely the Pakistan Environmental Protection Act (1997), the Punjab Environmental Protection (Amendment) Act (2012, the Forest Act (1927), and the Punjab Wildlife Act (1974). In addition, the Land Acquisition Act (1894) also provides powers in respect of land acquisition for public purposes. There are also several other items of legislation and regulations that have an indirect bearing on the sub-project or general environmental measures.

A. Statutory Framework

13. The Constitution of Pakistan distributes legislative powers between the federal and provincial governments through two 'lists' that are attached to the Constitution as Schedules. The Federal List covers the jurisdictions over which the federal government has exclusive legislative power, while the Concurrent List contains jurisdictions over which both the federal and provincial governments can enact laws. "Environmental pollution and ecology" is included in the concurrent list; hence, both the federal and the provincial governments can enact laws in this jurisdiction. However, to date, after the 18th Constitutional Amendment, the Federal Ministry of Environment was dissolved and the provincial governments are now authorized to formulate environmental laws and regulations. The key environmental laws affecting the subprojects are discussed below.

i. Pakistan Environmental Protection Act, 1997

14. The Pakistan Environmental Protection Act, 1997, is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, and noise pollution, and to the handling of hazardous wastes. The key features of the law, in as far as it has a direct bearing on the proposed subprojects, relate to the requirement for an IEE and an EIA for development subprojects. Section 12 (1) requires that: "No proponent of a sub-project shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination [IEE] or, where the subproject is likely to cause an adverse environmental effect, an Environmental Impact Assessment [EIA], and has obtained from the Federal Agency approval in respect thereof." The Pakistan Environmental Protection Agency has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies, in this case the Punjab EPA.

ii. Punjab Environmental Protection (Amendment) Act, 2012

15. After the 18th Constitutional Amendment in the Constitution of Pakistan, the Federal Ministry of Environment was dissolved and the provinces were accorded jurisdiction over the environment. The EPA Punjab has formulated its own Act, the major content of which is the same as the PEPA, 1997. Minor amendments/changes have been made, as follows:

a. The name of the Act has been changed to "Punjab Environmental Protection (Amendment) Act, 2012".
b. For the words "Federal Government", wherever they occur, the word "Government" shall be substituted; For the words "Federal Agency", wherever they occur, the words "Provincial Agency" shall be substituted; and
c. For the word "National", wherever it occurs, the word "Punjab" shall be substituted.
d. All the other clauses, sub-clauses, sections and sub-sections are almost identical.

Since these subprojects fall within Punjab province, may be approval from Punjab province will be required, if these fall under the category.

iii. Punjab Environmental Protection Agency Review of IEE and EIA Regulations

16. The Punjab Environmental Protection Act provides for two types of environmental assessments: IEEs and EIAs. EIAs are carried out for subprojects that have the potential for 'significant' environmental impacts, whereas IEEs are conducted for relatively smaller sub-projects with relatively less potential for significant impacts. The Punjab Environmental Protection Agency Review of the IEE and EIA Regulations categorizes the subprojects that require an IEE and an EIA. Schedules I and II, attached to the Regulations, list these types of subprojects.

17. The Regulations also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-by-step description of the approval process:

a. To determine whether a sub-project is categorized as requiring an IEE or EIA, use the two schedules attached to the Regulations.

b. An EIA or IEE is conducted as per the requirements outlined in the Pak-EPA guidelines.

c. If the project is located in the provinces, then the EIA or IEE is submitted to the concerned provincial EPA; if it is located in Islamabad and federally administrated areas, then it is submitted to the Pak-EPA. The Fee (depending on the cost of the sub-project and type of report) is submitted along with the EIA or IEE document.

d. The IEE/EIA is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.

e. The EPA conducts a preliminary review of the report and replies within 10 days of the submission. It either a) confirms completeness, or b) asks for additional information, if needed, or c) returns the report and asks for additional studies, if necessary.

f. If the issue is confirmation of completeness, then the EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90days, respectively.

g. The EPA accords their approval, subject to certain conditions:

   - ✓ Before commencing construction of the sub-project, the proponent is required to submit an undertaking accepting the conditions.
   - ✓ Before commencing operation of the sub-project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.

h. An Environmental Management Plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.

i. The EPAs are required to issue confirmation of compliance within 15 days of receipt of the request and complete documentation.

j. The IEE/EIA approval is valid for three years from the date of operational phase NOC.

k. After completion of construction, a monitoring report is to be submitted to the EPA, followed by annual monitoring reports, during operations.

18. As per Punjab Environmental Protection Act for the EIA or IEE, the STP and solid waste disposal facility would fall under Schedule II (Review of IEE & EIA Regulations). Schedule II projects require an EIA, due to their anticipated adverse environmental impacts. Under

provincial requirements, the water supply, sewerage and drainage, and transport projects do not require either an EIA or an IEE.

iv. National Environmental Quality Standards (NEQS)

19. The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and were amended in 1995 and 2000. Standards for the following types of effluent and emissions are specified in the NEQS and may be relevant to the specified projects:

a. Municipal and liquid industrial effluent parameters (32) for discharge to in land waters, sewage treatment facilities, and the sea.
b. Industrial gaseous emissions (16) into the atmosphere.
c. Motor and vehicle exhaust and noise (3)
d. Ambient air quality (9)
e. Drinking water quality (33)
f. Noise for residential, commercial, industrial, and silence zones

v. Other Relevant Laws

20. A number of other federal and provincial laws are important in the context of environmental management. The main laws that potentially affect the sub-projects in this MFF are listed below.

a. **The Punjab Wildlife Protection Ordinance, 1972,** empowers the government to declare certain areas to be reserved for the protection of wildlife and to control activities within in these areas. It also provides protection to endangered wildlife species. As no activities are planned in these areas, no provision of this law is applicable to the proposed sub-projects.

b. **The Forestry Act, 1927,** empowers the government to declare certain areas as reserved forests. As no reserved forests exist in the vicinity of the proposed sub-project, this law will not affect to the proposed sub-projects.

c. **The Antiquities Act of 1975** ensures the protection of Pakistan's cultural resources. The act defines 'antiquities' as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, and national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. 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. This project site is not in the proximity of a protected antiquity.

d. **Safety Regulations** directly or indirectly govern occupational health and safety (OHS) issues during the currently studied production activities. These regulations mainly include three laws and regulations: (i) PEPA Laws, 2000; (ii) Labor Laws; and (iii) Electricity Rules,1937.

B. ADB Requirements

21. ADB safeguard policies require that:

i) impacts are identified and assessed early in the project cycle;

ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and

iii) affected people are informed and consulted during project preparation and implementation.

22. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

23. The implementation processes as follows:

i) screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle;

ii) impacts are assessed, safeguard plans summarizing mitigation measures, monitoring program, and institutional arrangements are prepared, and arrangements are made to integrate safeguards into project design and implementation;

iii) affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them; and

iv) safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle.

24. ADB's safeguard policies require that both ADB's and developing member countries' (DMCs') safeguard requirements are complied with.

25. Applicable standards for air emissions for general application, ambient air condition at property boundary for general purpose, limits for process wastewater, domestic sewage and contaminated storm water discharges to surface water and ambient noise levels are given below, and are based on the standards described in the World Bank Group (IFC) Environmental, Health and Safety Guidelines (EHS Guidelines). The Punjab Environmental Quality Standard (PEQS) values are also given against each value for the comparison with local requirement.

Air Emissions Limits for General Application
(milligrams per normal cubic meter)

Pollutant or Parameter	Limit	PEQS
PM	50 for units with >⊓50 MWe input	300 -500
	100 for units with < 50 MWe input	
Nitrogen Oxides as NO2		Oxides of Nitrogen
Coal fired	750	1,200
Oil fired	460	600
Gas fired	320	400
Sulfur dioxide	Not to exceed 2,000	Sulfur Oxides 1,700

MWe Megawatts Electricity

Ambient Air Conditions at Property Boundary, for General Application
(micrograms per cubic meter)

Pollutant	Concentration	PEQS
Particulate Matter		
Annual Arithmetic Mean	50	360
Maximum 24 hour Average	70	500
Nitrogen Oxides (Maximum 24 hr)	150	80
Sulfur dioxide		
Annual Arithmetic Mean	50	80
Maximum 24 hr Average	125	120

Limits for Process Wastewater, Domestic Sewage, and Contaminated Storm Water Discharged to Surface Waters, for General Application

(milligrams per liter, except for pH, bacteria, and temperature)

Pollutant or Parameter	Limit	PEQS
pH	6–9	6 -9
BOD	50	80
COD	250	150
Oil and grease	10	10
TSS	50	200
Metals Heavy metals, total	10	-
Arsenic	0.1	1.0
Cadmium	0.1	0.1
Chromium Hexavalent	0.1	-
Total	0.5	1.0
Copper	0.5	1.0
Iron	3.5	8.0
Lead	0.1	0.5
Mercury	0.01	0.01
Nickel	0.5	1.0
Selenium	0.1	0.5
Silver	0.5	1.0
Zinc	2.0	5.0
Cyanide Free	0.1	-
Total	1.0	1.0
Ammonia	10	40
Fluoride	20	10
Chlorine, total residual	0.2	1.0
Phenols	0.5	0.1
Phosphorus	2.0	-
Sulfide	1.0	1.0
Coliform bacteria	< 400 MPN/100 ml	-
Temperature increase	< 3°Ca	< 3°C

Note: MPN, most probable number

a. The effluent should result in a temperature increase of no more than 3° C at the edge of the zone where initial mixing and dilution take place. Where the zone is not defined, use 100 meters from the point of discharge.

Ambient Noise

Receptor	Maximum Allowable log equivalent (hourly measurements) in dBA		PEQS	
	Day (07:00 – 22:00)	Night (22:00 – 07:00)	Day	Night
Residential, Institutional, Educational	55	45	55	45
Industrial, Commercial	70	70	65- 75	55 - 65

III. DESCRIPTION OF SUBPROJECTS

21. Under the first phase investments of the PICIIP it is proposed to implement urban development sub-projects in the following:

- Water supply;
- Sanitation; and
- Urban development, with respect to transportation infrastructure and the development of green spaces.

22. This Section provides an overview of the existing situation in Sialkot, and outlines the subproject proposals designed to address some of the current deficiencies in the provision of urban services. Where applicable, solutions and approaches which are alternative to the proposed subprojects are considered and discussed.

A. Water Supply Improvement Projects

i. Current Status

23. In total, 95 tube wells are operational, catering to the needs of the urban population of Sialkot. This does not include the cantonment area for which an additional 15 tube wells are in operation. The design discharge of all tube wells is 1.5 cusec (153 m^3/hr), however actual discharge varies depending upon the age and condition of the tube well. All tube wells operate on average 12 hours a day. Based on average discharge and operation time, the total daily production for Sialkot City (excluding the cantonment) is approximately equivalent to 38.4 million gallons, while per capita production is equivalent to 79.8 gallons per capita per day. These are raw estimates since accurate production data is not available due to the absence of metering and monitoring mechanisms. The higher volume of water production, absence of monitoring mechanisms, absence of valve control mechanisms on the pipe network, and absence of customer meters illustrates the exploitation of the resource and high production costs.

24. Based on the current and projected populations for the Sialkot and the projected per capita water demand of 33 gallons per day, both current (2015) water demand and future (2035) water demand is estimated to be less than available supply. Industrial water demand is assumed to be only 15% of the total water consumption as it is assumed that larger industrial establishments have a private water supply. Commercial and institutional demands have been assumed to be 15% and 10% of the total water consumption respectively.

25. The estimated daily production of water in Sialkot is 38.4 MGD, which supports current estimated demand. The high amount of losses (possibly up to 50%) would partially explain why it is not possible to provide a 24/7 service at present. The nominal rating of all the tube wells is 149.5 cusec (15,249 m^3/hr) or 80 MGD, although this is expected to now be less than 100 cusec (10,200 m^3/hr) given the lower water table and the condition of the pumps. Nevertheless, the capacity of the existing tube wells seems to be sufficient for the foreseeable future provided the pumps are rehabilitated and the lowering of the water table is addressed.

26. The piped water system in Sialkot is supplied by tube wells constructed at various locations in the city, and these pump water directly into the system. Valves have been

installed on the network but the staff of the SMC has not been using them, given the interconnectivity of the network and the sufficient production capacity of the system. Moreover, the valves have mostly been buried under the ground due to construction activities, and there is a lack of knowledge about their location. If one or two tube wells are dysfunctional, other tube wells in the vicinity feed the system thus catering for emergency needs.

27. Approximately 75% of the area within the city limits receives water from the SMC system. The pressure in the network is good, with limited complaints from the consumers. The quality of service and pressure is obvious, because almost all households have an overhead reservoir which is directly filled by the SMC supply up to second floor and without the need for a pumping facility. However, water quality is reported to be poor, especially by consumers in the low-income areas of the city. The main complaints relate to odor, and there is a perception that there is ingress of sewage into the water pipelines.
28. The design life of the tube wells is 15 years. Twenty nine tube wells are more than fifteen years old, while 11 tube wells are more than twenty years old. In its short-term plan, SMC recommends the construction of 11 new tube wells. The SMC has been re-boring wells during the past few years owing to the reduced discharge and efficiency of the tube wells. However, the turbines for these tube wells have not been installed due to a lack of funding. Overall 12 tube wells have been re-bored and require turbine replacement.

29. There is no integrated control system such as a Supervisory Control and Data Acquisition (SCADA) for the tube well installations or pressure gauges at the sites, which would enable some pumps to be switched off when not required.

30. There are eleven elevated or overhead reservoirs (OHR) distributed throughout the piped network with a total storage capacity of 1,568 m^3 (345,000 gallons), although these are currently not in service. Reportedly they were taken out of service due to security concerns, as it was considered that the water supply could be deliberately contaminated at the reservoirs. The storage represents 0.54 hours of storage excluding system losses. Generally, about 3-4 hours storage is considered necessary to balance supply and demand without giving consideration to fire-fighting water availability and the impact of load shedding which is frequent in Sialkot. The SMC Infrastructure and Services Division is not interested at this stage in bringing the reservoirs back into service as they are concerned that the time taken to fill the reservoirs would either increase the total pumping time or reduce the time that water is distributed to the consumers. Since water is already pumped into the system at high pressure, consumers are generally able to fill their above ground private storage tanks. However, bringing the reservoirs into service could provide for a more efficient supply and they could, if required, be filled concurrently with pumping directly into the network such that they fill during low demand and empty during peak demand.

31. The conditional survey for the OHR conducted during the study concluded that out of eleven (11) reservoirs, nine (9) could be rehabilitated. Almost all the reservoirs require plastering, fillers, finishing of structures, replacement of doors installed and replacement of delivery and rising mains. The connection of OHR with the distribution system and tube wells needs to be reinstated by construction of new connecting pipelines. If a 24/7 supply is to be provided using District Metering Areas (DMAs), it will be necessary to bring the reservoirs back into service. Furthermore, bringing the reservoirs back into service will provide security against power supply load shedding, which is currently prevalent.

32. Currently it is understood that good pressures are achieved at household connections throughout the system. However, many of the pipelines are reported to be old and in poor condition, so leakage and unaccounted for water is expected to be high. Overall 52% of

the network is identified as rusted and damaged requiring replacement. The total length of the network requiring replacement is 186 KM. Major network expansion in the city was undertaken during 1914, 1937, 1963 and onwards. No major project targeting network improvement in terms of replacement of rusted or damaged pipes has been initiated by the city government since the installation of the network. Moreover, the SMC does not have any mechanism for leak detection or identification and replacement of damaged pipes.

33. Currently the tube wells do not have pressure gauges or flow meters. This makes it difficult to operate them efficiently and there is no way to measure the performance of the tube wells or establish how much water is being lost in the network. While chlorination facilities are in place at the tube well pumping stations, it is not clear whether the water is being regularly chlorinated with the correct dosage.

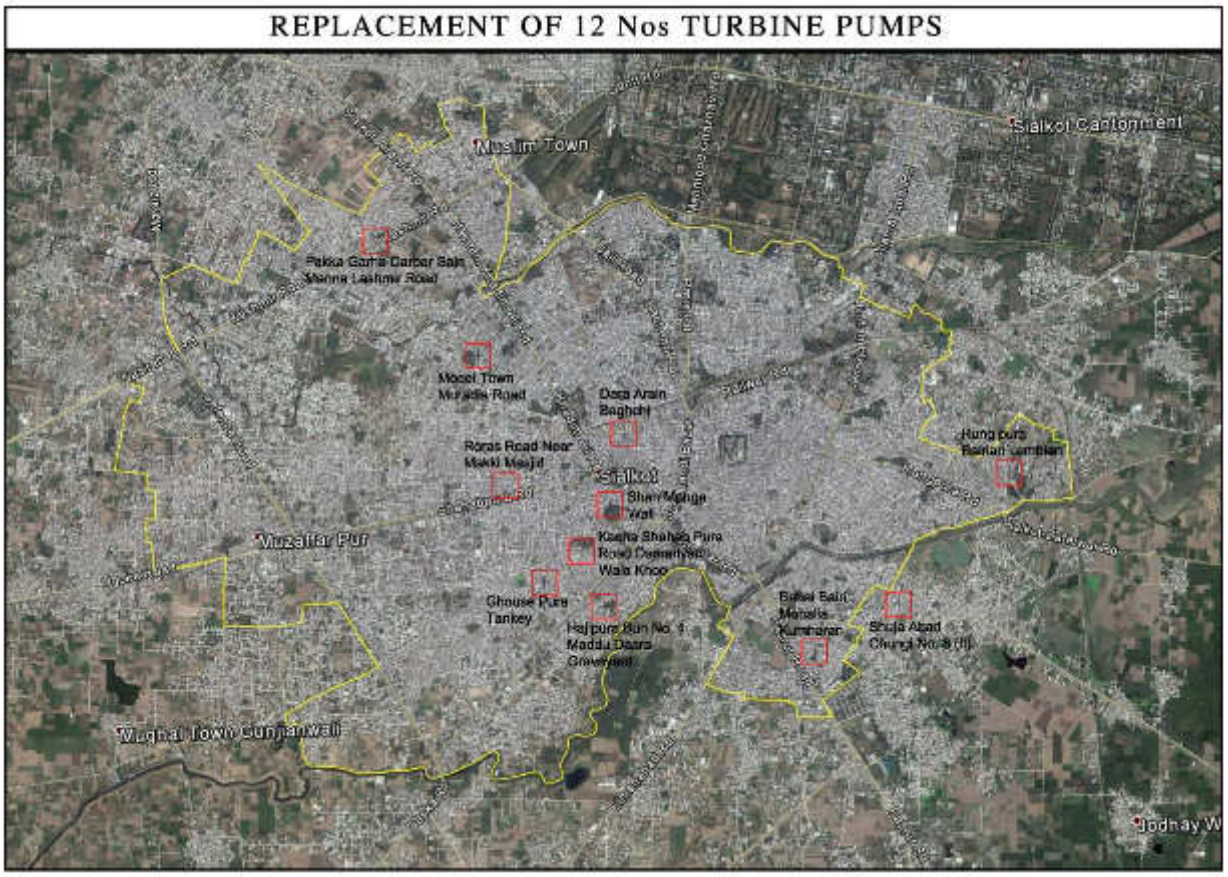
ii. **Proposed Projects**

a. Rehabilitation of Tube Wells

34. The objective of this subproject is to restore 95 tube wells to their original design rating such that a total capacity of 149.5 cusec (15,249 m^3/hr) can be achieved. SMC has been re boring wells to deal with the problem of reduced discharge. In most of the cases re-boring has been done, however the turbines of existing tube wells have been re-installed in new re-bored wells. The rehabilitation works required at the 95 tube wells within the existing service area are as follows:

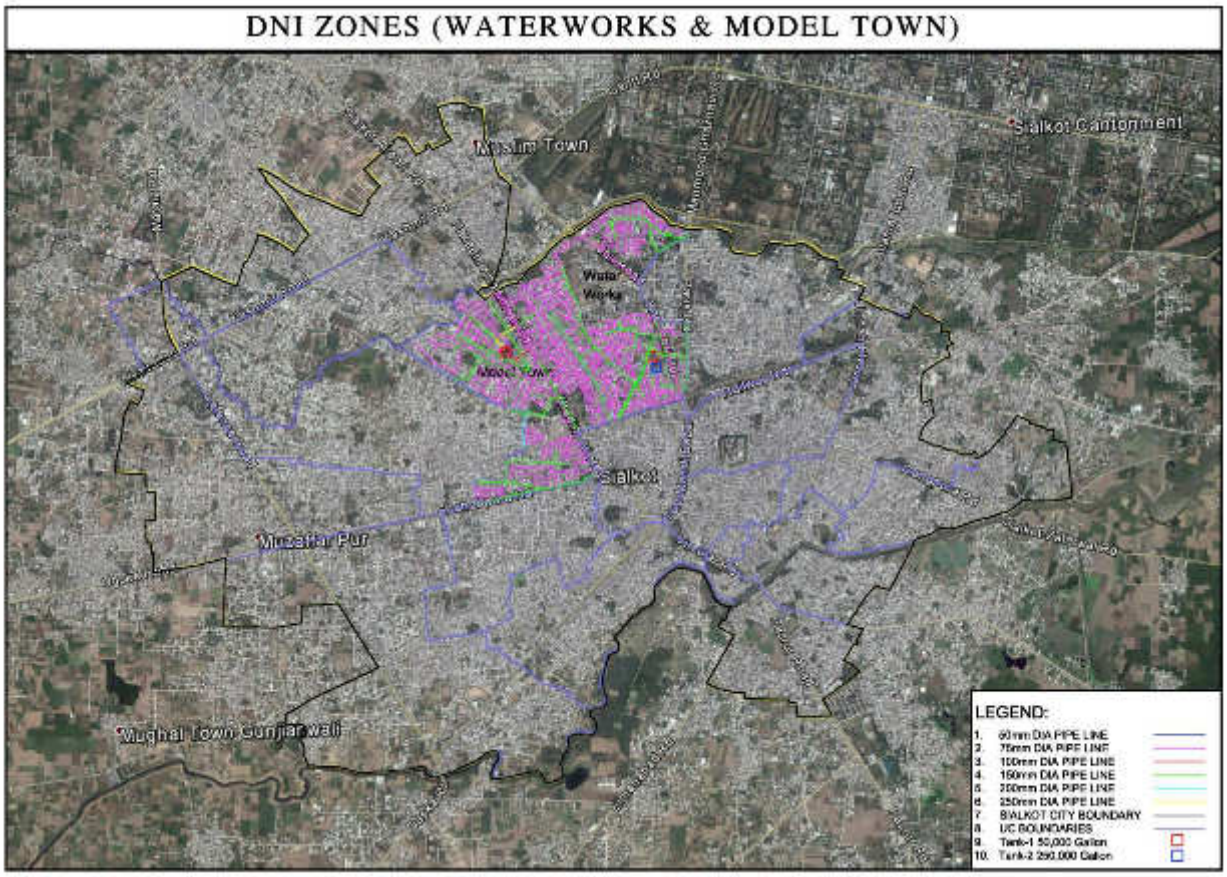
- Replacement of turbine pumps and motors at twelve (12) re-bored tube wells.
- Provision of new switchgear and electrical installations (26)
- Chlorination units at all 95 tube wells.
- Improving the efficiency of 60% of the tube wells (57) through the provision of bulk meters, pressure gauges, non-return valves, air valves, installation of capacitors, upgrading of delivery pipes as required.
- Development of DNI Zones: It is experimented that two union councils i.e. Model Town and Water Works are declared as DNI (Distribution Network Improvement) zones where water meters will be installed at all the houses and charged bill accordingly. These DNI zones will be supplied water for 24/7.

The intervention location of replacement of pumps and motors is shown below:

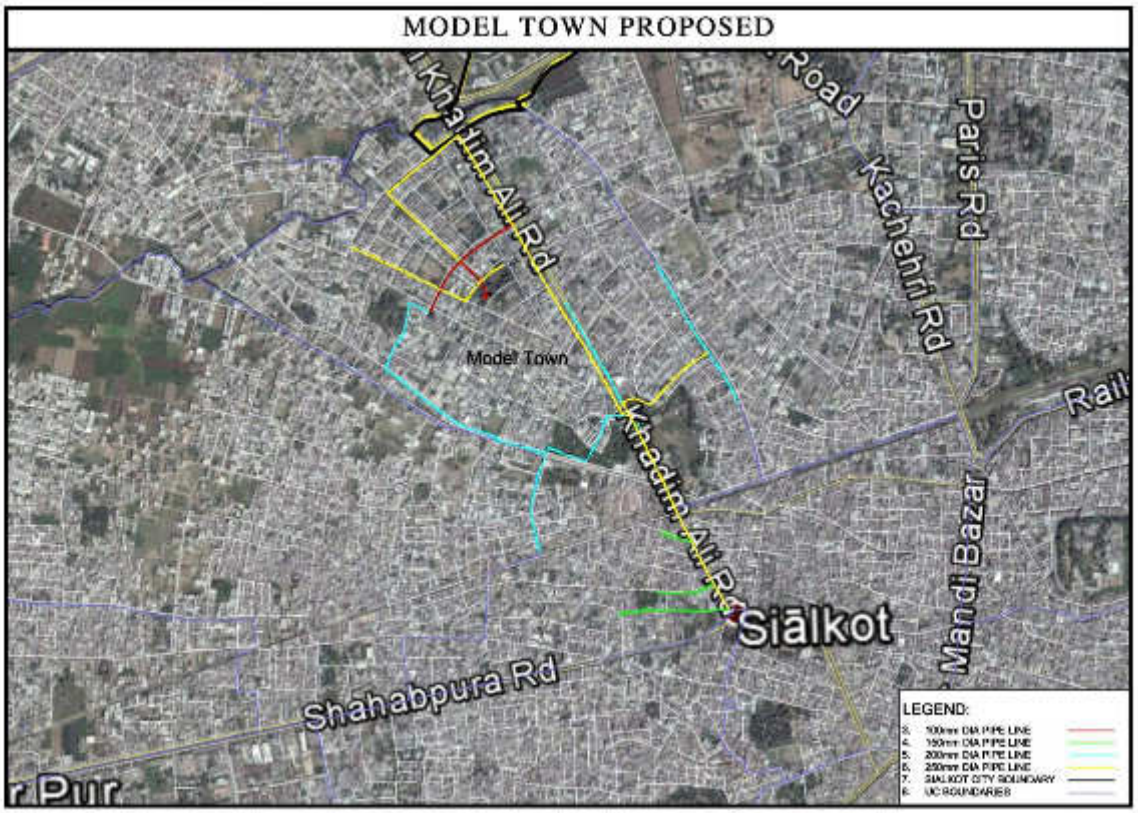


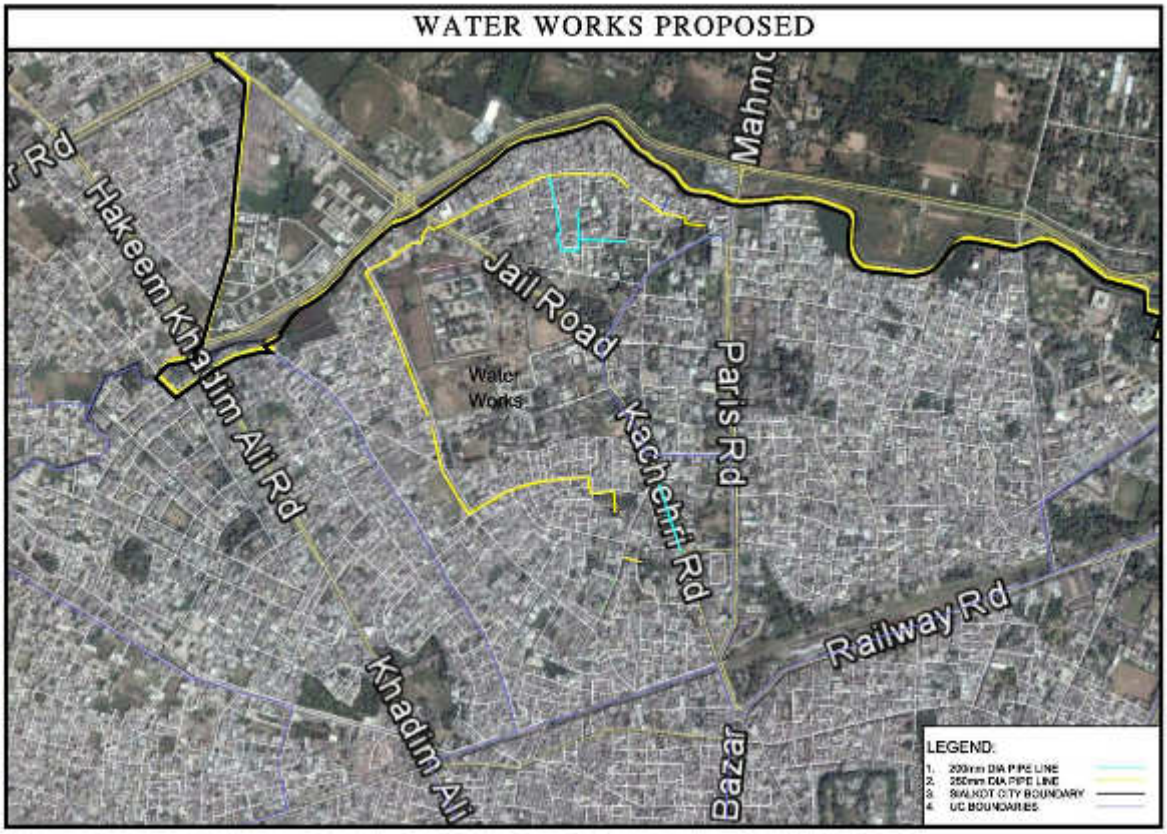
The intervention location of two DNI zones and proposed intervention of pipe replacement in these two DNI zones is shown below:

DNI ZONES (WATERWORKS & MODEL TOWN)



MODEL TOWN PROPOSED



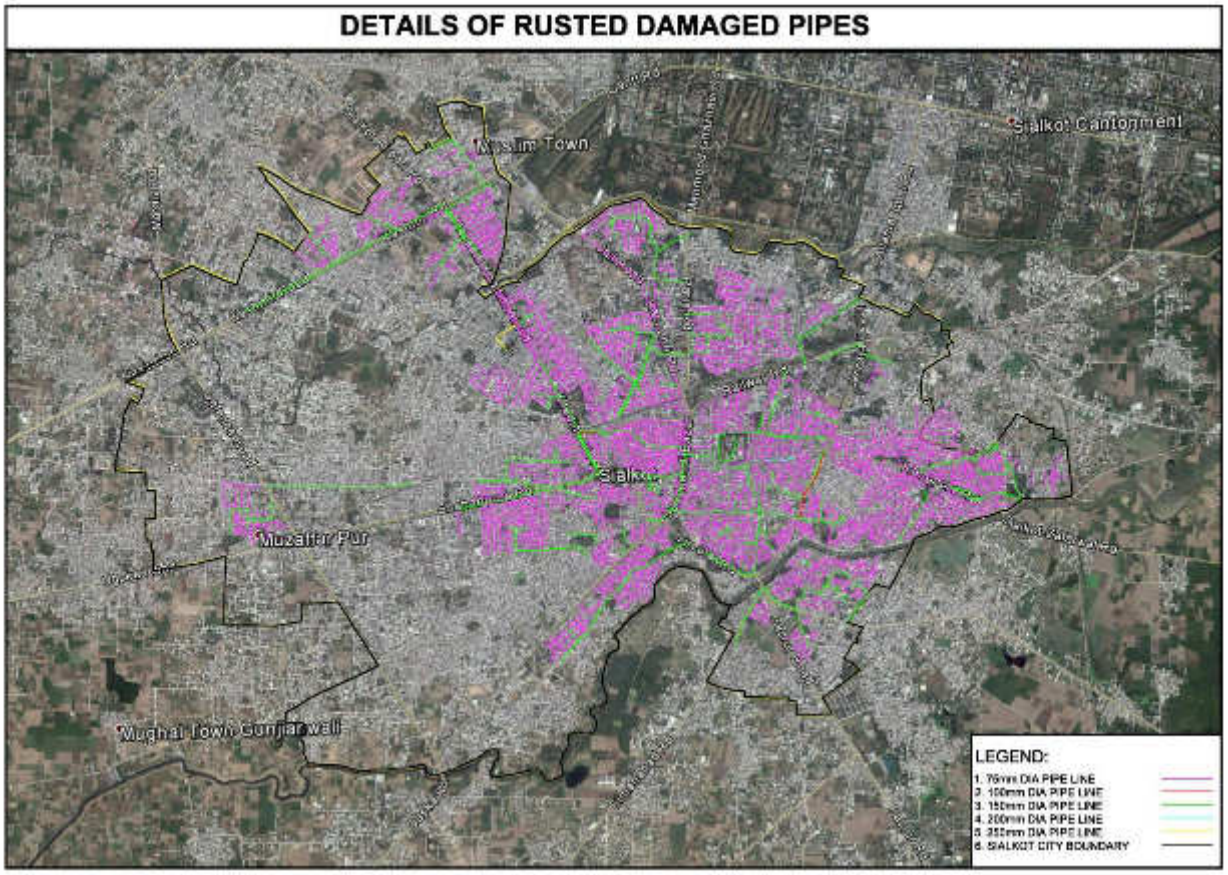


b. Rehabilitation of Distribution Network

Replacement of Rusted/Damaged Pipes

35. Approximately 75% of the city has coverage for water supply through a piped network. The major portion of the city is supplied by the piped network constructed by SMC while some public buildings and large installations have their own arrangements (tube wells and OHRs). In addition, privately constructed housing schemes including the WAPDA colony, MAG town, and the Government Polytechnic staff colony have poor condition/rusted networks, which are proposed to be replaced as a short-term investment plan. A total of 49 KM of the network (Cast Iron, Mild Steel and PVC pipes) is in poor condition and needs to be replaced, comprising pipelines ranging in diameter from 50-254 mm.

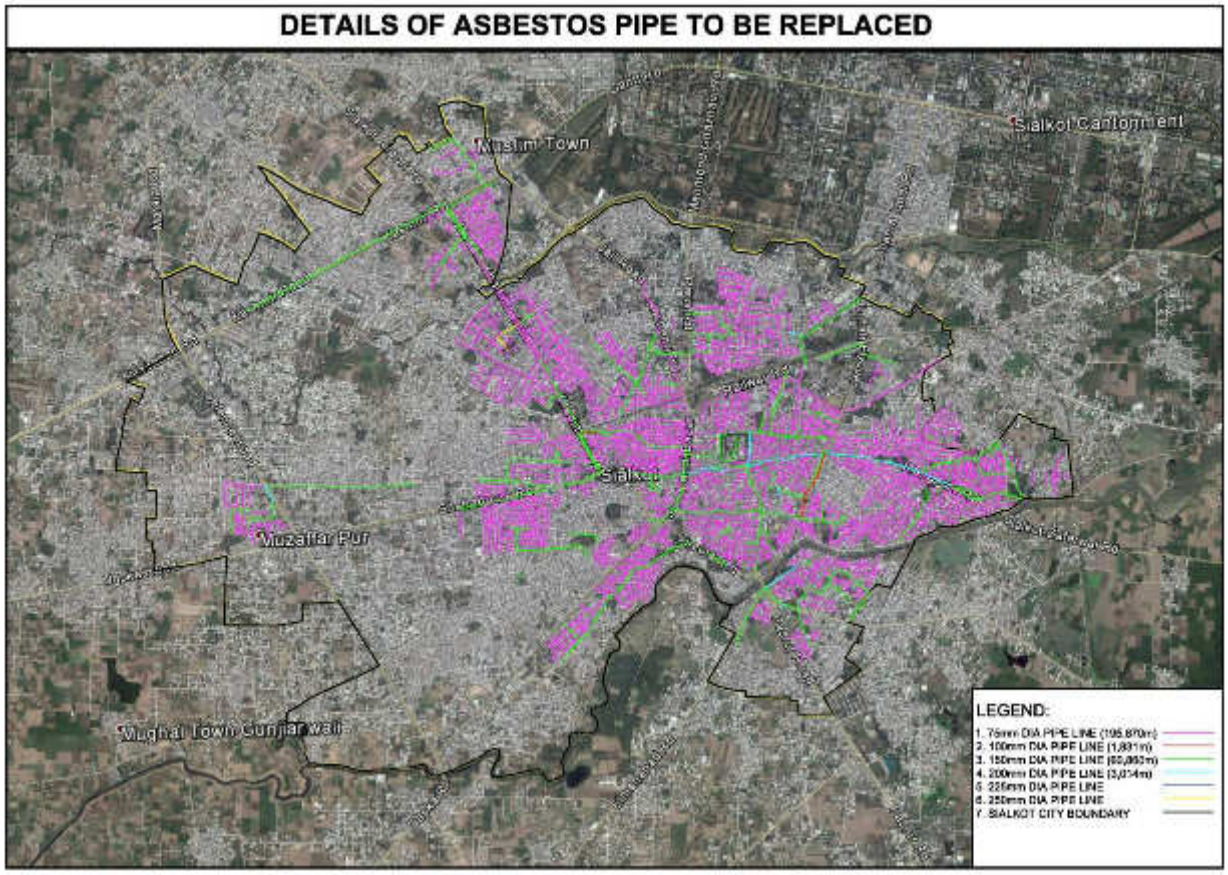
The location of rusted/damaged pipes is shown below:



Replacement of Asbestos Pipe

36. Keeping in mind the detrimental effects of asbestos on health, it is proposed to replace the asbestos cement pipes as part of the medium term investment plan. About 262 KM of asbestos cement pipe of either damaged or due to detrimental health impacts is required to be replaced. The existing AC pipes will remain buried in the ground by discontinuing their water connection because their disposal is health hazards. There is sufficient space available for laying side by side pipes.

The location of the asbestos pipes to be replaced is shown below:



Rehabilitation of Fateh Garh Distribution System

37. In Union Council Fateh Garh, a water supply scheme was constructed for Bogra serving approximately 400 households. The scheme consists of tube wells and a water distribution network. Due to technical flaws the scheme has never operated and has not been functional since the construction was completed. SMC staff report inadequacy of the distribution network (inappropriate design) limiting the supply water to the target population. The tube wells installed are functional and can be used if the pipe network is replaced. The scheme is proposed to be rehabilitated through replacing the pipe network.

c. Rehabilitation of Existing Overhead Reservoirs

38. This item will comprise the rehabilitation and bringing back into service of nine (9) of the existing eleven (11) overhead reservoirs. The other two are in better condition and do not require any rehabilitation (Shahab Road and Tiba Tank). The rehabilitation works will include:

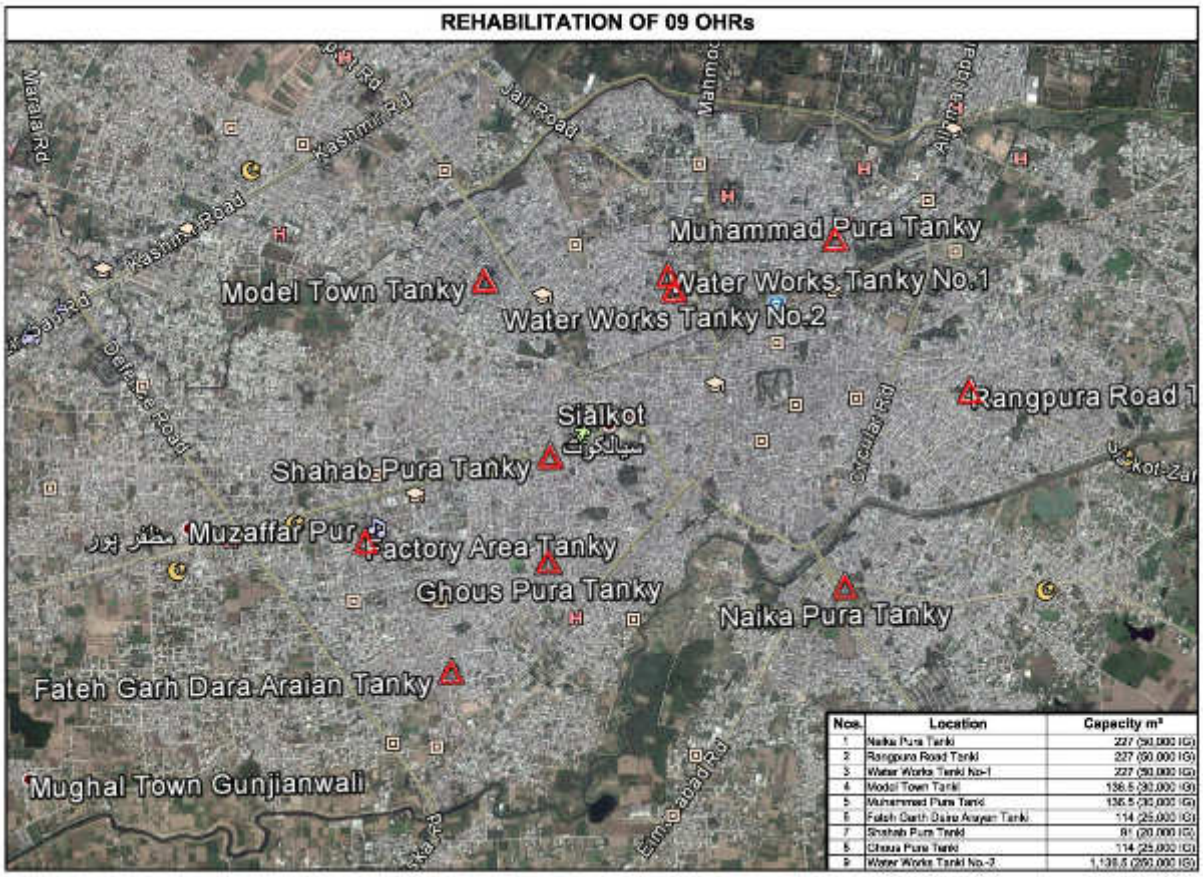
- Replacement of doors and windows.
- Plastering, fillers and minor structural repairs
- Connection on inlet and outlet pipe work and valves

Table-3.1 shows name and capacity of nine OHRs to be rehabilitated.

Table-3.1: Detail of Rehabilitation of Nine OHRs

#	Location	Capacity m^3
1	Naika Pura Tanki	227 (50,000 IG)
2	Rangpura Road Tanki	227 (50,000 IG)
3	Water Works Tanki No-1	227 (50,000 IG)
4	Model Town Tanki	136.5 (30,000 IG)
5	Muhammad Pura Tanki	136.5 (30,000 IG)
6	Fateh Garth Daira Arayan Tanki	114 (25,000 IG)
7	Shahab Pura Tanki	91 (20,000 IG)
8	Ghous Pura Tanki	114 (25,000 IG)
9	Water Works Tanki No.-2	1,136.5 (250,000 IG)

The intervention location of OHRs is shown below:



d. Installation of SCADA System

39. A Supervisory Control and Data Acquisition (SCADA) system will be installed to facilitate more efficient water supply system operation at DNI zones. It will allow automatic operation of tube well pumping stations based on the reservoir levels and system

pressure. It will enable real time measurement of flows and pressures throughout the system, and will enable accurate assessment of water losses. SCADA is essentially a real-time industrial process control system used to centrally monitor and/or control remote or local industrial equipment such as valves, pumps, sensors, etc. SCADA is a combination of telemetry and data acquisition, which will perform the functions of (i) data acquisition; (ii) networked data communication; and (iii) data presentation.

iii. Alternatives

40. Following alternatives for groundwater supply for Sialkot city is proposed under prefeasibility study:

41. Given the available groundwater resource, it is likely that supply of water from tube wells will remain the principal water source for the foreseeable future. However, alternative sources may need to be considered in the longer term given the reported lowering of the water table in the vicinity of Sialkot city, the potential impact of climate change on recharge and the continued high cost of pumping. These alternative water source options include rainwater harvesting, artificial recharge and surface water development.

42. *Rainwater Harvesting and Artificial Recharge:* Rainwater harvesting can play a significant role in ground water recharge, as groundwater levels in Sialkot are dropping and this raises the question as to (a) whether natural groundwater recharge is decreasing and (b) whether some means is available to increase groundwater recharge rates.

43. One option for increasing the rate of recharge will be to create storm water holding areas, which will serve the dual purpose of attenuating peak storm flows and allowing recharge but it will be complex due to the limited space available in all areas of the city. It does not appear to be viable for the areas where there is lack of open space. However, it should be considered as an integral part of the design of any parks provided as part of the overall planning approach. In addition, recharge tube wells can serve the purpose of recharging deep aquifers or injection wells can be provided for recharge through percolation. Recharge through abandoned dug wells can be another option and recharge trenches can be built where permeable strata is available at shallow depths. However, converting from a ground water source to a surface water source is the most suitable way to address the alarming scale of ground water depletion.

44. *Surface Water Development:* The imbalance between ground water recharge and ground water abstraction is likely to develop into a crisis and water insecurity issue. The Upper Chenab canal is passing by Sambrial Tehsil of Sialkot District while river Chenab crosses by Wazirabad District which is located 45 KM away from Sialkot. In the long term the available surface water resources (Chenab River and Upper Chenab Canal) need to be explored for domestic water supply project in Sialkot as well as adjacent cities. Water filtration plants may be designed and constructed for treatment of this water.

45. There are two options for water supply i.e. pressurized supply through continuous running of water turbines and filling of OHR and supply through it with intermittent running of tube wells. OHR option is considered energy efficient as compared with continuous pressurized water supply.

46. Liquid chlorine is used as disinfectant universally. It is considered useful at water supply facilities without considering any other alternative

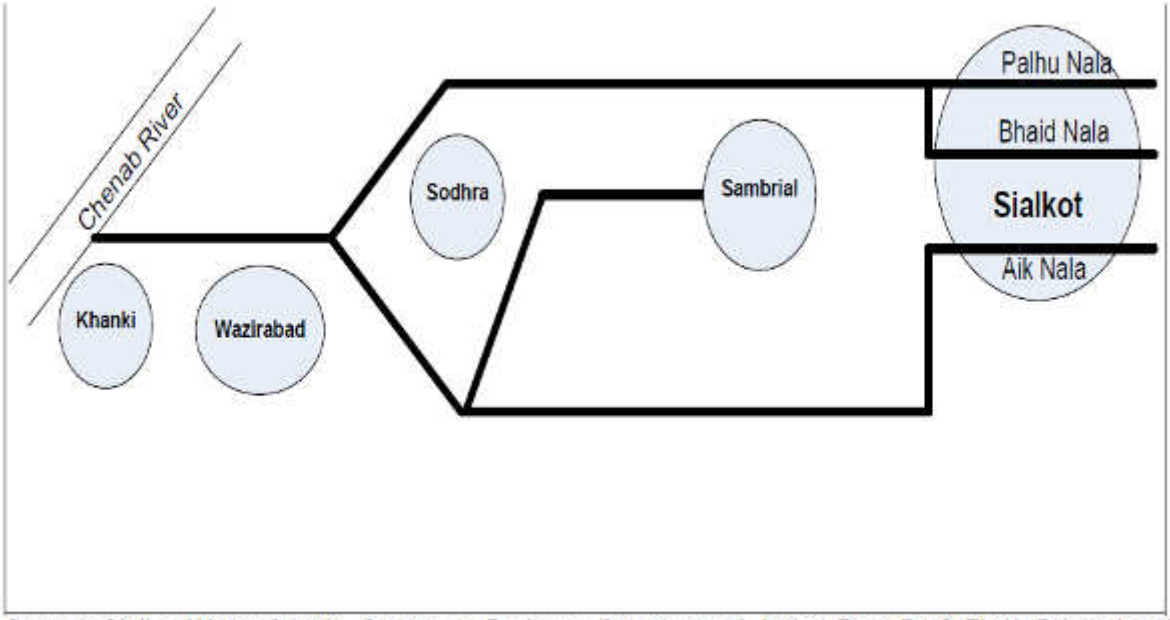
B. Sewerage and Drainage Improvement Projects

i. Current Status

47. Sialkot is traversed by two water channels or nullahs, the Bhaid and Aik Nullahs. The Bhaid Nullah drains the northern part of the municipal area and part of the Cantonment while the Aik Nullah drains the southern part of the municipal area. The Bhaid Nullah has a relatively small catchment area but receives wastewater from many industries and is highly polluted. It also has limited carrying capacity, which is exacerbated by many encroachments along its banks. The Aik Nullah originates in Jannu Hills, is 66 KM in length, has a much larger catchment but generally presents less of a threat to the town than does the Bhaid Nullah.

48. Both wastewater and storm water drainage are collected by a combination of sewers and open drains which eventually discharge into either the Aik or Bhaid Nullah or a tributary of the Bhaid Nullah, the Ganda Nullah, adjacent to the city core area.Water from all nullahs flows through the town and eventually drains into the Chenab River. Figure-3.1 presents the overview of the sewerage and drainage disposal system.

Figure-3.1: Sewerage and Drainage Disposal System



Source: Sialkot Water Supply, Sewerage Drainage Strategy and Action Pan, Draft Final, December 2010 GHK Consulting Ltd.

49. Sialkot has a relatively well developed sewerage system. There are essentially six separate catchment areas that comprise the sewerage system. Sewage from these catchment areas is collected by the sewerage network and conveyed to disposal stations from where raw sewage is discharged to the Aik Nullah, the Bhaid Nullah or the Ganda Nullah. Due to the dispersed nature of industries in Sialkot, the sewage received at the disposal stations contains a mix of domestic and industrial wastewater. During storms, a considerable quantity of storm water also finds its way into the sewerage system either

through interconnections or through the practice of lifting manholes during flood events to alleviate flooding.

50. The total length of the sewerage network in Sialkot city is 178 KM, while overall coverage is approximately 49% with the remaining part of the city served through covered or open drains. Approximately 14km of the network is choked and non-operational, and 15 KM is in poor condition, and needs replacement.

51. Contamination of the water supply system with sewage was cited by the SMC as a serious issue. This is reportedly caused by the proximity of water supply and sewerage pipes possibly laid in a common trench, in addition to the poor condition of the pipes. Replacement of the older, corroded pipes in the network and providing appropriate separation of the pipes should reduce this problem. Ultimately it is necessary to provide a 24-hour supply and keep the water mains pressurized to prevent contaminated water entering the water mains.

ii. Proposed Projects

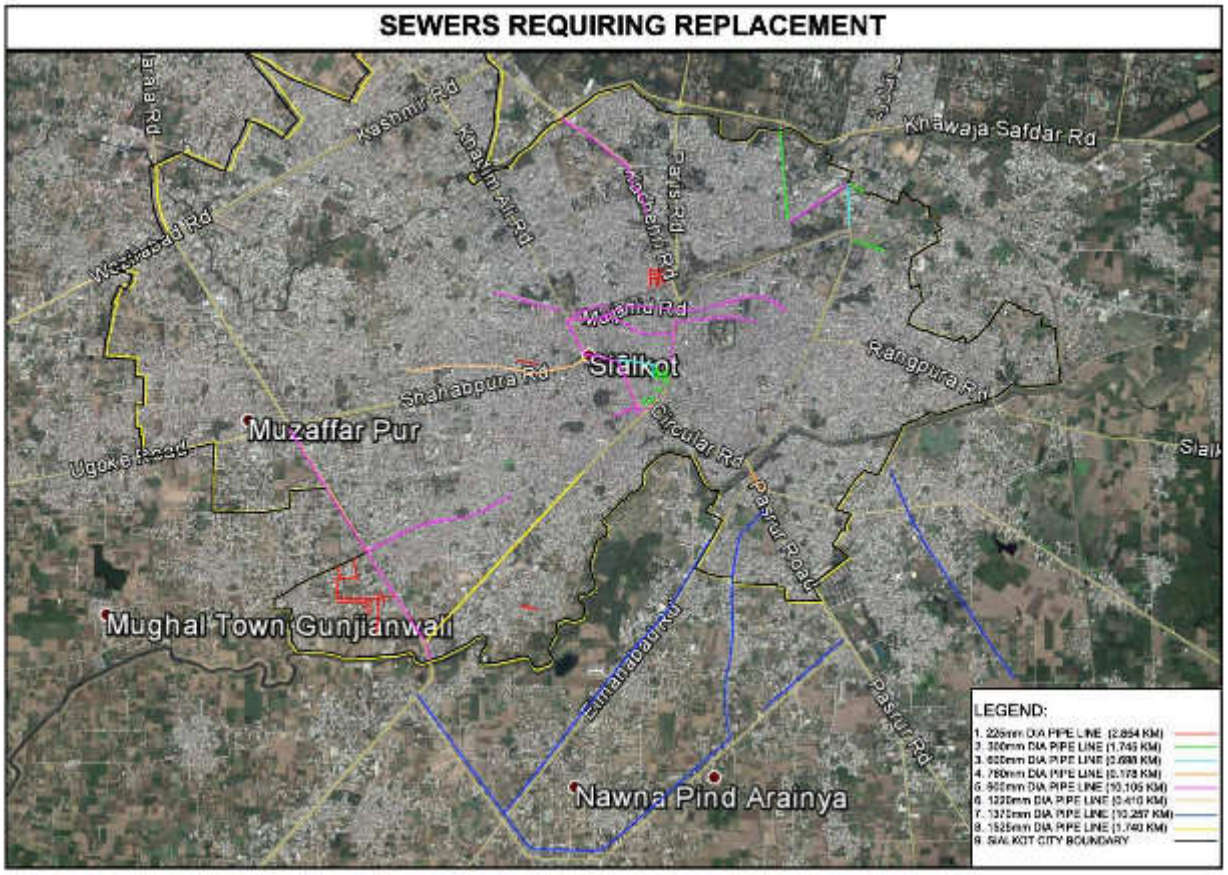
a. Sewerage Pipes Needing Replacement

52. There are 27.9 KM of sewers that require replacement. The breakdown in terms of sewer diameters is shown in Table-3.2.

Table-3.2: Detail of Sewers Requiring Replacement

#	Sewer Diameter (mm)	Sewer Length to be Replaced (KM)
1	1,524	1.74
2	1,370	10.257
3	1,219	0.410
4	914	10.105
5	762	0.178
6	609	0.700
7	304	1.745
8	225	2.854
Total		**27.989**

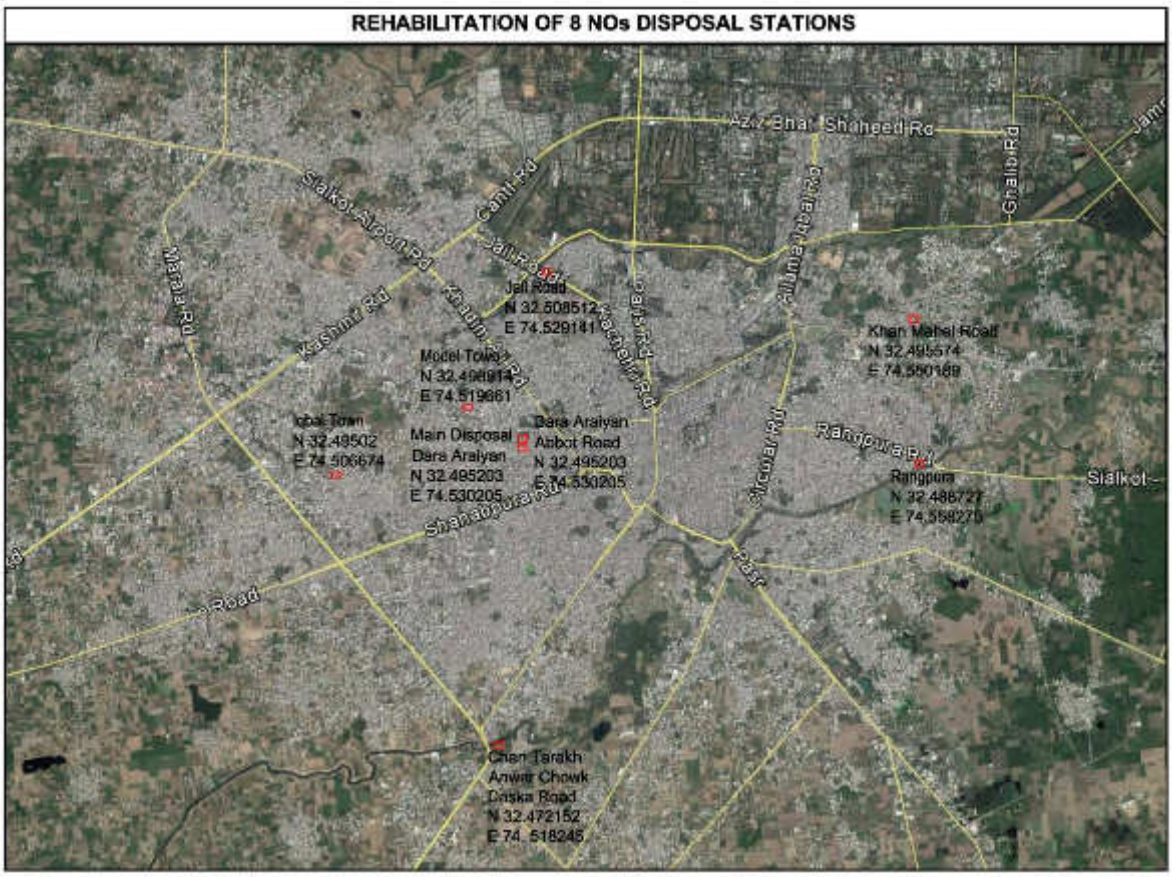
The intervention location of sewers replacement is shown below:



b. Rehabilitation of Disposal Stations

53. The condition of eight disposal stations is not good with respect to electrical, mechanical and civil condition. These eight pumping stations will be upgraded to increase capacity, so as to avoid overloading upstream sewers. The rehabilitation includes replacement of pump and motor, improvement of electrical panels, repair and maintenance of pumps and motors and civil work.

The intervention location of rehabilitation of disposal stations is given below:



C. Transport Routes Improvement Projects

i. Current Status

54. Traffic congestion is growing within the urban area of Sialkot city. Nearly all primary roads and some secondary roads, which carry significant traffic volumes, are dual carriageways with substantial road width, narrow central medians and footpaths. As is common in urban centers in Pakistan, the footpaths are generally encroached and are rarely available for pedestrian use. The omnipresent disorganized and opportunistic curbside parking and absence of adequate traffic management / control measures results in significant traffic congestion for much of the day. This is particularly the case in the old parts of the city where major commercial activity is concentrated.

55. The urban transport sector in Sialkot is measurably worse than that of Sahiwal. This is due to the higher population, a higher level of an economic activity, higher vehicle volumes, poor junction layouts, minimal traffic management facilities and encroachments which create side friction and often brings the traffic to a standstill. Moreover, the population is growing at an annual rate of 2.2% and there is an increasing rate of growth in motorized vehicles from 3.4% between 2005-2010 rising to a 10% annual growth for the 2012-2015 period.

56. Problems exist with poor road layouts, inefficient junction configurations, poor placement and maintenance of traffic signals, inadequate facilities for pedestrians, non-motorized transport and public transport, uncontrolled road side parking and absence of clear

demonstration and display of traffic regulatory control measures. This results in poor utility of road space, road congestion, inefficient mobility and threats to economic growth.

57. Public transport is not adequately developed. Only intercity bus routes passing through two major corridors pass through suburban areas. The majority of travelers use motor bikes for commuting adding to congestion. Two bus terminals situated on Jail Road are operating in Sialkot. One is owned by Daewoo that handles luxury intercity bus services. Main Terminal belonging to Sialkot Cantonment is spread over an area of 6.5 hectares. Around 1,200 plus bus departures a day are reported from this terminal. Terminal operation is, however, poorly managed. SMC is interested in developing a new site in the south of city. An elaborate road network exists that can be upgraded to operate city bus service. Currently the transport sector is administered through multiple organizations, whereas, the government is geared to assign the responsibility to Regional Transport Authority [RTA] at the district level.

ii. Proposed Projects

a. Road improvement/Upgrade

58. It is proposed that Kashmir Road in 3 KM length will be improved/upgraded with following interventions:

i. Road pavement
ii. Intersections improvement
iii. Traffic signals
iv. Storm water drainage
v. Walkways
vi. Regulatory signage
vii. Markings and cat eyes
viii. Curbstones
ix. Bicycle track
x. Parking
xi. Bus stops
xii. Street furniture
xiii. Face uplifting of buildings

Figure-3.2 shows one section of proposed layout of Kashmir Road.

b. Improvement of Bus Terminal

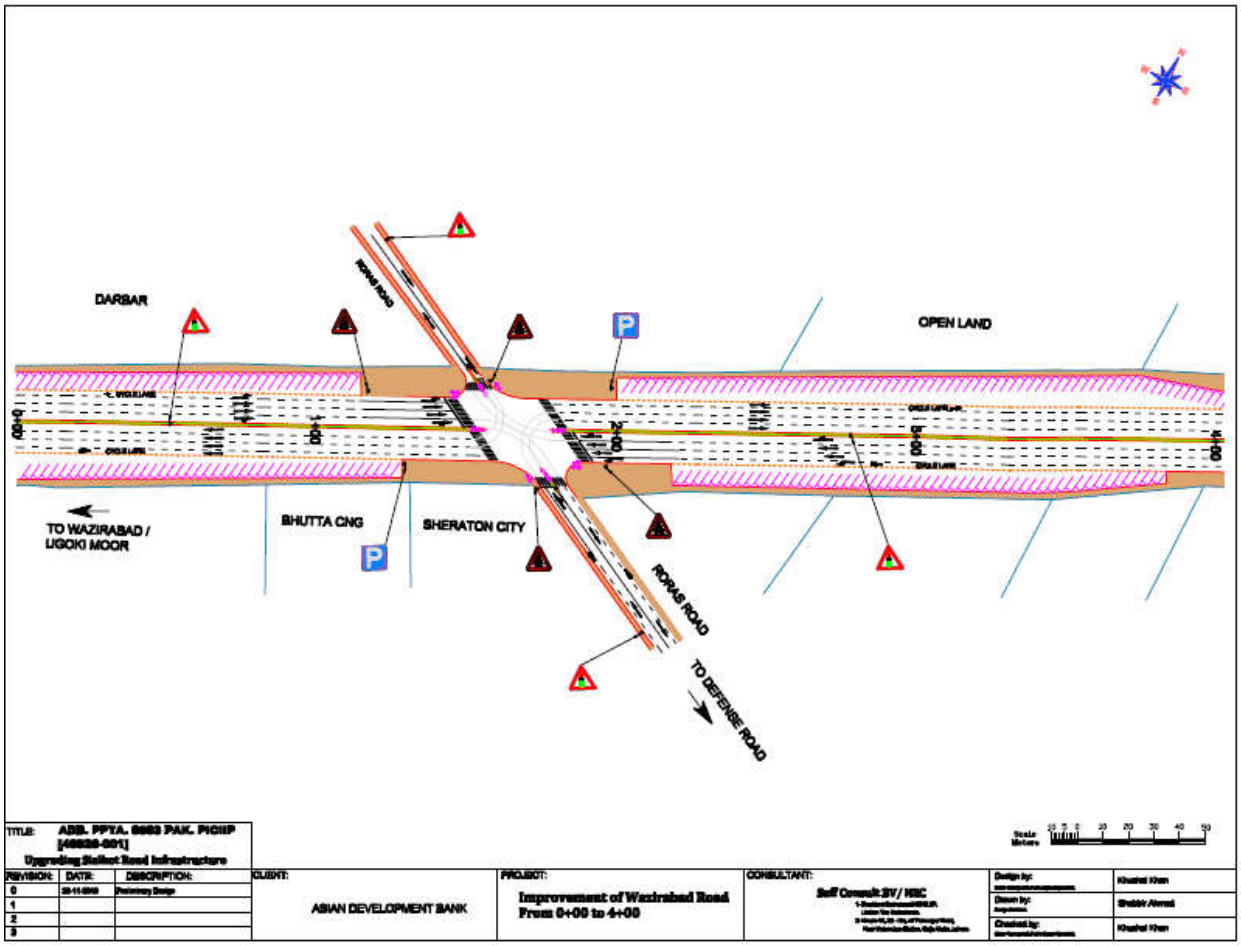
59. The cantonment area bus stand is proposed for revamping. Development of passengers lounges, cafes, parking, utilities, debussing, bussing, staking and maintenance are the part of revamping of the bus stand. The guiding principles for the designing of bus stand are that the existing structures and shops will not be demolished. The livelihood of the people will not be disturbed.

iii. Alternatives

60. The Local Government considers Kashmir Road, being the main city road, to be considered for up-gradation.

61. There only one main bus stand in the city, therefore up-gradation is proposed for this bus stand only

Figure-3.2: Proposed Layout of One Section of Kashmir Road



D. Green Spaces Development Projects

i. Current Status

62. There is lack of green spaces in Sialkot city. The existing parks are not well maintained.

ii. Proposed Projects

63. The following green space development projects are proposed:

- Development of Green Space along Drain Side: There is one big drain at Cantonment area which provides an excellent opportunity to develop a multi-functional green wedge that can provide ample green and recreational facilities for the inhabitants.
- Rehabilitation of Gulshan-e-Iqbal Park and Qila Park: Gulshan Park and Qila Park already exists in Sialkot city which needs development such as jogging tracks, recreational activities for children and sitting arrangemnets.

iii. Alternatives

64. Green belting is proposed along the drain at cantonment area which will improve landscape of the area.

65. The existing two parks, located at different parts of the city, are not in good condition and need rehabilitation.

IV. ENVIRONMENTAL & SOCIAL BASELINE CONDITIONS

66. This chapter describes the baseline environmental and social conditions of the subproject sites. The sites' environmental conditions will describe the various resources affected by the economic development that takes place, i.e. physical resources (atmospheric conditions e.g. ambient air quality and climate, topography and soils, surface water and groundwater quality), ecological resources (fisheries, wildlife, forests, rare and endangered species, protected areas etc.), and social resources.

A. Physical Resources

67. Sialkot is located in Province Punjab and has distance of 125km from Lahore in the northeast of Pakistan, along the Indian border. It is an industrial city and famous for its leather, sports and surgical products. The city is not just an industrial fort, but has a colorful culture that is strongly interspersed with its vibrant past.

i. Geography

68. Sialkot is situated between 32 30‘ north latitude and 74 30‘ east longitude at 256 meters above sea level. It is bounded on the north by Indian held Jammu and Kashmir, on the northwest by District Gujrat,on the southwest by the District Gujranwala, on the northeast by District Sheikhupura and Narowal.District Narowal was separated from Sialkot in the year 1991.Its total area is 3,107 square kilometer. In the southeast “Nullah Daik ” separates District Narrowal fromDistrict Sialkot and enters Lahore. In west, there is a vast plain area which is very fertile. The earth atthe surroundings of “Nullah Daik ” and river “Chenab” is also very fertile.

69. There are two canals in the district namely; Upper Chenab and Marala Ravi Link. These canals were derived from River Chenab and Marala Head Works in 1937 and 1955. In 1949, B.R.B canal was derived from Upper Chenab at Bambanwala.

ii. Climate

70. Sialkot is hot and humid during the summer and cold during the winter. The summer season starts from April and continues till October, while the duration of winter season is from November to March. June is the hottest month. The maximum and minimum temperature during the month of June is about 40 and 25 degree Celsius respectively. January is the coolest month. The maximum and minimum temperature during the month of January is about 19 and 5 degree Celsius respectively. The months of November and March are pleasant.

71. Sialkot experiences significant seasonal variations in temperature with the average monthly temperature varying from 11.6^{o}C in January to 32.2^{o}C in June with an average temperature over the coldest three months of the year of about 12.7^{o}C, rather lower than Lahore.

iii. Rainfall

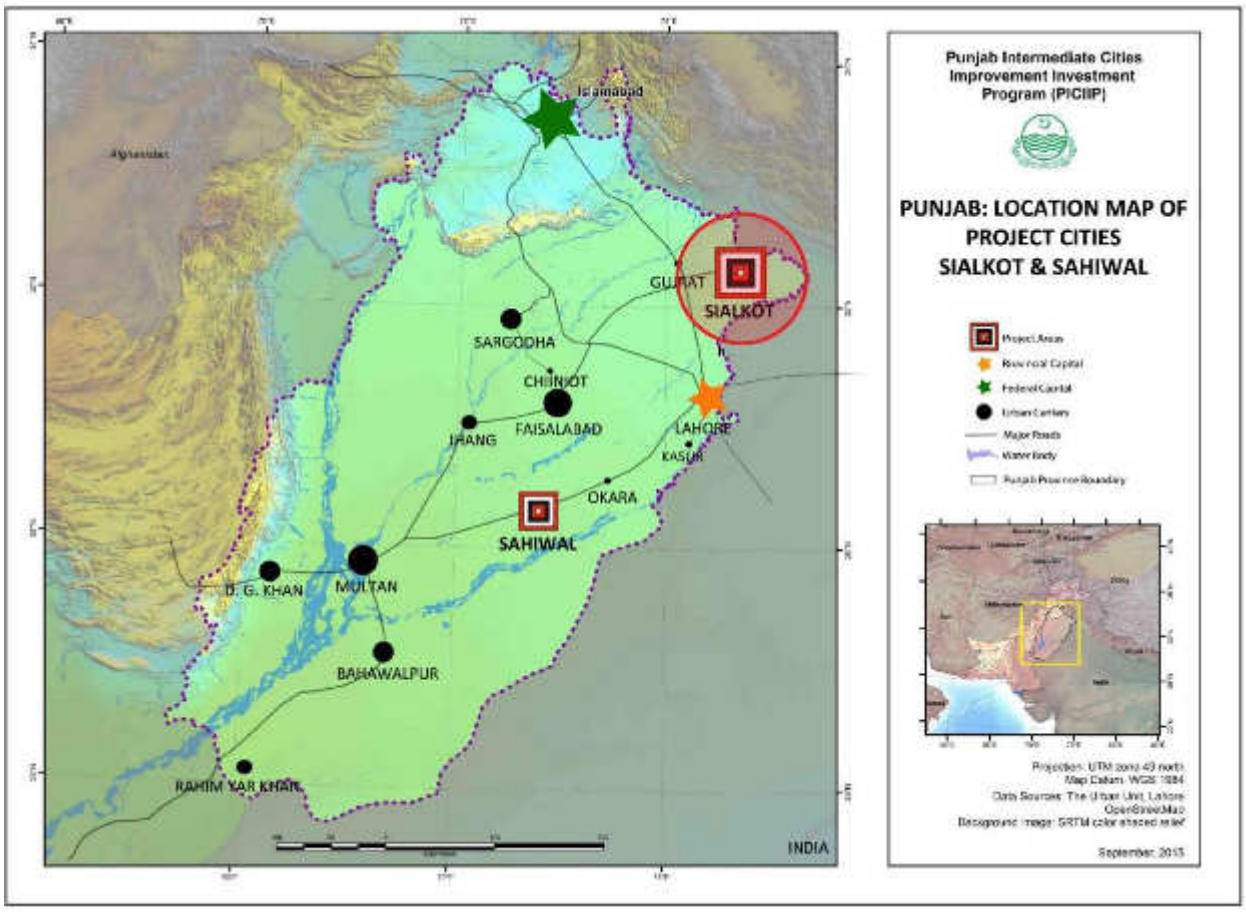
72. The mean annual rainfall is 957 mm, over half of which falls in the summer monsoon months of July and August which often results in flooding. Sialkot has one of the most modern weather forecasting and flood warning centers in the country, which is fully equipped to record and transfer data to and from the relevant concerns. This facility is equipped with radar and is internationally linked. The detail of temperatures and precipitation recorded at Sialkot are given in Table-4.1:

Table-4.1: Monthly Climate Information of Sialkot

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp. Mean Value C°	11.6	13.8	18.6	25.0	30.0	32.2	29.8	29.0	27.9	23.7	17.8	12.8
Mean Peak Temp. C°	18.5	21.0	25.7	32.8	38.0	39.9	34.9	33.6	33.6	31.7	26.1	20.1
Mean Lowest Temp. C°	5.0	7.1	11.8	17.3	22.0	25.1	25.1	24.8	22.3	16.0	9.6	5.6
Mean Monthly Precip. Mm	41.1	43.8	53.7	30.1	28.0	65.6	288.4	259.1	94.1	14.5	9.1	30.4

Source: Sialkot Weather Forecasting Center

Figure-4.1: Location Map



iv. Humidity

73. Maximum values of relative humidity are observed during the months of January and December. The values range between 76% and 36% during morning and evening times respectively. Minimum values are obtained during the month of May between the morning and evening times (i.e., 45% and 22%).

v. Hydrology

74. Sialkot is situated in the Upper Rachna Doab, which is bounded by the Ravi and Chenab rivers. It sits over abundant shallow and deep groundwater aquifers which are used by both the city water supply system and inhabitants with wells for their water supplies. The Chenab River flows to the northwest of Sialkot, and the Marala Ravi Link Canals flow to the west. Sialkot is traversed by three seasonal streams, comprising Aik Nala, to the south of the city, Bhaid Nala, between the Cantonment and the rest of the city, and Pahlu Nala, north of the Cantonment. The general slop of the land within the Doab is to the southwest and the area is an active flood plain, although floods are to a large extent controlled by irrigation and power generation works carried out on the Indian side of the border.

vi. Geology

75. The area is underlain by Pleistocene deposits to a depth of several thousand meters. The first 200meter of these deposits consist of approximately 70% silty sand interspersed with limited clay layers. The strata are generally heterogeneous with little vertical or lateral continuity. The historic center of Sialkot is located between two seasonal watercourses, the Bhaid Nullah and the Aik Nullah. It occupies land that is elevated up to about 10 meters above the surrounding areas. Apart from the central area, the city is generally flat. Overall, there is an east to west fall, from around 253 meters in the east to about 245 meters in the west, an average fall of about 1 in 1000.

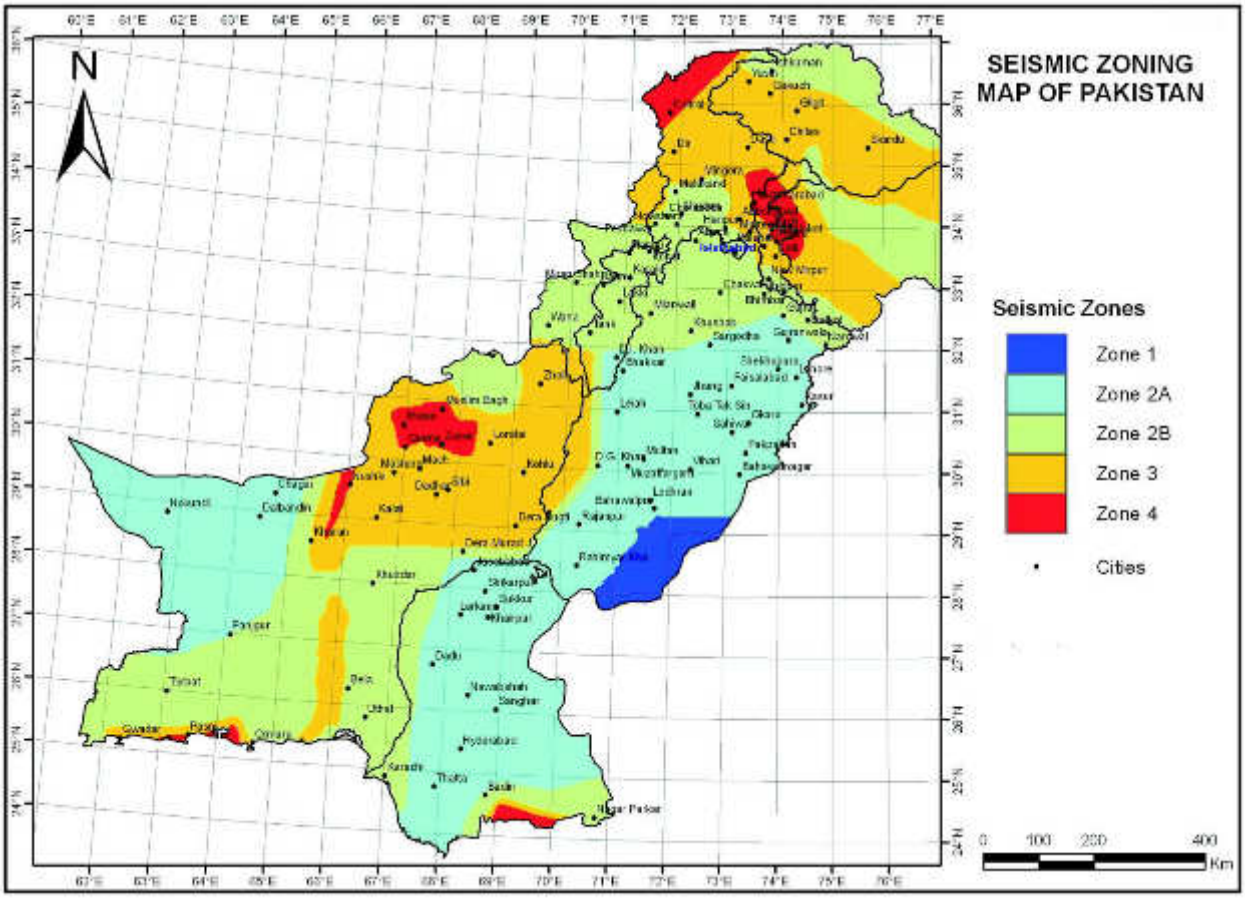
vii. Floods

76. Every year Sialkot District has to face the onslaught of flood causing devastation and disruption of normal life. The situation is sometimes aggravated due to excessive rains, flash floods in 'Nullahs' and high floods in rivers. Three rivers i.e. Chenab, Jammu Tawi and Munaawar Tawi threaten Bajwat in the north. The area in the south of Marala Head works including some villages of Sambrial is affected by the downstream discharge of River Chenab. Pasrur Tehsil is mainly hit by flood in Deg Nullah.

viii. Seismicity

77. Pakistan lies in a seismically active zone. Seismic observations indicate that hundreds of shocks occur in the region every year. According to the seismic zoning map of Pakistan, included in Pakistan Building Code Seismic Provisions (2007), the project area falls under seismic zone 2A, with a peak horizontal ground acceleration of from 0.08 to 0.16. The seismic zoning map of Pakistan is given as Figure-4.2.

Figure-4.2: Seismic Zoning Map of Pakistan



ix. Groundwater

78. Groundwater is the sole source of potable water exploited in Sialkot. The water table is in the range of 13–34meter below ground level and upper levels produce limited quantities on mineralized water. At depth of 137-152meter greater quantities of good quality groundwater are available and this is where the city's supplies are derived. The water table in recent years has been falling at a rate of one 0.30 meter per year. This is because of due to pumping down and decreased rainfall and recharge. It is not clear whether the aquifer is being overexploited, but this is unlikely at present level of abstraction in view of the wide dispersal of the tube wells. The quality of groundwater of Sialkot city is shown in Table-4.2. Turbidity is on the higher side. The samples are contaminated with coliforms.

Table-4.2: Groundwater Quality Analysis

Parameter	Value
pH	7.7 – 7.87
Turbidity, NTU	1.4 – 10.8
Total Dissolved Solids (TDs), mg/l	300 – 320
Fluoride, mg/l	0.03 – 0.1
Nitrate, mg/l	0.6 – 1.2
Arsenic, mg/l	*BDL
Total Coliform, MPN/100 ml	12 - >23
Fecal Coliform, MPN/100 ml	1.1 - >23

Source: PICIIP Feasibility Study Report, December 2016, * **BDL** Below Detection Limit

x. Wastewater Quality

79. The quality of the wastewater flowing in the Sialkot sewerage system is shown in Table-4.3:

Table-4.3: Wastewater Quality Analysis

Parameter	Value
Biochemical Oxygen Demand (BOD_5)- mg/l	61 - 226
Chemical Oxygen Demand (COD)-mg/l	114 – 764
Total Suspended Solids (TSS)-mg/l	50 – 760
Total Dissolved Solids (TDS)-mg/l	420 – 800
Oil & Grease-mg/l	4 – 7

Source: PICIIP Feasibility Study Report, December 2016

B. Ecological Resources

i. Ecology

80. The Sialkot District has been a part of the ecological zone called thorn forest but with the introduction of extensive irrigation network of canals for development of agriculture, industrial development and urbanization has changed its biological features. Most of the part of the district is now agriculture zone with human related or human dependent fauna and flora and for the most part of the district is now an agricultural zone.

81. About 2.17 % of the total area of the district is under human forest plantation of trees of economic importance like Shisham, Keeker, Mulberry that are used in construction and making sports goods and furniture. Other introduced species are Mesquite an invasive species and Safeda Sheesham Bohar and Bakain are also seen in and around the urban areas. The district Sialkot is the host of a variety of flora. The indigenous tress are Lasoora, Bairy, Siris, Keeker, Phali, Khajoor, Toot and Paper Mulberry. These are commonly found along the edges of agricultural fields.

Game Reserve

82. About 54 KM^2 of the Bajwat region in the Sialkot District is the Bajwat Game Reserve. About 16 KM^2 of the area around Marala Head works is also protected within the game reserve and is of considerable importance for wintering waterfowl.

83. Fortunately, from a planning perspective all development activities foreseen under PCIIP will be far away from these environmentally sensitive areas and will therefore not be adversely affected by any of the proposed interventions.

84. Most parts of the Punjab are under very intensive irrigated cultivation. In addition, livestock rearing is also practiced extensively, and milk animals are common. The use of chemical fertilizers and pesticides is very common. Several species of wildlife have adapted to the changed habitat. These include: jackal, jungle cat, Bengal fox, small Indian mongoose, shrew, hog deer, ravine deer, black buck, blue bull, hares and rodent pests including porcupine, fruit bats and wild boar. The avifauna which survived the modified habitat include doves, black partridge, cuckoos, koel, woodpeckers, parakeets, bulbuls, babblers, black drongo, bee eaters, finches, owls, hawks and house sparrow. The reptilian species of this modified habitat include krait, cobra, saw scaled viper, rat snake and monitor lizard.

ii. Protected areas / National Sanctuaries

85. In Pakistan there are several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. There is no protected area or national sanctuary near the area of works and subproject area.

C. Economic Development

86. Sialkot is located close to the Indian border some 125 KM north of Lahore. It is a major industrial center, specializing in leather products, surgical instruments, diesel engines, pharmaceuticals, steel rolling mills, textiles and sports goods. There are at least 264 tanneries, 244 leather garment producing units, 900 leather sports goods producing units, 57 rice husking mills and 14 flour mills in the city.

87. The history of industrialization of Sialkot is very old. The Damascene craftsmen of Sialkot (koftgars or koftars) were famous during the Mughal era for their fine swords and daggers. Papermaking in Sialkot dates back to the time of the Mughal Emperor Akbar which was famous all over the world. Brick making was another historic skill of the people of the Sialkot and those bricks were known as the "Sialkoti Bricks" throughout South Asia. Most of the states in the South Asian region relied on the Sialkoti bricks for the erection of forts, castles, monuments, public buildings, infrastructure construction, etc.

88. Nowadays, Sialkot is famous all over the world because of its sports equipment and Surgical Instruments manufacturing industry. The most successful sports manufacturing firms now have international collaborations with the well-known sports brands like Adidas (Germany), Puma (Germany), Nexo Sports (Canada), Nike (USA), Dita (UK), Mikasa Sports (Japan) and Slazenger (UK). In the recent past, however, lack of modernization and allegations of child labor usage have resulted in a loss of market share to the new entrants in the business like Thailand, Korea and China. The Sialkot Chamber of Commerce and Industry has now almost controlled the incidents of child labor usage within the industry with the collaboration of the United Nations (ILO). Most of the companies have adopted the ISO standards.

89. The facilities of a dry port and recently built airport have contributed significantly towards its economic growth and Sialkot is now the third largest economic hub in Punjab after Lahore and Faisalabad. It is commercially linked with the Lahore Stock Exchange through its Sialkot branch, known as the Sialkot Trading Floor (STF). The State Bank of Pakistan and the Export Promotion Bureau of Pakistan has branch offices in Sialkot. After Karachi, Sialkot is Pakistan's second largest source of foreign exchange earnings through its exports and remittances from the overseas manpower. For the past several decades, the manufacturers and exporters of the city have been awarded the annual National Exports Award by the Federation of Pakistan Chambers of Commerce and Industry. Sialkot has an Industrial Estate and an Export Processing Zone. Another Export Processing Zone is planned along the Sialkot Lahore Motorway. The per capita income of Sialkot is ranked among the highest in Pakistan.

i. Land Use

90. Land uses in Sialkot City are mixed, and in many cases incompatible. Sialkot would benefit from stronger land use controls, to prevent potentially harmful activities from being located near residential areas and vice versa. Sialkot has very few green areas or parks, with the most prominent being Gulshan-e-Iqbal park, off Narowal Road, a park in the Cantonment and the stadium. There is a need for more open spaces, more space for industrial activities and a better-defined road network, in both core city and contiguous areas.

91. Eleven arterial roads radiate out from the Sialkot City center and link it with surrounding agricultural areas, other cities and Sialkot International Airport which lies about 20 km to

the west of the City Centre. The airport road also connects to the Dry Port and proposed new Tanneries' Industrial Estate. This may become Sialkot's major growth direction.

92. Industries and housing estates have developed in a ribbon pattern along all of the north, west and south radial roads. Agricultural communities close to the roads and to industries are fast becoming urbanized.

ii. Industrial Land Use

93. Industries have developed in a ribbon pattern along all of the north, west and south radial roads, as have housing estates. Agricultural communities close to the roads and to industries are fast becoming urbanized. Whereas industrial land uses within the central city are scattered throughout the area in Wazirabad Road and in the small Industries estates along Haji Pura, Daska, Emanabad, Narowal, Defense, Kullowal roads and north of the Railway Station. Commercial land uses, once concentrated in the area around the fort, are now found in outlying areas such as Defense Rd., Paris Rd., Saddar in the Cantonment and along major roads.

94. There are about 3,000 large, medium and selected small industries in Sialkot District, some located in the central city areas and many along the arterial roads leading out of the city. Together, they employ about 22,300 persons. Industries located along Gujranwala Road include Redo factory, Micro Corporation, Europlus, Saga Sports, Taj Mahal Factory, Phonix Cutlery, Remix Factory, Tata Sports, Motor Bike Apparel, numerous leather goods factories, Awan Sports, Taylon Industries, Pakol Industry and many more. Sambrial Road has significant tanneries along it, particularly between the two canals, east of the Dry Port. On Pasrur Road, there are mixed land uses along the segment closer to Sialkot urban area, but there are many rice mills along the outer segments of this road. There are however no significant developments along Eminabad Road and Zafarwal Road outside urban limits.

95. There is an industrial complex in Sambrial, in vicinity of the airport. This includes an export processing zone, a dry port and a number of industries around it and all along Wazirabad Road, which passes through Sambrial. These industrial developments, as stated earlier, are near the airport. An industrial estate for tanneries is also proposed near the airport. For this purpose, an area of 155 hectares (384 acres) has been acquired.

iii. Commercial

96. The city has a number of commercial areas including the area immediately north of the fort. In addition to the older, more traditional areas high-end commercial, financial and related activities have been developed, making the city, once single-centered on the commercial areas around the fort, now multi-cantered.

iv. Institutional

97. Institutional land uses are also prominent, in areas such as Katchary Road, Beetshania Hospital, Allama Iqbal Memorial Hospital, the WAPDA offices and similar areas.

v. Settlement Patterns

98. Settlement in Sialkot started with the 5,000-year-old fort on the central hill and has proceeded to expand in a more or less organic, low-rise manner since. The only formally planned part of Sialkot is the Cantonment Area. The traditional rural settlement pattern of tightly developed compact villages, chaks, have had a significant influence on Sialkot's urban form and settlement patterns as they have become absorbed into the main urban area.

99. The dominant and most problematic current settlement pattern is an unplanned and uncontrolled sprawl. This takes three main forms:

- individual industrial developments, primarily along major traffic arteries;
- small-scale commercial or individual houses developed in an ad hoc manner, and
- the larger scale “housing societies” where significant sized pieces of land are converted from agriculture to multi-unit private residential development. These again occur without planning approval

Table-4.4 presents the areas and proportions of various land uses in Sialkot:

Table-4.4: Land Use Distribution in Sialkot

#	Land Use	Area		% of Total Area
		Acre	Sq. Km.	
1	Residential	1,836.81	7.44	46.0
2	Commercial	363.44	1.47	9.1
3	Agricultural	169.32	0.69	4.2
4	Public Buildings	151.96	0.62	3.8
5	Religious	38.10	0.15	1.0
6	Education	87.48	0.35	2.2
7	Health	52.05	0.21	1.3
8	Industry	322.36	1.31	8.1
9	Graveyard	91.02	0.37	2.3
10	Parks/Open Spaces	256.13	1.04	6.4
11	Vacant Area	284.52	1.15	7.1
12	Unidentified Parcels	338.00	1.37	8.5
Total Area		**3,991.19**	**16.17**	**100**

vi. Agriculture

100. The majority of the population in Sialkot District depends on agriculture and the major crops of district Sialkot are wheat, rice and sugarcane. Their average annual production over the period 1998-2001 was 453,242,6 and 11 thousand metric tons, respectively. A variety of vegetables are also grown in the district. There are two seasons called Rabi and Khareef . Wheat, rice and sugarcane are the main crops of the district. Study of cropping patterns indicates an increasing stress on food crops mainly wheat, rice and cotton the cash crop. The rice from District Sialkot covers the major portion of the Pakistan.

vii. Livestock

101. The population of cattle, buffaloes, sheep and goats was 195, 471, 42 and 137 thousand heads respectively. For poultry, there were 954 broiler, 134 layer and 9 breeding poultry farms, having a rearing capacity of 11,150, 747 and 63 thousand birds respectively. The annual availability of hides and skins is estimated at 536 thousand pieces. There exists a scope for dairy farms, animal/poultry feed and cattle/sheep/goat fattening farms.

viii. Irrigation

102. The source of Upper Chanab Canal and Marala Ravi Link Canal is Marala Head works. It is located in the north-west of the Sialkot District. Upper Chanab Canal irrigates Kharif crops of Daska Tehsil, Marala Ravi Link Canal irrigates part of Sialkot, Pasrur and Daska Tehsils. Rice is in abundance in canal fed areas and is of expellant irrigation from well is carried on throughout the district wherever water can be found except in the Bajwat,

Doshi and riverine circles where wells are hardly necessary. In the Aik and Charhari circles, constant supply of water is found everywhere. Irrigation from the Degh consists mainly of over spill, but in the lower reaches, lift by Jallars is sometimes employed.

ix. Power

103. A close look has not been taken at power supply and demand other than to note that an industrial city needs adequate, reliable and uninterrupted 24/7-power supply. Sialkot does not currently have this. Interruptions are frequent forcing industries; other businesses and many residents who can afford it to rely on back-up diesel generators. These are costly, environmentally degrading and generally a poor second option. Power generation and primary distribution is generally beyond a single urban center's capacity to manage and relies on provincial and national government support. A city with reliable power enjoys an immediate competitive advantage. Solar options are increasing in popularity and should be promoted for institutional and residential use, but the technology has not reached the stage whereby it can be the sole source for heavier industry.

x. Industrial Activity

Sports Goods

104. Sialkot is well known for its sports goods such as football, hockey sticks, cricket bats, all kind of sports gloves and sportswear; and enjoys an excellent reputation in the international market. The basic raw material is leather and mulberry wood that is available in Pakistan.

105. The Pakistan sports good industry is facing many competitors including China, Taiwan, India and South Korea. There is a need to modernize and mechanize the Industry for the improvement in quality and consequently in export.

Surgical Instruments

106. Sialkot enjoys specialized skills in surgical instrument manufacturing. Products are exported to high income markets of USA, Germany and France. Stainless steel and steel forgings both imported as well as local are major industrial inputs. The other materials required are processed chemicals. The manufacturers have concerns about the quality of the local steel, as it reportedly doesn't conform to health grade steel. Steel is mainly imported from Japan, France, Germany and Taiwan. Due to volatile prices of imported raw material the Sialkot based firms find it difficult to do long term forecasting. There is a shortage of good quality Titanium because its import is banned. Titanium is thus taken from ship breaking which causes air bubbles in the material.

Leather Products

107. The Leather industry makes up the second largest export-earning sector after textiles in Pakistan. Currently, the Sialkot sector of Leather is contributing around USD 457 million in 2013 but has the potential to multiply volume of exports with the improvement of quality and diversification in different range of products. Leather is the basic raw material. Pakistan is fortunate that the raw material required by the industry is available in the country in abundance. Local availability of raw materials and low wage cost gives the country a competitive edge in the world market.

108. The issues being faced by the leather industry are insufficient level of modernization and technology up gradation, low labor productivity, lack of confidence among small manufacturing establishments, environmental problems, new regulations of environmental and social compliance and lack of market information. There is stiff

competition from regional players such as China, India, Turkey, Thailand, Indonesia, etc. However, there are opportunities in terms of room for capacities utilization, product diversification and new markets. Sialkot can diversify further in Leather Goods for industrial use sector.

xi. Water Supply Service

109. Sialkot's water supply is good by Pakistan standards. There are about 43,469 connections in the town (39,658 domestic), which serve about 87% of the population within the old Municipal Corporation limits but only about 35% of the total urban population, excluding the Cantonment. However, according to the Administrator TMA Sialkot, the water supply coverage recently has increased close to 50%. There are approximately 5,500 connections in the Cantonment, covering an estimated 38,500 people or about 47.5% of the civilian population of the Cantonment.

110. The existing distribution system consists of one large interconnected system and four small discreet systems on the western side of the city. The estimated total length of main is about 198 KM. The water supply distribution network is very old with rusted pipes, which result in mixing of sewage in water supply lines, and significant amount of drinking water is wasted due to leakages.

xii. Sewerage System Service

111. Sialkot is served partly by sewers and partly by open and covered drains. The sewers are in poor condition and blocked in many places. The main system served the center of the city and the area to the west, discharging up to a 1,372 mm diameter trunk sewer along Roras Road, which conveyed wastewater to a main pumping station at Mianapura. This was intended to lift wastewater into the Bhaid Nullah.

112. The majority of the existing drains do not function due to filling in by adjacent shop owners and/or use of drains for dumping solid waste.

xiii. Solid Waste Management

113. Sialkot's solid waste management (SWM) system is in a state of disarray. The city currently generates about 350 tons of municipal solid waste daily, or about 125,000 tons per year. Of the 125,000 tons per year of municipal solid waste generated, only 25 percent enters the municipal waste system, leaving 75 percent of the population without waste collection. Practically all-municipal waste is burned, dumped or buried illicitly on vacant land throughout the city, causing significant environmental damage and posing a health hazard.

114. Population growth and increase in its economic activity means that Sialkot's daily waste generation is destined to accelerate to about 195,000 tons per year by 2020, and then to about 300,000 tons per year by 2030. Furthermore, poor solid waste management impedes road efficiency, blocks drainage leading to flooding, and generally contributes to a degraded urban environment. SWM is one urban service successfully privatized in many urban centers with a managed hierarchy of collection steps. This approach can be used to effectively mobilize communities, raise awareness of recycling potentials and add employment.

115. Numerous examples of individual recycling efforts are noted throughout the city involving plastic bottles, cardboard and metal. Private entrepreneurs, both informal and semi-formal are undertaking this, so there is obviously a market and money to be made. Industry and individuals are separating and selling recyclable materials. The Administrator notes there is no official recycling facility in Sialkot to take direct advantage of this collection, however, note was taken of at least 8 smaller facilities processing

plastic bottles and generating employment.49 The municipality can further these initiatives by further promoting at-source separation making it easier for the informal collectors. Other community-based public awareness initiatives could also help reduce the SWM demands on landfill and the environmental degradation that comes with it.

xiv. Transport

Road Networks

116. Sialkot is about two hours from Lahore and four hours from Islamabad. Sialkot is linked with the National Highway N-5 through Gujranwala and Wazirabad. A dual carriage-way is available between Sialkot and Wazirabad. A new bridge on the Chenab River, called the Shahbazpur Bridge, is under construction these days which is located to the north-east of Gujrat. Once completed, it will connect Sialkot to N-5 at Gujrat. The Sialkot Lahore Motorway (M-11) is also under construction. All the bus and commuter coach stations are located on the Jail Road. A bus service operated by Daewoo Express is available from Sialkot to Rawalpindi, Lahore, Gujranwala and Multan.

Public Transport

117. Sialkot's internal public transit consists almost entirely of informally operated small buses/vans and auto rickshaws which together account for 20% of inner city traffic. Only two formal bus routes operate within the city. In addition, several of the larger industries operate their own employee transport services to facilitate easy access to work and home. The absence of any significant traffic management means that transit operations are not efficient and both constrain and are constrained by the multiple road uses and resulting congestion. For intercity transport there are three bus terminals, including the Daewoo Terminal handling luxury bus connections to Lahore, Islamabad and other urban centers.

118. The Sialkot Chamber of Commerce & Industry (SCCI) has signed an MOU with American bus company FOTON to provide air-conditioned local transport to the citizens with CNG fuel. However main mode of transport within the city at present is the auto rickshaw. Although no proper taxi service exists in the city, there are many rent-a-car service outlets.

Traffic Management

119. Although the road network in the city is well developed and recently executed road improvements carried through joint efforts of Sialkot Chambers of Commerce and Industry (SCCI) and the Government has resulted in improved road surface conditions in most of city areas, the main problems lies in traffic management. Road junction layouts, utilization of road space, absence of pedestrian facilities, uncontrolled road side parking and absence of enforcement of traffic regulatory control measures result in congestion and . Additionally, irrespective of the public transit initiative referenced above, public transport overall is inadequately developed with only two formal bus routes operating in the city.

Rail Transport

120. Sialkot is served by Pakistan Railways through the Sialkot Junction. Sialkot used to be a junction in the British era with trains leaving for Jammu and Gurdaspur. Plans are under consideration to open the border for an international train between Sialkot and Jammu. Express trains to and from Narowal, Lahore, Rawalpindi, Faisalabad, Multan, Bahawalpur

and Karachi are available daily. The Railway station is situated in the center of the city. Other suburban train stations are Ugoki and Sambrial.

Air Transport

121. Sialkot International Airport is the first-ever private-sector airport of Pakistan managed by the SIAL consortium. It is located near Sambrial and is noted for having the longest runway in Pakistan. Direct flights are available from Sialkot International Airport to Karachi, Islamabad, Abu Dhabi, Sharjah, London, Muscat Kuwait, Dubai and Jeddah. Pakistan International Airlines has plans to start non-stop flights from Sialkot to Manchester, London, Barcelona. Hajj flights have started from the Sialkot International Airport last year in 2009.

122. A small Sialkot Cantonment Airport, located in the Sialkot Cantonment, is in use of the aviation wing of the Pakistan Army. This airport has also been used as a public airport by PIA for operating a Helicopter service from Sialkot to Islamabad in 1995- 1996.

Dry Port

123. Sialkot Dry Port carries the honor of being the first-ever private-sector dry port in Asia. It was established in 1986 near Sambrial, about 20 KM from the Sialkot city under the control of the Sialkot Dry Port Trust.

D. Social and Cultural Resources

i. Employment

124. Sialkot has more than 3,000 factories. These provide the majority of employment. This will have a significant impact on present and future Sialkot. The following summary points are of particular interest with respect to the Sialkot District (specific data for Sialkot urban center is not available, but may be somewhat different given the industrial focus):

- Overall labor force participation is below national average: 45% compared to 53.5 nationally
- Official unemployment rate is 6.6% compared to a national average of 5.3%
- Share of employment in the informal sector is close to the national average at 69% for Sialkot compared to 72.9% nationally
- Informal Sector employment comprises:
- 33% in manufacturing
- 16% in construction
- 33% in trade and hospitality, and
- 10% in personal services
- Lowest unemployment for all levels of education compared to national averages and other surveyed Districts
- Distribution of employment by major occupation groups is similar to national averages except with respect to “Craft and Related Trades Workers” where Sialkot exceeds all other Districts and at 33.9% is more than double the national average of 14.8%. This clearly reflects Sialkot’s unique and historical industrial activity.
- With respect to the sub-sector of “Precision, handicraft, printing and related trades workers” Sialkot excels with 20.2%, almost 4 times the national average of 5.5%, again reflecting Sialkot’s unique industries.

ii. Education

125. Sialkot has a fairly well-developed educational infrastructure that comprises a sub-campus of the Fatima Jinnah Women University, a sub-campus of the Virtual University of Pakistan, 8 Degree Colleges for Women, 5 Degree Colleges for Men, 2 Cadet Colleges, 6 Commerce Colleges, one Law College, one Medical College, one Homeopathic Medical College, one Nursing School, one Para- Medical School, one Poly-

Technique Institute, with numerous Inter Colleges, Higher Secondary Schools and over 250 High Schools. The University of Engineering Sciences and Technology (UEST) was recently established in collaboration with the Royal Institute of Technology, Sweden on the Sialkot Lahore Motorway and will also incorporate the development of a Technology Park.

iii. Health

126. This district like others in Pakistan has faced and would continue to face water- borne diseases such as cholera, diarrhea, Respiratory Tract Infections (RTIs), dengue virus, malaria, hepatitis B & C and skin diseases. The district Health Department has also prepared a disaster management plan to deal disastrous situation in the district through its own resources by integrating with other district departments.

127. There are four District Hospitals i.e. Sialkot, Daska, Sambrial and Pasrur, and over 20 other hospitals or specialized care facilities. In addition, there are 27 Basic Health Units in the Sialkot Tehsil alone, with considerably more scattered throughout the other three Tehsils comprising Sialkot District.

iv. Cultural Heritage

128. The old city of Sialkot is a great center of Punjabi culture with many important historical and religious sites and buildings amongst the fascinating labyrinth of narrow streets and crowded bazaars.

129. The centuries-old historical Sialkot fort still remains the victim of un-ending negligence of Sialkot Municipal Corporation (SMC) and archeology department, as this crumbling ancient fort has illegally been surrounded by the encroachers by raising their encroachments, badly damaging the natural beauty of this fort.

130. Although the offices of Sialkot district government and Sialkot Municipal Corporation (SMC) are located in this Fort since long, but the Sialkot district government and Municipal Corporation have never bothered to feel the need of maintenance of this fort, besides, remaining failure in making some direly needed effective measures to preserve and protect this rich heritage for future generation.

V. ASSESSMENT OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

131. The overall environmental impacts of the subprojects are positive since these are supposed to provide continuous safe water to the residents, dispose of sewage of the city in safe manner and improve roads and landscaping of the city. These projects shall prevent or alleviate the effects of pollutants on the human and natural environments.

132. This section describes the issues along with description of their impacts both on environment and public health, during the construction and operation stages of the projects. The impact significance is categorized as under by considering severity of risk on environment and human health and probability of occurrence.

A. Assessment of Risk – Environmental Aspects

133. To assess the threat posed by a hazard (*i.e.* risk), the principal factors to be considered are:

a) the likelihood that the threat may be realised; and
b) in the event of realisation of the threat, the nature and extent of the consequences.

134. A qualitative risk assessment methodology has been adopted for this project, comprising the Likelihood and Consequence values detailed in Table-5.1 and Table-5.2.

Table-5.1: Qualitative Likelihood Values

Likelihood Indicator	Likelihood Description	
A	Almost Certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May only occur in exceptional circumstances

Table-5.2: Qualitative Consequence Values

Consequence Indicator	Consequence Description	
1	Insignificant	Negligible, reversible, requires very minor or no remediation / minor injury with slight negative health impact
2	Minor	Reversible, requires minor remediation / major, non-fatal health impact to one or more individuals
3	Moderate	Reversible, short-term effect, requires moderate remediation / severe, non-fatal health impact to one or more individuals

Consequence Indicator	Consequence Description	
4	Major	Serious impact, medium term effect, requires significant remediation / single fatality or severe irreversible disability or impairment
5	Catastrophic	Disastrous impact, long term effect, requires major remediation / multiple fatalities, major permanent health impacts on a large number of individuals

135. On the basis of a likelihood and consequence matrix (Table-5.3), each hazard may be categorised into broad 'risk categories' and the required management approach for each risk category can be defined.

Table-5.3: Risk Matrix – Risk Categories and Management Response

		Consequence				
		1	**2**	**3**	**4**	**5**
Likelihood	**A**	M	M	H	H	H
	B	L	M	H	H	H
	C	L	L	M	H	H
	D	L	L	L	M	H
	E	L	L	L	M	M

H = High Risk – Proposed works methods not acceptable and must be altered.
M = Moderate Risk – Detailed management action plan to be prepared, including monitoring program.
L = Low Risk – Routine management procedures to be defined and monitoring requirements to be specified.

B. Anticipated Environmental Impacts

i. Anticipated Environmental Impacts due to Project Location

136. The environmental impacts related to location of the project are mostly in the areas of physical setting, socioeconomic setting, ecological setting and special areas (archaeological sites etc.). Detailed description of these settings is given in Chapter 3. Field evidences reveal that the impacts of the projects due to their locations are mostly in the category of 'insignificant'. No historical site is located in the vicinity or no displacement of inhabitants is involved. The most of the water supply, sewerage and drainage, green spaces development and transport routes improvement projects will be implemented within the city of Sialkot.

ii. Anticipated Environmental Aspects and Potential Hazards – Construction Phase

137. The potential hazards posed by construction activities are presented by environmental aspect in Table-5.4 to Table-5.10. Appropriate management actions for all of the potential environmental hazards shall be developed on the basis of the level of risk assessed to exist for each hazard identified. The potential hazards and assessment of

risks are identified for following elements:

- Air quality;
- Noise;
- Traffic;
- Soil;
- Solid waste
- Sanitary wastewater
- Health & Safety

Table-5.4: Subprojects Activities, Potential Hazards and Assessment of Risk – Soil

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Rehabilitation of existing OHRs (replacement of doors/windows, plastering, minor structural repair, cleaning, valves and pipeline connection)	Temporary and localized soil contamination for short period of time at specific place due to spillage of solvent/paint/chemicals on soil during repair and maintenance activities	B1 – Low
Replacement of rusted/damaged pipelines (49 KM)	Temporary and localized soil pollution for short period of time due to spillage of fuel/lubricant from construction camps and maintenance of vehicles and machines	C2 – Low
Replacement of asbestos pipelines (262 KM)	Temporary and localized soil pollution for moderate period of time due to spillage of fuel/lubricant from construction camps and maintenance of vehicles and machines	B2 – Moderate
Sewerage		
Sewerage pipes replacement (27.9 KM)	Temporary and localized soil pollution for short period of time due to spillage of fuel/lubricant from construction camps and maintenance of vehicles and machines	C2 – Low
Transport		
Improvement/up-gradation of bus stand	Temporary and localized soil pollution for moderate period of time due to spillage of fuel/lubricant from construction camps, generators and maintenance of vehicles and machines	B2 – Moderate

Table-5.5: Subprojects Activities, Potential Hazards and Assessment of Risk – Air

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Development of DNI zones (Installation of water meters at houses, replacement of pipelines, disposal of old pipes)	Temporary and localized dust emissions due to excavation and refilling activities for laying the pipelines for moderate period of time	B2 – Moderate
Rehabilitation of existing OHRs (replacement of doors/windows, plastering, minor structural repair,	Temporary and localized dust emissions due to repair and maintenance work for short period of time	B1 – Low

Subprojects/Activities	Potential Hazard	Assessment of Risk
cleaning, valves and pipeline connection)		
Replacement of rusted/damaged pipelines (49 KM)	Temporary and localized dust emission due to excavation and refilling activities for laying pipelines and movement of construction vehicles for moderate period of time	B2 – Moderate
	Localized and low intensity vehicular emissions due to transportation of pipes and accessories to the sites	B1 – Low
Replacement of asbestos pipelines (262 KM)	Temporary and localized dust emission due to excavation and refilling activities for laying pipelines and movement of construction vehicles for moderate period of time	B2 – Moderate
	Localized and low intensity vehicular emissions due to transportation of pipes and accessories to the sites	B1 – Low
Replacement of inappropriate sized pipelines, Realignment of inappropriately laid pipelines at Fateh Garh Distribution System	Temporary and localized dust emission due to excavation and refilling activities for laying pipelines and movement of construction vehicles for moderate period of time	B2 – Moderate
	Localized and low intensity vehicular emissions due to transportation of pipes and accessories to the sites	B1 – Low
Sewerage		
Sewerage pipes replacement (27.9 KM)	Temporary and localized dust emission due to excavation and refilling activities for laying pipelines and movement of construction vehicles for moderate period of time	B2 – Moderate
	Localized and low intensity vehicular emissions due to transportation of pipes and accessories to the sites	B1 – Low
Transport		
Improvement of 3 KM Kashmir Road	Temporary and localized dust emission due to construction activities for short period of time	B1 – Low
Improvement/up-gradation of bus stand	Temporary and localized dust emission due to construction activities (demolition of structures, mixing of material, movement of machines and vehicles) for moderate period of time	B2 – Moderate
	Localized and low intensity vehicular emissions due to transportation of construction material and disposal of construction debris	B1 – Low
	Localized and low intensity generator	B1 – Low

Subprojects/Activities	Potential Hazard	Assessment of Risk
	emissions	

Table- 5.6: Subprojects Activities, Potential Hazards and Assessment of Risk – Noise

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Replacement of pumps and motors (12)	Low intensity localized noise generation due to dismantling and placement of pumps and motors activities under enclosed structures for short period of time	B1 – Low
Provision of switchgear and electrical installation	Low intensity localized noise generation due to installation of electrical appliances activities at tube wells under enclosed structures for short period of time	B1 – Low
Improving efficiency of 57 tube wells (repair and maintenance of pumps and motors)	Low intensity localized noise generation due to repair and maintenance activities under enclosed strictures for short period of time	B1 – Low
Development of DNI zones (Installation of water meters at houses, replacement of pipelines, disposal of old pipes)	Low intensity localized vehicular noise due to movement of pipes and accessories carrying vehicles and construction machineries for short period of time	B1 – Low
Rehabilitation of existing OHRs (replacement of doors/windows, plastering, minor structural repair, cleaning, valves and pipeline connection)	Low intensity localized noise generation due to repair and maintenance work for short period of time	B1 – Low
Replacement of rusted/damaged pipelines (49 KM)	Low intensity localized noise generation due to pipe laying activities and movement of vehicles and machineries for moderate period of time	B2 – Moderate
Replacement of asbestos pipelines (262 KM)	Low intensity localized noise generation due to pipe laying activities and movement of vehicles and machineries for moderate period of time	B2 – Moderate
Replacement of inappropriate sized pipelines, Realignment of inappropriately laid pipelines at Fateh Garh Distribution System	Low intensity localized noise generation due to pipe laying activities and movement of vehicles and machineries for moderate period of time	B2 – Moderate
Sewerage		
Sewerage pipes replacement (27.9 KM)	Low intensity localized noise generation due to pipe laying activities and movement of vehicles and machineries for moderate period of time	B2 – Moderate

Subprojects/Activities	Potential Hazard	Assessment of Risk
Rehabilitation of disposal stations (8) (Replacement of pump and motor, improvement of electrical panels, repair and maintenance of pumps and motors and civil work)	Low intensity localized Noise generation due to repair and maintenance work at disposal station (enclosed structures) for short period of time	B1 – Low
Transport		
Improvement of 3 KM Kashmir Road	Low intensity localized noise generation due to construction activities for short period of time	B1 – Low
Improvement/up-gradation of bus stand	Low intensity localized noise generation due to construction activities (demolition of structures, mixing of material, movement of machines and vehicles) for moderate period of time	B2 – Moderate
	Low intensity localized noise from generator for short period of time	B1– Low
Green Spaces		
Development of green space along drain side	Low intensity localized noise generation due to movement of machines for short period of time	B1 – Low
Rehabilitation of Gulshan-e-Iqbal and Qila parks	Low intensity localized noise generation due to movement of machines for short period of time	B1 – Low

Table-5.7: Subprojects Activities, Potential Hazards and Assessment of Risk – Traffic

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Replacement of pumps and motors (12)	Low traffic volume increase by the vehicles carrying pumps, motors and accessories	B1 – Low
Provision of switchgear and electrical installation	Low traffic volume increase by the vehicles carrying electrical appliances	B1 – Low
Improving efficiency of 57 tube wells (repair and maintenance of pumps and motors)	Low traffic volume increase by the vehicles carrying pumps, motors and accessories	B1 – Low
Development of DNI zones (Installation of water meters at houses, replacement of pipelines, disposal of old pipes)	Low traffic volume increase by the vehicles carrying pipes and accessories	B1 – Low
Rehabilitation of existing OHRs (replacement of doors/windows, plastering, minor structural repair, cleaning, valves and pipeline connection)	Low traffic volume increase by the vehicles carrying construction material and accessories	B1 – Low
Replacement of rusted/damaged pipelines (49 KM)	Low traffic volume increase due to transportation of construction material and accessories	B1 – Low

Subprojects/Activities	Potential Hazard	Assessment of Risk
	Localized traffic congestion at pipe laying area for short period of time	B2 – Moderate
Replacement of asbestos pipelines (262 KM)	Low traffic volume increase due to transportation of construction material and accessories	B1– Low
	Localized traffic congestion at pipe laying area for short period of time	B2 – Moderate
Replacement of inappropriate sized pipelines, Realignment of inappropriately laid pipelines at Fateh Garh Distribution System	Low traffic volume increase due to transportation of pipes and accessories	B1 – Low
	Localized traffic congestion at pipe laying area for short period of time	B2 – Moderate
Sewerage		
Sewerage pipes replacement (27.9 KM)	Low traffic volume increase due to transportation of pipes, construction material and accessories	B1 – Low
	Localized traffic congestion at pipe laying area for moderate period of time	B2 – Moderate
Transport		
Improvement of 3 KM Kashmir Road	Localized traffic congestion due to construction and maintenance activities for short period of time	B1 – Low
Improvement/up-gradation of bus stand	Low traffic volume increase due to transportation of construction material and accessories and disposal of debris	B2 – Moderate
	Localized traffic congestion for moderate period of time	B2 – Moderate

Table-5.8: Subprojects Activities, Potential Hazards and Assessment of Risk – Solid Waste

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Replacement of rusted/damaged pipelines (49 KM)	Low volume localized generation of domestic solid waste from construction camps for moderate period of time	B2 – Moderate
Replacement of asbestos pipelines (262 KM)	Low volume localized generation of domestic solid waste from construction camps for moderate period of time	B2 – Moderate
Replacement of inappropriate sized pipelines at Fateh Garh Distribution System	Low volume localized generation of domestic solid waste from construction camps for short period of time	B1 – Low

Subprojects/Activities	Potential Hazard	Assessment of Risk
Sewerage		
Sewerage pipes replacement (27.9 KM)	Low volume localized generation of domestic solid waste from construction camps for moderate period of time	B2 – Moderate
Transport		
Improvement/up-gradation of bus stand	Low volume localized generation of domestic solid waste from construction camps for moderate period of time	B2 – Moderate
	Low volume generation of construction waste for moderate period of time	B2 – Moderate

Table-5.9: Subprojects Activities, Potential Hazards and Assessment of Risk – Sanitary Wastewater

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Development of DNI zones (Installation of water meters at houses, replacement of pipelines, disposal of old pipes)	Low volume localized generation of sanitary wastewater from construction camps for short period of time	B1 – Low
Replacement of rusted/damaged pipelines (49 KM)	Low volume localized generation of sanitary wastewater from construction camps for moderate period of time	B2 – Moderate
Replacement of asbestos pipelines (262 KM)	Low volume localized generation of sanitary wastewater from construction camps for moderate period of time	B2 – Moderate
Replacement of inappropriate sized pipelines, Realignment of inappropriately laid pipelines at Fateh Garh Distribution System	Low volume localized generation of sanitary wastewater from construction camps for short period of time	B1 – Low
Sewerage		
Sewerage pipes replacement (27.9 KM)	Low volume localized generation of sanitary wastewater from construction camps for moderate period of time	B2 – Moderate
Transport		
Improvement/up-gradation of bus stand	Low volume localized generation of sanitary wastewater from construction camps for moderate period of time	B2 – Moderate

Table-5.10: Subprojects Activities, Potential Hazards and Assessment of Risk – Health & Safety

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Rehabilitation of existing OHRs (replacement of doors/windows, plastering, minor structural repair, cleaning, valves and pipeline connection)	Minor nature health and safety concerns for the construction workers for short period of time	B1 – Low
Replacement of rusted/damaged pipelines (49 KM)	Minor nature health and safety concerns for the construction workers for moderate period of time	B2 – Moderate
Replacement of asbestos pipelines (262 KM)	Minor nature health and safety concerns for the construction workers for moderate period of time	B2 – Moderate
Replacement of inappropriate sized pipelines, Realignment of inappropriately laid pipelines at Fateh Garh Distribution System	Minor nature health and safety concerns for the construction workers for short period of time	B1 – Low
Sewerage		
Sewerage pipes replacement (27.9 KM)	Minor nature health and safety concerns for the construction workers for moderate period of time	B2 – Moderate
Transport		
Improvement/up-gradation of bus stand	Minor nature health and safety concerns for the construction workers for moderate period of time	B2 – Moderate

138. Most of the above mentioned subprojects and related project activities will generate environmental impacts during construction phase. The construction phase impacts are in the category of low to moderate risk. No construction phase impact is under high risk. Following section describes construction phase impacts and mitigation measures:

iii. Construction Phase Impacts and Mitigation Measures

139. It is an established fact that almost all major construction projects cause certain impacts on environmental resources. These impacts may create significant temporary hazards to the environmental resources of the project area during the project construction phase. The major construction phase impacts are listed below:

- Generation of dust due to excavation, transportation of construction material, mixing of building material and dumping of construction waste;
- Noise, vibration and air pollution due to construction and erection of electrical and mechanical equipment;
- Traffic volume in the area due to haulage of building material, equipment, construction machinery and transportation of workers at site;
- Soil pollution due to spillage and leakage of fuel and lubricants during cooking, fueling and maintenance activities

- Sanitary wastewater and solid waste generation from residences of construction crew; and
- Communicable disease hazard to workers from lack of sanitation facilities.

140. The construction activities affect the quality of local environment. Noise, fugitive dust emission due to construction and transportation, improper solid waste dumping are the sources of nuisance for the local community.

141. Mainly construction phase impacts are in the range of low to moderate risk. Most of these are not the major construction activities except for bus terminal construction activities. Mostly construction activities impacts can be mitigated by taking certain administrative measures during construction phase as given below:

142. The main responsibilities for mitigation measures during the construction phase of the projects rest with contractors appointed to carry out the water supply, sewerage and drainage, green spaces development and transport routes improvement projects. The SMC Engineers will however, have the responsibility for monitoring the implementation of mitigation actions by the contractors and will need to implement their own system of internal checks to ensure that mitigation actions are carried out satisfactorily. In exceptional circumstances, the SMC may need to use its authority to call a halt to construction activity, if the contractors refuse to adhere to the requirements of the mitigation plan contained in the contract documents.

143. In order to avoid creation of misunderstandings regarding who is responsible for particular mitigation activities recommended for the construction phase, the Construction Phase Environmental Mitigation Plan (CPEMP) should be appended to tender documents. This will ensure that contractors include the cost of mitigation actions into their bids and will provide a reliable mechanism for enforcement. In fact, most of the recommended actions involve no or very little capital investment, but it depends on the contractor's management to adopt a responsible attitude to environmental protection; ensuring construction activity is properly planned and mitigation actions are correctly implemented. The mitigation actions recommended during the construction phase have the following principal objectives:

iv. Dust Suppression

144. Excavation of ground for laying pipelines will generate dust. Regular water sprinkling is recommended at the dust generation points during the construction activities. In addition to this, proper protective equipment such as dust masks, goggles, hats, gloves and safety shoes should also be made available to the construction workers at the site to avoid potential health hazards and accidents.

v. Dumping of Construction Waste

145. At bus terminal revamping activities, construction debris will be generated because of demolition of existing structures. The debris produced during construction should preferably be dumped at nearby depressions rather than throwing unattended. It should be ensured that the leftover material is not dumped into any of the storm water drain or water course, because such practices can clog these man-made and natural drainage systems and cause many other problems for the residents.

vi. Noise

146. Construction activities, movement of construction vehicles and machines, and demolishing of structures will generate noise and affect nearby communities and construction workers.

147. High noise levels result in various health impacts such as hearing loss and number of physiological and other effects.

148. To attenuate noise impacts on workers and nearby community, the following measures should be taken:

- Carry out regular inspection and maintenance of the construction vehicles and equipment;
- Timely replacement of worn and noise producing parts of the construction machinery;
- In case of severe noise, use of sound barriers to avoid dispersion of sound waves into the nearby community; and use of noise protection equipment by the workers, working in noisy area

vii. Traffic Management

149. Construction activities for laying pipelines and revamping of bus terminal will cause traffic issues. Traffic management measures should be implemented as a means of reducing road accidents, improving the residential living environment, and reducing the chance of collisions between vehicles, pedestrians and cyclists and traffic congestion.

150. The construction material carrying vehicles will be instructed to have reduced speed of about 30 km per hour at the residential areas with covering of the material from the top to avoid dispersion of dust in the surroundings. In case of large number of vehicles arriving at the site, it should be planned in such a way that these vehicles arrive at the site in different timings of the day to avoid traffic jam issue and nuisance for the nearby community. As a measure to streamline heavy traffic in the area, proper road marking and signboard posting for safety and speed limit should also be done, particularly at nearby residential and commercial areas.

151. In case of digging of roads, the proper cordon off the digging site and traffic planning for moving traffic to alternate routes will be part of traffic management.

152. The vehicle drivers should be apprised of the local customs and values, and be advised to remain courteous to the local population. The construction material transport activities scheduling should be such that most of the tasks are executed in a manner so as not to cause traffic jams and congestion in the area.

viii. Disposal of Domestic Wastewater

153. During bus terminal revamping and pipe laying activities will take longer and construction crew will stay at campsite. These workers shall generate sanitary wastewater. Generally, during the construction phase, proper disposal of sanitary wastewater is not practiced. Sanitary wastewater should be disposed of into the nearby drain or sewers after passing through the septic tank. The management should plan to have a temporary septic tank for this purpose, for the construction crew.

154. Table-5.11 presents the typical characteristics of untreated domestic wastewater.

Table-5.11: Typical Characteristics of Untreated Domestic Wastewater

#	Contaminants	Concentration (Medium Strength)
1	Total Dissolved Solids (TDS) - mg/L	500
2	Total Suspended Solids (TSS) - mg/L	210
3	Biochemical Oxygen Demand (BOD_5) - mg/L	190
4	Chemical Oxygen Demand (COD) - mg/L	430
5	Chlorides – mg/L	50
6	Sulfate - mg/L	30
7	Oil & Grease - mg/L	90
8	Total Coliform - No./100 mL	10^7-10^9
9	pH	7

Source: Wastewater Engineering - Treatment and Reuse by Metcalf & Eddy, 2003

155. Table-5.12 presents impacts of wastewater on environment and human health.

Table-5.12: Environmental Impacts of Wastewater

Parameter	Impacts
pH	Growth inhibition of bacterial species (responsible for removing organic pollution) under highly acidic or alkaline conditions
	Corrosion of water carrying system and structures with acidic wastewaters having low pH
	Malfunctioning and impairment of certain physico-chemical treatment processes under highly acidic or alkaline conditions
Organic Pollutants	Depletion of dissolved oxygen (DO) levels, of the receiving water body, below limits necessary to maintain aquatic life (4-5 mg/l)
Suspended Solids	Sedimentation in the bottom of water bodies leaving adverse impact on flora and fauna
	Localized depletion of dissolved oxygen in the bottom layers of water bodies
	Reduced light penetration in natural waters and consequent reduction in photosynthesis
	Aesthetic nuisance
Oil and Grease	Reduced re-aeration in the natural surface bodies, because of floating oil and grease film and consequent depletion in dissolved oxygen levels
	Reduced light penetration in natural waters and consequent reduction in photosynthesis
	Aesthetic nuisance

ix. Domestic Solid Waste Management

156. Construction camp at bus terminal and pipe laying sites will also generate domestic solid waste. It should be segregated, packed and disposed of at the designated municipal solid waste dumping site.

x. Occupational Health and Safety

157. The management should be responsible for provision of safe drinking water, maintenance of occupational health and safety equipment, maintenance of sanitation conditions, along with supply of hygienic food and sewerage system for the construction team at the site.

158. The major beneficial impact of the construction phase of the project is employment for local people during construction.

xi. Air Pollution

159. The sources of air pollution at construction sites are the construction vehicles and generators.

160. Generators: Diesel oil is used as fuel in the generators used for standby electricity generation. Diesel-based generators generally emit pollutants such as CO, NOx, SO_2 and particulate matter.

161. Vehicles: At construction sites, traffic will be increased. It will cause fugitive dust and vehicular emissions. The major pollutants present in emissions would be oxides of nitrogen and carbon, particulate matter and un-burnt hydrocarbons. For well-maintained vehicles, the air emission will remain within the PEQS. Table-5.13 presents impacts of air emission on environment (E) and human health (HL).

Table-5.13: Impacts of Air Pollutants on Environment and Human Health and Life

Carbon Monoxide	HL	Heart attack, by reducing the oxygen carrying capacity of blood
		Birth defects including mental retardation and impairment of fetus growth
		Dizziness, headache, and nausea
		Increase in reaction time of the drivers, a threat to the road safety
Oxides of Nitrogen	E	Formation of photochemical oxidants
		Damage to materials and property, by acid rains, resulting from oxidation of oxides of nitrogen to nitric acid, after reacting with water vapors
		Retardation of growth in plants
	HL	Reduction in oxygen carrying capacity of blood
		Impairment of olfactory sense and night vision
		Dryness and roughness of the throat
Particulate Matter	HL	Respiratory diseases
	E	Choking of plant leaves restricting photosynthesis process
		Global cooling of earth by reflecting back the solar radiations
		Impairment of atmospheric visibility affecting the transportation safety
		Deterioration of aesthetic quality of atmosphere, land and water
Oxides of Sulfur	HL	Respiratory diseases, eye and throat irritation

	E	Precursor for acid rain, damage of property, plant and soil
Carbon Dioxide	E	One of the major greenhouse gases, contributing to global warming

xii. Soil Pollution

162. Soil pollution can take place during cooking, fuelling, lubrication and maintenance of vehicles and machines. Following mitigation measures are recommended for soil pollution control:

- Placement of secondary containment under fuel/lubricant containers and generator fuel oil tank to collect spillage and leakage
- Placement of fuel/lubricant container on paved floor at enclosed place
- Properly collect and dispose waste lube oil/oily rags after maintenance
- Avoid spill and leaks of oil, lubricants on floor during maintenance activities
- Immediate cleaning the spillage and leakage from the ground with saw dust/cloth and dispose of as solid waste

xiii. Environmental Aspects and Potential Operational Phase Hazards

163. The potential hazards posed by operational activities are presented by environmental aspect in Table-5.14 to Table-5.15. Appropriate management actions for all of the potential environmental hazards shall be developed on the basis of the level of risk assessed to exist for each hazard identified. The potential hazards and assessment of risks are identified for following elements:

- Noise;
- Health and safety

Table-5.14: Subprojects Activities, Potential Hazards and Assessment of Risk – Noise

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Operation of tube wells	Low intensity localized noise generation due to operation of tube wells under enclosed structures	B1 – Low
Operation of OHRs (operation of tube wells)	Low intensity localized noise generation due to operation of tube wells under enclosed structures	B1 – Low
Sewerage		
Operation of disposal stations	Low intensity localized noise generation due to operation of disposal pumps under enclosed structures	B1 – Low

Table-5.15: Subprojects Activities, Potential Hazards and Assessment of Risk – Health & Safety

Subprojects/Activities	Potential Hazard	Assessment of Risk
Water Supply		
Operation of chlorine facilities for disinfection at tube wells and OHRs	Medium level localized health and safety concerns associated with chlorine storage and handling facilities	B2 – Moderate
Algal growth in OHRs	Moderate impact on community health due to growth of algal in OHRs and contamination of water	B2 – Moderate

164. Operational phase impacts are related with handling and storage of liquid chlorine solution (Sodium Hypochlorite) at tube wells and OHR facilities and algal growth in the OHRs.

165. Handling and Storage of Liquid Chlorine: Mishandling of liquid chlorine (Sodium hypochlorite) and its exposure to the tube well operators may cause burns to the mouth and throat, gastrointestinal irritation, nausea, vomiting and diarrhea. Inhalation and ocular exposure to chlorine gas, produced when sodium hypochlorite is mixed with acidic or alkaline solutions, results in burning of throat and lungs, eye and nose irritation, chest tightness, coughing and sore throat. Exposure to higher concentrations of chlorine may lead to tachypnoea, cyanosis, swelling of the airway and, in severe cases, pulmonary oedema and respiratory failure. Sodium hypochlorite is corrosive and may irritate the skin or cause burning pain, inflammation and blisters.

166. Safe handling and storage of liquid chlorine is proposed. It includes:
Transportation: Sealed containers of chlorine will be transported at site
Storage: Closed and locked storage of chlorine containers, placement of labels, precautions/instructions at storage place in Urdu language, secondary containment for chlorine container, use of spill kit and proper ventilation at storage place
Handling: Only authorized person for the dispensing of chlorine through pump under secondary containment, use of face mask, gloves and apron during chlorine handling activities. Strict monitoring is required from SMC for ensuring that the safe handling and storage practices are being adopted at water supply sites.

167. Algal Growth in Water Reservoirs: Algal growth takes place in the water reservoir with time which contaminates water changes its taste. It is proposed after every year, the reservoirs shall be cleaned and disinfected.

VI. ENVIRONMENTAL MANAGEMENT PLAN

168. The main purpose of the Environmental Management Plan (EMP) is to provide a strategy for environmental protection. According to this plan, all the activities associated with the subprojects are controlled and monitored from the design phase, through construction, commissioning and operations. Problems that occur during the project's development are to be identified and rectified so as to prevent damage to the environment. The EMP addresses specific impacts identified in the IEE. If some issues have been overlooked, then the EMP should be amended, in consultation with the regulatory authorities, so as to ensure effective mitigation is implemented. The EMP aims to ensure that:

- It is implemented at each stage of the project;
- The project activities are managed so as to avoid or reduce the negative environmental and social impacts and enhance positive impacts;
- The surrounding communities are better off after the project is implemented, on social and environmental indicators;
- Precautions are taken against damage, and claims arising from damage are handled, in a timely manner;
- Information flow between the client, consultants, contractors and affected parties, if any, is optimized to ensure that all role players are aware of their particular responsibilities;
- Affected structures, roads and natural features are protected during construction and then rehabilitated according to the guidelines in the EMP;
- Local labor and entrepreneurs from the affected communities are used throughout the project and for project related activities wherever possible;
- Accurate records of the progress of the project (including objections) are maintained so that the concerned can be traced out in the event of claims against the client;
- The monitoring reports are produced for regulatory bodies. Their frequency and content are agreed upon prior to start of the construction phase; and
- The mechanisms are in place for reviewing the efficacy of the mitigation plan and any improvements made in the course of the projects, so that other similar projects may benefit from the experience gained.

169. The EMP contains the following information to be used for its effective implementation:

- Responsibilities or potential skills of individuals, groups, government agencies and NGOs for carrying out mitigation actions identified in the EIA assessment;
- Guidelines for communication between all parties with responsibilities for implementing the mitigation plan;
- Costs of implementing the mitigation measures;
- Institutional and training requirements for implementing the mitigation measures;
- A monitoring program to track project related events and progress in implementing the mitigation measures;
- Community liaison procedures; and
- Mechanisms for improving the mitigation plan.

A. Environmental Management Plan (EMP)

170. The environmental management plan (EMP) for those subproject activities which have environmental impacts of medium risk is provided in Table-6.1. This plan gives an overview of planned mitigation measures, frequency of monitoring, monitoring requirement and responsibilities.

B. Institutional Arrangements

i. Sialkot Municipal Corporation (SMC)

171. Sialkot Municipal Corporation (SMC) is the overall executing agency for the water supply, sewerage, transport routes and green spaces development projects in Salkot. The Mayor of Sialkot is the executive head of the Municipal Corporation. The Deputy Mayor performs the functions of the Mayor if the Mayor is unable to perform functions on account of absence or for any other reason. The Mayor heads the municipal Corporation. He is assisted by the Chief Officer (CO). The CO coordinates and facilitates the performance of functions assigned to the Municipal Corporation under the supervision of the Mayor. The CO is the focal person in the Municipal Corporation. He acts as the coordinating and administrative officer in-charge of the offices and units of the Corporation.

172. There are five Municipal offices of the Corporation including i) Planning and Coordination; ii) Municipal Regulations; iii) Infrastructure; iv) Services; and v) Finance. A Municipal Officer (MO) heads each corporation office. These offices work under CO. The MO Infrastructure and MO Services are responsible for water supply, sewage and sewage treatment and disposal, storm water drainage, sanitation and solid waste, roads and streets, traffic planning, street lighting, firefighting, parks and slaughter houses in the Municipal Corporation. In addition, this office provides all engineering related support to other offices of the corporation (and where requested to the Union Administration).

173. Overall the SMC would be responsible for the implementation and execution of all the above mentioned projects. The water supply, sewerage and drainage and transport routes improvement projects would be executed directly by the SMC through contractors.

ii. The Urban Unit

174. The Urban Unit was established in 2006, as a Project Management Unit (PMU) of the Planning and Development department under the Government of Punjab. In 2012, it underwent significant transformation and converted into an independent private limited company, registered with the Securities and Exchange Commission of Pakistan (SECP). The objective of The Urban Unit is to provide guidance and support to Government departments in developing urban sector reforms and to coordinate the implementation of the reform program.

175. Thematic areas of coverage include GIS, urban planning and design, solid waste management, water and sanitation, urban transport, municipal finance and urban economics, information and communication technology, management information system, capacity development and social and environment safeguards, and monitoring and evaluation (M&E). It is an important partner and interlocutor for PICIIP activities in Sahiwal and Sialkot.

iii. Environmental Safeguard Specialist

176. The Urban Unit established under Punjab Government will facilitate SMC in managing environmental concerns of the proposed projects and implementing environmental safeguard. The environmental safeguard specialist consultants will be hired for providing resources for environmental safeguard management as appropriate and required. The Urban Unit with the assistance of environmental safeguard specialist consultants will be responsible for:

- Monitoring the implementation of environmental management measures required for each subproject.

- Preparing environmental screening checklists and classifying subprojects that have not been yet classified.
- Based on the checklist and as per the requirements of ADB SPS (2009), PEPA1997and relevant provincial Environmental Protection Acts, preparing IEEs and EMPs.
- Submitting the checklists and IEE reports to ADB as part of the approval of subproject.
- Ensuring that EMPs are included in tender documents.
- Ensuring that all regulatory clearances are obtained before starting civil works for the subproject.
- Ensuring that the EMPs, including all proposed mitigation measures and monitoring programs are properly implemented.
- Undertaking monitoring of subprojects and preparing environmental monitoring reports and delivered to ADB.
- In the case of unpredicted environmental impacts occurring during project implementation, preparing and implementing a Corrective Action Plan (CAP).
- In the case that a Category B subproject needs to have its sitting or alignment changed or its environmental classification reconfirmed, reviewing it to determine whether a supplementary study is required. If so, carryout the study and implement any amendments to the original EMP.
- Preparing a project specific EMP for the operations that includes a Site Specific EMP for each of the work areas.
- Providing awareness training in environmental management for all employees working on the subproject.
- Ensuring that meaningful public consultations (including both men and women) are undertaken with affected groups and local NGOs. The list of people attending the consultation, time and locations, subjects discussed during consultation will be recorded in a systematic manner.
- Sharing information and disclosure of environmental safeguard documents (including any Corrective Action Plans prepared in cases of change to original project design) as required

iv. ADB

177. ADB will take the following responsibilities:

- Review project IEEs as a basis for the approval of subprojects.
- Publicly disclose the final IEE before project appraisal, and afterward updated IEE and corrective action plan prepared during project implementation, if any, as well as environmental monitoring reports on the ADB website.
- Monitor the implementation of the EMP and due diligence as part of overall project review mission.
- Provide assistance to the TMA, if required, in carrying out its responsibilities and safeguard capacity building.

v. Civil Contractor

178. For water supply, sewerage and drainage, transport routes improvement and green spaces development projects, civil contractors will be hired directly by SMC. The responsibilities of the civil contractor will be as under:

- Ensure compliance of CPEMP and CSP throughout the construction activities
- Ensure efficient site management for the storage of equipment, stockpiling materials etc.;
- Ensure construction plan devised and agreed with the SMC ;
- Ensure compliance of the construction plan;
- Ensure quality of the infrastructure as per mentioned in the construction contract;

- Recruit labor from local communities first;
- For the construction camp on the site, ensure appropriate sanitary arrangements, accommodation and drinking water availability;
- Liaise with the local communities regarding services and goods supply at the site;
- Liaise with the local communities regarding construction activity, time span, likely nuisances such as noise, dust and disturbance;
- Ensure provision of appropriate night lights (if required) and standby power sources; and
- Plan working hours to provide minimum disturbance to the community.

vi. District Environment Officer (DEO)

179. The district's environment department is the sub department of Works and Services Department of District Government Sialkot and is headed by the District Officer Environment. The major functions of the department include:

- To assist Provincial Environment Protection Agency (EPA) in the discharge of its functions under the Pakistan Environment Protection Act,1997
- Regulate motor vehicles subject to the provision of the Pakistan Environment Protection Act,1997 and the rules and regulations made there under
- To ensure, guide and assist the proponents of new projects in submission of initial environmental examination (IEE)/Environmental Impact Assessment (EIA) to the DG Punjab EPA for approval.
- Identify the needs for legislation in various sector of the environment

180. District Environment Officer (DEO) of Sialkot under Environmental Protection Department (EPD), Punjab will be overall responsible for the enforcement of PEQS through his inspectors. He will be responsible for the compliance of following:

- Municipal and liquid industrial effluent parameters (32) for discharge to in land waters, sewage treatment facilities, and the sea.
- Industrial gaseous emissions (16) into the atmosphere.
- Motor and vehicle exhaust and noise (3)
- Ambient air quality (9)
- Drinking water quality (33)
- Noise for residential, commercial, industrial and silence zones

C. Local Regulations for Acquiring Environmental Approval

181. As per Government of Punjab, the SMC will have to prepare and submit environmental assessment reports of these projects to EPD Punjab to get construction phase No Objection Certificate (NOC), prior to start of construction or implementation. These reports will have to be prepared as per IEE or EIA guidelines. The public hearing and presentation of the project in front of nominated Expert Committee of EPD are also the requirements. After getting NOC, the construction can be started. The construction requires implementation of construction phase EMP, as given in the EIA or IEE report. After the completion of construction, the environmental compliance report, as per EMP of the EIA or IEE, will have to be submitted along with the application for the grant of operational phase NOC. After getting operational phase NOC, the project will then be started.

182. The water supply, sewerage, transport routes and green spaces development projects do not require any NOC from EPD as per EIA/IEE regulation.

D. Environmental Training Needs Assessment

183. For following the environmental compliance and preparing the environmental assessment reports, SMC does not has the capacity. SMC will need support from environmental

consultant for monitoring environmental parameters of the projects and preparing performance reports for ADB. The consultant will be responsible for the preparation of environmental assessment, monitoring and performance reports and submitting it to ADB, training of the SMC staff on ADB's environmental safeguards during construction and operational phases, translation of EMP actions into on ground implementation etc.

184. Frequent training on environmental compliance would be required by those within the SMC Infrastructure and the services officials. Most of this training will be conducted on-the-job and in workshops.

Table-6.1: Planned Environmental Monitoring

Subprojects	Mitigation Measure	Monitoring Requirement	Frequency	Responsible
Construction Phase				
- Water supply pipe replacement - Bus stand	**Soil Pollution Control** - Placement of secondary containment under fuel/lubricant containers and generator fuel oil tank to collect spillage and leakage - Placement of fuel/lubricant container on paved floor at enclosed place - Properly collect and dispose waste lube oil/oily rags after maintenance - Avoid spill and leaks of oil, lubricants on floor during maintenance activities - Immediate cleaning the spillage and leakage from the ground with saw dust/cloth and dispose of as solid waste	Strict monitoring of best practices during fuelling, oiling and maintenance activities with regard to soil contamination	Daily	Contractors Supervision by SMC
- DNI zones - Water supply pipe replacement - Fateh Garh - Sewerage pipe replacement - Bus stand	**Dust Suppression** Regular water sprinkling at dust producing areas during construction activities by the contractor to suppress dust (Construction Phase Environmental Mitigation Plan-CPEMP, would be appended with the contractor bidding document)	Monitoring of water sprinkling practices at construction site	Daily (during construction period)	Contractors Supervision by SMC
- Water supply pipe replacement - Fateh Garh - Sewerage pipe replacement - Bus stand	**Noise Control** - Contractor will operate well maintained vehicles and construction machines to avoid noise at the construction site - Regular maintenance of vehicles and construction machinery would be the responsibility of the contractor (Proper lubrication, oiling and greasing of the moving parts of the machines) - Regular monitoring of vehicular and machines noise - Taking appropriate maintenance measures in case noise level increases to 85dBA	- Review of maintenance record of vehicles and machines - Noise monitoring of vehicles, machines and surrounding areas of the construction sites - Monitoring of noise control measures taken by the contractor (in case noise levels are higher than PEQS and 85 dBA)	- Review of maintenance record for every new vehicle/machine arriving at site - Daily noise monitoring & recording of vehicles/machines and surroundings	SMC

Subprojects	Mitigation Measure	Monitoring Requirement	Frequency	Responsible
	- Vehicle/machines movement is allowed only at day time - High noise producing machines would be enclosed or provided with noise barriers at site to attenuate noise levels - There will be no construction activity or movement of vehicles at night time - Noise control measures would be part of CPEMP		three times (Morning, noon, afternoon)	
- Water supply pipe replacement - Fateh Garh - Sewerage pipe replacement - Bus stand	**Traffic Management** - Vehicles will be instructed to have reduced speed limit of 30 km per hour at the residential areas to avoid accident - Construction material carrying vehicles will be covered from the top to avoid dispersion of dust in the surrounding areas - In case of large number of vehicles arriving at the site, these will be planned in such a way that these should arrive at the site in different timings of the day to avoid traffic jam and nuisance for the nearby community - Proper road marking and sign board posting at residential and commercial areas - Cordon off the construction work areas and diversion of traffic to other sides as per traffic plans - Prior communication of alternative routes to the public to avoid traffic congestion at construction site	- Strict monitoring of speed limits and frequency of arrival at the site - Monitoring of road marking and signboard placing at the road side - Alternative rout plans and communication to public for the affected roads	Daily (during construction period)	SMC
Bus stand	**Construction Waste Disposal** - Disposal of construction waste at depressions - Avoid dumping at residential areas - Avoid dumping in the water bodies - Construction waste dumping practices would be part of CPEMP	Monitoring of construction waste dumping practices	Daily (during construction period)	Contractors, supervision by SMC
- Water supply pipe replacement - Sewerage pipe	**Domestic Solid Waste Disposal** - Contractor will be instructed in the CPEMP for properly collection and dumping of domestic solid	- Monitoring of solid waste management at site regarding proper collection, placement	Daily	Contractors Supervision by SMC

Subprojects	Mitigation Measure	Monitoring Requirement	Frequency	Responsible
replacement - Bus stand	waste at the designated municipal solid waste dumping site	and dumping at designated site		
- Water supply pipe replacement - Sewerage pipe replacement - Bus stand	**Sanitary Wastewater Disposal** Sanitary wastewater will be disposed of nearby drain after treatment in the septic tanks	- Construction and operation of septic tanks at the site - Proper disposal of sanitary wastewater at the drain/sewers - Monitoring of wastewater parameters (pH, BOD_5, COD, TSS, TDS)	- Start of construction activities - Daily - Weekly	Contractors Monitoring by SMC
- Water supply pipe replacement - Sewerage pipe replacement - Bus stand	**Health and Safety of Workers** - Contractor will provide Construction Safety Plan (CSP) along with the bidding and contract document which will be implemented during the construction period - Contractor will be responsible for providing and strictly implementing the use of safety gadgets by the workers during construction activities. - Availability of first aide medical facility at sites	Monitoring that the CSP is properly implemented at the site by the contractor	Daily	Contractors Supervision by SMC
Operational Phase				
Chlorination facility at tube wells and OHRs	<u>Transportation:</u> Sealed containers of chlorine will be transported at site <u>Storage:</u> - Closed and locked storage of chlorine containers - Labelling, precautions/instructions at storage place in Urdu language - Secondary containment for chlorine container - Use of spill kit - Proper ventilation at storage place <u>Handling:</u> - Only authorized person for the dispensing of chlorine through pump under secondary containment - Use of face mask, gloves and apron during chlorine handling activities	Regular monitoring of safe handling and storage practices	Daily	SMC

Subprojects	Mitigation Measure	Monitoring Requirement	Frequency	Responsible
Algal growth in OHRs	Cleaning and disinfection of OHRs	Ensure that OHRs are being cleaned as per OHR cleaning procedure	Annually	SMC

E. Grievance Redress System

185. A Grievance Redress System (GRS) will be established by the SMC to facilitate resolution of community complaints and grievances about the subproject environmental performance, in line with the requirements of ADB's SPS 2009. Under this mechanism, a Grievance Redress Cell (GRC) will be established.

186. The civil contractors will maintain a Community Complaints Management Register (CCMR) at site for logging complaints and grievances. This register will be filled and maintained with the assistance of SMC. All written and oral grievances will be recorded in the Register. The information recorded will include the date of the complaint and particulars of the complainant; a description of the grievance; the follow-up action required; the person responsible for implementing the action; and a target date for its completion. Each contractor will primarily be responsible for redressing the grievances within its jurisdiction under overall supervision of SMC. Construction-based grievances will mainly be dealt with by the SMC. The CCMR will be frequently checked by the SMC and necessary actions will be taken in case the contractor is not following up.

187. Affected communities and their representatives will be identified during the project preparation stage. The SMC will work towards resolving the grievances recorded in the CCMR in conjunction with the contractors within seven calendar days.

F. Environmental and Social Complaint Register

188. SMC project management team will maintain an environment and social complaints register at site offices to document all complaints received from the local communities. The register will also record the measures taken to mitigate these concerns. The final report will be communicated to the ADB. The SMC monitoring team will monitor the implementation of social and environmental mitigation measures as per the ADB Safeguard Policy Statement.

G. Environmental Management Cost

189. The total cost of environmental management includes human resources, mitigation measures during the construction and operational phases, and laboratory testing charges. The estimated cost of EMP implementation is given in Table-6.2.

Table-6.2: Cost Estimate for Environmental Management

Particulars	Detail	Unit Rate (Rs)	No. of Units	Total Amount (Rs)
Environmental Safeguard Specialist	One person for 6 months responsible for compliance of ADB requirements and training of SMC staff	150,000/month	6	900,000
Construction Phase Compliance of CPEMP	Contractors will be responsible for implementing Construction Phase Environmental Mitigation Plan (as appended with the bidding and contract documents). These costs will be included in their bids and will be part of their overall construction cost	-	-	-
Laboratory	i) PM monitoring	i) 3,000 ii) 3,000	i) 15 ii) 75	510,000

Particulars	Detail	Unit Rate (Rs)	No. of Units	Total Amount (Rs)
Testing Charges Construction Phase (6 months)	ii) Stack flue gas analysis for generators and vehicles iii) Wastewater analysis iv) Water quality analysis v) noise	iii) 6,000 iv) 6,000 v) 200	iii) 15 iv) 15 v) 300	
Personal Protective Equipment (6 months)	i) Dust masks ii) Face masks iii) Ear plugs iv) Ear muffs v) Safety helmet vi) Safety shoes vii) Safety gloves viii) First aid boxes ix) Firefighting equipment	Contractor		
Environmental Training of the SMC Staff	i) General environmental awareness ii) ADB safeguard requirements iii) GoPb environmental legislation and compliance requirements iv) Monitoring requirement v) Health and safety vi) Firefighting	Lump Sum		300,000
Total				**1,710,000**

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

190. Public consultations have been carried out during the prefeasibility study stage and during this feasibility study, with different stakeholders. These stakeholders included the local communities directly or indirectly affected either positively or negatively by the project components, NGOs, government departments, and private sector bodies. At the feasibility study stage the consultations have been carried out during preparation of the Gender Analysis and Gender Action Plan, the Poverty Analysis and Social Development Plan, and the Land Acquisition and Resettlement Action Plan. The summary of these consultations is presented in this chapter.

191. The objective of the Public Consultation process was to involve stakeholders from the earliest stages. The viewpoints of the stakeholders have been taken into account and their concerns and suggestions for possible improvements have been included where appropriate. Much of the consultation process to date has resulted in positive feedback from the stakeholders. They appreciated the project components which would improve their lives, but with some concerns relating to land acquisition reimbursement.

192. There is also a requirement for ongoing consultation for preparation of Land Acquisition and Resettlement Plan (LARP), which is being documented separately. It is expected that this process will continue through all stages of the subproject in order to accommodate stakeholders' aspirations and to orient the stakeholders positively towards the project implementation and where possible to harness cooperation over access issues in order to facilitate timely completion.

193. The environmental assessment process under the Pakistan Environmental Protection Act only requires disclosure to the public after the statutory IEE/EIA has been accepted by the relevant EPA. In this IEE, the consultation process was performed to satisfy the ADB requirements.

A. Results of Public Consultation

194. This section provides results of various public consultations carried out during prefeasibility and feasibility study stages.

i. Prefeasibility Study Stage Public Consultations

195. In the social surveys undertaken under the PFS, water supply emerged as the main issue for people living in poor areas. These people are not satisfied with the available water, such that in some areas they have disconnected the supply due to poor quality and odors that appear as a result of the mixing of water and sewerage systems. Most people use the water supply for washing purposes and are fetching the water from the filter plants installed in the various parts of the city. In some areas water is pumped from private wells installed by the households.

196. People are concerned that the poor quality of the water is causing diseases such as hepatitis, diarrhea, worm infections, and malaria. Regarding costs, they are paying on average Rs.626 on quarterly basis.

197. The proposed underpass development that is part of the transport improvement project will affect the livelihood of 53 families during the construction stage of the project. Land acquisition and resettlement is not required, as it only disrupts the

commercial areas, affecting the businesses both sides of the proposed corridors. The displaced people do not have alternate sources of income, being entirely dependent on these businesses. Although the full extent of the subproject is not yet clear, especially how this facility will be developed, people shared their views after consultation, as discussed below;

- The general public is very happy with the proposed under-pass project. They held the view that excess traffic failure is a problem, having adverse effects on local schools, especially Allama Iqbal Degree College for Girls. The under pass will result in the smooth flow of traffic in the area.
- There is a Nullah (drain) located close to the project area, and during construction of the underpass, the entire residential area will be cut off from the drainage system, so there will need to be alternative drainage options identified prior to the commencement of construction.
- Traffic will likely be affected during the project construction stage, so an alternate route must be given to avoid larger traffic failure.
- People were worried that their commercial structures will be affected during the project execution stage. In case their structures are damaged, they will need to be compensated.
- Encroachment by other businesses and mobile vendors will affect livelihoods during the construction stage.
- Some people have doubts that the project will not be completed on time and will create problems for them.
- The project may lead to the loss of business, negatively affecting livelihoods.
- The movements of local residents, especially female students, will be hindered severely, so they should be provided with an alternate route.
- The DPs should be provided with an alternate source of income prior to commencement of civil work to account for the expected loss of income.

ii. Feasibility Study Stage Public Consultations

198. Following are the summary points of the public consultations carried out during feasibility stage:

- Women participants of the Focal Group Discussions (FGDs) in both cities reported that health related expenditures form a significant portion of their total monthly expenditures. There is anecdotal evidence that a large majority of the population relies on private sector health facilities.
- Women and men in all FGDs, in both cities, have noted that there is a high prevalence of hepatitis which they attribute to contaminated water and inadequate solid waste disposal.
- According to primary data from FGDs, there is no development activity, donor assisted projects or initiatives. The civil society representatives provided a different perspective but it can be stated that with the exception of some philanthropic activity for installation of water filters, none of the sample areas are being targeted under any urban services improvement programs.
- Women residents talked at length on the poor or non-existent services available to them in terms of the quality and quantity of water, sanitation, health or education.
- Poor communities do not have gas and no proper arrangements for water supply, sewage or solid waste management.
- At an institutional level, it is observed that there are no specific gender mainstreaming strategies or mechanisms at the level of the TMAs in both Sahiwal and Sialkot and it would not be an exaggeration to state that these public services institutions are gender-blind. None of the TMAs mentioned having any policies and resources to this effect and indeed the facilities and working environment is very unfriendly towards women despite the fact that both employ women, at least in the workers' category.

- Overall, the issues in water access and quality are common across both cities. These include poor water quality, erratic supply and mixing of water pipelines with sewage.
- Government water supply follows fixed timings and is mostly available three times a day for an hour each time (roughly same finding for both cities). Water quality has been reported to be poor to very poor and unsafe for drinking, in all cases. Some residents e.g. UC Mianapura, Sialkot noted that water quality is so bad that it is even unfit for bathing. For drinking purposes, almost all households resort to either boiling water or collecting it from the various public and private water filtration plants installed in different areas. While a small number of people reported that they are making do with collecting water from filters, most of the women and men stated that filter plants are either far away or are dysfunctional.
- Due to the unavailability of municipal water supply, the majority depend on motor-operated pumps and pay heavy electricity bills (ranging between Rs 3,000-4,000 per month)
- The FGD in UC New Mianapura East, Sialkotrevealed that even the pumped water they get within their houses is not good and they have to go to the nearest filter plant which is half an hour away on foot to get water.
- The main points of conclusion, from the consultations around the sewage system, are as follows: the public system is a badly planned, haphazard, outdated, inefficient, faulty collection of old rusty pipes and open and semi-covered and covered drains. All primary data confirms a perpetual problem of clogged and overflowing drains, flooding of streets and lanes with filth and sewage with *adhoc* arrangements being made in emergency situations that only provide temporary relief. The severity of the situation varies but is particularly alarming in middle or low income areas. Women respondents in all FGDs mentioned great difficulty faced by them due to this problem and the health, hygiene and mobility constraints they face because of this situation.
- Rain water is gathered and remains standing for days and many areas reportedly remain inundated for days on end. The functioning of the TMA is considered to be highly unsatisfactory and people have mentioned that there are severe staff shortages. According to city residents, the cleaning and operation of the sewerage system is a combination of luck, chance or circumstance where an active UC chairman or councillor will take action to mobilise resources.
- In UC Model town, Sialkot, residents reported the presence of households who have kept livestock (cows and buffaloes) within their homes and animal dung and other waste is being collected and disposed of directly at street level. Residents have unsuccessfully lodged complaints and tried to take action on this matter.
- The FGD respondents mentioned that solid waste collection staff are limited; containers are not placed evenly across the city; neighborhood and lane level disposal is not thought out; the dumpers are often faulty; and, timing schedules are not adhered to. Moreover, it was noted that SWMC sanitary workers often refused to work on the pretext that they are on strike. TMA has alleged that the separation of solid waste sanitary staff has created a difficult situation whereby they sweep garbage directly into open lines and let the TMA staff attend to it. Residents of New Mianapura East, Sialkot also mentioned that SWMC only collect from major market roads and there is unattended industrial waste as well in their area. The landfill site had not been finalized at the time of field-work and according to the SWMC all suitable options had been exhausted to no avail.
- The only mode of transportation for a large majority of the population are *qingchis* and auto rickshaws and these are reportedly unaffordable. Most of the women noted that they travel on *qingchis* at a flat rate for Rs 20 within the city but more for travel to far off places and this places a huge financial burden especially for those who have to go out every day for education or employment purposes. Women in the FGD (UC Kareempura, Sialkot) noted difficulties in having to sit next to male passengers and said they would very much like a metro bus system which they can avail for Rs 10 as in bigger cities.
- It is evident that the city residents (men and women) in Sahiwal and Sialkot feel that there are not adequate, safe, reliable, consistent or regular services vis-à-vis water

supply, sewage, solid waste management or transportation. It is also evident that women, due to their multiple productive and reproductive roles, are inconvenienced and burdened due to limitations in service provision. Men and children are also involved in terms of both time and labour (water carrying/collecting, garbage collection). The proposed project, therefore, stands to benefit everyone and does not have any adverse impacts.

- The field findings from the FGDs indicate community prioritisation of needs as follows:
  - Better sewage and sanitation
  - Water supply
  - Solid waste management
  - Health facilities/improvements
  - Community spaces/centres
  - Transportation
- Another equally important and oft-mentioned concern by almost all women is their aspiration for *a women-friendly public space that is open to all and where they can come together for various purposes.* "A centre run for women and by women" is how many different women put it – a space where they can congregate for various purposes in a safe and unhindered manner.
- The civil society organizations (e.g. in Sahiwal) emphasized clean water, sewage system, health and education. The CSOs in Sialkot reiterated the same as those of Sahiwal with the addition of awareness raising and sensitization of civic and legal rights and obligations, implementation of existing laws and labor standards relating to women, jobs and skills training for skilled and unskilled labor.
- Willingness to pay for the amenities was explored under all sectors and in all data collection instruments for primary data collection. By and large, all respondents in both cities with the exception of women respondents in UC Waterworks (Sialkot) reported that they are not *able* to pay any additional charges for water supply or solid waste because they are already barely able to make ends meet. "The Rs 626 is already too high and we sometimes have to pay this amount in installments" is how the women in UC Kareempura, Sialkot put it.
- The respondents in the more affluent UC Waterworks reported, however, that their willingness to pay depends on the suitability of proposed arrangements and they indicated that perhaps 50 percent of the households are in a position to pay an extra Rs 100-200 for improved (efficient and regular) water supply and solid waste management.
- Households are already paying fees for privately acquired services, such as electricity bills for water or rickshaw fares. These fees are usually higher than municipal service charges, and this therefore suggests a willingness to pay.

VIII. FINDINGS AND RECOMMENDATIONS

199. This study was carried out at the feasibility study stage of the PICIIP. Primary and secondary data were used to assess environmental impacts. The report has provided a picture of all potential environmental impacts associated with the project, and recommended suitable mitigation measures.

200. Most of the water supply, sewerage and urban development improvement projects have minor environmental impacts during the construction phase, and these are manageable through implementation of the CPEMP with overall supervision by the SMC. However, the staff of the SMC will require training on EMP implementation during the construction phases

201. The water supply, sewerage, transport routes and green spaces projects do not require No Objection Certificates from the government. The information provided in this report can form the basis of any further submission to ADB as required.

202. Construction phase environmental mitigation plan (CPEMP) and construction safety plans are also required to be prepared before awarding construction contract to the contractors. These plans will be part of the bidding documents.

203. These projects will not pose any negative social impact. However, if land acquisition is required, compensation to the APs and concerned parties will be provided. The LARP; Gender Analysis and Gender Action Plan; Poverty Analysis and Social Development Plan; and, Land Acquisition and Resettlement Plan have been completed in tandem with this IEE. These studies have:

- *Examined and assessed the overall social and poverty profile of the project area on the basis of the primary and secondary data sources and prepared socio-economic profiles of the project areas.*

- *Prepared a social and poverty analysis, taking into account socio-economic and poverty status of the project area of influence, including the nature, extent and determinants of poverty. In addition, estimation of the likely socioeconomic and poverty reduction impacts of the project were included.*

- *Held consultations with relevant officials from the government, including consultation with affected communities to assess responses to the project and ascertain the nature and scope of local participation in project planning and implementation.*

- *Identified, analyzed and, where appropriate, quantified the potential resettlement Impacts (minimal) of the proposed project on the area and the population.*

204. Baseline monitoring activities have not been carried out during the project feasibility stage. The requirement for baseline monitoring, prior to the commencement of construction and operation activities, shall be integrated into contract documentation in order to establish performance thresholds, pollution limits and contingency plans for the contractor's performance.

205. During the operational phase, the monitoring of environmental parameters should ensure that statutory requirements have been achieved. Monitoring activities will focus on

periodic recording of environmental performance and proposing remedial actions to address any unexpected impacts.

IX. CONCLUSIONS

206. The water supply, sewerage and urban development projects under PICIIP are feasible and sustainable from engineering, environmental, and socioeconomic points of view. Implementation of the EMP is required and the environmental impacts associated with the subprojects need to be properly mitigated. Existing institutional arrangements are available for the implementation of the EMP. Additional human and financial resources will be required by SMC to comply with environmental safeguard requirements. The proposed mitigation and management plans are practicable but require additional resources.

207. This IEE, including the EMP, should be used as a basis for an environmental compliance program and as guidelines for the preparation of construction related EMP document which should be included as an Appendix to the contract document. The EMP shall be reviewed at different stages of the project and be updated as per requirement. In addition, any subsequent conditions issued by EPA Punjab as part of the environmental clearance should also be included in the environmental compliance program. Therefore, continued monitoring of the implementation of mitigation measures and implementation of the environmental conditions for work should be properly carried out and reported at least twice a year as part of the project performance report.

ANNEXURE-1
REA CHECKLISTS

Rapid Environmental Assessment (REA) Checklist

SEWAGE TREATMENT

Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environmental Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on i) involuntary resettlement, ii) indigenous peoples planning iii) poverty reduction, iv) participation, and v) gender and development.
- ❑ Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: PAKISTAN/Punjab Intermediate Cities Improvement Investment Project (PICIIP)

Sector Division: Water and other urban infrastructure and services

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area			
➢ Densely populated?	☐	■	
➢ Heavy with development activities?	☐	■	
▪ Adjacent to or within any environmentally sensitive areas?			
➢ Cultural heritage site	☐	■	
➢ Protected area	☐	■	
➢ Wetlands	☐	■	
➢ Mangrove	☐	■	
➢ Estuarine	☐	■	
➢ Buffer zone of protected area	☐	■	
➢ Special area for protecting biodiversity	☐	■	
➢ Bay	☐	■	
B. Potential Environmental Impacts			

SCREENING QUESTIONS	Yes	No	REMARKS
Will the Project cause			
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	■	
▪ Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.??	■	☐	Transient impacts possible during replacement of sewer lines. Mitigation measures proposed as part of the EMP
▪ Dislocation or involuntary resettlement of people?	☐	■	
▪ Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	☐	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Overflows and flooding of neighboring properties with raw sewage?	☐	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Environmental pollution due to inadequate sludge disposal or industrial waste discharge illegally disposed in sewer?	☐	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Noise and vibration due to blasting and other civil works?	■	☐	Transient impacts during construction. Mitigation measures proposed as part of the EMP.
▪ Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	☐	■	No treatment plants
▪ Social conflicts between construction workers from other areas and community workers?	☐	■	
▪ Road blocking and temporary flooding due to land excavation during rainy season?	■	☐	Transient impacts during construction. Mitigation measures proposed as part of the EMP. Scheduling of works to avoid the rainy season
▪ Noise and dust from construction activities?	■	☐	Transient impacts during construction. Mitigation measures proposed as part of the EMP.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Traffic disturbances due to construction material transport and wastes?	■	□	Transient impacts during construction. Traffic management measures proposed as part of the EMP.
▪ Temporary silt runoff due to construction?	■	□	Transient impacts during construction. Mitigation measures proposed as part of the EMP.
▪ Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	□	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	□	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Contamination of surface and ground waters due to sludge disposal on land?	□	■	Situation is unchanged from current scenario in the absence of treatment plant facilities.
▪ Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in sewage and sludge?	□	■	Situation is unchanged from current scenario

Rapid Environmental Assessment (REA) Checklist

URBAN DEVELOPMENT

Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environmental Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on i) involuntary resettlement, ii) indigenous peoples planning iii) poverty reduction, iv) participation, and v) gender and development.
- ❑ Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: PAKISTAN/Punjab Intermediate Cities Improvement Investment Project (PICIIP)

Sector Division: Water and other urban infrastructure and services

SCREENING QUESTIONS	Yes	No	REMARKS
C. Project Siting Is the project area			
➢ Densely populated?	☐	■	
➢ Heavy with development activities?	☐	■	
▪ Adjacent to or within any environmentally sensitive areas?			
➢ Cultural heritage site	☐	■	
➢ Protected area	☐	■	
➢ Wetlands	☐	■	
➢ Mangrove	☐	■	
➢ Estuarine	☐	■	
➢ Buffer zone of protected area	☐	■	
➢ Special area for protecting biodiversity	☐	■	
➢ Bay	☐	■	
D. Potential Environmental Impacts Will the Project cause			

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services?	☐	■	
▪ Deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?	☐	■	
▪ Degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests?	☐	■	
▪ Dislocation or involuntary resettlement of people?	■	☐	Social safeguard report under preparation for parties affected by plans to redevelop the bus terminal
▪ Degradation of cultural property, and loss of cultural heritage and tourism revenues?	☐	■	
▪ Occupation of low lying lands, floodplains and steep hillsides by squatters and low income groups, and their exposure to increased health hazards and risks due to polluted industries?	☐	■	
▪ Water resource problems (e.g. depletion/degradation of available water supply, deterioration of surface and ground water quality, and pollution of receiving waters?	☐	■	
▪ Air pollution due to urban emissions?	☐	■	
▪ Social conflicts between construction workers from other areas and local workers?	☐	■	
▪ Road blocking and temporary flooding due to land excavation during rainy season?	■	☐	Traffic management measures required as part of the EMP. Scheduling of construction work to avoid rainy season
▪ Noise and dust from construction activities?	■	☐	Transient impacts from construction activities. Mitigation measures proposed as part of the EMP

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Traffic disturbances due to construction material transport and wastes?	■	□	Traffic management measures required as part of the EMP. Transient impacts
▪ Temporary silt runoff due to construction?	■	□	Construction activities to be confined to dry season/dry weather. Scheduling to be stipulated in the EMP
▪ Hazards to public health due to ambient, household and occupation pollution, thermal inversion, and smog formation?	□	■	
▪ Water depletion and/or degradation?	□	■	
▪ Overpaying of groundwater, leading to land subsidence, lowered groundwater table, and salinity?	□	■	
▪ Contamination of surface and ground waters due to improper waste disposal	□	■	
▪ Pollution of receiving waters resulting in amenity losses, fisheries and marine resources depletion, and health problems?	□	■	

Rapid Environmental Assessment (REA) Checklist

WATER SUPPLY

Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environmental Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on i) involuntary resettlement, ii) indigenous peoples planning iii) poverty reduction, iv) participation, and v) gender and development.
- ❑ Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: PAKISTAN/Punjab Intermediate Cities Improvement Investment Project (PICIIP)

Sector Division: Water and other urban infrastructure and services

SCREENING QUESTIONS	Yes	No	REMARKS
E. Project Siting Is the project area			
➢ Densely populated?	☐	■	
➢ Heavy with development activities?	☐	■	
▪ Adjacent to or within any environmentally sensitive areas?			
➢ Cultural heritage site	☐	■	
➢ Protected area	☐	■	
➢ Wetlands	☐	■	
➢ Mangrove	☐	■	
➢ Estuarine	☐	■	
➢ Buffer zone of protected area	☐	■	
➢ Special area for protecting biodiversity	☐	■	
➢ Bay	☐	■	
F. Potential Environmental Impacts Will the Project cause			

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?	☐	■	
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	■	
▪ Hazard of land subsidence caused by excessive groundwater pumping?	☐	■	
▪ Social conflicts arising from displacement of communities?	☐	■	
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?	☐	■	
▪ Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	☐	■	
▪ Delivery of unsafe water to distribution system?	■	☐	Disinfection system proposed at production and storage facilities
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?	☐	■	
▪ Over pumping of groundwater, leading to salinity and ground subsidence?	☐	■	
▪ Excessive algal growth in storage reservoir?	■	☐	Preventative maintenance required for all production and storage facilities
▪ Increase in production of sewage beyond capabilities of community facilities?	■	☐	Improvements to sewerage system proposed in parallel with this project
▪ Inadequate disposal of sludge from water treatment plants?	☐	■	
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	☐	■	
▪ Impairments associated with transmission lines and access roads?	☐	■	
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals?	■	☐	Handling and storage procedures built into the EMP

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other containments?	■	□	Handling and storage procedures built into the EMP
▪ Dislocation or involuntary resettlement of people	□	■	
▪ Social conflicts between construction workers from other areas and community workers?	□	■	
▪ Noise and dust from construction activities?	■	□	Noise and dust control measures to be specified in the EMP. Impacts are transient.
▪ Increased road traffic due to interference of construction activities?	■	□	Traffic management plan to be specified in the EMP. Impacts are minor and transient.
▪ Continuing soil erosion/silt runoff from construction operations?	□	■	
▪ Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulation in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	■	□	Preventative maintenance required for all production and storage facilities. Monitoring requirements to be specified in the Monitoring Plan
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?	■	□	Preventative maintenance required for all production and storage facilities. Monitoring requirements to be specified in the Monitoring Plan
▪ Accidental leakage of chlorine gas?	□	■	
▪ Excessive abstraction of water affecting downstream water users?	□	■	
▪ Competing uses of water?	□	■	
▪ Increased sewage flow to increased water supply	□	■	
▪ Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	■	□	Improvements to sewerage system proposed in parallel with this project

ANNEXURE-2
DETAIL OF PUBLIC CONSULTATION PARTICIPANTS

Name	Title/Designation and Organisation	Date, Place
Sialkot		
Mohd Zafar Qureshi	Tehsil Municipal Officer	4th Nov
Mohd Shiraz	Managing Director, SWMC	4th Nov
Mustansar Khan	Chief Sanitary Inspector	5th Nov
Ashraf Bajwa	Assistant Tehsil Officer, Water Supply	5th Nov
Muzammil Yaar	District Officer, Social Welfare	5th Nov
Mohd Sharif Ghumman	Deputy District Officer, Social Welfare	5th Nov
Fakhira Yasmin Tazeem Akhtar	Superintendent Dar-ul-Falah, Mother and Child Home Deputy Teacher, Dar-ul-Falah, Mother and Child Home	7th Nov
Asma Ahmed Erum Shehzadi	Superintendent, Shelter home/dar-ul-aman Second In charge, Shelter home/dar-ul-aman	7th Nov
Hina Nasreen	President, Baidaari	7th Nov
Mohd Ijaz Noori	Chairman Pakistan Council for Social Welfare and Human Rights	7th Nov
Shakir Husain	Representative, Fair Trade Asia Pacific	7th Nov
Mohammad Ishfaq	President, Roz Human Rights	7th Nov
Shakila Ijaz	Lady Health Visitor, Union Council Waterworks	8th Nov

Sialkot
FGD 1: New Mianapura East **Participants:** 1. Mouzma Anwar 2. Sehrish Anwar 3. Shumaila Ajmal 4. Saba Iqbal 5. Razia Iqbal 6. Razia Munir 7. Parveen Akhtar 8. Sidra Bilal 9. Shama Yasin 10. Shehnaz Asghar 11. Sheena Taha 12. Ms Nayyar
FGD 2: Union Council Kareempura, Mohallah Raja Baazar (5th Nov) **Participants:** 1. Riffat Sultana 2. Kaneez Fatima 3. Razia Begum 4. Roohi Bano 5. Mohammad Tasleem 6. Nasreen Tariq
FGD 3: Old Model Town/Union Council Mubarikpura (now Mianapura) 7th Nov **Participants:** 1. Sabiha Jalal 2. Shabana Zia 3. Rafia Abid 4. Ms Ejaz 5. Mian Aftab Jahangir 6. Sohail Mir
FGD 4: Union Council Waterworks (8th Nov) **Participants:** 1. Maqsooda Begum 2. Yasmin Razzak 3. Nazeera Begum 4. Shazia Nasir 5. Sadia Usman

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