ISSIP 2 - Project

Framework for the
Environmental and Social Impact
Assessment Framework (ESIAF)
El-Sharkeya Governorate

Executive Summary
LIST OF ACRONYMS AND ABBREVIATIONS

CDA  Community Development Association
CSC  Construction Supervision Consultant
EEAA  Egyptian Environmental Affairs Agency
ER  Executive Regulations
EIA  Environmental Impact Assessment
ESA  Environmental Site Assessment
ESIAF  Environmental and Social Impact Assessment Framework
ESMMF  Environmental and Social Management and Monitoring Framework
FGD  Focus Group Discussion
FM  Force Mains
HAA5  Haloacetic acids
HCWW  The Holding Company for Water and Wastewater
ISSIP  Integrated Sanitation and Sewerage Infrastructure Project
ISSIP-1  Integrated Sanitation and Sewerage Infrastructure Project Phase 1
ISSIP-2  Integrated Sanitation and Sewerage Infrastructure Project Phase 2
MWRI  Ministry of Water Resources and Irrigation
MoH  Ministry of Health
MOH UD  The Ministry Of Housing and Urban Development
NGO  Non Governmental Organizations
NOPWASD  The National Organization for Potable Water & Sanitary Drainage
PIU  Project Implementation Unit
PIUM  Project Implementation Unit Manager
PO  Project Operator
ppm  Parts Per Millions
PS  Pump Stations
PSC  Project Steering Committee
RPF  Resettlement Policy Framework
RSU  Rural Sanitation Unit
RSU-EE  Rural Sanitation Unit Environmental Expert
THMs  TriHaloMethanes
WB World Bank
WSC Water and Sanitation Company
WWTP Wastewater Treatment Plant

Exchange Rate: $ / L.E. = 5.81 as of 22 December 2010
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1. Introduction

1.1 Background

Although drinking water supplies have been introduced to the rural areas in Egypt several decades ago the sanitation services were not developed in parallel. Currently about 95% of urban households are provided with piped drinking water supply and coverage of sanitation services in these areas is about 84%. In contrast, about 70% of rural households have access to piped water supplies, while sanitation services are limited to about 26% of rural households across Egypt. This situation has resulted in many problems that could be summarized as follows:

1- Rural households use sewage cesspits septic that are often leaking sewage to the surrounding environment causing health risks to rural inhabitants.
2- Sewage often leaches to the groundwater raising the groundwater level, especially in northern parts of the country where groundwater level is relatively high. This, in addition to the associated risks of contaminated groundwater supplies, threatens the structural stability of many rural households, and
3- The absence of centralized sanitation services leads to discharging quantities of untreated sewage in irrigation canals causing organic and pathogenic contamination to surface water, and subsequently raising contamination risks to agriculture soil and crops.

In January 2009 HCWW, with support from the World Bank (WB), has initiated the Integrated Sanitation and Sewerage Infrastructure Project (ISSIP) which is providing deprived villages in Gharbeya, Beheira and Kafr El Sheikh with sanitation services. The developmental objective of ISSIP is to improve health conditions of rural inhabitants in the project area and to improve surface water quality in selected irrigation command areas. The first phase of ISSIP (ISSIP-1) is implementing centralized sanitation systems in about 222 villages within 14 clusters and decentralized systems in about 120 villages with smaller populations. In order to widen the coverage areas of the ISSIP and to increase number of beneficiaries HCWW is planning to implement a second phase of the ISSIP (ISSIP-2) in which geographic coverage of the project will be extended to another 2 Lower Egypt Governorates, namely Menofya and Sharkeya Governorates, and 2 Upper Egypt Governorates, namely Asyut and Sohag Governorates. The proponents of the ISSIP-2 are NOPWASD and HCWW, along with its subsidiary companies in the new project areas. HCWW has requested the assistance of the World Bank for implementing the ISSIP-2.

This Environmental and Social Impact Assessment Framework (ESIAF) has been prepared for the ISSIP-2 proposed interventions in Sharkeya Governorate, while other ESIAFs will be prepared for the other 3 project governorates.

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1 A cluster contains a number of villages and relatively highly populated areas that are closely located and could be served with a centralized wastewater treatment plant.
Due to the extensive geographic coverage of the proposed project and the uncertainty of the exact development schedule of the utilities and infrastructure in all project phases, an Environmental and Social Impact Assessment Framework (ESIAF), rather than a detailed site specific Impact Assessment, has been prepared. This ESIAF has been prepared following Terms of Reference prepared by HCWW, and cleared by the World Bank.

1.2 Objectives of the Study

The aim of the ESIAF is to identify the potential environmental and social impacts of the ISSIP-2 in Sharkeya Governorate, and to develop an environmental and social management framework to be followed by the project stakeholders.

The specific objectives of the study are to:
- Assess the potential environmental and social impacts of the project in the project areas;
- Compare the impacts in relation to relevant national and international requirements and guidelines;
- Develop screening criteria for acceptability of project intervention from environmental and social aspects;
- Develop an environmental and social management framework for the mitigation of the potentially negative impacts and for monitoring compliance with the relevant environmental laws and standards;
- Assess the capacity of the implementing agencies to implement the developed environmental and social management framework, and
- Develop a capacity building program to cover any identified gaps in the capacity of the implementing agencies regarding environmental and social measures.

It is worth noting that a Resettlement Policy Framework (RPF) is has been prepared in parallel to this ESIAF. The RPF is addressing cases where involuntary resettlement may occur during the course of project implementation.
2. Legislative and Regulatory Consideration

2.1 Applicable Environmental and Social Legislation in Egypt

2.1.1 Presidential Decree 135/2004

The Decree has established HCWW giving it the authority to collect, treat and safely dispose of wastewaters. Operational budget, properties and assets of water and wastewater utilities have been transferred from local authorities to HCWW, and its 14 subsidiary companies in some governorates.

2.1.2 Law 93/1962 for Discharge of Wastewaters

The law regulates the disposal of wastewater, and liquids at large, to the sewerage networks. The law has specified the procedures to be followed for establishing sewerage networks, house connections, licensing procedures for connecting different establishments to the sewers and the sampling/analysis responsibilities. The Executive Regulations of the law have been abrogated by Ministerial Decree 44/2000, which has set details for treated effluent standards and sludge standards for reuse in agriculture. The ISSIP-2 implementing agencies, and the project beneficiaries, should comply with the Law during the execution of the project.

2.1.3 Law 48/1982 for Protection of River Nile and Watercourses

Law No. 48 for the year 1982 and its Executive Regulation regulate the discharge to watercourses and groundwater. Said discharge shall comply with the standards of the law for relevant receiving media. WWTPs working under ISSIP-2 should comply with the discharge standards of this law.

2.1.4 Environment Law No. 4/1994 as Amended by Law No. 9/2009

Environmental Law No. 4 for the year 1994 as amended by Law No. 9 for the year 2009 and its Executive Regulation ("Environmental Law") are the main legislation governing environmental protection in Egypt. The Environmental Law stipulates in Articles 19 through 23 that an environmental impact assessment should be prepared for development projects as a condition precedent for obtaining the license, in which the EIAs for ISSIP-2 WWTPs and collection systems should comply with. Relevant to the ISSIP-2 activities the law also includes certain standards for air emissions, noise emissions, handling of hazardous materials and hazardous wastes, and management of excavation and construction wastes.

2.1.5 Law 38/1967 for General Cleanliness
This law regulates cleanliness of cities with respect to garbage collection and disposal, in addition to sewage cesspits evacuation and disposal. The Law has some regulations for the wastes resulting from construction. The Law also has some requirements for disposal of solid waste which will be relevant to some ISSIP-2 activities.

2.1.6 Law 117/1983 for Protection of Antiquities

The law defines antiquities as “Each movable or immovable produced by different civilizations”. The definition of antiquities includes arts, science, literature and religions from ancient ages up to 100 years ago. The definition also includes human corpses which have remained from the ancient ages. The relevant articles of the Law to the project activities is related to respecting buffer zones around antiquity sites that could be close by construction sites of the project and also to follow standards procedures in case of chance-find of antiquity objects during the excavation works.

2.1.7 Engineering Codes of Practice

The engineering design and construction specifications of wastewater collection and treatment utilities are regulated by several engineering codes of practice issued from the Minister of Housing. These codes of practice include some environmental conditions and specifications for different engineering works of wastewater projects. The relevant Codes of Practice are:

- Ministerial Decree No. 286 for the year 1990 concerning the Egyptian Code for Design and Execution of Water Supply and Wastewater Piping Networks.
- Ministerial Decree No. 168 for the year 1997 concerning the Egyptian Code for Wastewater Pumping Stations.
- Ministerial Decree No. 169 for the year 1997 concerning the Egyptian Code of Practice for Wastewater Treatment Works.
- Ministerial Decree No. 334 for the year 2002 concerning the Egyptian Code of Practice for Sanitary Ware in Buildings.
- Ministerial Decree No. 171 for the year 2005 concerning the Egyptian Code of Practice for Reuse of Treated Wastewater in Agriculture.

2.2 World Bank Guidelines and Safeguard Policies

The World Bank (WB) has identified 10 environmental and social safeguard policies that should be taken into consideration in its financed projects. The objective of these policies is to prevent and mitigate undue harm to people and their environment during the development process. The Safeguard Policies that are triggered are discussed below.

2.2.1 OP 4.01 – Environmental Assessment
The ISSIP-2 has been classified as Category B project, requiring an environmental assessment in accordance with the Banks Operational Policy on Environmental Assessment (OP 4.01). Projects under Category B are defined as projects that could have potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and other natural habitats, these impacts are site specific; few if any of them are irreversible; and in most cases litigator measures can be designed. The environmental impacts that are likely to be caused by the project have been analyzed in this ISSIP-2 EIA report. Mitigation measures were identified for all expected negative impacts, along with an Environmental management plan for implementation of these mitigation measures.

### 2.2.2 OP 4.11 – Physical Cultural Resources

The location of culturally valuable site near any of the project developments could not be confirmed at this stage. Also there is a possibility of chance-finding of such resources during the construction activities of the project. Therefore, the possibilities of triggering this policy are not known at this stage. In order to adequately manage this issue the Environmental and Social Management and Monitoring Framework (ESMMF) includes procedures for controlling possible impacts on such sites if existed near any construction works, the ESMMF also includes steps to be followed in case of chance-finds, these procedures are complying with the requirements of Law No. 117 of the year 1983 for the Protection of Antiquities aforementioned.

### 2.2.3 OP 4.12 – Involuntary Resettlement

According to the WB’s safeguard policy on Involuntary Resettlement, physical and economic dislocation resulting from WB funded developmental projects or sub-projects should be avoided or minimized as much as possible. Unavoidable displacement should involve the preparation and implementation of a Resettlement Action Plan (RAP) or a Resettlement Policy Framework (RPF) to address the direct economic and social impacts resulting from the project or sub-projects' activities causing involuntary resettlement. There is little possibility that the ISSIP-2 will cause physical or economic dislocation of people, through locating Pump Stations and Waste Water Treatment Plant. Thus, an RPF has been prepared in order to outline a proposed approach and work plan to guide the implementation, handover and monitoring and evaluation of the resettlement process, in case OP 4.12 is triggered at any point.

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2 The RAP requires detailed knowledge about concerned interventions, while the RPF outlines overall resettlement objectives and principles.
3. Baseline Study

3.1 Location

El Sharqiya governorate is one of the governorates of East Delta, it extends between latitudes: 10.30 and 19.31 to the north and between longitudes 15.32 and 25.32 to the east. To the north of El Sharqiya governorate situated The Manzala Lake & the governorate of Dakahlia, while Qalubia and Dakahlia is located to the west of El Sharqiya governorate, & governorates of Cairo & Qaliubiya is located at the south. At the east of El Sharqiya governorate located 2 governorates of the Suez Canal governorates: Ismailia & Port Said.

Figure 0-1: Districts of Sharkeya
Figure 3-2 above is presenting the location of the six districts in which the ISSIP-2 interventions will be implemented (Derb Negm, Zakazi, Abo Hammad, Ibrahimya, Faqous and Hehya).

3.2 Climate

Generally the climate of the governorate is moderate with low rate of rainfalls during winter and strong winds in the winter and spring. The average rainfall is about 17 mm/year. Temperatures are generally moderate with an average temperature of about 27°C in summer and about 18°C in winter. The average relative humidity is 80% in winter and about 72% in summer. The prevailing wind direction is northwest and north east (66% of the year). While the southwest winds are blowing during the summer and spring months (about 10% of the year). The Khamasin winds (loaded with dust) blow during the spring and significantly affect the air quality.

3.3 Air Quality

According to the Environmental Profile of Sharkeya Governorate (2007) the ambient air measurements taken from different parts of the governorate indicates that the ambient air pollutants are less than the allowable limits of Law 4/1994.

3.4 Soil Type

The top soil of the governorate is formed different types of soils, the clay and silty soil dominates the western parts of the governorate near the Nile delta, while the sandy soil dominate the desert areas in the south and east. Soil in many parts of the governorate, especially the northern parts, is suffering from erosion, which has led to desertification of some agricultural land in the governorate.

3.5 Flora and Fauna

Other than cultivated crops (in which the most common are cotton, wheat, rice, corn, and vegetables) in agricultural lands the governorate includes common plants of the region such as wormwood plant trees sycamore tree, acacia, eucalyptus and different palm plants which spread on the banks of canals and drains.

The dominating fauna in the area is farm animals and other species adapted to urban areas such as feral cats and dogs, rodents, lizards, bats and birds, which depend on waste for their nutrition.

None of 29 declared protected areas in Egypt exists in Sharkeya Governorate. The nearest protected area to the governorate is Lake Manzala in Dakahleya Governorate (about 30 km to the north).

Also among 34 important areas for birds (as declared by EEAA) none exists in Sharkeya Governorate. However, the Environmental Profile of Sharkeya Governorate has
mentioned that there are 3 lakes in the governorate known for bird watching tourism where some migrating birds from Europe rest during autumn, two of these lakes are located in Hosayneya District (not among ISSIP-2 districts) and one located near Ikyad village in Faqous District. Although Faqous is among the districts of ISSIP-2, this lake is located about 5 km southeast of the ISSIP-2 cluster in Faqous District.

3.6 Surface Water

Dameitta branch of the Nile is the western border of Sharkeya Governorate and forms the main source of water in the governorate. There is a number of main irrigation canals that passes through the governorate such as Manayef Canal in the north, Bahr Moyes and Bahr Faqous in the middle of the governorate and Ismailia Canal in the south. There are also major agricultural drains that pass through the governorate such as Bahr El Baqar and Mahsama Drains.

3.7 Groundwater

The main groundwater aquifer in the governorate is the Quaternary Aquifer which of an average thickness of about 120 meters. The Miocene Aquifer lies below the Quaternary Aquifer in the southern parts of the governorate. The hydrogeological maps of the governorate show that the groundwater flow is mainly towards the north (where Hehya and Faqous Cities are located) and also to the east (where Ismailia City is located). Groundwater table is deep in the desert southern areas of the governorate (reaching 70 meters) and relatively shallow in the northern parts of the governorate (reaching 1 meter).

3.8 Culturally Valuable Sites

The Governorate is rich of antiquity sites that include ancient Egyptian tombs, Islamic and Christian antiquity sites. The antiquity sites are San El Hagar, Tal Basta, Belbis, Saft El Henna, Tal El Dabaa, Tal Pharon, Al Soa, and Abbasa villages.

The information that was available during the preparation of this ESIAF was not sufficient to confirm or deny if one of the antiquity sites will be located near the project constructions. Therefore the ESMMF includes measures for adequate management of the project activities so as not to cause any impacts to possible nearby antiquity sites.

3.9 Water Supply and Sanitation Services

According to the statistics of 2007 the rate of water supply in the governorate is 74 liter/capita/day, which is much less than the national average of 120 liter/capita/day drinking water is produced from 5 main water treatment plants, 9 mobile plants, 196 groundwater wells and 8 desalination plants.

Concerning wastewater, the wastewater infrastructure of the governorate handles about 350,000 m3/day of sewage collected from different districts of the governorate. According to the Environmental Profile of Sharkeya Governorate, prepared in 2007,
among about 500 rural villages in the governorate, only 14 villages were served by sanitation services during 2007, and sanitation projects were under construction in another 17 villages. This gives indication that most rural areas in the governorate are deprived from the service.

### 3.10 Demographic and Socioeconomic Indicators

According to Environmental Profile of Sharkeya Governorate the population of the governorate was 5,340,058 capita in 2007, in which urban population was 23.1% and rural population was 76%. The average age of men is 70.4 years in the governorate and the average age of women is about 70.9 years. The ratio of males is 51.3% while the females account for 48.7% of the total population.

The proportion of illiterates in El Sharkeya is 2.1%. The following table shows the educational level of the population of the El Sharkeya governorate, where the percentage of pre-university education is 24.8% and the university education ratio is 9.2% of the population.

**Table 0-1: Education statistics in Sharkeya Governorate**

<table>
<thead>
<tr>
<th>Date</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
<th>Percentage of total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiteracy</td>
<td>19353</td>
<td>26152</td>
<td>45505</td>
<td>2.1%</td>
</tr>
<tr>
<td>Read &amp; write</td>
<td>8142</td>
<td>9301</td>
<td>17443</td>
<td>2.7%</td>
</tr>
<tr>
<td>In less than college</td>
<td>99875</td>
<td>97426</td>
<td>197337</td>
<td>24.8%</td>
</tr>
<tr>
<td>In college</td>
<td>22408</td>
<td>16206</td>
<td>38612</td>
<td>9.2%</td>
</tr>
</tbody>
</table>

Source: The Environmental Profile of Sharkeya Governorate

The governorate includes 27 central hospital and one University hospital. The mortality rate among children, during 2007, was 1.42% for infants and 2.02% for children below five years.

The Gross National Product of the Governorate was 7,621.9 according to the National Human Development Report of 2007. Agriculture is the main economic activity in the governorate, with 808,493 Feddans for productive land, along with related activity such as animal production, dairy production, poultry production …etc. Industry is concentrated in three main industrial cities: 10th of Ramadan, Belbeis and Salheya.
4. Project Description

4.1 The Project Areas

The ISSIP-2 will be implemented in the districts of Derb Negm, Zakazik, Abo Hammad, El Ibrahimeya, Faqous and Hehya of Sharkeya Governorate. The proposed project interventions will be within six clusters, each cluster form a centralized system serving scattered low population areas. The six clusters will include 37 villages as indicated in Table 4-1. While Figure 4-1 illustrates the locations of the six clusters within the Governorate.

Figure 4-1: Map of Sharkeya Governorate showing the clusters of ISSIP-2
<table>
<thead>
<tr>
<th>District</th>
<th>Cluster</th>
<th>Village</th>
<th>Local Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derb Nejm</td>
<td>1</td>
<td>Alkhaes</td>
<td>Alswah</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amreet</td>
<td></td>
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<td></td>
<td></td>
<td>Ksheek</td>
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<td></td>
<td></td>
<td>Dbeej</td>
<td>Gmezat Bani-Omar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bramkeem</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Almeesa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Manshyat Kishk</td>
<td>Safour</td>
</tr>
<tr>
<td>Elzaqazeek and Abo-hammad</td>
<td>2</td>
<td>Kafr Abaza</td>
<td>Bardeen</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Touhrat Hemed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Inshas Elbasal</td>
<td></td>
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<td>10</td>
<td>Elzahraa</td>
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<td>11</td>
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<td></td>
<td>12</td>
<td>Kafr Dnohia</td>
<td></td>
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<tr>
<td>El-ibrahimya</td>
<td>3</td>
<td>Kafr Elshorafa</td>
<td>Mubasher</td>
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<tr>
<td></td>
<td>13</td>
<td>Kafr Mohsen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Sharqyat Mubasher</td>
<td></td>
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4.2 Project Objectives

The main objective of the project is to provide the targeted population in Sharkeya Governorate with sanitation services which will improve the hygiene and health conditions at these locations.

The development objective outcome will be measured by the following indicators:
- Increased number of people with access to improved hygiene and sanitation services in the project areas
- Reduction in domestic pollution loads from the project areas entering water courses
- Improved capacity of project implementing agencies to design, implement, operate and maintain project infrastructure

4.3 Existing Situation and Proposed Project Interventions

The total population in the six clusters is 1,785,222 capita according to 2006 censes. The project has two phases; the first phase is to provide the sanitation services for the above mentioned villages up to year 2030. The second phase is to provide the sanitation services up to year 2050.

The main components of the sanitation systems that will be provided by the ISSIP-2 are:
- Gravity sewers and the associated house connections. The sewers network will be laid under roads in the villages and will end in pump stations. It is worth noting that the main villages, previously indicated in Table 4-1 will also receive wastewater from smaller settlements nearby that could be served with the same pump stations.
- Pump Stations (PS) which will be located at low elevations, relative to gravity sewers. PSs will include submersible pumps that will transfer the sewage to wastewater treatment plants (WWTP)
- Force Mains (FM) which are pressurized pumps that transfer sewage from PSs to WWTPs
- Crossing works in which the force mains cross a road, a railway line or a water course. Generally crossing works should be avoided for minimizing project capital costs as well as minimize disturbance to crossed ways
- WWTPs which provides secondary treatment to the sewage before being discharged to irrigation drains.

In addition to the infrastructure improvement (which is the hardware component of the project) the project will also include an awareness component for improving hygiene practices and utilization of new systems, a monitoring component for selected water bodies to monitor the environmental benefits of the project and an institutional development and capacity building component for the implementing agencies.

Table 4-2 gives the number of PS, WWTPs and crossing works at each cluster.

Table 4-2: Proposed project interventions at the six clusters
4.4 Estimated Costs

The total budget of ISSIP-2 for covering the four governorates (Sharkeya, Sharkia, Asyut and Sohag) is US $ 315 Millions. Budget for infrastructure interventions is US $ 300 million, while budget for the awareness component, the monitoring component and institutional development components is US $ 5 million for each.

4.5 Description of the Construction Activities and the Associated Environmental Aspects

4.5.1 Construction of Wastewater Treatment Plants and Pump Stations

Construction activities include preparation and leveling of the site, excavation works for the sumps and reactors, civil works for buildings, transportation and fixation of heavy equipment (generators, transformers, pumps, steel bridges over reactors and tanks), and testing for water proofing and for electromechanical equipment.

The construction of inlet works, reactors and sumps will require major dewatering and driving down of prefabricated units in the soil. There will be a need for establishing temporary offices, workshops and housing units for construction labors.

As a result of WWTP and PS construction, large amount of soil may be produced due to excavation and leveling works. In addition, at areas of high groundwater tables, a significant amount of water due to dewatering may be produced. Solid waste and sewage will be generated from the construction labors. Solid wastes and liquid wastes will also be generated from the construction of the WWTP and the associated administration building, workshops, and installation of equipment. The handling of these wastes is further discussed in Chapter 5 and 7.

4.5.2 Construction of Force Mains and crossing works

Force mains are constructed in trenches, however, since it is under pressure and according to the site conditions it might be constructed above ground at certain sites.

Avoiding crossing works, as much as possible, is strategically adopted by the engineering consultants of the project, Al-Dar Consulting Engineers, through selection of WWTP
locations. However, because of the nature of the project area and the excessive number of watercourses, small roads and railways, crossing works could not be completely avoided.

Crossing works for watercourses are normally undertaken over piles that are driven into the canal bed through auguring or impacting. This is done only in the non-navigational canals, which applies to the majority of canals in the project areas. For navigational canals, the crossing is undertaken either through the side or piers of an existing bridge, or through tunneling a culvert under the canal. However, it is believed that crossing through tunneling could be avoided, because of its relatively high costs.

Crossing of roads is normally undertaken through cross excavation of the road, placing of a concrete, or steel, culvert which will contain the crossing pipeline, and then filling over and repaving the road. Sometimes the Traffic Department refuses to obstruct major artery roads in order to keep the traffic flow. In such cases a tunneling technique should be adopted to pass the pipe culvert.

The same two methods, cross excavation and tunneling, also apply for crossing railways. However, it will be more common to use the tunneling technique for crossing railways to avoid delays in trains' traffic.

4.5.3 Construction of Collection Systems and House Connections

The sewage collection system that will be implemented in the project is a shallow system. The public sewers are constructed in trenches normally located middle of the roads. Most of the roads in villages are compacted silty clay or sand. Accordingly, except in some main roads, there will be no need for asphalt demolition. The excavation works shall mainly be undertaken using mechanical excavators, but in some cases the excavation will be manual, especially in narrow streets which do not allow for excavator's access.

The construction of house connections will be carried out by the project, in order to adhere to the technical specifications of the collection system, avoid uncontrollable delays, and operate PSs and WWTPs at optimum capacities. The construction of such system will include excavation of roads in front of houses; possible introduction of plumbing modifications to the sanitary facilities.

Units that generate oily wastewater or high solids content, such as restaurants, bakeries, mechanic workshops, service stations, ...etc. will need to install oil traps, or interceptors to retain unacceptable oil/solids loads from entering the sewerage system.

4.6 Description of the Operation Activities and the Associated Environmental Aspects

4.6.1 Operation of Collection Systems and Rising Mains

Wastewater shall be collected in the public sewers, through house connections, where it flows by gravity to PSs then to WWTPs. The interceptors and oil traps, which shall be
fixed in some households and commercial units, should be cleaned frequently from separated oils and settled solids, to maintain their performance as designed. Maintenance and repair works during the operation stage could be undertaken by local CDAs or Project Operators (PO) assigned by the WSC.

4.6.2 Operation of Pump Stations

Collected wastewater is discharged through the gravity systems to the PS sumps, which will be equipped with level controls to operate the pumps when sewage level in the sump reach certain levels. The PS will be equipped with screens to separate impurities and large solids, in order to prevent pumps clogging; these screens should be cleaned frequently to maintain its efficiency.

4.6.3 Operation of Wastewater Treatment Plants

Secondary treatment, using the activated sludge process, will be used in the WWTPs followed by disinfection with chlorine gas. In order to prevent production of harmful chlorinated products, it has been recommended in the ESMMF to undertake de-chlorination, after completion of disinfection process, using sulphur dioxide or sodium thiosulphate.

The removed sludge from secondary sedimentation is partially pumped to the drying bed for volume reduction (through drying). Separated sludge According to further analysis in this ESIAF, it has been recommended to separated sludge chemically stabilize sludge inside WWTPs, using lime, to minimize odors generation and vectors attraction.
5. Potentially Significant Environmental and Social Impacts

5.1 Positive Impacts

The aim of the ISSIP-2 is to achieve environmental improvements in the project areas through providing sustainable safe sanitation services to areas which were deprived from these services. The following are the main environmental and social benefits expected from the ISSIP-2:

- Reduction of health risks associated with exposure of villagers with improperly drained sewage in their surroundings
- Reduction of water borne diseases resulting from possible microbial pollution of drinking water obtained from shallow contaminated wells, or through suction of contaminated water in water supply pipes through accidental negative pressures in water pipes
- Improve water quality in drains and irrigation canals and water intake facilities, which currently receive raw sewage evacuated from individual cesspits and collected from private sewerage networks in some villages
- Improve groundwater quality through preventing infiltration of sewage from porous cesspits
- Alleviate high groundwater table problem in the project areas
- Improve quality of life for targeted villagers through achieving the above environmental benefits, upgrade their real estate values and contribute in alleviating poverty conditions through work opportunities in construction and operation of the project
- Achieve economic benefits by saving some healthcare expenses, improving people's productivity and improving water resources management
- Strengthen community participation in environmental protection through involving CDAs in project operation and social mobilization activities

5.2 Potentially Negative Impacts during Construction

5.2.1 Risks Associated with Waste Handling and Disposal

The waste that would be generated during construction could be categorized to the following categories:

- Excavation waste, which is usually inert if the construction site is free from land contamination. However, there might be cases where contaminated areas are selected for PSs and WWTPs. The possibilities for encountering such situations could not be assessed at this stage as the exact locations of PSs and WWTPs have not been finalized.
- Water removed from excavated areas through the dewatering process is an environmentally important issue. Open land disposal of this water could also cause significant nuisance if it was not properly drained.
5.1.3 Solid Waste

- Old cesspits which shall be demolished, if not utilized, during the fixation of new house connections. There will be a requirement to evacuate the remaining sewage in these cesspits by tankers, which should be discharged to the nearest WWTP.
- Human wastes generated by construction labor, including sewage and garbage collected from labor camps in PS and WWTP locations
- Normal construction waste including wasted concrete, steel, bricks, wood ... etc, which is chemically inert

The ESMMF includes measures to adequately manage these types of waste.

5.2.2 Noise and Air Emissions

The excavation of top soil in construction sites will cause dust emissions that will vary according to the type of soil and the excavation technique. Also there are other, relatively minor sources of air emissions, such as construction trucks and power generators.

Noise will also be associated with construction activities, especially those associated with using heavy machinery for demolition, piling, tunneling, use of cranes, heavy trucks and generators. The noise of these equipment vary from continuous sources, such as cranes and trucks, to intermittent impacts, from piling and demolition. The most effected people of noise impacts are the construction workers, then the neighboring residential areas.

The ESMMF includes measures to ensure compliance with Law 41/1994 standards for air and noise emissions.

5.2.3 Disturbance of Traffic and Difficulty of Access

The main impact on roads traffic will be during possible lying of transmission mains along, or cross main roads. Longitudinal excavation will cause narrowing of the excavated road for relatively long period, while the lateral crossing of roads may cause blocking of the road, but for relatively short period, possibly few hours.

Because the control of traffic impacts, resulting from crossing works, is undertaken by the Local Traffic Department and Railway Authority (for railways crossing), the ESMMF has focused on establishing coordination between the ISSIP and the two authorities to prevent unacceptable traffic delays.

Excavation in villages' roads will cause minimum impact to vehicles traffic, as most of villages roads are mainly used for pedestrian and field animals traffic. Therefore, the blockage of villages' roads through excavation will cause access problems to pedestrians, and possibly to riders of animals and agriculture tractors. This access difficulty will have more impacts on elderly people, handicapped and children, who may accidentally fall in open trenches or make tedious long cycles before they reach their targeted locations. The ESMMF includes mitigation measures to be taken during construction to minimize such effects.
5.2.4 Effects on Structures Integrity

Weak structures are very sensitive to differential settlement, which can affect its stability. The differential settlement could be associated with dewatering activities, if groundwater table is lowered than the foundation level for surrounding buildings. Furthermore deep excavations could cause soil movements that could also result on differential settlements for adjacent sites, while piling, especially for PS sumps, could cause violent vibrations that could also cause effects on the surrounding sites.

The construction of pipeline trenches will require much less dewatering, compared to PS sumps, but because that villages and Izbas in the area are characterized by narrow streets, the houses will be relatively close to trenches. Therefore, it has been recommended in the ESMMF to confine the lowering of groundwater in trenches by applying deep wood sheets to confine lowered groundwater table to the sides of the trench.

The risk associated with dewatering works in WWTPs on neighboring building is considered negligible, because there will be buffer zones between the WWTP and nearest buildings.

5.2.5 Risk of Injuries to Construction Labor

Injury to construction labor might occur during construction works through falling into open trenches, collapse of old walls, falling from heights, falling of hoisted objects, injuries during hammering, welding ... etc. Normally construction workers are trained to avoid such accidents especially those who work for large construction companies which adopt strict occupational health and safety measures. The ESSMF includes measures to ensure adoption of sound safety measures by construction contractors.

5.2.6 Risks of Improper Management of Culturally Valuable Sites

There are number antiquity sites in the project area, in which their exact locations and the proximity of these locations to one of the project developments are not confirmed at this stage. In such case, the risk on such structures will be similar to the impacts on structures integrity discussed previously.

Law 117/1983 for the Protection of antiquities has set certain standards that should be followed during excavation works near a registered antiquity site. The Supreme Council for Antiquities emphasizes that collaboration should be established between the Council and the infrastructure developer during construction near an antiquity. These standards and requirements were adhered in the ESMMF, which has defined procedures for chance-finds of antiquity objects, and measures for protection of antiquity sites during construction activities. Also the ESMMF has defined procedures for managing chance-found antiquity objects.

5.2.7 Risks of damaging underground infrastructure
During excavation for laying the sewerage pipes there are risks of damaging underground potable water pipes, or telecommunication lines. Although having sewers normally laid in the middle of roads, while water pipes and telecommunication lines, if it is underground, normally laid on road sides will reduce damage risks, most of these infrastructure lines were laid long time ago without adherence to their normal locations.

In the public consultation, the participants suggested that the contractor should use data available from information technology center prepared by the governorate in regards to infrastructure underground network (drinking water, electricity, and telecommunication) which has been recommended in the ESMMF.

5.2.8 Socioeconomic Impacts of Construction Works

Construction of piping network will cause traffic delays, which may impact the lucratively of microbus and small carts owners. Also there may be delays for employees, merchants and entrepreneurs reaching their works. Normally such impacts are minor and could be tolerated by inhabitants of rural area, who commonly walk for long distances before reaching the main road where they can find their targeted means of transportation. In case of construction works in a certain road, it will still be convenient for villagers, in most cases, to walk the same distance to reach another part of the road that does not have traffic congestions.

On the other hand, the scale of such impacts could be raised if the construction works lasted for long times. In the public consultation, it was suggested that the contractor will be advised to arrange with the society NGOs the schedule of excavation and take the sensitivities about vital and important roads into his account during construction works. This has been reflected in the ESMMF.

5.3 Potentially Negative Impacts during Operation

5.3.1 Risks Associated with Sludge Handling

Sludge management is one of the most important challenges facing WWTPs, because of the large amounts of sludge that constitute high concentrations of pollutants separated from the treatment process. The standard WWTP process as identified by the engineering consultants includes sludge gravity thickening tanks, where the solids is more concentrated and supernatant is returned to biological treatment, followed by drying beds that depend on solar/atmospheric drying. Dried sludge will either be used as organic soil conditioner/fertilizer or disposed in disposal sites.

The main environmental impacts associated with sludge handling are the bad odors, the attraction of insects its high content of pathogens and heavy metals.

Sludge drying beds will achieve partial stabilization of the sludge. Accordingly, the application of lime has been recommended to provide a more rapid rate of sludge stabilization, to mitigate impacts inside WWTPs. The application of lime has been
recommended by the Executive Regulations as one of sludge stabilization alternatives. Lime stabilization has also the advantage of being relatively cheap and easy to apply, therefore it has been recommended in the ESMMF.

5.3.2 Risks Associated with Disposal of Final Effluent

The proposed secondary treatment followed by disinfection in the WWTPs will normally qualify the final effluent for meeting Law 48/1982 standards. However, there are possibilities that some operational problems may cause non compliance with these standards. These problems are related to overloading the WWTP through more sewage quantity, through higher loads, or through bypassing the WWTP during maintenance and repair periods.

The production of chlorination byproducts is another environmental issue, these byproducts result from the reaction of chlorine with the organic matter in water. These byproducts suspected for their health effects to humans therefore they are usually regulated in drinking water supplies. Although there is little possibility that these byproducts migrate through drains to reach a drinking water supply, the formation of such byproducts is not environmentally favorable especially that they could have impact on aquatic life. The mitigation measures of the ESMMF includes performing de-chlorination, to eliminate free chlorine after achieving the bacteria kill, to prevent further production of harmful chlorinated products as result of reaction of free chlorine with drains' organic matter.

5.3.3 Nuisance from PS and WWTP

The operation of PSs and WWTPs is normally associated with generation of odors and vectors. The odors will be mostly generated from sludge handling units, inlet open channels and screens. The biological units will also generate odors if it is overloaded or not provided with sufficient aeration. The impacts of odors are subjective; it could vary from one person to another according to the background odors in the area. Also people tolerance of odors differs according to their exposure for similar odors. For example in WWTPs the staff working at the plant is normally more tolerable to odors than inhabitants of neighboring residential areas.

The feasible methods for controlling odors is through maintaining high performance of biological treatment of wastewater and chemical treatment of sludge as indicated in the previous two sections. Other means of mitigation is to be as far as possible from odor recipients, which could be done through the selection of PSs and WWTPs locations, and keeping suitable buffer zones between odorous units and neighbors. It has been recommended in the ESMMF to model odor dispersion through appropriate air dispersion modeling technique.

5.3.4 Risks Associated with Handling of Hazardous Substances and Disposal of Hazardous Waste
The hazardous substances that would be handled in WWTPs include chlorine gas, diesel for standby generators, lubricating oils and laboratory chemicals. Chlorine gas is heavier than air, very toxic and cause suffocation, if inhaled. It is also highly corrosive. The Egyptian Engineering Code for Design and Execution of Wastewater Treatment Plants, Decree 1691/1997, has set certain precautions for safe storage which should be considered in designing chlorine buildings. This has been considered in the ESMMF. It is expected that utilized steel chlorine cylinders will be returned to the vendor for refilling, therefore no risks are expected for disposal of empty chlorine cylinders. The diesel in PSs and WWTPs will be stored. The main environmental risk associated with diesel storage is leakage. The ESMMF includes measures to minimize leakage risks and containment of any leakage if occurred. Lubricating oils and laboratory chemicals that would be used in PSs and WWTPs workshops may have some hazardous properties, however, normally the risks in both possibilities and pathways are minimum if adequate handling procedures are employed.

5.3.5 **Risks of Clogging to the Shallow Sewers System**

The shallow sewerage system selected for the project, although achieves benefits of low cost construction and significantly less construction waste production, is characterized by low pipes slopes and, accordingly higher risks of clogging. The ESMMF has addressed sewers clogging risks through maintaining the performance of individual solids/oils separation units, fixed for some commercial units, through pipeline maintenance, and through prompt response to any clogging incidents.

5.3.6 **Risks Associated with Passing Sewage Pipes over Watercourses**

There may be necessary crossing for rising mains above surface water bodies, which are either supported on piles or on piers of existing bridge. The environmental risk is associated with possibility of leakage from the rising mains directly to the water. Such risk is relatively low, because of the low possibilities, especially during the first years of operation, and because normally the leaking quantities are quite low. However, the ESMMF has identified measures to detect leaks and undertake regular maintenance.

5.3.7 **Risks Associated with Handling and Disposal of Commercial Units, PS and WWTP Waste**

These wastes include separated solids and oils from commercial units interceptors, screens of PSs, grit removed from WWTPs and oil traps. Separated solids should be collected and discharged to sludge pumping stations in WWTPs; accordingly these solids will pass through sludge stabilization processes discussed earlier. Screened solids from PSs normally are large objects, relative to settled solids from wastewater, which could be categorized under domestic solid waste, such as tin cans, bottles, food remaining ... etc. Such waste is normally inert and could be disposed in normal domestic waste disposal areas. Grit separated in WWTPs normally contains sand, gravel and some relatively large solid particles, the suitable method of handling this grit is to stabilize it with lime and place it in drying beds. Oil separators receiving wastewater from mineral oil sources,
such as petrol stations and mechanics workshops, will have hazardous oil that should be safely transported to a hazardous waste facility.

5.3.8 Air Emissions and Noise

WWTPs that work with the activated sludge process, and use surface aeration system, will generate fine spray droplets from the aeration tanks, these droplets could be dispersed for long distances, especially during periods of strong winds. These droplets will contain relatively high concentrations of pathogens existing in the aeration tank, and hence could cause infection risks to neighboring areas. The ESMMF includes measures to minimize these risks to the WWTP workers and the neighboring community.

The impact of such air emissions of standby generators are considered minor, because the diesel generators are only expected to operate temporary during power cutoffs.

Noise generating sources in the project are pump rooms in PSs and WWTPs, however, the impacts are expected to be minor, or even negligible, to the neighboring sites because normally those pumps are contained inside building. A relatively higher impact will be on the PS staff, which may be exposed to intermittent pumping noise, caused by intermittent pumps switching controlled by level control. This may be uncomfortable to PS staff. Measures for compliance with Law 4/1994 noise standards, especially for the working environment, have been recommended in the ESMMF.

5.3.9 Socioeconomic Aspects for Affordability and Willingness to Pay Capital and Operational Costs

Recovery of house connection costs and project operation costs is a key issue for the project sustainability. The provision mechanism of these costs was not finalized before the preparation of this ESIAF. If the villagers will have to pay for their house connection and for maintenance and operation of the project facilities willingness and affordability issues will be raised. In the current situation villagers are already paying for evacuating their cesspits on regular basis, it would be expected, in general terms, that they will tolerate paying for operation and maintenance for the sewerage system if the cost will be almost equal to what they are paying currently, especially that a sewerage system is a much better service than sewage tankers. The exact socioeconomic impact of this issue can be adequately assessed if a willingness to pay study is undertaken for the proposed villages, which is a recommended measure in the ESIAF.

5.3.10 Effects on Cesspits Evacuation Business

The currently active cesspits evacuation business will suffer from gradual reduction of number of customers as the ISSIP-2 coverage extends. Because the cesspits evacuation business basically depends on renting the tankers, many other applications could use these tankers in serving un-covered villages by the ISSIP-2. Also these tankers could be employed in some activities of the ISSIP-2 such as evacuating existing cesspits before
construction of house connection and contracting local CDAs in cleaning some of the interceptors of some commercial units. Therefore such impact is considered minor.
6. Analysis of Alternatives

The objective of analyzing different project alternatives is to evaluate some project options, which have not been decided before the preparation of this ESIAF, from the environmental and social perspective. This analysis of alternatives shall help project stakeholders in reaching some strategic options for the project design.

Because that the exact development of the project has not been identified at this stage, many important alternatives could not be evaluated in this ESIAF, such as site alternatives for PS, WWTP, routing of rising mains, selection of discharge points in drains, locations of waste disposal sites, ...etc. Therefore a screening criteria, later presented in the ESMMF, shall provide guidelines for the Project Implementation Unit (PIU) to weigh different alternatives, in due time, and reach adequate environmentally sound selection of such alternatives.

6.1 No Project Alternative

The ISSIP-2 is expected to result in significant environmental improvement in the project areas. The existing situation, in which target areas are deprived from sanitation services, leads to major environmental and health problems to inhabitants. Even though there are some impacts associated with ISSIP-2 construction and operation as previously indicated, the overall environmental impacts are expected to be positive. This conclusion is reflected on the views of project stakeholders as the main concern was the delay in project implementation where they can get use of the important project benefits.

Environmental improvements expected from the ISSIP-2, over the existing situation include:

- Improving surface water quality in the project areas. Although there are risks of discharging noncompliant effluent to drains as discussed earlier, overall the pollution loads received in water courses will be significantly reduced, because currently large ratio of generated sewage is discharged by tankers to drains. Although the rate of sewage generation could increase as a result of the project, due to expected increase of water consumption as reaction to the availability of sanitary drainage, the better effluent quality discharged will make the received load of each pollutant much lower.

- Improve the quality of groundwater and the high water table in most of the project areas, through preventing infiltration of sewage to groundwater

- Although there may be odor problems associated with operation of WWTP and PSs, the impacts of odors and vectors problems are expected to significantly improve. In the existing situation the infrequent evacuation of cesspits and land discharge of sewage makes the odors/vectors problems much more acute and disperse than the expected impacts around WWTPs and PSs.

- The socioeconomic benefits of the project significantly outweigh the expected impacts. The ISSIP-2 shall upgrade the quality of life of inhabitant, through improving public health, reducing water borne diseases, improving psychological
stress resulting from odors, vectors, stagnant water, unavailability of appropriate urban drainage, …etc. Although there may be few economically effected groups such as inhabitants of neighboring lands to WWTPs and PSs and cesspits evacuation contractors, much more groups will gain economic benefits such as workers in construction and operation and owners of served areas with the sanitation services, in which real estate prices are expected to raise.

The impacts expected by the ISSIP-2, which are not materialized in the current situation include:

- All impacts expected during construction
- Risks associated with handling of chlorine, and ASTs
- Air emissions of standby generators in PSs and WWTPs

The overall environmental and social advantages are believed to significantly overweigh the disadvantages, especially when the recommended mitigation measures are implemented.

### 6.2 Alternatives of Piping Materials

There are no direct preferences for piping materials from the environmental and social point of view related to the direct impacts of the ISSIP-2. However, the preferences will be based on the life cycle analysis of these piping materials.

The screening criteria in the ESMMF has included complete ban of using asbestos pipes in the ISSIP-2, due to the problems associated with its disposal during the project operation. The ban of asbestos and awareness of its dangers is growing in Egypt; however, this is not yet officially reflected in available Laws and Codes of practice.

### 6.3 Alternatives to the Utilization of Sludge

The sludge generated from WWTPs shall be utilized in conditioning agricultural lands or disposed in landfills.

The utilization of sludge on agricultural land is the preferred option from an environmental point of view, provided that there are safe concentration levels of heavy metals, safe biological properties, and safe land application rates followed according to the specifications of Decree 44/2000 and the guidelines of USEPA. The reason for this preference is that volume of waste received in disposal sites will be reduced and an equivalent quantity of chemical fertilizers, associated with an environmental cost for its production, will be saved.

On the other hand, the sustainability of using sludge as a land conditioner will be doubtful if the costs for sludge quality monitoring are not covered by revenues from sale of the sludge. In other words if revenue from the sale of sludge does not cover the extra WWTP operating costs resulting from monitoring activities recommended in the ESMMMF, it will be better to go for the disposal alternative.
The PIU should assess whether it is feasible to sell the sludge as land conditioner after implementing recommended quality control measures, before starting the project operation.

If reusing the sludge is not a feasible option, then the PIUM should plan for sludge disposal in landfills.
7. Environmental and Social Management and Monitoring Framework

7.1 Objectives of the ESMMF

The objectives of this Environmental and Social Management and Monitoring Framework are to initiate a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators. The ESMMF identifies certain roles and responsibilities for different stakeholders for implementing, supervising and monitoring the environmental performance of the project.

7.2 Management and Monitoring Activities During Construction Phase

The overall environmental management of the ISSIP-2 will be the responsibility of the Project Implementation Unit Manager (PIUM) who will supervise the environmental aspects of the project, in addition to his role in overall management and monitoring of the project. The PIUM will be supported by Environmental Experts in the Rural Sanitation Units (RSU) of Sharkeya Water and Sanitation Company (RSU-EE). The EIAs for WWTPs and collection systems as well as specialized work required for the implementation of ESMMF measures will be undertaken by consultants assigned by the PIU. The implementation of most of ESMMF measures during construction will be undertaken by the contractor and will be supervised by Construction Supervision Consultants (CSC) assigned by NOPW ASD for WWTPs and by WSC for collection systems. The distribution of tasks for ESMMF measures during construction are explained below according to this general setting. More details about the environmental institutional structure of the ISSIP-2 is given in Section 7.4.

7.2.1 Management of Waste Generated During Construction

Mitigation measures:

The following mitigation measures are recommended for controlling the impacts associated with waste generated during construction activities:

1. Selected sites for PS (along with the associated collection networks) and WWTP should be environmentally assessed prior to starting construction activities. An Environmental Consultant should be assigned to undertake Environmental Impact Assessment (EIAs) as required by Law 4/1994. The EIAs will identify the degree of contamination and the costs for adequate waste management associated with site preparation. The PIUM will then evaluate whether it is feasible to using the site, given the waste management costs, or it is better to move to another site.

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3 The PIU which has been formed for ISSIP-1 will also be responsible for ISSIP-2 as further explained in Section 7.4
2. Contaminated sites, which will be found feasible to comply with waste management procedures, should have certain areas for stockpiling waste. For general domestic waste (garbage) waste stockpiles should be hauled at the end of each day to approved solid waste disposal sites by the local authority. If the encountered waste is hazardous, such as contaminated soil with hydrocarbons, industrial waste or healthcare waste the following steps should be followed:

- All workers in cleaning the site should wear protective gear identified by the ESA depending on the type of waste. At minimum the protective gear should include safety shoes and anti puncture gloves in case of healthcare waste.
- The waste should be hauled to the nearest approved hazardous waste disposal facility, which should be notified about the waste type and estimated quantity before site clearance begins.

The previous measures should be undertaken by the construction contractor and supervised by an environmental consultant assigned by the PIU.

3. There shall be no land disposal for water removed from construction sites. Based on geotechnical investigations that will be carried out during the design phase, the design engineer should estimate volumes of dewatering liquid, and dewatering schedule and the proposed methods for discharging this water to a sewer, an agricultural drain or recharging to the groundwater, so no ponds of stagnant water would be left behind. The PIUM should make sure that discharging this water to the sewer should be undertaken in coordination with the Water and Sanitation Company (WSC), and that discharging this water to agricultural drains or recharging it to groundwater should be approved by the Ministry of Water Resources and Irrigation (MWRI). Adequate dewatering practices will be designed by the design consultant, undertaken by the contractor and supervised by CSC.

4. Sewage/septage remaining in cesspits, which will be bypassed or demolished during construction of house connections, should be removed by tankers and disposed in a PS, WWTP, or a city sewer. This should be undertaken by the construction contractor and supervised by the CSC. The CSC should make sure that the contractor has coordinated with the WSC and is actually implementing this on ground through random inspections.

5. Contractors should allocate certain areas within the construction site for the offices/camps of the construction staff. There should be collection tanks for receiving wastewater from these offices/camps, which should be tightly closed and evacuated frequently to operating PSs, WWTPs or city sewers. There should also be covered bins for the collection of solid waste and the construction contractor should make arrangements with the local authority or a solid waste collector to frequently remove this waste from the site and to dispose it in an approved disposal sites. This should be undertaken by the construction contractor and supervised by the CSC who should make sure that the contractor has coordinated with the WSC and the Local Authority, for disposal of sewage and garbage, and is actually implementing this measure on ground through random inspections.

6. Inert construction waste in PS and WWTP sites should be collected in designated areas inside the construction site and hauled frequently to approved disposal sites.
by the local authority. This should be undertaken by the construction contractor and supervised by the CSC.

Monitoring Activities:

1. Observation of accumulated waste, in terms of waste stockpiles and waste bins. This monitoring activity will be undertaken at the end of each business day by the CSC and reported in monthly reports.
2. In case of contaminated sites with hazardous waste the environmental supervising consultant should monitor quantities of delivered hazardous waste to appropriate facilities through reviewing delivery manifests.

7.2.2 Management of Noise and Air Emissions

Mitigation measures:

1. During excavation in sandy soils, which will lead to dense dust emissions, the soil should be sprayed with water. Excavated soil stockpiles and stored sand should be located in sheltered areas. Stored fine sand should be covered with appropriate covering material, such as polyethylene or textile sheets to avoid soil dispersion. The transportation of excavation/construction waste should be done through licensed and sufficiently equipped vehicles with a suitable special box or with a cover to prevent loose particles of waste and debris from escaping into the air or dropping on the road.
2. Air emissions of construction machinery should be within the standards of Annex 6 of the Executive Regulations of the Environment, which have been presented earlier in Table 2-7. This could be achieved by including this requirement in the tender document for construction works, and reviewing of contractor documentations about construction machinery exhaust emissions. The PIUM, assisted by environmental consultant if needed, should make sure these measures are included in the tender document and in contractors bids.
3. Minimization of exposure of construction workers to different noise levels and noise impacts according to the Law standards mentioned in Tables 2-5 and 2-6 in Chapter 2. This could be achieved through adjusting working hours, breaks, and exposure duration to be within permissible limits. Also construction workers should be provided with ear muffs, if needed, especially for those working near piling machines.
4. Minimize construction through nighttime whenever possible to reduce disturbance to residential areas.

The implementation of field work mitigation measures shall be the responsibility of the contractor, while CSC shall provide field supervision and document the contractor's compliance with the above measures in monthly reports.
Monitoring activities:

1. Noise Monitoring will be undertaken to check that noise levels and noise exposure are within the permissible limits of the Law. Point sources noise monitoring should be undertaken beside noisy machinery in locations of workers' exposure. Ambient noise measurements should be taken at neighboring sites of the construction activities. A noise meter will be available to the PIU in which the RSU-EE should take these measurements.

2. Noise complaints from neighboring locations should be registered by the CSC. When complaints are received they should be recorded and documented in monthly progress reports.

7.2.3 Management of Traffic and Facilitation of Access

Mitigation Measures:

1. Because the control of traffic and railways is the responsibility of the Local Traffic Department and the Railway Authority respectively, all mitigation measures for safeguarding long delays of vehicles and trains traffic will be undertaken by them. The role of the project management will be focused on involving the two authorities in the project planning process, to identify the type of crossing works, and to take their permission for the duration and method of execution for specific crossings. The responsibility for having approvals of both authorities during planning phase will be on the PIUM, while taking specific excavation permits during construction will be carried out by the RSU-EE.

2. During the excavation of roads in villages, there should be a wood or metal bridge for pedestrians' access over each opened trench. Pedestrian paths beside or across trenches should be as flat as possible, and clearly marked with warning signs that are visible at night. In all cases the maximum length of an open trench in certain road should not exceed 500 meters. This measure should be implemented by the contractor and supervised by the CSC.

3. The contractor should assign at least one worker, or guard, on duty at the construction site overnight, to help people access the paths and bridges, and to respond to any falls or accidents.

4. Alternate access routes should be identified and communicated with the residents before starting construction. This will be implemented by a suitable CDA who shall be nominated and supervised by the PIU/RSU.

Monitoring Activities:

1. The monitoring of traffic flow on roads and railways shall be undertaken by the Traffic Department and the Railway Authority. The monitoring activities that should be undertaken by project include recording and documenting the contractor's access facilitation adequacy and possible, complaints from residents and falling accidents.

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4 This condition has been recommended by the HCWW
7.2.4 Management of Structures Stability

Mitigation measures:

1. During the geotechnical investigations for PS sites, prior to dewatering or deep excavation, the effects of dewatering, hammering and earthworks on surrounding buildings should be investigated. The geotechnical report should include certain measures to be followed by the contractor according to the proximity of surrounding buildings, and the expected features of dewatering and earthworks. The PIUM should make sure, through reviewing geotechnical reports, that the geotechnical engineering consultant has fulfilled these requirements.

2. During construction the CSC should ensure that the contractor is accurately implementing the recommendations of the geotechnical reports, for PS locations. Among the measures that could be employed:
   - Apply the recommended time schedule for dewatering and piling machines, and the safe excavation slopes recommended by the geotechnical report.
   - For confining dewatering process in PSs a suitable piling curtain should be fixed (such as secant piles or sheet piles) according to the recommendations the geotechnical report.
   - For providing protection against vibrations around PS locations, the geotechnical report may recommend establishment of cutoff barrier through a vertical trench, whenever needed, to absorb vibrations.

3. For dewatering from trenches in narrow streets, there should be wood sheets driven in the soil at the edges of the trench to keep groundwater table unchanged under existing buildings. The geotechnical report should identify suitable safe slopes and buffer distances to houses during trench excavations, and CSCs should ensure implementation of these slopes.

Monitoring activities:

1. The CSC should document his observation on the buildings stability, as well as any complaints or suggestions from residents.

7.2.5 Enhancing Safety of Construction Labor

Mitigation measures:

1. During tendering phase the PIUM should make sure that the tender documents include requirements for contractors to submit their safety plan among their technical offers. The tender evaluation should have suitable scoring for better safety plans.

2. During construction the CSC should make sure that the contractor is adhering to the safety plan prepared for the site. Any comment on noncompliance with safety
measures should be reported by the CSC and should be reflected in the invoices that are settled for the contractor.

Monitoring activities:

1. Documenting number of accidents, and analyzing reasons that led to the accident and updating procedures to avoid future accidents. The CSC should undertake this documentation and report it in monthly progress reports.

7.2.6 Management of Culturally Valuable Sites and Chance-Finds of Antiquity Objects

Mitigation measures:

1. Prior to construction works the project's construction plan should be presented to the Supreme Council for Antiquities, who shall identify project locations (including PSs, WWTPs, sewer lines and rising mains) that require providing protection against possible damage to near antiquities
2. The mitigation measures described for protection of structures integrity, from dewatering activities, vibrations and general earthworks, shall also be applied for identified antiquity sites
3. In case of finding a suspected antiquity object during excavation the CSC should order immediate cessation of excavation works, leave the object exactly on its found location, taking photographs to document time and status of the object, assigning guards to watch the found antiquity and contacting the Supreme Council of Antiquities to handle the site.

Monitoring activities:

1. Chance find objects will be documented by the CSC. The documentation should include date, time and exact location of the found object, in addition to the followed procedures until the object has been handled by the Supreme Council for Antiquities.

7.2.7 Management of Underground Infrastructure

Mitigation measures:

1. Collecting the most accurate maps for infrastructure routes from WSCs and Governorates information centers, and making such data available to the contractor prior to commencing the works. This should be undertaken by the RSU-EE prior to construction works
2. Excavating manual trial pits in each street to locate the infrastructure pipes before using mechanical excavation. This should be undertaken by the contractor and supervised by the CSC.
Monitoring activities:

1. Monitoring activities for such risks, will be documenting number of accidents, and analyzing reasons that led to the accident and updating procedures to avoid future accidents. The CSC should undertake this documentation and report it in monthly progress reports.

7.2.8 Management of socioeconomic impacts during construction

Mitigation measures:

1. The contractor should clearly identify the schedule of implementation for each stage of roads excavation, including the time when normal traffic conditions will be resumed. This schedule should be communicated to the local community, through the RSU-EE and local CDAs, and clearly displayed on the construction site, mentioning dates and times where the construction works will be finalized. Any delays to the schedule should be also clearly displayed with the reasons given for such delay. The inhabitants of the neighboring areas should be encouraged to comment on the schedule, provide information about certain roads sensitivities and provide their views for possible modifications on the plan.

2. The contractor should be penalized for any unjustified delays in implementing the project. The PIUM should supervise the adherence of the contractor to the time-schedule and if a specific item has been delayed an immediate notification should be sent to the contractor.

It is worth noting that PSs and WWTPs should be constructed on state-owned lands unless a reasonably justifiable factor leads to use privately owned land. For dealing with such cases a Resettlement Policy Framework (RPF) has been prepared parallel to this report.

Monitoring activities:

1. Monitoring of residents complaints, about construction delays and possible socioeconomic effects, should be done by the CSC along with the measures taken to respond to such complaints.

Tables 7-1 and 7-2 summarize the mitigation measures and monitoring activities that should be implemented during the construction phase.
Table 7-1: Environmental Management Matrix during Construction Phase

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of Direct Supervision</th>
<th>Means of Supervision</th>
<th>Rationale for estimated Cost of Implementation / Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of improper handling of waste generated during construction</td>
<td>Undertake EIAs (with odor modeling) for WWTP sites, networks and PS sites to evaluate site contamination status</td>
<td>Planning - conceptual design</td>
<td>- Environmental consultant assigned by PIU</td>
<td>PIUM</td>
<td>Review of consultants reports</td>
<td>$ 160,000 (8 WWTP and 35 networks)</td>
</tr>
<tr>
<td></td>
<td>In clearing contaminated sites workers should use proper PPE, non hazardous waste should be properly stockpiled and disposed in approved location by local authority, and hazardous waste should be hauled to approved waste facility</td>
<td>Construction - Construction Contractor</td>
<td>Environmental consultant assigned by PIUM</td>
<td>Field supervision</td>
<td>Included in Project's Budget</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of Direct Supervision</th>
<th>Means of Supervision</th>
<th>Rationale for estimated Cost of Implementation / Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior estimation of dewatering liquid volume and arranging disposal of in nearest sewers agriculture drains, or recharged to groundwater aquifer after consent from MWRI</td>
<td>Preconstruction and construction</td>
<td></td>
<td>- Design consultant for for identifying liquid volume and suitable disposal methods</td>
<td>- PIUM for preconstruction arrangements</td>
<td>- PIUM to review consultant's reports obtaining approvals</td>
<td>- Dewatering disposal included in project's budget</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Construction Contractor for implementation</td>
<td>- CSC for field supervision during construction</td>
<td>- CSC for field supervision</td>
<td>- PIU management cost or normal CSC price^{5}</td>
</tr>
<tr>
<td>Evacuation of wasted household cesspits and to sewer, PS or WWTP</td>
<td>Construction</td>
<td></td>
<td>- Construction Contractor</td>
<td>Field supervision, review WSC approvals and random inspections</td>
<td>- Contractor cost in normal bid price and normal CSC price</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evacuation of construction site sewage and proper collection and disposal of construction site's garbage</td>
<td>Construction</td>
<td></td>
<td>- Construction Contractor</td>
<td>Field supervision, review WSC and local authority approvals and random inspections</td>
<td>- Contractor cost in normal bid price</td>
<td></td>
</tr>
</tbody>
</table>

^{5} PIU management costs are further detailed in Section 7-5 where the required human resources and training needs are detailed. While normal prices for contractors and consultants means that the additional costs for them carrying out mitigation measures are either zero or negligible according to their normal expected activities in the project as defined in the cost estimate prepared by the Engineering Consultants.
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of Direct Supervision</th>
<th>Means of Supervision</th>
<th>Rationale for estimated Cost of Implementation /Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise and air emissions</td>
<td>Proper stockpiling, haulage and disposal of non-hazardous, normal construction waste and asphalt waste</td>
<td>Construction</td>
<td>- Construction Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>- Contractor cost in normal bid price</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>Soil spraying (in sandy soil), Sound storage, transportation and disposal of stockpiles</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>- Contractor normal bid price</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>Ensure that air emissions of construction machinery within legal standards</td>
<td>Tender and preconstruction</td>
<td>Contractor</td>
<td>PIUM</td>
<td>Review vehicle exhaust certificate</td>
<td>- Contractor normal bid price</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>Controlling noise exposure of workers by adjusting working hours and using ear muffs</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>- Contractor normal bid price</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>- Avoid night noisy works whenever possible</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>- Contractor normal bid price</td>
</tr>
</tbody>
</table>
### Proposed Mitigation Potential Impact Measures

#### Disturbance of traffic and access difficulty
- Obtain permit from Traffic Department and Railway Authority on crossing works once during design and planning and once again prior to commencing work to ensure approval on work schedule.
- Place suitable warning signs, pedestrian bridges, pathways that should be visible at night. Open trench in certain location should not exceed 500 m.
- Assign one worker to be present 24 hours for helping people with difficulty in access or respond to falling accidents.
- Provide awareness to residents about alternative access and take their views in site planning.

#### Project Phase
- Planning and pre-construction
- Construction
- Preconstruction and construction

#### Institutional Responsibility for Implementation
- PIUM
- Contractor
- CDAs

#### Responsibility of Direct Supervision
- PIUM
- CSC
- PIUM and RSU-EE

#### Means of Supervision
- Review of required permits on planned crossing works
- Field supervision
- Review quarterly reports

#### Rationale for estimated Cost of Implementation / Supervision
- RSU and PIU management costs
- Hardware costs to be covered by project's budget
- CSC normal price
- Cost of worker to be covered by contractor from project's budget
- CSC normal price
- CDA expenses are part of awareness budget
- PIU and RSU mgt costs
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of Direct Supervision</th>
<th>Means of Supervision</th>
<th>Rationale for estimated Cost of Implementation / Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects on structures integrity</td>
<td>Investigate effects of dewatering, hammering and earthworks on surrounding structures as part of the site geotechnical report</td>
<td>Preconstruction</td>
<td>Geotechnical consultant assigned by the PIU</td>
<td>PIUM</td>
<td>Review technical reports produced by the consultant</td>
<td>Geotechnical investigations included in the project budget</td>
</tr>
<tr>
<td></td>
<td>Implement recommendations of geotechnical report</td>
<td></td>
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<tr>
<td></td>
<td>Provide wood sheet curtains on trench edges in villages narrow streets and apply safe slopes</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>- Tools to be employed by the contractor will be included in normal bid price</td>
</tr>
<tr>
<td></td>
<td>Tender documents for construction works should include requirements for submitting safety plan</td>
<td>Preconstruction</td>
<td>HCWW</td>
<td>PIUM</td>
<td>Review tender documents, technical scoring and technical proposals from contractors</td>
<td>PIU management costs</td>
</tr>
<tr>
<td></td>
<td>Implementation of approved safety plan</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field observation</td>
<td>- Contractor normal bid price</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of Direct Supervision</td>
<td>Means of Supervision</td>
<td>Rationale for estimated Cost of Implementation / Supervision</td>
</tr>
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</tr>
<tr>
<td>Risk of improper management of culturally valuable sites</td>
<td>Present maps of proposed project construction sites to the Supreme Council for Antiquities, and get their feedback about sites which need protection</td>
<td>Preconstruction</td>
<td>RSU-EE</td>
<td>PIUM</td>
<td>Review of official letters including comments of the Supreme Council of Antiquities about construction locations</td>
<td>- RSU-EE and PIU management costs</td>
</tr>
<tr>
<td></td>
<td>Apply previously mentioned measures for protection of structures integrity for antiquity sites</td>
<td>Construction</td>
<td>Contractor</td>
<td>CSC</td>
<td>Field supervision</td>
<td>Geotechnical investigations, construction tools and CSC part of the project budget</td>
</tr>
<tr>
<td></td>
<td>Apply chance finds procedures to found antiquity objects</td>
<td>Construction</td>
<td>CSC who will order immediate stopping of excavation</td>
<td>PIUM</td>
<td>Review documentation of chance find procedures</td>
<td>- Possible delays in construction works to be covered from project's budget^6</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- PIU management costs</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Risk of damaging infrastructure</td>
<td>Acquire infrastructure maps from WSCs and Governorates information centers</td>
<td>Preconstruction</td>
<td>RSU-EE</td>
<td>PIUM</td>
<td>Review progress reports</td>
<td>- RSU and PIU management costs</td>
</tr>
</tbody>
</table>

^6 In case of chance-finds the construction work will be stopped until the Supreme Council for Antiquities clears the site. This will involve extra costs related to rental of unused equipment and unaccounted for mobilization and demobilization. Because these costs will be borne by the contractor for reasons beyond his control, he will be expected to claim it back from the project budget.
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
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</tr>
</thead>
</table>
|                       | Carry out trial pits prior to excavation                                                      | Construction  | Contractor                                      | CSC                               | Field Supervision    | - Contractor normal bid price  
| Socioeconomic         | Communicate construction schedule transparently with inhabitants                              | Construction  | RSU-EE and local CDAs                           | PIUM                              | Review progress reports  
| impacts               | Penalties contractor for unjustified delays                                                    | Construction  | RSU-EE                                          | PIUM                              | Review progress reports  
|                       | Ensure market price compensations for land acquisition                                         | Planning      | - WSC pricing committee                         | PIUM And WSC-ERO                 | - Review reports of pricing committee  
|                       |                                                                                               |               |                                                 |                                   |                      | - WSCU and PIU management costs                                                                                   |
## Table 7-2: Environmental Monitoring Matrix during Construction Phase

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Risks of improper handling of waste generated during construction</td>
<td>Accumulation of waste</td>
<td>Construction sites</td>
<td>Observation, documentation</td>
<td>Daily field observation and documentation in monthly reports</td>
<td>CSC</td>
<td>- normal CSC price</td>
</tr>
<tr>
<td></td>
<td>Amount of delivered hazardous waste to approved facility</td>
<td>Construction sites</td>
<td>Manifests review</td>
<td>Daily during site preparation with documentation in monthly reports</td>
<td>- Environmental consultant assigned by PIU to supervise clearance of contaminated sites</td>
<td>- Environmental consultant costs included in his management costs</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>Noise intensity, exposure durations</td>
<td>Construction site</td>
<td>Onsite noise meter measurements from representative locations at construction sites</td>
<td>Once quarterly during construction</td>
<td>Contractor</td>
<td>US $ 5,000 for noise meters for the PIU</td>
</tr>
<tr>
<td>Complaints from residents</td>
<td></td>
<td>Construction site</td>
<td>Record and document complaints received from residents</td>
<td>Recording to be once complaint is received. Documentation shall be in monthly reports</td>
<td>CSC</td>
<td>- normal CSC price</td>
</tr>
<tr>
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<td>------------------------------------------</td>
</tr>
<tr>
<td>Disturbance of traffic and access difficulty</td>
<td>Accidents, complaints and remarks from residents</td>
<td>Construction site</td>
<td>Record and document complaints received from residents</td>
<td>Recording to be once complaint is received. Documentation shall be in monthly reports</td>
<td>CSC</td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Effects on structures integrity</td>
<td>complaints and remarks from residents</td>
<td>Construction site</td>
<td>Record and document complaints / remarks received from residents</td>
<td>Recording to be once complaint is received. Documentation shall be in monthly reports</td>
<td>CSC</td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Safety risks to construction labor</td>
<td>Number of accidents and reasons for them</td>
<td>Construction site</td>
<td>Documentation of accidents</td>
<td>To be documented in monthly reports in case of accidents</td>
<td>CSC</td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Risk of improper management of culturally valuable sites</td>
<td>Date, time, locations and status of chance finds</td>
<td>Construction site</td>
<td>Documentation of chance-find procedures</td>
<td>In case an object has been found</td>
<td>CSC</td>
<td>- CSC normal price</td>
</tr>
<tr>
<td>Risk of damaging infrastructure</td>
<td>Number of accidents and reasons for them</td>
<td>Construction site</td>
<td>Documentation of accidents</td>
<td>To be documented in monthly reports in case of accidents</td>
<td>CSC</td>
<td>- CSC normal price</td>
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<tr>
<td>Socioeconomic impacts</td>
<td>Complains from local community</td>
<td>Construction</td>
<td>Receive and document complaints</td>
<td>Complaints to be recorded once received. Documentation to be in monthly reports</td>
<td>CSC</td>
<td>- CSC normal price</td>
</tr>
</tbody>
</table>
7.3 Management and Monitoring Activities During Construction Phase

The maintenance and operation of the collection networks, PSs, rising mains and WWTPs will be undertaken by the WSC, either directly or through assigning a private Project Operator (PO) against special contract. Accordingly the ESMMF roles and responsibilities were assigned in the following sections.

7.3.1 Management of WWTP Sludge

Mitigation measures:

1. Lime stabilizations should be undertaken through the application of lime to the sludge removed from thickening tanks, before being spread onto dry beds. The details of lime application, type of lime, preparation and dosing system will be identified in the detailed design of the WWTPs. The system should be able to maintain the sludge pH at a minimum of 12 for 2 hours, and a minimum of 11.5 for two days. The application of lime to the sludge will be undertaken by the PO and supervised by the RSU-EE.

2. The PO should instruct workers handling sludge, or working near sludge tanks in the WWTP, to wear suitable gloves and boots. Hygiene instructions should be disseminated to workers, before they start working. These instructions should be clearly illustrated in posters placed in the offices and rest rooms of workers.

3. Mature dried sludge should be analyzed against the standards of Decree 44/2000, as shown in Table 2-3, and according to sampling analysis procedure. If the sludge is within legal limits it could be reused as an organic fertilizer. Land application limitations, presented in Table 5-1, cannot be guaranteed by the PO as this will rather be the responsibility of purchaser of the sludge. The PO shall sign a contract with purchaser that should include the sludge analysis, as an attachment, the yearly loading rate for different types of soil, and the safe cumulative loading rate, according to the limits as previously identified in the USEPA risk assessment.

4. If the mature sludge batch cannot be analyzed, the analysis are above Decree 44/2000 standards, or it needs to be removed from the WWTP because no further storage space was available, then the sludge should be safely disposed in land. Disposal sites for sludge should be approved by the Local Authority according to the guidelines mentioned in Table 5-2. If the disposal site will be a controlled landfill, an agreement will be signed with the landfill operator, whether the City Council or private operator, about the suitable location of sludge cells within the landfill and the requirements of sand cover. The disposal procedures will be undertaken in this case by the landfill operator, and will be supervised by the City Council.

7 Source: Vector Attraction Reduction of EPA 40 CFR 503 Subpart D
Monitoring activities:

1. The PO should undertake continuous monitoring of pH of immature sludge drying beds. Logs of pH values should be used for controlling the lime dosing.
2. If mature sludge will be used in agriculture, it should be sampled each 6 months, which is the estimated period for sludge maturation, and analyzed against the parameters mentioned in Table 2-3.
3. A periodical medical check for the workers of the WWTP should be undertaken to detect any related disease.

7.3.2 Management of Final Effluent’s Quality

Mitigation measures:

1. Evacuated sludge and septage from cesspits, septic tanks or animal slurries in Izbas and un-served villages, should be discharged to sludge streams in WWTPs rather than to wastewater streams. The implementation of such measure will require these tankers to sumps of sludge pumping stations in WWTPs, which should have an appropriate capacity to receive removed sludge from secondary sedimentation tanks, and septage from tankers. The WWTP designer should include allowance for this in the design, and the PO should organize receiving of tankers at certain times in the WWTP.
2. Implement preventive maintenance Program to all structures and electromechanical equipment in PSs and WWTPs. The supplier of each equipment should provide a preventive maintenance schedule for supplied equipment. Implementing this schedule should be part of the WWTP and PS operational manual.
3. In order to reduce the possibilities for using the WWTP bypass lines, the following measures are recommended:
   - The PS sumps should be designed to receive stormwater based on meteorological data of maximum storm during the design period.
   - Each WWTP should have at least two parallel lines. During maintenance/repair of one line the influent should be bypassed to the other line. Bypass lines should be facilitated from different points in the WWTP, so as to have maximum flexibility. In addition to the bypass from the intake works, there should be a bypass line after secondary settlement in case there are repairs in the disinfection unit.
   - A preventive maintenance program should be preplanned annually before the start of the fiscal year. Maintenance in WWTPs should be planned during lowest peak hours (such as overnight) and months of lower sewage discharge.
   - In case the influent is totally bypassed to the receiving drain, the PIUM should be immediately be notified with the reasons, durations and applied control measures for such event. The PIUM should directly notify the MWRI (through the PSC) and EEAA with the incidents. After returning to normal operation mode, reasons for using the bypass line should be analyzed to prevent repeating these incidents in future.
4. Chlorination should be followed by de-chlorination of the final effluent by applying sulphur dioxide or sodium thiosulphate\(^8\) to at the outlet of contact tank, to reduce free chlorine in receiving drains and to avoid producing further chlorinated products in the surface water. The design engineer should consider that de-chlorination will consume some of the dissolved oxygen in the final effluent, and will re-raise the COD and BOD and possibly reduce the pH. Therefore designs of biological treatment should take this into consideration.

**Monitoring activities:**

1. PO should undertaken continuous monitoring of PS and WWTPs incoming and outgoing discharges. Daily averages should be calculated and documented
2. Daily monitoring of influent and effluent water quality at WWTPs should be undertaken. The daily monitoring should include analysis of COD, TSS, TKN and total P.
3. Monthly monitoring of full Law 48/1982 parameters mentioned in Table 2-2

**7.3.3 Management of PS and WWTP Nuisance**

**Mitigation measures:**

1. Undertake air dispersion modeling for odors as part of the design and EIA process to ensure that strong odors will not reach residential areas.
2. Maintain efficient performance of biological treatment efficiency and lime application to sludge as mentioned in the two previous sections. Any complaints due to unacceptable odors should be confronted by identifying the source of the odor, evaluating the reason for odor emission, and improving the efficiency of the identified unit that caused the odor.
3. Apply screening criteria, further discussed in Section 7.3, to select best locations for the PSs and WWTPs in order to maintain suitable buffer zones that will lead to minimum nuisance to neighboring sites. The EIA process for WWTPs should include air dispersion modeling for odors to ensure that strong odors will not reach residential areas.
4. Locate administration buildings, and areas where WWTP staff are mostly exposed to, upstream of the prevailing wind direction, whenever possible, to minimize nuisance to the WWTP staff.
5. Establish close communication with the neighboring areas, and assign a staff member in the WWTP to receive odor complaints. This could be done through posters and the distribution of brochures that illustrate the right to complain, and the contacts information of the responsible staff, and the RSU officer assigned to supervise the plant.

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\(^8\) Another possible means of dechlorination is using activated carbon, which is believed to be unfeasible
Monitoring activities:

1. Record odor complaints received from neighboring areas. The record should include name of the person who has made the complaint, time of complaint, time and duration of unacceptable odor. Complaints records should be reported in monthly reports. The RSU should analyze odor complaints on monthly basis and document how each complaint was confronted.

7.3.4 Management of Hazardous Substances and Empty Containers

Mitigation measures:

1. According to The Egyptian Engineering Code for Design and Execution of Wastewater Treatment Plants, Decree 169/1997, the location of the chlorine building should be in the southern part of the WWTP, away from workers offices and any source of ignition. The chlorine cylinders store should be right next to the processing area. The chlorine building should possess the following properties:
   - The storage area should have a capacity for storing sufficient chlorine cylinders for 10 days operation. The cylinders should be stored horizontally in 2 rows or 4 rows. The cylinders should be stored over steel supports with a minimum distance between cylinders’ axis of 1.1 m, while the steel supports should have a minimum distance to nearest wall of 1m.
   - The processing area should be at least 3.5 m high. The area should be sufficiently large for placing evaporators so that the distance between evaporators and injection machines should not be less than 1 m, the distance between evaporators/injection machines and nearest wall should not be less than 1.75 m and the minimum length of the room should be 5 m.
   - It is preferable to provide a mechanical handling system for chlorine cylinders, in such case the handling shall be done with top crane winches capable of accessing storage rows and areas for chlorine trucks unloading.
   - Chlorine buildings should be airtight and equipped with leak detectors and neutralization basins which should be equipped with caustic soda sprays. Any cylinder suspected to be leaking should be transferred to the neutralization tank until leaked chlorine has been neutralized.
   - The store and processing area should be well ventilated and away from direct sunlight so that the maximum temperature shall not exceed 45°C. There should be mechanical ventilators fixed at a height not less than 50 cm from the building floor. Each ventilator should have an opening of at least 35cm x 35 cm, with a maximum spacing between ventilators of 2 m. There should additional emergency mechanical ventilators provided with ducts to collect any chlorine leaked to the neutralization tank. The emergency ventilators should be controlled by leak detectors that will automatically operate if chlorin leakage is detected.\(^9\)

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\(^9\) This automatic control of the emergency ventilators is not specified in Code 169/1997
2. Empty chlorine cylinders, lubricating oil containers and laboratory chemicals containers should be collected at a certain location inside the chlorine building before being returned to the supplier. The vendor who will supply the WWTP with chlorine cylinders should take waste cylinders back on the same truck. This process should be documented in manifests that should be signed by the vendor.

3. Diesel tanks should be surrounded with impermeable bund with a capacity equal to the tank capacity. Any leaked diesel from the diesel tank should be pumped to diesel trucks until the leakage is repaired. No USTs should be used in the project.

Monitoring activities:

1. Chlorine leak detectors with continuous sensors should be provided for chlorine detection. Any leakage incident should be documented by the WWTP operator in the monthly reports along with taken measures and the adequacy of the emergency ventilation system.

2. Leaks from diesel tanks will be detected through visual observation. Any leakage should be documented in monthly reports, along with measures taken by the operator to contain the leakage.

3. Records of empty containers returned to vendors should be kept in the WWTP, along with signatures of vendor’s representative on waste manifests acknowledging receipt of the containers.

7.3.5 Preventive Measures for Sewers Clogging

Mitigation measures:

1. All commercial units that have high solids/oil contents in their wastewater, such as restaurants, bakeries, mills, barns ...etc. should install suitable solids/oil separation units so as not to cause problems to the collection network. Although this is the responsibility of the commercial units according to Law 93/1962, it will be necessary to properly install such units, according to the engineering specifications of Egyptian Code 334/2002 for sanitary ware in buildings. During the design phase the engineering consultant will provide the most suitable design for such units according to the type of commercial units in served villages, and the implementation of these units will be undertaken by the contractor as part of the house connections construction activities.

2. Regular inspection and cleaning of these solids/oils separators should be undertaken by local CDAs upon consent from the WSC and agreement with beneficiary commercial units. This set-up could be made at the beginning of the project operation as the commercial units should have a maintenance contract with a CDA as a pre-requisite for his sewer connection, and this contract should be renewed as a pre-requisite for operating license renewal of the commercial unit. The design consultant of the collection network will prepare an operational manual that should clarify how often these separation units should be cleaned and the local CDA should implement this manual under supervision of the RSU-EE.
3. Gravity sewers should be regularly flushed by flushing tanks installed at high gradient points. The Egyptian Code 286/1990 for designing sewerage systems specifies that the volume of the flushing tank should be equivalent to the volume of 50 meters length of the pipes, and it should be equipped with floating level control to automatically fill it when it is emptied. The flushing should be undertaken once or twice daily. The design engineer will specify in the operation manual how often the system should be flushed by the WSC, or its assigned PO of the network. Small bore sewers that would be used in relatively small streets will require special measures for frequent clearing to prevent clogging; such measures should be identified by the design engineer and followed by the PO.

4. Each PO should have a trained technician (plumber) to undertake urgent repairs resulting from clogging. If the PO cannot effectively repair the clogging he should arrange for quick intervention from the WSC emergency department.

Monitoring activities:

1. Monitoring indicators for sewers clogging will be number of clogging incidents, and the applied repair works by the PO.

7.3.6 Preventive Measures for Crossing Works Leakage

Mitigation measures:

1. The integrity of the crossing pipe should be checked by detecting pressure difference during commissioning.
2. Minor leaks in the rising main will be detected by recording differences between the discharges recorded out of the PS and in the WWTP\textsuperscript{10}. The PO should detect both discharges daily, and in case of unusual differences in discharge, the PO should promptly undertake visual inspection at the crossing pipe and to repair any detected leak.
3. Crossing pipelines should be regularly maintained according to the timetable identified by the design consultant in the operation manual to ensure their integrity, regular observation of the integrity of joints and elbows should be undertaken by the PO.

Monitoring activities:

1. Recorded discharge from the outlet of PS and inlet discharge in WWTP should be recorded daily along with difference between them to detect leakage in rising mains.

\textsuperscript{10} The standard design of PS and WWTP will include discharge measurement tools.
7.3.7 Management of Commercial Units, PS and WWTP Wastes

Mitigation measures:

1. The management of separated solids from commercial units interceptors will be undertaken regularly by the CDAs as mentioned earlier. The generated sludge from these units, which does not have mineral oils of flammable liquid, should be discharged to sludge pumping station of the corresponding WWTP. The process should be documented through signing forms by served commercial units and receiving WWTP.

2. Separated solids from PS screens should be collected daily in a covered bin inside the PS location, until they are delivered to the solid waste contractor for disposal in domestic solid waste disposal sites. The disposal process should be documented in a contract with the waste contractor indicating disposal location, and should be checked with the local authority.

3. Separated grit should be stabilized by lime to prevent the possible generation of odors, and then left to dry in a separate drying bed. Dried grit should be collected by a solid waste contractor, and disposed of at an approved site according to a documented procedure as illustrated above.

4. CDAs should de-sludge oil traps receiving wastewaters with mineral oils from petrol stations and mechanic workshops according to the design schedule. The oil should be dispose of at an approved hazardous waste facility. Waste removal/disposal should follow documented manifest system having signatures of operator of the receiving hazardous waste facility.

Monitoring activities:

1. Monitoring of solid waste transferred to appropriate disposal sites will be through auditing waste delivery manifests available with POs and CDAs.

7.3.8 Management of Air Emissions and Noise

Mitigation measures:

1. Cultivate intensive wind barrier trees around aeration tanks that use surface aeration, so that droplets of aeration tanks are not spread around the area.

2. Ensure compliance of standby generators in PSs and WWTPs with Law 4/1994 emission standards by including certificates of emissions standards provided by the generator supplier.

3. Noise at administration areas of PSs should be within the noise standards of working environment illustrated in Tables 2-5 and 2-6. If case higher continuous or intermittent noise intensities were encountered the PO should use acoustical tools and ear muffs to reduce noise exposure to workers.
Monitoring activities:

1. The PO should monitor exhaust emissions from standby generators against the stipulations of Law 4/1994 for carbon monoxide, sulphur dioxide, nitrogen oxides and total hydrocarbons. The monitoring is to be performed once during the normal operation of the generators.
2. The PO should monitor noise intensity at locations of workers in PSs during. The measurements are to be undertaken annually under normal PS working conditions.

7.3.9 Management of Willingness and Affordability to Pay among Project Villages

Mitigation measures:

1. The PIUM should assign a social consultant to undertake willingness and affordability to pay survey for the 11 nominated villages. If the survey resulted that the willingness and affordability of people do not indicate that the project operation could be fully financed from the beneficiaries, the social consultant should recommend alternative methods of finance that should be employed before the project construction.

7.3.10 Management of Willingness and Affordability to Pay among Project Villages

Mitigation measures:

1. Make private contractors for cesspits evacuation aware of the available business opportunities using their tankers, such as serving uncovered/laterly covered areas, opportunities during ISSIP-2 construction and operation.
2. Construction contractors, POs and CDAs carrying out different activities of ISSIP-2 will be provided with contact details of local private tankers. It is believed that those local private tankers will be cheaper than other tanker owners who will need to travel to reach local sites; therefore local tankers will offer better prices for ISSIP-2 stakeholders.

Monitoring activities:

1. The business status of private contractors could not be accurately assessed, except they provide accurate data on their business which is doubtful. Therefore the construction contractors and CDAs will keep records of numbers of times they used private tanker owners in the ISSIP

The mitigation measures and monitoring activities recommended during the operation phase for centralized systems are presented in Tables 7-3 and 7-4 respectively along with the institutional responsibilities for implementation and supervision.
Table 7-3: Environmental Management Matrix during Operation Phase

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Rationale for estimated Cost of Implementation / Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of improper handling of sludge</td>
<td>Design and implement lime dosing system for raising pH to 12 for 2 hours and to 11.5 for 2 days</td>
<td>Planning and operation</td>
<td>- Design consultant for the system design - PO for operation</td>
<td>- PIUM</td>
<td>- PIUM through review of designs - RSU-EE through Review of monthly reports and occasional field inspections</td>
<td>- Normal design costs - PIU and RSU management costs - Costs of lime to be included in project's budget</td>
</tr>
<tr>
<td>Provide workers with protective gear and hygiene instructions</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- occasional field inspections</td>
<td>- PO normal costs - RSU management costs</td>
<td></td>
</tr>
<tr>
<td>Analyze sludge and decide accordingly whether the sludge could be used in agriculture and how is it going to be applied</td>
<td>Operation</td>
<td>RSU-EE</td>
<td>PIUM</td>
<td>- Review of procedures in progress reports</td>
<td>- PO normal costs - RSU management costs</td>
<td></td>
</tr>
<tr>
<td>Dispose unused sludge in controlled landfill if existing</td>
<td>Operation</td>
<td>Landfill operator or Waste contractor assigned by PO</td>
<td>- City Council - RSU-EE</td>
<td>- City council through regular inspections - RSU through documents review and occasional field inspection</td>
<td>- Sludge disposal costs to be included in project’s budget - PO normal costs - RSU management costs</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Proposed Mitigation Measures</th>
<th>Project Phase</th>
<th>Institutional Responsibility for Implementation</th>
<th>Responsibility of direct supervision</th>
<th>Means of supervision</th>
<th>Rationale for estimated Cost of Implementation / Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks associated with disposal of final effluent</td>
<td>enable sludge pumping stations to receive waste from interceptors and septic tanks, facilitate access of tankers</td>
<td>Design and operation</td>
<td>- Design consultant for inclusion in design &lt;br&gt;- PO for facilitation and record keeping</td>
<td>PIUM and RSU-EE</td>
<td>- PIUM to ensure inclusion in design &lt;br&gt;- RSU-EE to review PO performance, records and occasional visits</td>
<td>- Normal costs of design engineer &lt;br&gt;- Normal PO price &lt;br&gt;- PIU and RSU management costs</td>
</tr>
<tr>
<td>Preventive maintenance of structures and equipment</td>
<td></td>
<td>Pre operation and operation</td>
<td>- Supplier to provide maintenance schedule &lt;br&gt;- PO to implement</td>
<td>PIUM and RSU-EE</td>
<td>- PIU to review schedule &lt;br&gt;- RSU to inspect PO implementation</td>
<td>- Normal costs for supplier and PO &lt;br&gt;- PIU and RSU management costs</td>
</tr>
<tr>
<td>Design PSs sump to receive stormwater, design WWTPs with at least two parallel lines, facilitate several inlets to the bypass line, schedule maintenance during low peak hours/months, use one line during maintenance/repair of other line, and report total influent bypass incidents</td>
<td>Design, and operation</td>
<td>Design, and operation</td>
<td>- Design consultant to include requirements in design and to provide maintenance schedule &lt;br&gt;- PO to operate</td>
<td>PIUM during design and RSU-EE during operation &lt;br&gt;- PIUM to review designs and schedule &lt;br&gt;- RSU-EE to review PO records</td>
<td>- PIUM to review designs and schedule &lt;br&gt;- RSU-EE to review PO records</td>
<td>- Design consultant normal price &lt;br&gt;- Normal PO price &lt;br&gt;- PIU and RSU management costs</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of direct supervision</td>
<td>Means of supervision</td>
<td>Rationale for estimated Cost of Implementation / Supervision</td>
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<tr>
<td>Unacceptable odors and nuisance</td>
<td>Design and install sulphur dioxide or sodium thiosulphate dosing unit for de-chlorination and safeguard against possible raise in BOD/COD.</td>
<td>Design, and operation</td>
<td>Design consultant for designing suitable dosing unit, and extra aeration in biological treatment</td>
<td>- PIUM and RSU-EE</td>
<td>- PIUM to review design and - RSU-EE to inspect PO</td>
<td>- Dechlorination system and extra aeration requirements to be included in the project budget - Normal design consultant cost - PIU and RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Maintain high efficiency of biological treatment and lime application to sludge</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- Review of monthly reports and occasional field inspections</td>
<td>- Included in above items - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Provide suitable buffer zones around PSs and WWTPs locations as part of the EIA to cause minimum odor impacts</td>
<td>Planning</td>
<td>EIA consultant</td>
<td>PIUM</td>
<td>- Review of EIAs</td>
<td>- included in EIA prices - PIU management costs</td>
</tr>
<tr>
<td></td>
<td>Locate admin buildings in upstream wind direction</td>
<td>Design</td>
<td>Design consultant</td>
<td>PIUM</td>
<td>- Review of plant layout</td>
<td>- included in Design consultant price - PIU management costs</td>
</tr>
<tr>
<td></td>
<td>Establish communication with neighboring areas</td>
<td>Operation</td>
<td>RSU-EE</td>
<td>PIUM</td>
<td>- Review of means of communications</td>
<td>- Communication with neighbors included in awareness budget - RSU and PIU management costs</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
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</tr>
</tbody>
</table>
| Risks of handling hazardous substances | Design precautions of chlorine building | Design | Design consultant | PIUM | - Review of design reports | - Normal design consultant price  
- PIU management costs |
| | Empty chlorine cylinders, oil containers and lab chemicals containers to be returned to vendors | Operation | PO | RSU-EE | - Review of cylinders manifests | - PO normal costs  
- RSU management costs |
| | Adequate maintenance and repairs of diesel tanks | Operation | PO | RSU-EE | - Review of maintenance, repairs and documented leak response measures | - PO normal costs  
- RSU management costs |
| Risks of sewers clogging | Design and installation of engineered solids/oils separators at correspondent commercial units | Design and construction | - Design consultant for the design  
- contractor for construction | PIUM for design supervision  
- CSC for construction supervision | - PIU review of design  
- CSC field supervision | - Costs of separators are included in the project budget  
- Normal design consultant and CSC price  
- PIU and RSU management costs |
| | Regular inspection and cleaning of solids/oils separators | Operation | - Local CDA | - RSU-EE | - Review of contracts with CDAs documentation and occasional site visits | - CDAs costs for separators cleaning to be paid by beneficiary commercial units  
- RSU management costs |
<table>
<thead>
<tr>
<th>Potential Impact</th>
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<tbody>
<tr>
<td></td>
<td>Maintenance, cleaning and flushing of gravity sewers and small bore sewers</td>
<td>Operation</td>
<td>- PO</td>
<td>- RSU-EE</td>
<td>- Review of documentation and occasional site visits</td>
<td>- Normal PO operational costs - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Prompt repair of clogging</td>
<td>Operation</td>
<td>- PO</td>
<td>- RSU-EE</td>
<td>- Review of documentation and occasional site visits</td>
<td>- Normal PO operational costs - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Prompt response to leakage</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>Field supervision</td>
<td>- Normal PO costs - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Regular maintenance of pipelines</td>
<td>Operation</td>
<td>PO</td>
<td>RSU</td>
<td>Document review and field observation</td>
<td>- Normal PO costs - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Implement designed schedule for solids and oils removal from commercial units interceptors and discharge it to WWTP sludge pumping stations</td>
<td>Operation</td>
<td>CDA</td>
<td>- RSU-EE</td>
<td>- Documents review and occasional site supervision</td>
<td>- CDAs costs for separators cleaning to be paid by beneficiary commercial units - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Daily removal of PS screens waste to domestic solid waste disposal sites</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- Documents review and occasional site supervision</td>
<td>- Disposal costs included in project's operation budget - RSU management costs</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
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<tr>
<td>Air emissions and noise</td>
<td>Stabilizing separated grit with lime, dry it in separate drying beds and dispose dry grit in domestic solid waste disposal sites</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- Documents review and occasional site supervision</td>
<td>- Lime cost included in sludge stabilization - Grit disposal costs included in project's operation budget - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Remove oil from oil separators in petrol stations and workshops and dispose it in hazardous solid waste disposal sites</td>
<td>Operation</td>
<td>CDA</td>
<td>RSU</td>
<td>- Documents review and occasional site supervision</td>
<td>- CDAs costs for separators cleaning to be paid by beneficiary commercial units - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Cultivate wind barrier trees around aeration tanks</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- Field visits for WWTPs</td>
<td>- US $ 10,000 for 8 WWTPs - PO normal price for irrigation and care</td>
</tr>
<tr>
<td></td>
<td>Supplied standby generators to PSs and WWTPs should be tested for emission standards</td>
<td>Construction</td>
<td>Supplier</td>
<td>CSC</td>
<td>- Review certificate for emission standards from an air quality lab</td>
<td>- Normal supplier price</td>
</tr>
<tr>
<td></td>
<td>Use acoustical tools and ear muffs to reduce noise exposure to PS workers if required</td>
<td>Operation</td>
<td>PO</td>
<td>RSU-EE</td>
<td>- Review of procedures reports</td>
<td>- PO normal price</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Proposed Mitigation Measures</td>
<td>Project Phase</td>
<td>Institutional Responsibility for Implementation</td>
<td>Responsibility of direct supervision</td>
<td>Means of supervision</td>
<td>Rationale for estimated Cost of Implementation / Supervision</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------------------------------------</td>
<td>-----------------------------------</td>
<td>----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Affordability of poor people to participate in project costs</td>
<td>Categorize the community according to affordability to pay</td>
<td>Preconstruction</td>
<td>Social Affairs Departments</td>
<td>RSU-EE</td>
<td>- Review categorization reports</td>
<td>- Cost by Social Affairs Departments - RSU and PIU management costs</td>
</tr>
<tr>
<td>Effects on cesspits evacuation business</td>
<td>Provide awareness to private contractors about other business opportunities</td>
<td>Preconstruction</td>
<td>CDAs</td>
<td>RSU-EE</td>
<td>Review reports of number of interviewed contractors</td>
<td>- Awareness included in awareness budget - RSU management costs</td>
</tr>
<tr>
<td></td>
<td>Provide construction contractors, POs and operating CDAs with contact details of local private contractors</td>
<td>Construction and Operation</td>
<td>RSU-EE</td>
<td>PIUM</td>
<td>Review correspondence and contact lists</td>
<td>- PIUM and RSU management costs</td>
</tr>
</tbody>
</table>
Table 7-4: Environmental Monitoring Matrix during Operation Phase

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of improper handling of sludge</td>
<td>pH of fresh sludge</td>
<td>WWTP drying beds</td>
<td>Continuous pH sensors</td>
<td>Continuous for two days after laying fresh sludge in drying beds (2 days average to be documented)</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td></td>
<td>Zn, Cu, Ni, Cd, Pb, Hg, Cr, Mo, Se, As, faecal coliforms, salmonella and escharis eggs</td>
<td>WWTP drying beds</td>
<td>Taking representative sample and analyze it according to requirements of Decree 44/2000</td>
<td>Once each 6 month, or whenever sludge is being sold</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td></td>
<td>Water borne diseases for WWTP workers</td>
<td>Identified medical center</td>
<td>Medical examination and lab analysis</td>
<td>Quarterly</td>
<td>PO</td>
<td>To be included in project's operation budget</td>
</tr>
<tr>
<td>Risks associated with disposal of final effluent</td>
<td>Discharge rate of influents</td>
<td>PS and WWTPs</td>
<td>- Fixed flow meters and weirs</td>
<td>- Continuous, average flow to be recorded daily</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
</tbody>
</table>

11 WWTPs are normally equipped with water laboratory therefore the analysis costs are assumed to be part of the project budget

12 As above
### Potential Impact

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD, TSS, TKN and P</td>
<td>COD, TSS, TKN and P</td>
<td>WWTPs influent and effluent</td>
<td>- Sampling and analysis in WWTP lab</td>
<td>- Daily</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td>Full Law 48/1982 parameters</td>
<td>Full Law 48/1982 parameters</td>
<td>WWTP effluent</td>
<td>Sampling and analysis in WWTP lab</td>
<td>- Monthly</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td>Unacceptable odors and nuisance</td>
<td>Neighbors complaints</td>
<td>PSs and WWTPs</td>
<td>Record keeping of complaints</td>
<td>- Record once a complaint is received</td>
<td>RSU-EE</td>
<td>RSU management costs</td>
</tr>
<tr>
<td>Risks of handling hazardous substances</td>
<td>Chlorine concentration in air</td>
<td>Chlorine building in WWTP</td>
<td>Chlorine detectors</td>
<td>- Continuous leak detection - Leak incidents to be documented in monthly reports</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td>Integrity of diesel tanks</td>
<td>Integrity of diesel tanks</td>
<td>WWTP</td>
<td>Visual observation</td>
<td>- Daily</td>
<td>PO</td>
<td>PO normal costs</td>
</tr>
</tbody>
</table>

---

13 As above
<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Monitoring Indicator</th>
<th>Monitoring Location</th>
<th>Monitoring Methods</th>
<th>Monitoring Frequency</th>
<th>Monitoring Responsibility</th>
<th>Estimated Monitoring Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of sewers clogging</td>
<td>Number of clogging incidents</td>
<td>PO premises</td>
<td>- Documentation of clogging incidents and repair procedures</td>
<td>- Monthly reporting of documented clogging incidents</td>
<td>- PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td>Risks of rising main leaking to crossing watercourse</td>
<td>Discharge of PSs and WWTPs</td>
<td>PSs and WWTPs</td>
<td>- Readings of PS and WWTP flow meters and weirs and calculate the difference</td>
<td>- Daily</td>
<td>- PO</td>
<td>PO normal costs</td>
</tr>
<tr>
<td>Risks of improper management of solid wastes</td>
<td>Waste delivery manifests</td>
<td>CDAs premises, PSs and WWTPs</td>
<td>Auditing waste manifests and contracts</td>
<td>Quarterly</td>
<td>RSU - EE</td>
<td>RSU management costs</td>
</tr>
<tr>
<td>Noise and air emissions</td>
<td>CO, SO₂, total hydrocarbons and NOx</td>
<td>Generators at WWTPs and PSs</td>
<td>Onsite gas analyzer measurement for exhaust</td>
<td>Once during normal operation</td>
<td>PO</td>
<td>US $ 10,000 for PSs and WWTPs</td>
</tr>
<tr>
<td>Noise intensity, exposure durations and noise impacts</td>
<td>PSs</td>
<td>Onsite noise meter measurements from representative locations</td>
<td>Annually</td>
<td>PO</td>
<td>Cost of noise meters to PIU previously indicated</td>
<td></td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Monitoring Indicator</td>
<td>Monitoring Location</td>
<td>Monitoring Methods</td>
<td>Monitoring Frequency</td>
<td>Monitoring Responsibility</td>
<td>Estimated Monitoring Cost</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Affordability of poor people to participate in project costs</td>
<td>% coverage of house connections of different socioeconomic categories</td>
<td>RSU premises</td>
<td>Prepare statistics of covered house connections among non-affordable and affordable categories</td>
<td>Quarterly</td>
<td>RSU-EE</td>
<td>RSU management costs</td>
</tr>
<tr>
<td>Impacts on cesspits evacuation business</td>
<td>Number of tankers rentals in ISSIP-2 activities</td>
<td>Construction contractors, POs and CDAs</td>
<td>Review records for each contractor</td>
<td>Quarterly</td>
<td>RSU-EE</td>
<td>RSU management costs</td>
</tr>
</tbody>
</table>
7.4 Institutional Framework for Implementation

7.4.1 Existing Environmental Management Structure for the ISSIP-1

Implementation of ISSIP-1 has started in January 2009, and the project is working in the Governorates of Gharbeya, Beheira and Kafr El Sheikh. A Project Steering Committee (PSC) has been formed for the overall supervision and guidance for the project implementation and to ensure coordination between different stakeholders. The PSC is headed by the minister of Housing and Urban Development and includes representatives from NOPWASD, HCWW, the three WSCs of ISSIP-1, Ministry of Water Resources and Irrigation, Ministry of Health and Population, Ministry of Agriculture and Land Reclamation, Ministry of Social Affairs and Ministry of State for Environmental Affairs.

A Project Implementation Unit (PIU) has been formed within HCWW for the overall management of the project implementation. The PIU currently includes 7 full-time technical staff members which are:
- The PIU Manager (PIUM)
- Financial Specialist
- Procurement Specialist
- Monitoring and Reporting Specialist
- Construction Monitoring Specialist
- Information Technology Specialist
- Sanitation Engineer

The PIU is also getting assistance from different consultants on "as needed basis", including environmental consultants, social consultants, sanitation engineering consultants and water quality consultants.

The three WSCs of Gharbeya, Beheira and Kafr El Sheikh, governorates of ISSIP-1, includes Rural Sanitation Units (RSU) which have been formed for supervising rural sanitation projects implemented in their correspondent governorates. Each RSU have one Environmental Expert (RSU-EE) who liaise between different environmental management and monitoring activities undertaken at the local level, and the PIUM

The organizational setup for implementing the ESMMF of ISSIP-1 is according to the following:
- The PIU have overall supervision responsibility for the environmental performance of the project. The PIUM is the overall Environmental Manager of the project. In addition to supervising environmental performance of the project, the PIUM is also responsible for assigning specialized environmental experts for specific tasks, such as preparing EIA's and performing certain specialized reports. The PIUM is also responsible for liaising with the PSC for support from other ministries and project counterparts.
- The tendering for WWTP works is undertaken by NOPWASD, who grant the works to the contractor with the most advantageous offer and also assigns Construction Supervision Consultants (CSCs) to supervise construction
The assigned construction contractors will have the responsibility for implementing most of the field measures of the ESSMF during construction under the supervision of CSCs, both contractors and CSCs are committed to undertake these tasks as part of their contracts with NOPWASD. PIUM provides CSCs with a checklist of items to report on environmental measures taken during construction.

- Tendering for collection systems, PSs and FMs are undertaken by local WSCs, therefore the same procedures for assigning contractors and CSCs mentioned above will be also followed, but the assigning of works will be from the WSC rather than NOPWASD.

- The operation of the sub-projects will be carried out by the WSCs, either directly or through an assigned Project Operator (PO). Therefore most of the ESMMF measures that will be taken during operation will be undertaken by the operating body of the systems (PO) and supervised/documented by RSU-EE.

The implementation of ISSIP-1 has suffered from some delays due to very high bid prices of works, as bid prices were based on preliminary designs rather than detailed designs. This PIU is planning to overcome this obstacle in implementing ISSIP-2. The delay in project implementation has also been reflected on the ESMMF. During the preparation of this ESIAF two of the WWTPs have been already tendered, one in Gharbeya and one in Beheira, in which two EIAs have been already prepared for them by an external consultant according to the requirements of the ESMMF. As the construction phase has not been started, the implementation of correspondent ESMMF measures for construction works has not been started as well.

The ESMMF of ISSIP-1 has identified a number of training courses to be provided to different project stakeholders, these courses are presented in Table 7-5.

### Table 7-5: Recommended training courses for ISSIP-1

<table>
<thead>
<tr>
<th>Training course</th>
<th>Contents</th>
<th>Type of training</th>
<th>Participants</th>
<th>Proposed Scheduling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailored training on ESMMF</td>
<td>- Project features&lt;br&gt;- Legal aspects&lt;br&gt;- Environmental impacts and mitigation measures&lt;br&gt;- Monitoring and evaluation&lt;br&gt;- Templates for required reports</td>
<td>Classroom with field visits and exercises</td>
<td>- PIU staff&lt;br&gt;- WSCU staff&lt;br&gt;- NOPWASD, HCWW technical staff&lt;br&gt;- IIIMP PIU&lt;br&gt;- EEAA&lt;br&gt;- MWRI</td>
<td>Once before project implementation</td>
</tr>
<tr>
<td>Environmental aspects of wastewater engineering</td>
<td>- Types and processes of treatment&lt;br&gt;- International environmental standards for WWTPs&lt;br&gt;- Water quality objectives&lt;br&gt;- Sludge management&lt;br&gt;- Solid and hazardous materials management&lt;br&gt;- Odour control</td>
<td>Classroom with field visits and exercises</td>
<td>- PIU staff&lt;br&gt;- WSCU staff&lt;br&gt;- NOPWASD, HCWW and WSCs technical staff&lt;br&gt;- IIIMP PIU&lt;br&gt;- EEAA&lt;br&gt;- MWRI</td>
<td>Once before project implementation</td>
</tr>
</tbody>
</table>
During the preparation of this ESIAF, two of the above courses were already delivered: a course about wastewater engineering and another about environmental auditing and legislation.

7.4.2 Proposed Organizational Set-up for Implementing ISSIP-2

As the ISSIP-2 will build on the experience of ISSIP-1, the same organizational set-up for the project will be maintained along with adding an RSU for Sharkeya WSC, as well as WSCs in the other three governorates, and recruiting RSU-EE to handle the related ESMMF tasks. Accordingly the modification on the organizational set-up for the project will be as presented in Figure 7-1.

Figure 7-1: Environmental Management for Set-up for ISSIP after adding ISSIP-2 Sharkeya

<table>
<thead>
<tr>
<th>Training course</th>
<th>Contents</th>
<th>Type of training</th>
<th>Participants</th>
<th>Proposed Scheduling</th>
</tr>
</thead>
</table>
| Environmental Auditing and Inspection  | - Environmental auditing techniques  
- Auditing checklists  
- Environmental auditing reports | Classroom                  | - PIU staff  
- WSCU staff  
- POs  
- CDAs                         | Once before operation and then once every two years                     |
| Social assessment and communication with the society | - Communication skills  
- Mass communication  
- Social surveys and sampling | Classroom with field visits and exercises | - PIU staff  
- WSCU staff  
- POs  
- CDAs                         | Once before operation and then once every two years                     |
| Basics of Solid Waste Management       | - Components of solid waste management  
- Attribution of solid waste management to deterioration of surface water quality | Classroom                  | - PIU staff  
- WSCU staff  
- Local councils staff  
- CDAs                         | Once before operation and then annually                                |

During the preparation of this ESIAF, two of the above courses were already delivered: a course about wastewater engineering and another about environmental auditing and legislation.

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During the preparation of this ESIAF, two of the above courses were already delivered: a course about wastewater engineering and another about environmental auditing and legislation.

7.4.2 Proposed Organizational Set-up for Implementing ISSIP-2

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During the preparation of this ESIAF, two of the above courses were already delivered: a course about wastewater engineering and another about environmental auditing and legislation.
Tendering procedures, assigning of contractors, CSCs and POs described for ISSIP-1 will continue in ISSIP-2. PIUM will have among his responsibilities for ISSIP-1 the overall responsibility of implementing ISSIP-2 and will be assisted in Sharkeya Governorate by Sharkeya RSU-EE, and the pool of consultants according to the need. The RSU-EE will follow-up and supervise the day to day implementation of different ESMMF measures, as previously indicated in the Environmental Management and Monitoring Matrices (Tables 7-1 through 7-4), while the pool of consultants will undertake specialized tasks that could not be efficiently undertaken by the RSU-EE. Example for that is preparing EIAs, which will need experienced environmental consultants that will undertaken site reconnaissance and identify different sensitivities and analyze the impacts accordingly, therefore such task will be outsourced to external Environmental Consultants that will be assigned by the PIUM, while the implementation of site specific measures will be followed-up by the RSU-EE.

It is worth noting that the responsibilities of implementing some of recommended measures in the ESMMF are assigned to the engineering consultants who will prepare the detailed designs of PSs and WWTPs, therefore, the PIUM should coordinate the inclusion of these measures with the engineering consultants in due time. These coordination tasks include:

- Coordinating with the Geotechnical Consultant adequate methods of dewatering so that the integrity of neighboring structures will be maintained and the water drainage will be effective
- Coordinating with the Engineering Consultant performing the detailed design of WWTP suitable methods for sludge stabilization, receiving septage from unserved areas, design of de-chlorination units, operation during high loads, shock loads and equipment maintenance, and locating administration buildings downstream of prevailing wind direction.

7.4.3 Required Human Resources and Training

RSU-EE for Sharkeya will be recruited on full-time basis for the project. All other PIU staff and pool of consultants will support the implementation of ESMMF in Sharkeya according to the assigned tasks in the ESMMF matrix presented in Tables 7-1 through 7-4.

Counterparts from Sharkeya Governorates will attend training courses that are already included among ISSIP-1 activities. In case the number of attendees in a course exceeded 20 persons, the course should be repeated so as not to exceed this number. The two courses that have been already given to ISSIP-1 stakeholders should be repeated to ISSIP-2 counterparts.

7.5 Reporting of ESMMF Activities

The PIUM will receive monthly reports from RSU-EE and CSC including the ESMMF activities, during different project phases. These monthly reports should include the activities undertaken during the month with regards to environmental mitigation
measures and monitoring activities. The PIUM will prepare quarterly reports, based on received monthly reports from RSU-EEs and CSCs, in addition to reports received from specialized consultants assigned for different tasks in the project. The quarterly reports will be submitted, after clearance from the PIUM, to the PSC. At the end of each fiscal year, the PIUM will summarize results of four quarterly reports and submit an annual report to the PSC. It is recommended to send copy from annual reports to EEAA, and to disclose a non-technical version to the local community.

It is worth noting that the PO will prepare an official Environmental Register for the WWTP that will include monitoring data and any reporting on implemented mitigation measure in the WWTP.

7.6 Estimated Budget for the ESMMF

Because the ISSIP has environmental and water quality objectives, most of the mitigation measures recommended in the ESMMF will be included in the project's budget, while the budget for the remaining mitigation measures and monitoring activities is illustrated in Table 7-6.

Table 7-6: Estimated Budget for the ESMMF

<table>
<thead>
<tr>
<th>Activity</th>
<th>ESMMF Issue</th>
<th>Budget (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items that are specific for Sharkeya Governorate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIAs for new WWTP including odor modeling</td>
<td>Ensure application of ESIAF issues to local conditions in WWTP site</td>
<td>160,000</td>
</tr>
<tr>
<td>EIAs for sewerage networks and associated PS and RM</td>
<td>Ensure application of ESIAF issues to local conditions in PS/network sites</td>
<td>175,000</td>
</tr>
<tr>
<td>Allowance for air quality monitoring by external party</td>
<td>Implement monitoring program of the ESMMF</td>
<td>10,000</td>
</tr>
<tr>
<td>Wind barriers around surface aeration tanks</td>
<td>Preventing aerosols from migrating to neighboring areas</td>
<td>10,000</td>
</tr>
<tr>
<td>Budget for awareness campaigns and social mobilization</td>
<td>Raising awareness of local inhabitants regarding environmental and social aspects</td>
<td>100,000</td>
</tr>
<tr>
<td>Salary of RSU-EE</td>
<td>Overall responsibility for follow-up mitigation measures, monitoring activities and reporting</td>
<td>50,000</td>
</tr>
<tr>
<td>Disclosure of annual Environmental Reports</td>
<td>Ensure communication with local community</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td><strong>510,000</strong></td>
</tr>
</tbody>
</table>

Items that are specific for the 4 Governorates
The proposed budget of ISSIP-2 that are needed for the ESMMF implementation in Sharkeya Governorate is US $ 510,000 while the budget for other items that could be shared between the four governorates such as training courses, noise meter and the allowance for external consultants is US $ 250,000.

<table>
<thead>
<tr>
<th>Activity</th>
<th>ESMMF Issue</th>
<th>Budget (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailored training on ESMMF</td>
<td>Capacity building of stakeholders</td>
<td>10,000</td>
</tr>
<tr>
<td>Training on environmental aspects of wastewater engineering</td>
<td>Capacity building of stakeholders</td>
<td>5,000</td>
</tr>
<tr>
<td>Training on environmental Auditing and Inspection</td>
<td>Capacity building of stakeholders</td>
<td>15,000</td>
</tr>
<tr>
<td>Training on Social assessment and communication with the society</td>
<td>Capacity building of stakeholders</td>
<td>15,000</td>
</tr>
<tr>
<td>Noise meter to serve the 4 governorates</td>
<td>Implement monitoring program of the ESMMF</td>
<td>5,000</td>
</tr>
<tr>
<td>Allowance for Environmental Safeguards Consultant</td>
<td>Supporting PIU when needed</td>
<td>100,000</td>
</tr>
<tr>
<td>Allowance for Environmental Safeguards Consultant</td>
<td>Supporting PIU when needed</td>
<td>100,000</td>
</tr>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td><strong>250,000</strong></td>
<td></td>
</tr>
</tbody>
</table>
8. Public Consultation

8.1 Focus Group Discussions (FGD)

8.1.1 Methodology

Four FGD were held in Sharkeya. The objective of conducting these FGD was to get a social profile of the area of the project and to understand the people's perceptions towards the project and their willingness to participate. The villages were selected in two different districts that are apart from each other in order to get a clear idea of the people's perceptions in two distant areas.

A total of 18 males and 20 females attended the FGD. They were held in the villages of El Zahraa in Bardeen district and the village of Mahmoudya in Hehya district. The women were mostly illiterate and were mostly housewives with few employees, while the men were farmers and employees and were all literate.

In addition 90 in-depth interviews were conducted on a random sample in the governorates of Menofya and Sharkeya to get a detailed knowledge of the areas of the project.

8.1.2 Findings

FGDs revealed that both men and women work in agriculture. Agriculture is the main economic activity in the area but not the only one since the small landholdings due to the fragmentation of land does not provide for the whole family. Women also are heavily involved in poultry raising with some having dairy production. Job opportunities are also available in factories in the industrial city of 10th of Ramadan. Poverty is prevalent since there is a high rate of unemployment especially among women, while those who own land mostly have less than 1 feddan.

Level of education is relatively high since most of FGD participants were diploma holders while elderly were mostly illiterate. The Omdas in these two villages were respected and had a say when it comes to the public interest and good of the village. Gender norms prevail and women share the brunt of all activities, since they participate in agriculture work as well as the domestic work. They are also responsible for water disposal as well as fetching water. They said that they usually dispose the water used for washing and cleaning in the streets or in the canal if they live near a canal. They do this to lessen the load on their septic tanks and decrease the costs of emptying the tanks. Emptying the tanks is done once a week and costs LE 15/ time which means that they pay an average of LE 30- 50 /month. However, those who cannot afford weekly emptying, resort to emptying their tanks on their own and dispose the sewage in the canal. Others said that the tankers are not always available and this has resulted in their inability to empty the tanks when required thus jeopardizing their houses. In one village, participants
said that they have installed a local sewerage network on their own but it did not work efficiently and resulted in more pollution problems.

In addition to all the above sewage problems, all participants confirmed that tap water is contaminated by the seepage from the septic tanks causing the mixing of sewage with tap water. As a result, rural people are forced they buy water for cooking or resort to fetching water from artesian wells in the farms far from the canal. In one village, people said that using water wells constitutes 50% of water used.

Accordingly all participants in the four FGD in Sharkeya expressed their dire need of the project and also expressed their willingness to donate land for treatment plants and are willing to cooperate with the contractor to facilitate the construction works. It is also unfortunate according to the participants that the tankers drivers throw the emptied sewage in the canals causing ominous contamination of the canals. Crops, as a result, are irrigated by contaminated canal water and many water borne diseases have appeared in the past years. There are local CDA in the villages and these CDAs help in addressing local issues such as collecting donations to build a veterinary clinic, a nursery and a religious institute.

8.2 Public Consultation Meeting

The Public consultation was held on Thursday December 30, 2010, At Zagazig culture Palace, in Sharkeya governorate, at 11:00 AM. The meeting was advertised in Al Aharam newspaper a week earlier.

Official invitations by the governorate and the HCWW were directed to representatives from Local Units, Local Public Council, Directorates of Health, Departments of Environment and NGOs. In addition to that, the governorate invited a group of local residents as representatives from each targeted village.

The meeting was attended by 104 members, among which there were 33 women, including representatives from:
- City council
- Local Public council
- HCWW (PIU members)
- Environmental Department in the Governorate
- EEAA- representative
- Education directorate
- Local NGOs
- Local press and local TV (channel 4)
- Community members (5 attendees from each village – representatives from 10 different villages attended)

The meeting included presentations by the following key people:
- Major General Ahmad Fawzi – Assistant secretary general for Sharkeya governorate
During the opening discussion the following points were raised:
- Previous studies were held but no actual implementation of the project.
- How to ensure providing project maintenance after completion.
- Discussing the possibility of providing the project through a grant and not a loan, since the community cannot afford more financial burden.
- Discussion of the notable improvement in the conditions of the potable water in Sharkeya.
- Village of Amrit members have participated in providing a local sewerage network, which is functioning in an improper manner leading to over flooding of sewage in the village streets.
- Ensuring that the land will be donated voluntarily and no one will be forced to abandon their land without a fair compensation.
- In general, public land will be mostly used for construction of the pump stations.
- The possibility for the HCWW representatives to provide more awareness about the project to the members of the local NGO’s and CDA’s.
- The possibility of using the sludge as biogas or as fertilizer.
- The land for the pump station in the villages of Sobieh and Baramka has already been chosen. The required land is a public property and all necessary procedures are currently being undertaken.
- Village of Matawa have already collected 100 thousand pounds for buying the land necessary for constructing the pump station. They need the consultant to identify the appropriate area.
- The village of Seds indicated that there is a satellite village called elKobtan, if possible could it be included in the project.

In general everybody is welcoming the idea of the project and clearly indicated their willingness to participate for the success of the project.

Table 2 presents the main issues raised during the Sharkeya Public Consultation and the correspondent actions that needs to be taken.

Table 8-1: Main Issues raised in the Menofya Public Consultation Meeting and correspondent actions that need to be taken

<table>
<thead>
<tr>
<th>Raised issues</th>
<th>Actions to be taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land that will be used will be given by the community ensuring the will to provide the land</td>
<td>Temporary expropriated land will be documented by HCWW social specialist and proper compensation should be immediately disbursed</td>
</tr>
<tr>
<td>Ensuring proper maintenance for the project after completion</td>
<td>A special budget was allocated for the issue and will be conducted under specific measures</td>
</tr>
<tr>
<td>Raised issues</td>
<td>Actions to be taken</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Possibilities of funding through a grant and not a loan</td>
<td>The funding is a loan through the world bank that should be repaid. This is clear.</td>
</tr>
<tr>
<td>Using the sludge as biogas or fertilizer</td>
<td>Already is implemented through El Gabal El Asfar treatment station</td>
</tr>
<tr>
<td>Ensuring no damage will be done to the houses during excavations.</td>
<td>Close supervision will be conducted during period of construction</td>
</tr>
</tbody>
</table>