



**WATER UTILITIES CORPORATION**

**BOTSWANA EMERGENCY WATER SECURITY AND EFFICIENCY PROJECT**

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR REHABILITATION OF MAMBO  
WASTEWATER TREATMENT PLANT IN FRANCISTOWN**

**OCTOBER 2021**

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## ABBREVIATIONS / ACRONYMS

ADWF	Average Dry Weather Flow
AIA	Archaeological Impact Assessment
AIDS	Acquired Immune Deficiency Syndrome
AP	Aggrieved Persons
ASRH	Adolescent Sexual and Reproductive Health
BAF	Biological aerated filter
BEAPA	Botswana Environmental Assessment Practitioners Association
BEWSEP	Botswana Emergency Water Security and Efficiency Project
BNMPWWS	Botswana National Master Plan for Wastewater and Sanitation
BPC	Botswana Power Corporation
BMC	Botswana Meat Commission
BOD	Biological Chemical Demand
BOS	Botswana Bureau of Standards
BTC	Botswana Telecommunications Corporation
C-ESMP	Contractor's Environmental and Social Management Plan
CHBC	Community Home Based Care
CHP	Combined heating plant
CLO	Community Liaison Officer
COC	Code of Conduct
COD	Chemical Oxygen Demand
DEA	Department of Environmental Affairs
DLSS	Department of Labour and Sanitation Services
DM	Dry Matter
DNMM	Department of National Museum and Monuments
DOHS	Department of Occupational Health and Safety
DSP	Department of Social Protection
DSS	Department of Social Services
DTRP	Department of Town and Regional Planning
DWA	Department of Water Affairs
DWNP	Department of Wildlife and National Parks
DWMPC	Department of Waste Management and Pollution Control
DWS	Department of Water and Sanitation
EAPB	Environmental Assessment Practitioner's Board
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender Based Violence
GC	Grievance Committee
GRC	Grievance Redress Committee
GM	Grievance Mechanism
GPS	Global Positioning System
GBV	Gender-based Violence
HAART	Highly Active Antiretroviral Therapy
HDPE	High density polyethylene
HIV	Human Immuno- Deficiency Virus
IAP	Interested and Affected Parties
IDCC	Infectious Disease Care Clinic
IT	Information Technology
KPIs	Key Performance Indicators

MBBR	Moving bed biofilm reactor
MDG	Millennium Development Goal
MEWT	Ministry of Environment Wildlife and Tourism
MFEP	Ministry of Finance and Economic Planning
MLGRD	Ministry of Local Government
MLD	Mega Litres per Day (=m <sup>3</sup> /d)
MLGRD	Ministry of Local Government and Rural Development
MLMWS	Ministry of Land Management Water and Sanitation Services
NDP	National Development Plan
NMES	National Monitoring and Evaluation Systems
NMM	National Museums and Monuments
NOSA	National Occupational Safety Association
MDGs	Millennium Development Goals
MFDP	Ministry of Finance and Development Planning
MID	Electro Magnetic Flow Meter
NGO	Non-Governmental Organisation
NOSA	National Occupational Safety Association
OAP	Old Age Pension
OHS	Occupational, Health and Safety
OP	Operational Procedure
PAP	Project Affected Persons
PCR	Polymerase Chain Reaction
PDO	Proposed Development Objective
PIU	Project Implementation Unit
PLO	Project Liaison Officer
PSC	Project Steering Committee
PTA	Parents and Teachers Association
QA/QC	Quality Control and Quality Assurance
RAP	Resettlement Action Plan
RBC	Rotating Biological Contactor
RE	Resident Engineer
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SHEA	Sexual Harassment, Exploitation and Abuse
SES	Socio-economic Survey
SHE	Safety, Health and Environment
SSVCT	SEA, SH and VAC Compliance Team
STI	Sexual Transmitted disease
TB	Tuberculosis
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TOR	Terms of Reference
TPH	Total Petroleum Hydrocarbons
VAC	Violence Against Children
VCP	Vulnerable Community Plan (or Vulnerable Communities Plan)
WB	World Bank
WBG	World Bank Group
WEG	Motors and Generators Company
WDC	Ward Development Committee
WHO	World Health Organisation
WTW	Water Treatment Works

WUC	Water Utilities Corporation
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WWTP	Wastewater Treatment Plant
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## GLOSSARY OF TERMS

**Air Pollutant:** Any substances in air that could, in high enough concentration, harm human beings, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of matter capable of being airborne.

**Dump:** A site used to dispose of solid wastes without environmental controls.

**Emission:** Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities, from residential chimneys; and from motor vehicle, locomotive, or aircraft exhausts.

**Environmental and Social Assessment (ESIA):** An instrument to identify and assess the potential environmental and social impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures.

**Exposure:** A potential health threat to the living organisms in the environment due to the amount of radiation or pollutant present in the environment.

**Empowerment:** Is the expansion of assets and capabilities of vulnerable and marginalized individuals and groups to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives. In its broadest sense, empowerment is the expansion of freedom of choice and action. It is a participatory process which places or transfers decision-making responsibility and the resources to act into the hands of those who will benefit. This can include (i) capacity building for stakeholder organizations; (ii) strengthening legal status of stakeholder organizations; (iii) stakeholder authority to manage funds, hire and fire workers, supervise work, and procure materials; (iv) stakeholder authority to certify satisfactory completion of project and establish monitoring and evaluation indicators and (v) support for new and spontaneous initiatives by stakeholders.

**Environmental and Social Impact:** Any change, potential or actual, to: (i) the physical, natural, or cultural environment, and (ii) impacts on surrounding community and workers, resulting from the project activity to be supported.

**Gender:** Refers to the socially constructed roles ascribed to males and females and the resulting socially determined relations. These roles are learned, change over time, and vary widely within and across cultures. Gender is one of the key entry points for social analysis/ assessment. It is important to understand the social, economic, political, and cultural forces that determine how men and women participate in, benefit from, and control project resources and activities. A good analysis would highlight gender specific constraints, risks and opportunities.

**Grievance Procedures:** The processes established under law, local regulations, or administrative decision to enable property owners and other displaced persons to redress issues related to acquisition, compensation, or other aspects of resettlement.

**Groundwater:** The supply of fresh water found beneath the earth's surface (usually in aquifers), which is often used for supplying wells and springs. Because groundwater is a major source of drinking water, there is growing concern about areas where leaching agricultural or industrial pollutants or substances from leaking underground storage tanks are contaminating it.

**Ipelegeng:** One of Government of Botswana's safety net programmes where vulnerable people are registered to undertake labour-based works and are paid at the end of the month. The workers are also given food daily.

**Kgosi:** Traditional leader or chief of a ward/village (Plural is DiKgosi).

**Kgotla or Customary Court:** Name given to the place for community meetings and customary court hearings in a ward/village (Plural is Dikgotla).

**Kgotla Meeting:** A public meeting held at the Kgotla, in the presence of a Kgosi or his representative. All individuals are encouraged to speak freely and openly as it upholds the idea of equality.

**Land:** The surface of the earth consisting of soil and things permanently attached to surface, including land-based natural resources such as forests. This is the general rule, but the extent of 'land' differs from country to country. In this context, land refers to agricultural and/or non-agricultural land and any structures thereon whether temporary or permanent and which may be required for the Project.

**Land Acquisition:** The process of acquiring land under the legally mandated procedures of eminent domain. This includes all methods of obtaining land for project purposes, which may include outright purchase, expropriation of property and acquisition of access rights, such as easements or rights of way. Land acquisition may also include: (a) acquisition of unoccupied or unutilized land whether or not the landholder relies upon such land for income or livelihood purpose; (b) repossession of public land that is used or occupied by individual households; and (c) project impacts that result in land being submerged or otherwise rendered unusable or inaccessible.

**Land Expropriation:** The compulsory taking of land by the state, in exercise of its power of eminent domain. The process whereby a person is compelled by a public agency to alienate all or part of the land and fixed assets s/he owns or possesses, to the ownership and possession of that agency, for a public purpose, in return with compensation at replacement value.

**Monitoring:** The process of repeated observations and measurements of environmental and social quality parameters to assess and enable changes over a period.

**Project Affected Person:** Any person who, because of the implementation of a project loses their right to own, use, or otherwise benefit from a built structure, land (residential, agricultural, or pasture) annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily.

**Permeability:** The rate at which liquids pass through soil or other materials in a specific direction.

**Permit.** An authorization, license, or equivalent control document issued by an approved agency to implement the requirements of an environmental regulation; e.g., a permit to operate a wastewater treatment plant or to operate a facility that may generate harmful emissions.

**Potable Water:** Water that is safe for drinking and cooking.

**Public Consultation:** the process of engaging affected people and other interested parties in open dialogue through which a range of views and concerns can be expressed in order to inform decision-making and help build consensus. To be meaningful, consultation should be carried out in a culturally appropriate manner, with information in local languages distributed in advance.

**Recycle/re-use:** The process of minimizing the generation of waste by recovering usable products that might otherwise become wastes. Examples are the recycling of aluminium cans, wastepaper, and bottles.

**Resettlement Action Plan (RAP):** An instrument to be prepared when subproject locations are identified and the project will result in physical and/or economic displacement and livelihood impacts. It specifies the procedures that it will follow and the actions that it will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by an investment project.

**Rehabilitation or Livelihood Assistance:** A term often used to describe the process of re-establishing lifestyles and livelihoods following resettlement.

**Run-off:** That part of precipitation, snowmelt, or irrigation water that runs off the land into streams.

**Smoke:** Particles suspended in air after incomplete combustion of materials.

**Solid Wastes:** No liquid, non-soluble materials, ranging from municipal garbage to industrial wastes that contain complex, and sometimes hazardous, substances. Solid wastes include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid wastes also refer to liquids and gases in containers.

**Socio-Economic Survey (SES):** A complete and accurate survey of the project-affected population. The survey focuses on income-earning activities and other socioeconomic indicators.

**Social Impact:** An effect (both positive and negative) on a social issue resulting from development projects.

**Stakeholders:** Include all individuals and/or groups who are affected by, or can affect, a given operation. Stakeholders can be individuals, interest groups, corporate organizations.

**Vulnerable Individuals or Groups:** Those who by gender, ethnicity, age, physical or mental disability, economic disadvantage, religious affiliation, social status or other characteristics may be more adversely affected by project impacts including. Vulnerability denotes a condition characterized by higher risk and reduced ability to cope with shock or negative impacts. It may be based on socio-economic condition, gender, age, disability, ethnicity, or other criteria that influence people's ability to access resources and development opportunities.

**Indigenous Peoples Plans (or Vulnerable Communities Plans):** As a compliance measure with OP 4.10 on Indigenous Peoples, a Vulnerable Community Plan (VCP) is prepared for any investment project which affects Indigenous Peoples. In this project, the term vulnerable communities will be used to mean those communities who meet the criteria of Indigenous Peoples under OP 4.10. The Plan is designed to reflect culturally appropriate benefits and processes and is based on the full consideration of the options preferred by Indigenous Peoples affected by the project in a consultation process that respects the principles of free, prior and informed consultation leading to broad community support. The Plan also includes provisions which ensure that institutions responsible for government interaction with Indigenous Peoples should possess the social, technical and legal skills needed to carry out proposed development activities. Elements of a VCP include an assessment of the legal framework, collection of baseline data, examination of land tenure, strategy for local participation, design of mitigation measures and activities, assessment of institutional capacity, an implementation schedule and a system for monitoring and evaluation.

**Ward:** A division of a settlement, village or town, for administrative and representative purposes.

**Water Pollution:** Water pollution is the contamination of water bodies, usually as a result of human activities. Water bodies include for example lakes, rivers, oceans, aquifers and groundwater. Water pollution results when contaminants are introduced into the natural environment. For example, releasing inadequately treated wastewater into natural water bodies can lead to degradation of aquatic ecosystems. In turn, this can lead to public health problems for people living downstream. They may use the same polluted river water for drinking or bathing or irrigation. Water pollution is the leading worldwide cause of death and disease, e.g. due to water-borne diseases.

## 1. EXECUTIVE SUMMARY

### 1.1. INTRODUCTON

The Government of Botswana through Water Utilities Corporation (WUC) is undertaking the Botswana Emergency Water Security and Efficiency Project (BEWSEP) with funding from the World Bank. The Mambo Wastewater Treatment Plant (WWTP) is a sub-project under this project. The Botswana Environmental Assessment Act (2010), environmental and social policies of the World Bank (WB) require the sub-project to conduct an Environmental and Social Impact Assessment (ESIA) with an Environmental and Social Management Plan (ESMP) in line with World Bank's Operational Policy Procedures and Standards.

#### ***1.1.1. BEWSEP Description and Development Objective***

The Proposed Development Objective (PDO) of the project is to improve availability of water supply in drought vulnerable areas, increase the efficiency of WUC and strengthen wastewater management in selected systems. The project is organized under three components:

**Component 1:** To improve availability of water supply and efficiency

**Component 2:** To improve wastewater and sludge management

**Component 3:** Sector reforms and institutional strengthening

The BEWSEP has been classified by the World Bank as Category 'A' because of the Mambo WWTP which is likely to have significant adverse environmental and social impacts which are sensitive, diverse, and unprecedented. The key risk is potential environmental impacts likely to be generated from rehabilitation and expansion works at the WWTP.

This report is submitted in accordance with the requirements of section 7 and 8 of the Botswana's Environmental Assessment Act of 2010 and World Bank Safeguard Policies. Following submission of the project brief, the Department of Environmental Affairs (DEA) indicated that the project needed to be put through a detailed ESIA.

### 1.2. PROJECT DESCRIPTION

This project entails the rehabilitation and expansion of Mambo WWTP to improve operational performance and limit pollution of downstream water sources. The recommendations made in this report are in line with the Mambo WWTP Feasibility Study completed in 2020 by Hydroplan Consulting Company.

The Feasibility study undertaken by Hydroplan Consulting Company recommended measures that must be implemented to achieve a successful, well-functioning WWTP and they are as follows:

#### Tanker Discharge Bay

Installation of a Tanker Discharge Bay(septage acceptance station) composed of screen, flow measurement and automatic collection of septic samples. The advantage of this system is that all necessary data are logged automatically and visible from the process control room. Another advantage is that the acceptance station can be equipped with an automatic sampler that collects samples automatically. A disadvantage of the system is that it is relatively expensive and requires frequent maintenance.

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## Inlet Works

### Screen

Reduce the gap between on the screen bars to 50 mm, so that it will not only capture large items but medium size objects too. This reduction of the bar spacing may assist to reduce the load on the downstream mechanical screen.

### Screw Pumps

Replacement of the screw pumps to be operated continuously. This will avoid the shock loads to the preliminary (mechanical) stage of the WWTP and ensure a continuous flow and more stable operation.

## Preliminary Treatment (Mechanical Treatment)

- 1.) Refurbishment of existing equipment by replacing electro-mechanical equipment to operate both lines
- 2.) Replacement of all screens by modern screens (belt filter screen, step screen or similar), and construction of combined, aerated grit and grease channels (two lines). The new screw pumps and new screens would be installed in the existing civil works, while grit and grease channel would be built next to existing structure.
- 3.) Combined compact screen, grit and grease removal devices that are stainless steel, pre-manufactured units. Three of these units would be required and be operated in parallel.

## Primary Treatment

The entire electro-mechanical equipment of both settling tanks (pumps, motors, valves, scraper bridges, wheel track) require replacement. According to examination by Hydroplan (2019), the civil structure is in good shape and can be maintained for future use. Additionally, the following are recommended;

- A new sludge pumping station is required to remove the settled sludge.
- pumping station
- sludge thickener will have to be designed and built.

## Biological Treatment

Retrofit the existing denitrification tank for installation of a moving bed biofilm reactor (MBBR)

## Pumping Station

Refurbishment of the pumping station.

## Trickling Filters

- Replacement of filler material (stones) with plastic material, preferably hanging substrate material
- Build additional trickling filters in order to achieve the required nitrification of Ammonium.

## Disinfection

To replace the chlorination process by UV disinfection.

## Digesters

- Construction of sludge thickener near the digesters for primary, excess sludge (humus tanks), and faecal sludge.
- All mechanic and electric equipment is to replace including pipe works (gas and sludge).
- Installation of a heating system, so that the digesters can be operated at a temperature between 35°C and 38°C continuously.

## Gas Holding Tank

A gas balloon and all necessary accessories be installed for safe operation of a gas storage.

### **1.2.1. MAMBO WWTP ACTIVITIES**

#### **Mobilisation/Pre-Construction**

- Award of contract to a suitable contractor
- Finalisation of C-ESMP and all related documents such as TMP, COVID-19 Plan, Labour Plan, Procurement Plan
- Obtaining requisite permits/consents.
- Training of staff regarding GM and sensitization of communities to the GM
- Clearance of the working space.
- Erection of construction offices within Mambo WWTP perimeter fence
- Engagement of staff
- Transportation and offloading of equipment into the site.
- Procurement and transportation of material needed for the sub-project
- Community consultations including with the Village Development Committee (VDC).
- Drainage of the influent and sludge removal to clear way for construction and rehabilitation

#### **Construction (12 months)**

##### **Specific Rehabilitations Works**

- Dismantling of non-functional equipment
- Replacement of the screw pumps,
- Replacement of screens and preliminary treatment with a new, modern facility (screens, combined aerated grit and grease chamber),
- Rehabilitation of Primary Sedimentation Tanks and equipment,
- Building of a new sludge thickening tank,
- Rehabilitation of the existing Digesters,
- Rehabilitation of the existing Gas Holding Tank,
- Rehabilitation and modification of the existing Denitrification unit,
- Design and installation of mechanical works of the pump station,
- Design and installation of electrical works of the Mambo WWTP

- Design and installation of telemetry and SCADA system
- Refurbishment of Administration Block.
- Replacement of chlorination by UV disinfection

#### **Specific Expansion Works**

- Installation of porter camps and offices
- Building a new additional Primary Sedimentation Tank,
- Construction of eight new Trickling Filters and four humus tanks / secondary sedimentation tanks,
- Improvement of the construction of a new faecal sludge acceptance station,
- Construction of an additional new Digester,
- Construction of an additional new Gas Holding Tank,
- Construction of a Combined Heat and Power plant (CHP) for reducing energy cost
- Construction of a new Maintenance and Electrical workshop(s)
- Concrete casting of supporting structures

#### **Operation (20 years)**

- Offloading of influent by sewage trucks at WWTP
- Movement of influent from the industries through sewage lines
- Screening of the influent to separate coarse material from liquid
- Incineration of the coarse material
- Sedimentation of the liquid influent to extract raw sludge
- Processing and drying of the raw sludge
- Processing in the aeration tank with compressed air
- Final separation of sludge in the settling tanks to extract raw sludge
- Disinfection of recycled water with chlorine
- Disposal of effluent into the river
- Testing of effluent to check compliance to standards

#### **Decommissioning (12 months)**

- Pumping out of the extra wastewater and raw sewage to another WWTP
- Final treatment of the remaining influent
- Removal of electrical and mechanical equipment
- Chemical treatment of the machines and structures
- Breaking down of concrete structures
- Haulage of rubble from the WWTP to the landfill
- Land rehabilitation by backfilling with clean soil
- Re-vegetation of the disturbed area

#### **1.2.2. JUSTIFICATION OF THE SUB-PROJECT**

The objective of the proposed development is to improve operational performance of the Mambo WWTP and limit pollution of downstream water sources that is currently taking place. The wastewater received from Francistown and Tati Siding is currently not treated to the required Botswana Bureau of Standards 93:2012 (BOS 93:2012) Wastewater – Physical, Microbiological, and Chemical requirements. The effluent, which is discharged into the Tati river, which feeds into the Shashe river, and subsequently into the Dikgatlhong Dam (50 km downstream) is high in *Escherichia Coli*, Total coliforms, Faecal coliforms, and Manganese content.

### 1.2.3. PROJECT LOCATION

#### Project Villages

The project area consists of Francistown and eight (8) surrounding villages namely (1) Tati Siding, (2) Tonota, (3) Mathangwane, (4) Borolong, (5) Sashe Mooke, (6) Mandunyane, (7) Matshelagabedi, and (8) Matsiloje. The villages in the project area are located between 20 and 45 km from Mambo WWTP. All the other seven (7) villages are located in different hydrological catchments as shown in the following Figure 4-2, except for Tati Siding. The areas of Francistown and Tati Siding (marked in green) are the only ones connected to the Mambo WWTP. The remaining areas (coloured in purple) are peripheral settlements and are served by onsite sanitation systems, such as pit latrines and septic tanks.

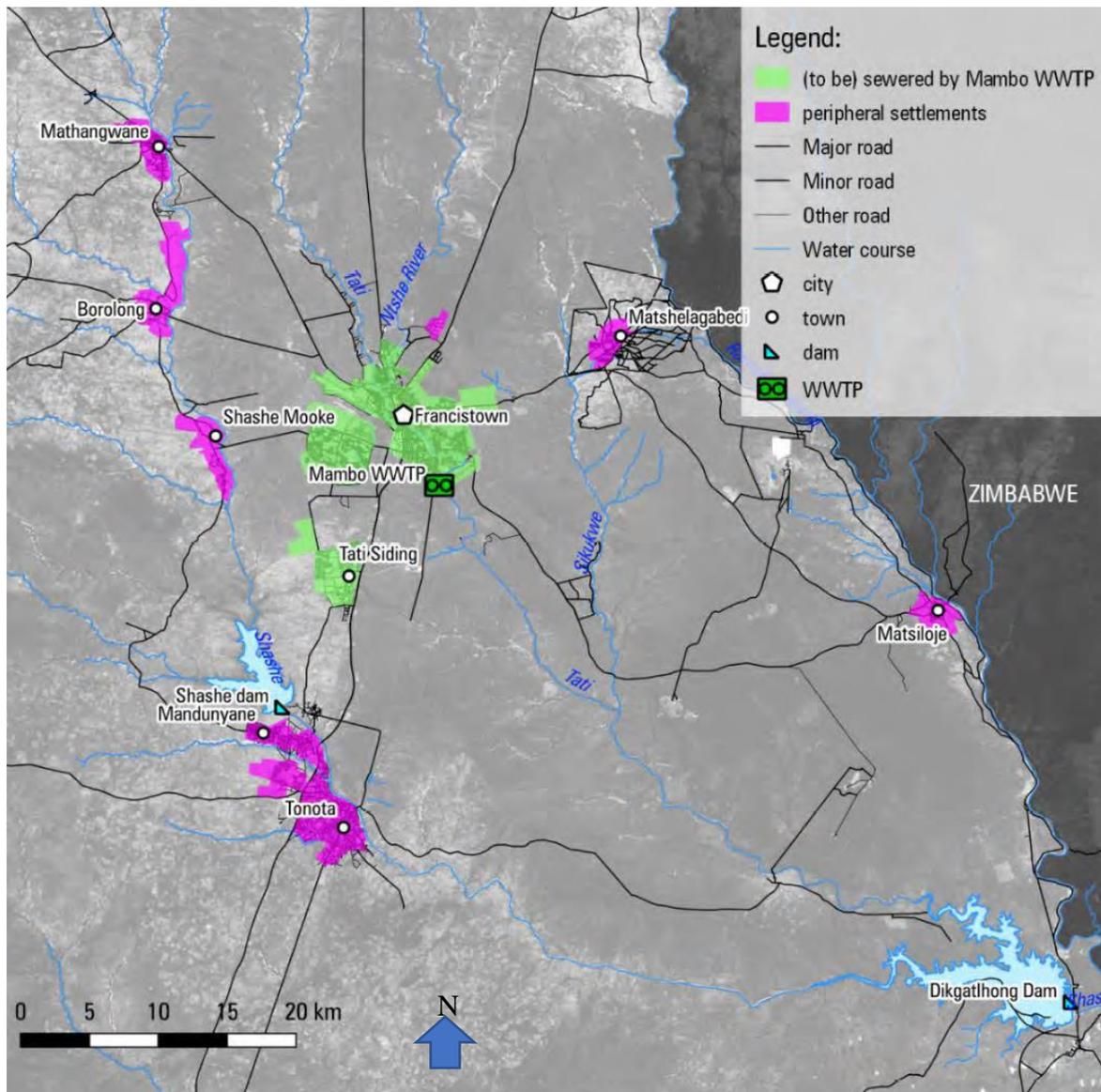


Figure 1-1: Project Catchment Area

The City of Francistown is in the north eastern part of Botswana, joined to Gaborone by a 433 km A1 highway. Mambo WWTP is located at the southern edge of Francistown on the eastern side of Lady Mary private farm. Tati river runs about 100 m from the treatment plant.

#### 1.2.4. PROJECT BENEFICIARIES

The rehabilitation of Mambo WWTP will benefit the Francistown community as a whole and the village of Tati Siding. The estimation of wastewater flows and loads done by Hydroplan Consulting Company was based on the assumption that Mambo WWTP will only treat the water of Francistown and Tati Siding, which are already connected by a force main from the City to Mambo WWTP. The sanitation of the surrounding villages, in the exception of Tonota, will happen via onsite sanitation systems, however, going forward, the faecal sludge collected in Francistown, Tati Siding and the surrounding villages will be transported to the Mambo WWTP and be treated there.

#### **1.2.5. PROJECT COMMENCEMENT AND ESTIMATED COST**

The project is expected to commence in January 2022 after procurement due diligence and approvals of safeguards documents at an estimated cost of P260,000,000.00 for 12 months.

#### **1.2.6. ASSESSMENT OF PROJECT ALTERNATIVES**

Mambo WWTP is currently not functioning properly and it is prone to mechanical breakdowns which affect the quality of effluent produced. This has a detrimental effect on the environment as partially treated effluent is disposed into the Tati river. WUC therefore, has the option to take action to rectify the problem, or to not act and leave the plant as it is currently functioning. The latter shall be considered the “no project alternative.” and the former the “project alternative”.

##### **1.2.6.1. No Project Alternative**

This alternative means not taking any action but continuing with the existing WWTP as it is currently being operated. This alternative will result in the following:

- The continuance of partially treated effluent being disposed into the Tati river.
- There shall be high possibility of polluting Dikgatlong Dam by Tati river carrying inadequately treated effluent into the dam.
- Pollution to the environment and groundwater sources shall persist.
- The problems at the pump stations (blockages, spillages and non-functional parts) shall not be adequately attended to hence there is possibility of persistence of these problems.
- WUC will incur no costs of rehabilitation and expansion.
- Employment opportunities that would emanate from the project shall not be realized.
- Potential for the recycling and re-use of the Mambo WWTP for horticultural purposes shall not be realized.
- Livestock, fish, wild animals, and humans that use water directly from Tati river shall continue to be put in pollution danger.

##### **1.2.6.2. Project Alternative**

#### **Recommended Measures and Options for Rehabilitation of WWTP**

This option presents measures for each of the treatment stage in Mambo WWTP and, where technically feasible, different options regarding what to do with the equipment at each stage are presented, where a replacement of a unit is inevitable due to the poor condition, no further options is recommended but outright replacement is recommended. The treatment stages where the equipment must be assessed for possible refurbishment or replacement are as follows:

- Tanker Discharge Bay
- Inlet Works
- Preliminary Treatment (Mechanical Treatment)
- Primary Treatment

- Biological Treatment
- Biogas Utilization

### **1.2.7. RATIONALE FOR ESIA**

#### **1.2.7.1. Objectives of the ESIA Study**

- To inform the beneficiary communities and relevant stakeholders of the proposed project.
- To assess the level of stakeholder interest for the project and enable stakeholder views to be considered in project design and environmental and social performance.
- To promote and provide, means for effective and inclusive engagement with project interested and affected parties throughout the project lifecycle on issues that could potentially affect them.
- Assess the current environmental and social baseline conditions in sufficient detail to the subsequent inform the impact assessment.
- Identify key environmental and social issues with the assistance of stakeholders and potentially affected communities.
- Assess the magnitude and probability of the predicted impacts of the proposed sub-project and ultimately their significance.
- Develop mitigation measures and management actions through an Environmental and Social Management Plan (ESMP) that address the potential impacts (enhancing the positive impacts and eliminating or reducing the negative ones) and risks of the sub-project.
- Determine the environmental monitoring and reporting requirements, emergency response procedures, institutional or organization arrangements, and capacity development measures to ensure the implementation of the ESMP.

#### **1.2.7.2. Methodology**

- Screening by World Bank
- Literature Review
- Site Visit
- Consultations with Public and Stakeholders

### **1.3. ENVIRONMENTAL AND SOCIAL SAFEGUARD POLICIES, LEGISLATIVE AND ADMINISTRATIVE FRAMEWORK RELEVANT TO THE SUB-PROJECT**

The following policies, legislation and standards are relevant to the sub-project.

**Table 1-1: World Bank Policies Triggered**

<b>World Bank Safeguards Operational Policy (OP)</b>	<b>Triggered by this Project</b>	<b>Relevance to the Sub-Project</b>
OP 4.01 Environmental Assessment	Yes	Initial evaluation has identified potential negative environmental and social impacts, thus, there is a need for an environmental and social assessment to ensure appropriate mitigation measures are in place during all stages of the sub-project.
OP 4.11 Physical Cultural Resources	Yes	An Archaeological Impact Assessment (AIA) had to be undertaken for the Mambo WWTP site and for pump

		stations in an effort to investigate if there are any physical cultural resources. No trial trenching was done; however, the construction stage may result in deep excavations of which chance finds may be encountered. The archaeological investigations did not discover any places or artefacts of archaeological significance at the WWTP and the pump stations.
OP 4.10 Indigenous Peoples	Yes	This policy triggered at project level but not relevant to this sub project
OP 4.12 Involuntary Resettlement	Yes	This policy triggered at project level but not relevant to this sub project.
OP 4.37 Dam Safety	Yes	When the Bank finances a project that includes the construction of a new dam, it requires that the dam be designed, and its construction supervised by experienced and competent professionals. It also requires that the borrower adopt and implement certain dam safety measures for the design, bid tendering, construction, operation, and maintenance of the dam and associated works therefore this policy triggered at project level but not relevant to this sub project. .
OP 7.50 Projects on International Waterways	Yes	This policy is triggered at project level and Mambo WWTP utilises the Tati river for disposal of effluent. Tati river is a tributary of Limpopo river which runs along Botswana, South Africa, and Zimbabwe.
<i>World Bank Environmental Health and Safety (EHS) Guidelines</i>	Yes	The sector specific EHS Guidelines for Water and Sanitation are relevant to this sub-project because they include information relevant to the operation and maintenance of (i) potable water treatment and distribution systems, and (ii) collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities. Furthermore, the general EHS guidelines are also applicable to the sub-project.
<i>Grievance Mechanism (GM)</i>	Yes	For this sub-project, the WUC and the contractor will ensure that all complaints will be communicated to and registered by the Contractor's nominated representative usually the Contractor's Community Liaison Officer (CLO) in the site daybook immediately upon receipt, including details of the complainant, attempts to resolve the complaint, the resolution of the complaint and outcome.

**Table 1-2: Legislation, Policies and Standards Relevant to the Sub-Project**

No.	Document/Legislation	Relevance to the Sub-Project
1.	<i>Trade Effluent Agreement</i>	WUC should ensure that all industries which use the sewer system that connect to Mambo WWTP have all signed the Trade Effluent Agreement and are adhering to it.

No.	Document/Legislation	Relevance to the Sub-Project
		WUC should undertake regular inspections of major industries sewer connections.
2.	<i>Water Utilities Corporation (WUC) Policy on Safety Health and Environment (SHE)</i>	WUC should ensure that their facility does not put at risk the safety and health of downstream users of water in the Tati river by ensuring that water released is of good quality.
3.	<i>National Occupational Safety Association (NOSA) Integrated Five Star System</i>	WUC should adhere to their own good quality systems which will prevent poor maintenance of the WWTP which puts the occupation health of workers at risk.
4.	<i>Water Utilities Corporation Draft Environmental Management Policy</i>	WUC Environmental Policy aims to protect the environment in which they operate in. One of their objectives is the manage wastewater in a manner that will sustain the environment as such it is imperative that at no point should water not meeting the minimum standard be disposed into the environment.
5.	<i>National Development Plan 11 (NDP11)</i>	WUC should, in line with the challenges outlined by the NDP, strive to stop pollution by not releasing water that does not meet the minimum requirements as well as maximizing on recycling of wastewater for other uses.
6.	<i>City of Francistown Development Plan (1997-2021)</i>	Francistown is growing and as such WUC should ensure that the WWTP should be able to process all wastewater from Francistown and surrounding areas.
7.	<i>Development Control Code (2013)</i>	WUC should adhere to the objective of preventing of airborne emissions and water borne discharges by ensuring that the WWTP is operating as it was designed and servicing it regularly.
8.	<i>Botswana National Master Plan for Wastewater and Sanitation (BNMPWWS)</i>	WUC should ensure that as part of the upgrade of the facility there are measure put in place for the recycling of water and waste generated from the facility.
9.	<i>Environmental Assessment Act (2010)</i>	Extensive public consultations were undertaken with affected communities, over and above the mandated Kgotla meeting as per the EA Act of 2010, Focus Group Meetings were held.
10.	<i>Environmental Assessment Act (2020)</i>	This Act is an amendment of the EA Act 2010 which is aimed at improving the review durations and shortening of the EIA process. This Act is likely to be put in effect in May 2021.
11.	<i>Monuments and Relics Act (2001)</i>	An AIA was undertaken and there were no issues with the site.
12.	<i>Water Utilities Corporation Act (1970)</i>	The site is already connected to the WUC supply network. Treatment of waste does not require use of potable water from the facility.
13.	<i>Forestry Act (Cap 38:04) (1968)</i>	The project area is not in a protected forest area and is currently characterized by mixed <i>Acacia</i> woodland.
14.	<i>Herbage Preservation (Prevention of Fires) Act (Cap 38:04) (1977)</i>	The Act is useful in preventing forest fires around the project area. A forest fire has been reported in 2011 that ravished the project area. It is therefore important to put measures in place that will avoid altogether the occurrence of fires and also there should be quick and effective response strategies to fire as stipulated in the Strategy on Disaster Preparedness and Management for WUC.
15.	<i>Agricultural Resources Conservation Act (Cap 35:06) (1979)</i>	With the disposal of untreated wastewater into the environment, animal and plant life are potentially affected. This undesirable situation necessitates immediate action to rectify the operational deficiencies at the Mambo WWTP.
16.	<i>Atmospheric Pollution (Prevention) Act (Cap 65:03) (1971)</i>	Odour that is sometimes generated by the plant contributes to air pollution and measures should be put in place to address and contain this situation in the expansion and improvement of the plant.

No.	Document/Legislation	Relevance to the Sub-Project
17.	<i>Waste Management Act (1998)</i>	This Act should be considered especially because operational activities generate waste materials such as screenings and sludge. These needs to be managed and disposed of at appropriate sites or areas. It is believed that the plant upgrade will improve the quality of the treated wastewater disposed from the Mambo WWTP to meet the required standard.
18.	<i>Public Health Act (2013)</i>	Working conditions in wastewater conditions is dangerous as well as hazardous, the occupational safety of workers should be given priority by ensuring that they have protective clothing, and the working environment is as safe as possible. WUC is currently a member of the Reference Group co-ordinating the formulation of the National Occupational Health and Safety Policy, which will govern the protection and medical surveillance of workers depending on the type of hazards.
19.	<i>The Water Works Act (1962)</i>	Even though for the operation of Mambo WWTP, WUC is not abstracting water from any water works, it is imperative to take note of this Act as they are the governing body overlooking the provision and reticulation of water and wastewater to the public.
20.	<i>Water Act (1967)</i>	This Act is particularly important and should be adhered to because currently Mambo WWTP is disposing sewage into the river. It should be ensured that wastewater is treated up to required standard to avoid pollution of water courses. There are stated penalties for contravention of this Act.
21.	<i>Factories Act (1978)</i>	Protective clothing is to be supplied to the workers and they should always be encouraged to use them.
22.	<i>Acquisition of Property Act (1955)</i>	There are no properties to be affected by the project.
23.	<i>Special Economic Zone Act (2015)</i>	This Act is relevant to this project because the expansion of the Mambo WWTP capacity has to take into consideration the planned special economic zones that will in future also utilise Mambo WWTP through the sewage network.
24.	<i>Wastewater Discharge Standards (BOS 93: 2012)</i>	It is evident from the test results that treated wastewater from Mambo does not comply with the standards as set by BOBS, (See Appendix 7). It is imperative therefore that measures are put in place such as upgrading of the plant to bring the quality of the wastewater to standard. The standard will be used in conjunction with EHS Guidelines.
25.	<i>Wastewater Quality Requirements for Irrigation (BOS 463:2011)</i>	Some farmers along the river harvest the effluent water from the river and use it for agricultural purposes. It is also used to irrigate the golf course in Francistown.
26.	<i>The National Policy on HIV/AIDS (1998)</i>	HIV education should be provided to workers during construction and this should include voluntary testing.
27.	<i>National Policy on Natural Resources Conservation and Development (1990)</i>	The policy is very important in guiding the operation of the Mambo WWTP as degradation of the environment has to be prevented and measures put in place to reduce, <i>inter alia</i> , water pollution, air pollution, and avoiding activities that will reduce the aesthetic appeal of the environment.
28.	<i>Botswana Vision 2036</i>	<p>Vision 2036 is relevant to this project because this project is aimed at improving people's lives at social level by provision of wastewater services.</p> <p>This sub-project further realises the pillar 3 which is "sustainable environment" by provision of recycled water which fulfils the</p>

No.	Document/Legislation	Relevance to the Sub-Project
		pillar's statement of promoting maximum sustainable yield for renewable resources.
29.	<i>Revised Guidelines of Ipelegeng (2012)</i>	The sub-project will employ unskilled labour in the surrounding villages therefore reducing pressure on the Ipelegeng Project.
30.	<i>Domestic Violence Act (2008)</i>	This Act is relevant to this sub-project because at construction stage, it is an economic activity that results in labour influx which result in social competition. The social competition plays a role in fuelling domestic violence or gender based violence.
31.	<i>Children's Act (2009)</i>	This Act is relevant to this sub-project because where there is influx of labour, children especially girl child is subjected to inter-generational relationship due to economic pressures. In homes, unreported cases of child abuse are on the rise because of protection of abusive breadwinners. This Act also prohibits child labour.
32.	<i>Revised Destitute Person's Policy (2002)</i>	The Mambo WWTP is situated in Francistown and affects some villages in Greater Francistown and downstream. Patayamatebele village which is downstream and solely relies on water pumped from Shashe river is in danger of being high affected by poor quality of effluent that is discharged on the river. The village has a small population, with majority of the population relying on social programs like Ipelegeng and Destitute Persons Program. It is therefore imperative that implementation of the sub-project considers all possible ways to protect the community and reduce any risks or negative effects that can disturb or interrupt the daily lives of the community when the project is on.
33.	<i>National Policy on Gender and Development</i>	The policy is relevant to this sub-project because the employment process during construction should afford the same opportunities for both men and women. No gender discrimination will be allowed.
34.	<i>African Union Agenda, 2063</i>	It is relevant to this sub-project because it seeks to accelerate the implementation of past and existing continental initiatives for growth and sustainable development.
35.	<i>Sustainable Development Goals (SDGs)</i>	Employment creation that will be fulfilled by the sub-project will go a long way in achieving eradication of poverty and hunger and improved health and nutrition. The employment process that does not discriminate against gender promotes protection of human rights and gender equality.
36.	<i>Francistown Revitalization Plan</i>	Mambo WWTP will take into consideration the Francistown Revitalisation Plan, through the population projections up to 2040 and commercial growth, the planned capacity of the WWTP has projected that it shall be double by 2040 to cater for the economic and commercial growth.
37.	<i>Francistown Urban Development Plan 4</i>	In terms of capacity, Mambo WWTP must take into consideration any future development that is considered under Francistown Urban Development Plan 4. Sewage infrastructure is a critical part of the development plan.

#### 1.4. Grievance Mechanism (GM)

The sub-project may give rise to complaints from community members, stakeholders, project affected persons and the public. These complaints need to be attended to and resolved as quickly as possible at the sub-project level. In this regard, a Grievance Committee (GC) will be established with defined terms of reference. Membership of the GC shall comprise of the following:

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- Contractor's CLO
- Land Board Representative
- WUC Representative
- Two Local Representatives (One man and one woman)
- Project Liaison Officer 1 (Safeguards Social Consultant)
- Environmental Officer 2 (Safeguards Environmental Consultant)
- Community Liaison Officer (CLO)
- Non Governmental Organisations (NGO) in the project area
- A representative from the Ministry of Youth Empowerment Sports and Cultural Development
- A representative from Department of Gender Affairs

A Grievance Mechanism (GM) for conflict prevention and resolution has been devised in consultation with the affected communities. **Table 1-3** below shows the GM process.

**Table 1-3: Grievance Mechanism Process**

Step	Process	Description/Required Action	Completion Timeframe	Responsible Agency/Person
1.	Receipt of complaint	Document date of receipt, name of complainant, nature of complaint	1 day	Community Liaison Officer (CLO)
2.	Acknowledgement of grievance	By letter, email, phone	1-5 days	CLO
3.	Screen and establish the foundation / merit of the grievance	Visit the site; listen to the complainant/community; assess the merit	7-14 days	GC members including the CLO, complainant, and his/her representative
4.	Implement and Monitor a Redress Action	Where complaint is justified, identify, and carry out the redress	21-30 days or at a time specified in writing to the complainant	CLOs, WUC Social and Environmental Safeguard Specialists to coordinate the implementation of redress action
5.	Inform complainant and community (use of community boards, newspaper, radio, what's app group, Facebook page) to inform community of grievance outcome and solicit response from complainant if claim has been fully addressed or not.	Where complainant is not satisfied, inform complainant of escalation process.  If satisfied or not, ensure grievance logbook is updated.	1-2 days after making a decision on a grievance by the GC	CLO
6.	Extra intervention for a dissatisfied scenario	Review the redress steps and conclusions, provide intervention solution	2-4 weeks of receiving status report	Ministry of Land Management, Water and Sanitation Services (MLMWS), PLO, Social and

				Environmental Officers, and GC to review and react
7.	Judicial adjudication	Complainant has the option to take complaint to court of law	No fixed time	Complainant
8.	Funding of Grievance Process	WUC logistics and training, redress compensation, court process	No fixed time	WUC

**1.4.1. SUMMARY OF ARCHEOLOGICAL IMPACT ASSESSMENT**

The focus of the archaeological investigation was within the primary areas where the proposed refurbishment of the plant will take place. Survey of the earmarked area was conducted in and around the surrounding areas. The project area is already impacted by existing infrastructure surrounding it. The area has been demarcated by a fence which is manned by security guards. Nothing of archaeological or historical significance was encountered during survey, within the proposed areas of development. The area was vegetated with grass due to the recent rainfall in the area. Quartz is most dominant in the area; however, no stone tools were found. The Department of National Museum and Monuments (DNMM) have the ranking scale as indicated in the table below. The project area is ranked No. 5 ('No further work required') under the Botswana National Museum grading system provided in the table below. Appendix 6 contains the AIA report and DNMM's approval.

**Table 1-4: DNMM Ranking Scale**

Scale	Interpretation
1	Preserve at all cost
2	Preserve if possible, otherwise extensive salvage work
3	Test excavation to determine work is required
4	Systematic representative sampling sufficient
5	No further work required

**1.4.2. SOCIAL BASELINE DATA**

There are no vulnerable communities under this sub-project as per OP 4.10 definition.

**1.4.2.1. POPULATION**

Since the founding of Francistown as a gold mining and railway centre in the nineteenth century, the city's population has consistently shown an increase. Within the national framework, Francistown remains Botswana's second largest urban centre with approximately 4.8 percent of the country's urban population compared to 4.9 percent in 2001. The 2001 statistical figures reveal that Francistown contained a population of 83 023 persons. The city also experienced the highest density in the whole country, which stood at 825 persons/ km<sup>2</sup> during the 1991 period. The available statistics indicate that the Francistown's population increased from 18,613 in 1971 to 31,035 in 1981, 65,244 in 1991, and 83,023 in 2001 and finally 98 961 in 2011. Central Statistics Office (2005) estimates that the population currently stands at 116,927 by 2020 as shown in the table below.

**Table 1-5: Population of Francistown**

Place	2015	2016	2017	2018	2019	2020	2021
Botswana	1,954,491	1,976,398	2,003,867	2,031,513	2,059,352	2,087,397	2,115,654
Francistown	108,602	110,100	111,870	113,597	115,281	116,927	118,540

*Source: Statistics Botswana, 2011*

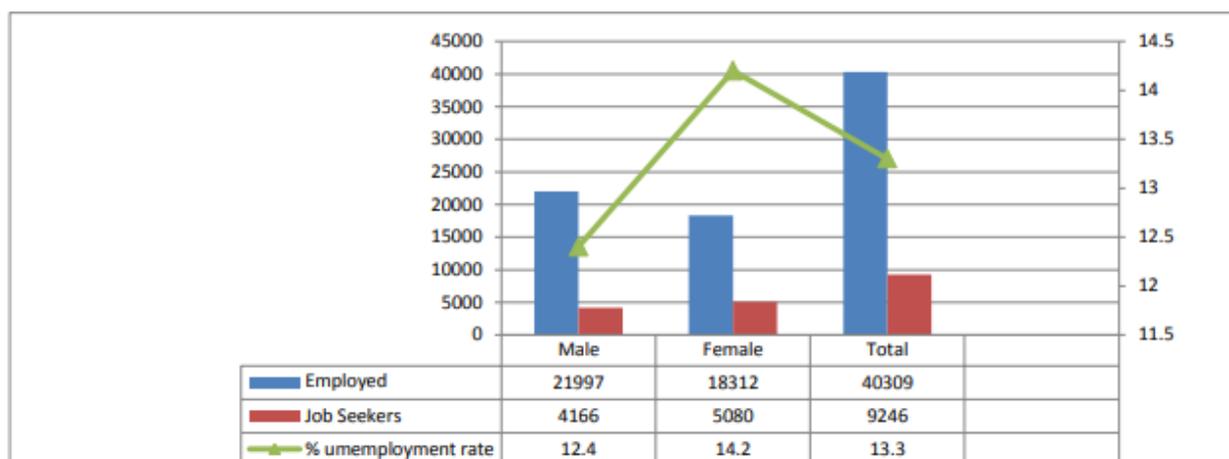
### 1.4.2.2. POVERTY LEVELS AND EMPLOYMENT

Due to its well-developed transportation links the city has encouraged the growth of a large wholesale sector serving most parts of Northern Botswana including parts of Caprivi Strip, Zambia, and Zimbabwe. Shopping tours operate from Bulawayo and as far away as Lusaka to Francistown. It serves as a retail centre for settlements as far as 200 km away resulting from the regular bus services. These include Tati Siding, Tonota, Mathangwane and Ramokgwebana.

Despite the relatively high average income per capita, Botswana is still plagued by many development problems common to low income countries, and cities like Francistown are the most affected. Inequality is high with a per capita consumption Gini co-efficient of 0.649 in 2009/10 in relation to an acceptable range of 0.4. On the other hand, poverty levels in Botswana have been falling steadily from 30.6% in 2002/03 to 19.3% in 2010.

Generally, unemployment rate in Botswana has been decreasing at a marginal rate, with urban areas having less unemployment rates than the rural areas. In the year 2009/10 female unemployment rate in all cities and towns was higher than that of males with 16.8% and 10.2% respectively. As per statistics Botswana 2011 unemployment in Francistown is almost double that of Gaborone. In 2010, unemployment among the youth was as high as 25%. To date unemployment in Francistown is still a concern as the youth are mostly affected. Employment opportunities are usually temporary, or contract basis, mostly from construction companies, involved in infrastructure development.

Employment was estimated for persons aged 15 years and above. Unemployment rate for Francistown was estimated at 13.3 percent in 2011. In comparison with males, females were more unemployed. Figure 1-2 reveals that unemployment rate was 14.2 percent for females and 12.4 percent for males in 2011. In comparison with Gaborone and other towns in Botswana, Francistown has the highest unemployment rate, followed by Jwaneng at 12.7 percent and Orapa had the lowest unemployment rate of 8.2 percent. However, Francistown's unemployment rate was lower than the national unemployment rate of 17.8 percent. The high unemployment rate of Francistown compared to Gaborone and other towns is as a result of a high influx of rural-urban migrants with the hope of securing employment. Though Francistown has roads and infrastructure, investors are still not attracted to it due to a high low-income population as a result of the movement of people from the surrounding rural areas flocking into the city in search of employment (Statistics Botswana, 2011).



(Source: Statistics Botswana, 2011)

**Table 1-6: Employment by Gender in Francistown**

### **1.4.2.3. ACCESS SOCIAL PROTECTION**

The Government of Botswana has public programs that exist to address the risks and vulnerabilities of its citizens. Most of the programs are being implemented by public agencies, in some cases with the cooperation of development partners and civil society organizations, though virtually all programs are financed by the government.

#### **Orphans Care Program**

This program was launched in 1999 and in terms of expenditures is currently one of the largest assistance programs in Botswana. It is managed by the Ministry of Local Government and Rural Development (MLGRD) Department of Social Protection (DSP), Division of Child Protection Services. It is designed to respond to the needs of orphans, including those for food, clothing, shelter, education, protection, and care. The City of Francistown Council Social and Community Development Department is the implementer of this program in Francistown.

Orphans receive a food basket and other items (such as a school uniform, clothing and a transportation allowance), orphans are also provided with psychosocial support from MLGRD's social workers.

Starting in 2009, the MLGRD replaced the delivery of the food basket with a smartcard (called a coupon) that gives the beneficiary the possibility of acquiring the specified foodstuffs at participating shops. The smartcard uses fingerprint verification (biometrics) to authorize each transaction. It gives the beneficiaries a choice of when and, to some extent, where they purchase their food.

#### **Destitute Persons Program**

This program was established in 1980 as a response to the gradual erosion of the traditional safety net. It is managed by the MLGRD's DSP, Division of Social Benefits. The program was intended to serve the few who have absolutely no other sources of support but also covers other people in need. The program classifies the destitute persons as either permanent or temporary. The permanently destitute are those whose age or physical or mental conditions render them completely dependent. They are therefore eligible for benefits for life but require an annual recertification by social workers. The temporarily destitute are those who are incapacitated by ill health or natural disasters and are thus unable to support themselves in the short term.

The benefits provided by the Destitute Persons Program are a coupon (a smartcard similar to the one used for the Orphan Care Program) to buy food and a cash allowance for non-food, access to social services, and various subsidies. The food coupon and the cash are provided monthly.

#### **Needy Children and Needy Students.**

These two programs are managed by the MLGRD's Department of Social Protection and implemented by local governments. Under the Destitute Persons, the Community Home Based Care (CHBC), and the Remote Area Development Programs, beneficiaries with "needy students" receive uniforms, the payment of room and board in a private house, support for transportation to and from school when the classes begin and end, tuition exemptions, and help with other fees (such as Parents and Teachers Association (PTA) and pot fees). Transfers of clothing to "needy students" are procured and delivered by local authorities. The Needy Children Program is for needy youths who are out of school, including orphans that are 18 years and over and no longer qualify for the Orphan Care Program but still are considered to have needs. They are provided with support depending on their needs, which can be extended until they are 29 years old.

### **The World War II Veterans Program**

The Veterans Program. This pension was introduced in 1998 for veterans of World War II and their survivors (spouses and children up to the age of 21). The program is managed by the MLGRD's DSP, Division of Destitute Persons and Old Age Pension and is implemented by the offices of the District Commissioner in various districts. The benefit provided by the program is a monthly cash transfer. The payments are made through the Post Office using a cheque-book-like leaflet. The Program offer some protection to survivors in that, when the direct beneficiary dies, the transfer is given to the surviving wife or, if there is more than one, the transfer is divided among the surviving wives.

### **Old Age Pension**

The OAP was established in 1996. It is a universal transfer that benefits all those aged 65 and older. It is managed by the MLGRD's DSP, Division of Destitute Persons and Old Age Pension.

### **Disability Cash Transfer**

This is a monthly cash transfer given to caregivers of people with severe disability to buy them their necessities. These are people with disability who rely completely on their carergivers.

### **Transfers to NGOs and other CSOs.**

The MLGRD transfers funds to various organizations that cater to children, youth, and other groups at risk. These include organizations that manage children's homes, homes for abused women, rehabilitation homes for drug addicts, and homes for the elderly. The MLGRD also funds organizations that provide counselling and help to reintegrate children in conflict with the law back into society.

### **1.4.3. LITERACY AND EDUCATION**

The Government has undoubtedly committed itself to, among the other things improve access to preschool education; providing ten years of basic education for all; increasing access to higher secondary and tertiary education; expanding vocational and technical training; and promoting life-long learning. Moreover, Government has also provided both educational facilities and human resource to improve the standard of education. The City provides all four levels of education accessible to Francistown residents and its surrounding areas (pre-school, primary, junior/senior secondary and tertiary).

#### **Pre-School Education**

In Francistown, there are currently 62 Day Care Centres of which 47 are privately run, 6 are run by Non-Government Organizations and, 6 are run by different Churches and the remaining 3 are operated by the Ward Development Communities in different localities. There are problems with the operations of Day Care Centres in Francistown. The main one is the unavailability of Civic and Community plots, which results in unlawful operations of Day Care Centres in residential areas and alternately causing high demand for change of land use to Day Care Centres.

#### **Primary School Education**

There has been expansion of primary school education with targets of achieving universal access to primary education. There are a total of 20 government primary schools and 4 private primary schools in Francistown. Out of the 20 government primary schools, only one school, namely, Centre for Deaf, offers special education.

#### **Secondary Education**

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There are nine (9) secondary schools in Francistown; of which seven (7) are Junior Secondary Schools while two (2) are Senior Secondary Schools. The Junior Secondary Schools are Donga, Goldmine, Montsamaisa, Mmei, Setlalekgosi, Selolwe Hill and Selepa. The Senior Secondary Schools are Mater Spei College and Francistown Senior Secondary School.

#### **1.4.4. SOCIAL INCLUSION OF YOUTH, WOMAN AND OTHER VULNERABLE GROUPS**

##### **Youth Empowerment**

Botswana has developed a National Youth Policy which enabled youth development in Botswana to be undertaken within the framework of the National Youth Policy of 1996 and the National Action Plan for Youth, 2001-2010. The overall objective of the framework was to ensure that the youth were given every opportunity to reach their full potential both as individuals and as active citizens of Botswana, this policy addresses new challenges such as Human Immuno-Deficiency Virus (HIV) and Aquired Immuno Deficiency Syndrome (AIDS), emerging issues such as Science, Information and Technology and Environmental Conservation and Protection. The Policy has also been aligned to recent national, regional and international policies and programmes that address youth development.

##### **Woman Empowerment**

Botswana's National Policy on Gender and Development was done in March 2015 designed to address the social inequities that still survive economically and socially. Priority areas include poverty prevention and economic development, social protection, the promotion of democracy, freedom from violence and the protection of vulnerable groups. The recognition of gender equality and legal involvement is important because it lends credence to the cause and serves to empower women in Botswana.

The Gender Affairs Department has sanctioned programs dedicated to the coordination and development of gender equality throughout the republic. The Women's Economic Empowerment Programme and the Women's Grant are two such examples. These agendas provide seed money for women's groups to help jumpstart women-led small business projects.

The presence of women in the business sector and in leadership positions is important, especially when it comes to women's empowerment in Botswana

#### **1.4.5. HEALTH**

Francistown has three types of health facilities categorized by the level of services provision. These are one referral hospital, namely, Nyangabgwe Hospital; three major clinics, namely, Jubilee, Donga and Area W, which operate 24 hours a day; ten other clinics; and, four health posts. The clinics are managed through District Health Management Team lead by a Public Health Specialist. The District has eight Infectious Disease Care Clinics (IDCC's). These offer clients with Highly Active Antiretroviral Therapy (HAART). Clients have easy access to these facilities, personnel and to HIV related programs such as HAART, CHBC, Tuberculosis (TB), testing, Adolescent Sexual and Reproductive Health (ASRH), Sexual Transmitted Infections management and condom distribution. Francistown has one Private Health Centre (Tati river clinic) and 15 private clinics that augment the public health facilities.

#### **1.4.6. WATER SUPPLY**

Shashe Dam is the source of drinking water for Francistown and the surrounding villages such as, Tati Siding, Mathangwane, Matsiloje, Matshelagabedi etc. Shashe dam is located about 30 km

south of Francistown and was constructed under the Second Water Supply Project. The construction of the dam began in 1970, and it was opened in 1973. The dam is a zoned embankment with a height of 32 metres. The length of the dam is 3.5 km.

From this resource, Francistown is supplied by a water distribution network with a length of about 1,954 km and 45,000 house connections. At the foot of the dam, the water treatment plant is located from where the clean water is pumped to the service areas. In 2016/17, the Shashe Water Treatment Plant (WTP) treated 33,606 m<sup>3</sup> /d and, out of this volume, 14,235 m<sup>3</sup> /d had been consumed by Francistown and 2,570 m<sup>3</sup> /d by the town of Tonota. In 2018/19, Francistown used about 16,704 m<sup>3</sup> /d and Tonota 3,360 m<sup>3</sup> /d. At present, the WTP at Shashe dam produces about 38,000 m<sup>3</sup> /d of potable water to cover the domestic and the industrial demand of the area (Hydroplan Consulting Company, 2019)

#### **1.4.7. SUMMARY OF SOCIAL ASSESSMENT FINDINGS**

There are no vulnerable communities under this sub-project as per OP 4.10 definition. Francistown which is the project area remains Botswana's second largest urban centre with approximately 4.8 percent of the Botswana's urban population compared to 4.9 percent in 2001. Central Statistics Office (2005) estimated that the population stands at 116,927 by 2020. In 2010, unemployment among the youth was as high as 25%. To date unemployment in Francistown is still a concern as the youth are mostly affected. Employment opportunities are usually temporary, or contract basis, mostly from construction companies, involved in infrastructure development. Francistown provides all four levels of education accessible to residents and its surrounding areas (pre-school, primary, junior/senior secondary and tertiary). The City has three types of health facilities categorized by the level of services provision. The health facilities include Nyangabwe Hospital (referral hospital); three major clinics, namely, Jubilee, Donga and Area W, which operate 24 hours a day; ten other clinics; and four health posts.

#### **1.4.8. STAKEHOLDER CONSULTATIONS LEADING TO BROAD COMMUNITY SUPPORT**

The consultations served a number of purposes which included informing the IAPs about the proposed project, providing a forum for soliciting their views and concerns about the project, obtaining expert opinion on certain issues, and obtaining technical information pertaining to the project. Consultation minutes are in **Appendix 4 and 5**.

- Publication of a notice in *The Daily Newspaper* on 26<sup>th</sup> January 2018 informing the public about the ESIA study including the objectives of the project the anticipated impacts and venues for public meetings (See Appendix 2). Kgotla meetings were also held at affected communities. Due to a number of challenges including rain and low attendance of the six advertised meetings, only three were held on the initial scheduled dates which are Gerald Kgotla, Tatitown Kgotla and Patayamatebele Kgotla. The meetings of the other three wards were held on different dates as agreed with the ward leadership and they were widely advertised with the mobile loudspeaker a night before they were held and the turn up was impressive.
- Furthermore, to extend the consultation coverage several focused group meetings were held in other wards of Francistown. These meetings assisted the consultation process to reach large groups because ward Councilors were used as media to mobilize the community to attend the meetings and the turn up was also impressive.

**Table 1-7: Findings of the Public Consultations and Summary of Meetings Outcomes**

Gender of the Participant	Issues Raised	Response
Female	<ul style="list-style-type: none"> <li>- Appreciated the sub-project as it will improve the efficiency of the Plant and reduce drain blockages and offensive smell coming from the plant.</li> </ul>	<ul style="list-style-type: none"> <li>- The responded by assuring that the rehabilitation and expansion of the plant will curb problems such as blockages and offensive smell.</li> </ul>
Male	<ul style="list-style-type: none"> <li>- Social issues like crime, teenage pregnancies and family breakdowns may increase during upgrade of the Plant.</li> </ul>	<ul style="list-style-type: none"> <li>- The environmental and social monitoring officer usually invites health and social specialists to educate the employees about these sensitive issues. If need be the public is invited for issues involving the public.</li> </ul>
Male	<ul style="list-style-type: none"> <li>- <i>Kgosi</i>, VDC and councillor should be involved in the sub-project in order to deal quickly with any disputes.</li> </ul>	<ul style="list-style-type: none"> <li>- The issue will be included in the ESIA Report as part of the GM implementation.</li> </ul>
Female	<ul style="list-style-type: none"> <li>- Unfair recruitment by contractors, priority is usually given to foreigners.</li> </ul>	<ul style="list-style-type: none"> <li>- In cases where skills are available locally, the local people must be given priority. The unskilled labour should strictly be reserved for the locals.</li> </ul>
Female	<ul style="list-style-type: none"> <li>- The expansion of the Plant should not affect the operations of the existing infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>- The plant shall be rehabilitated stage by stage to insure that the functioning of the sewage system is not greatly disturbed.</li> </ul>
Female	<ul style="list-style-type: none"> <li>- Community should take responsibility for the utilisation of sewer lines.</li> </ul>	<ul style="list-style-type: none"> <li>- It is true and important that the community must understand that the sewer system needs to be taken care of first by the community by ensuring that what is disposed in the sewer is not what can spoil the good functioning of the sewer system.</li> </ul>
Male	<ul style="list-style-type: none"> <li>- Unsatisfactory service by WUC in attending the leakages that occur in the sewage network and this end up putting the uncomprehending children's health in danger and this emits horrible odours in the air that affect them.</li> </ul>	<ul style="list-style-type: none"> <li>- WUC appreciated the delays that sometime occur in attending the leakages. The situation must improve.</li> </ul>
Female	<ul style="list-style-type: none"> <li>- The poor quality of portable water used in Patayatebele.</li> </ul>	<ul style="list-style-type: none"> <li>- WUC has decided to refurbish Mambo WWTP in order to improve the effluent quality disposed into the Tati river. WUC is planning to supply Patayamatebele with water from Ditladi village via a pipeline.</li> </ul>
Male	<ul style="list-style-type: none"> <li>- Sewer networks in not reaching some parts of the village in Tati Siding.</li> </ul>	<ul style="list-style-type: none"> <li>- WUC is aware of that fact and has made an application to the Government in 2016 in order to extend the sewer network to some</li> </ul>

Gender of the Participant	Issues Raised	Response
		parts of Tati Siding but they have not yet been responded to.

#### 1.4.9. SUMMARY OF INSTITUTIONAL CONSULTATIONS

**Table 1-8: Summary of Institutional Consultations**

Stakeholder	Issues Raised
Grindrod Petrologistics	Grindrod Petrologistics fully support the implementation of the Trade Effluent Agreement because it will ensure that only tested and approved effluent will be disposed into the system leading to Mambo WWTP.
Bolux Milling	Bolux Milling who are currently not operational in food processing have accepted that the Trade Effluent Agreement can improve the quality of the effluent from their factory.
Department Physical Planning	According to the City of Francistown Development Plan 1997-2021 under development proposals, it is indicated that the sewage master plan for the city has already been prepared.
Department of Waste Management and Pollution Control	The Mambo WWTP project must observe the following legal instruments: Waste Management Act of 1998, Air Pollution Prevention Act of 1971, Waste and Sanitation Policy of 2001, Botswana Strategy for Waste Management of 1998, Wastewater Discharge Standard BOS 93:2012.
Skip Hire	Skip Hire, a waste collection company, emphasised that they collect a lot of waste from different companies who are clients of Mambo WWTP, therefore it is the responsibility of those companies to ensure that waste collected is of the standard required by WUC.
City of Francistown Council, Public Health Unit	The expansion of the Mambo WWTP will benefit the users because the improved quality of the effluent will not pollute the environment.
Department of Water Affairs (DWA)	DWA stated that no actual penalties have been directed towards WUC for Mambo WWTP poor effluent quality, but the water quality analysis repeatedly depicts undesirable quantities in various parameters.
Nortex Textiles	Nortex Textiles emphasised that the common salt used in the dyeing process is higher than set standard of Total Dissolved Solids in the Trade Effluent Agreement. This can only be rectified by dilution with other trade effluent from the city.
Neighbouring Property Owner	Sometime the treated water released by the Mambo WWTP is very black and contains many particles in it, but without that water it would not be possible to water their golf course.
Local Farmer (Butch Rennie)	He was concerned that water pumped from boreholes next to Tati river is being consumed by human and animals.

#### 1.4.10. IDENTIFICATION AND ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

Pre-Construction Phase	
Impact	Mitigation/Enhancement
Employment Creation	- Give locals priority for unskilled jobs.
Boost to the Local Economy	- Purchase project supplies and support services from local suppliers.
Noise Pollution	- Stick to the daytime working hours between 06h00 to 18h00. - Fit all loud machinery with silencers.
Increase in Crime	- Provide security at the construction site.
HIV/AIDS Prevalence	- Provide HIV/AIDS education to the employees. - Provide free condoms at the construction site. - Implement the Health and Safety Plan.
COVID-19	- Practice social distancing. - Wear face masks in public. - Wash hands regularly with water and soap. - Sanitise hands with alcohol based sanitizers. - Monitor temperatures of everyone entering the facility by temperature measuring at the gate. - Provide an isolation room/ sick bay at the camp for infected persons or suspected cases.
Construction Phase	
Impact	Mitigation/Enhancement
Boost to the Local Economy	- Purchase project supplies and support services from local suppliers.
Noise and Dust Pollution	- Stick to the daytime working hours between 06h00 to 18h00. - Fit all loud machinery with silencers. - Ensure dust suppression at work areas.
Increase in Crime	- Provide security at the construction site
COVID-19	- Practice social distancing. - Wear face mask in public. - Wash hands regularly with water and soap. - Sanitise hands with alcohol based sanitizers. - Monitor temperatures of everyone entering the facility by temperature measuring at the gate. - Keep a register (including contact details) of persons entering the site.
HIV /AIDS Prevalence	- Provide HIV/AIDS education to the employees. - Provide free condoms at the construction site. - Contractor to devise a Health and Safety Management Plan and adhere to it.
Potential Increase in GBV, SEA, SH and VAC	- Provide social welfare education to the employees. - The contractor should engage a social worker once a month for educational purposes to the employees. - Implement the project GM.

Disruption of utilities	<ul style="list-style-type: none"> <li>- Inform the community a day before the utilities are interrupted by the construction activities.</li> <li>- Implement the project GM.</li> </ul>
Disruption of archaeological artefacts	<ul style="list-style-type: none"> <li>- A monitoring archaeologist must be engaged to monitor ground-breaking activities.</li> <li>- If any suspected archaeological material (chance finds) is encountered during construction, report immediately to the monitoring archaeologist and to DNMM and follow outlined Chance Find Procedures.</li> </ul>
Land Pollution by Waste Mismanagement	<ul style="list-style-type: none"> <li>- Provide segregated waste bins on construction site.</li> <li>- Engage a licensed waste collector to collect waste on weekly basis.</li> <li>- Provide portable flushable toilets where water system toilets are not functioning on site.</li> </ul>
Contamination Due to Hydrocarbon Spillages	<ul style="list-style-type: none"> <li>- Use machinery and vehicles in good condition.</li> <li>- A maintenance workshop should have an impermeable concrete base.</li> <li>- Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery to prevent spillages from getting in contact with the ground.</li> </ul>
Occupational Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a full-time SHE Officer to coordinate all SHE activities.</li> <li>- Adhere to Health and Safety Plan.</li> </ul>
Community Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a fulltime SHE officer to coordinate all SHE activities.</li> <li>- Implement GM.</li> </ul>
<b>Operation Phase</b>	
<b>Impact</b>	<b>Mitigation/Enhancement</b>
Creation of Employment	<ul style="list-style-type: none"> <li>- Give locals priority for unskilled jobs.</li> </ul>
Air Pollution	<ul style="list-style-type: none"> <li>- The WWTP equipment must be up to standard and always functioning in order for the plant to always produce high quality effluent that does not have bad odour.</li> <li>- Implement Operation and Maintenance Plan.</li> </ul>
Improved Quality of the Effluent	<ul style="list-style-type: none"> <li>- The WWTP equipment must be up to standard and always functioning for the plant to always produce high quality effluent.</li> <li>- Routine effluent testing to ensure compliance to BOS 93: 2012 and guidance from WBG EHS Guideline - Wastewater and Ambient Water Quality.</li> <li>- Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio-filters, chemical scrubbers, etc.) as needed to reduce odors.</li> <li>- Where necessary, consider alternate aeration technologies or process configurations to reduce volatilization.</li> </ul>

<p>Pollution by inadequately treated Liquid Effluents</p>	<ul style="list-style-type: none"> <li>- Minimize bypass of the treatment system by using separate storm water and wastewater systems, if possible, and providing capacity sufficient to treat peak flows</li> <li>- Implement an industrial source control program which includes monitoring and effective regulatory enforcement</li> <li>- Collaborate with public officials to select appropriate treatment technologies</li> <li>- Maintain wastewater treatment facilities and achieve effluent water quality consistent with applicable national requirements or internationally accepted standards and consistent with effluent water quality goals based on the assimilative capacity and the most sensitive end use of the receiving water.</li> <li>- Treat greywater, if collected separately from sewage, to remove organic pollutants and reduce the levels of suspended solids, pathogenic organisms and other problematic substances to acceptable levels based on applicable national and local regulations.</li> <li>- Greywater lines and point of use stations should be clearly marked to prevent accidental use for potable water quality applications</li> <li>- Consider re-use of treated effluent for irrigation purposes</li> <li>- Treated wastewater quality for land application or other uses should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and BOS 463:2011.</li> <li>-</li> </ul>
<p>Pollution causes by solid waste</p>	<ul style="list-style-type: none"> <li>- Select appropriate sludge treatment technologies, considering, the quantity and sources of sludge, available resources for capital expenditures, training, operations and maintenance, availability of skilled operators, maintenance personnel, and the desired disposal methods or end uses of the treated solids.</li> <li>- Land application or other beneficial re-use of wastewater treatment plant residuals should be considered but only based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO)19 and BOS 463:2011.</li> </ul>
<p>Air Pollution and Odours</p>	<ul style="list-style-type: none"> <li>- Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio-filters, chemical scrubbers, etc.) as needed to reduce odours and otherwise meet applicable national requirements and internationally accepted guidelines.</li> <li>-</li> </ul>

Accidents and Injuries

- Install railing around all process tanks and pits. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available
- Use PFDs when working near waterways
- Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance
- Use fall protection equipment when working at heights
- Maintain work areas to minimize slipping and tripping hazards
- Use proper techniques for trenching and shoring
- Implement fire and explosion prevention measures in accordance with internationally accepted standards
- Establishment of work zones so as to separate workers from traffic and from equipment as much as possible.
- Reduction of allowed vehicle speeds in work zones.
- Use of high-visibility safety apparel for workers in the vicinity of traffic
- For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing motorists
- Locate all underground utilities before digging.

Chemical Exposure and Hazardous Atmosphere

- Implement a training program for operators who work with chlorine and ammonia regarding safe handling practices and emergency response procedures
- Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance.
- Prepare escape plans from areas where there might be a chlorine or ammonia emission
- Install safety showers and eye wash stations near the chlorine and ammonia equipment and other areas where hazardous chemicals are stored or used
- If source water contains radioactive substances, locate water treatment units and water treatment sludge areas as far as possible from common areas (e.g., offices)
- Conduct radiation surveys at least annually, especially in areas where radionuclides are removed
- Limit wastes entering the sewer system to those that can be effectively treated in the wastewater treatment facility and reduce the amount of air-strippable hazardous compounds entering the system by controlling industrial discharges (e.g., by permit or similar system). Analyze incoming raw wastewater to identify hazardous constituents,
- Ventilate enclosed processing areas and ventilate equipment, such as pump stations, prior to maintenance.
- Use personal gas detection equipment while working in a wastewater facility.
- Continuously monitor air quality in work areas for hazardous conditions (e.g., explosive atmosphere, oxygen deficiency)
- Periodically sample air quality in work areas for hazardous chemicals. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to limit worker exposure, for example collection and treatment of off-gases from air stripping
- Prohibit eating, smoking, and drinking except in designated areas
- Rotate personnel among the various treatment plant operations to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials.

Pathogens and Vectors	<ul style="list-style-type: none"> <li>- Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods</li> <li>- Provide and require use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes</li> <li>- Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps to minimize chemical and radionuclide exposure</li> <li>- Encourage workers at wastewater facilities to wash hands frequently</li> <li>- Provide worker immunization (e.g., for Hepatitis B and tetanus) and health monitoring, including regular physical examinations.</li> <li>- Avoid handling screenings by hand to prevent needle stick injuries</li> <li>- Maintain good housekeeping in sewage processing and storage areas</li> <li>- Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, especially composting facilities, facility because of their greater risk of infection.</li> </ul>
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Decommissioning Phase	
Impact	Mitigation/Enhancement
Creation of Employment	<ul style="list-style-type: none"> <li>- Give locals priority for unskilled jobs.</li> </ul>
Boost to the Local Economy	<ul style="list-style-type: none"> <li>- Purchase project supplies and support services from local suppliers.</li> </ul>
Noise Pollution	<ul style="list-style-type: none"> <li>- Stick to the daytime working hours between 06h00 to 18h00</li> <li>- Fit all loud machinery with silencers.</li> </ul>
Land Pollution by Waste Mismanagement	<ul style="list-style-type: none"> <li>- Provide segregated waste bins on construction site.</li> <li>- Engage a licensed waste collector to collect waste on weekly basis.</li> <li>- Provide portable flushable toilets where water system toilets are no functioning on site.</li> </ul>
Contamination Due to Oil and Fuel Spillages	<ul style="list-style-type: none"> <li>- Use machinery and vehicles in good condition.</li> <li>- A maintenance workshop should have an impermeable concrete base.</li> <li>- Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery to prevent spillages from getting in contact with the ground.</li> </ul>
Increased Potential for Soil Erosion	<ul style="list-style-type: none"> <li>- Working ground must be kept compact by sprinkling with water compacting with heavy duty rollers.</li> </ul>
Potential Labour Influx	<ul style="list-style-type: none"> <li>- Give priority to locals for unskilled job.</li> </ul>
Potential Increase in GBV, SEA, SH and VAC	<ul style="list-style-type: none"> <li>- Provide social welfare education to the employees.</li> <li>- The contractor should engage a social worker once a month for educational purposes to the employees.</li> </ul>
Occupational Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a full-time SHE officer to coordinate all SHE activities.</li> </ul>

- Have a full-time SHE officer to coordinate all SHE activities.
- Implement GM.

### 1.5. ESTIMATED BUDGET FOR IMPLEMENTATION OF ESMP

The Environmental and Social Management Plan (ESMP) clearly indicates the required cost for implementing components of the ESMP. Every impact identified in this sub-project is allocated resources and costs that will enable it to be mitigated or enhance as indicated at the monitoring tables. The ESMP cost for the construction phase of the project are estimated at P10,250,000.00 (USD 1,025,000.00). Operation cost are also estimated but will be borne by WUC and budgeted through the budgeting cycles of the corporation. Although a reflection of the decommission phase estimated costs are shown the true values will only be realistic closer to the date of decommissioning owing to inflationary changes.

### 1.6. ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION ESMP

The responsibility of monitoring of the ESMP is given to the Environmental Consultant and the competent authority, the Department of Environmental Affairs (DEA). Implementation of the ESMP is the responsibility of the client and the Contractor. The Contractor shall appoint an environmental officer registered with Botswana Environmental Assessment Practitioner’s Board (EAPB) formerly known as the Botswana Environmental Assessment Practitioner’s Association (BEAPA) and a qualified Social Expert to oversee the proper implementation of all social and environmental mitigation and enhancement measures recommended in this report. The contractor’s environmental officer will prepare a Contractor’s ESMP (C-ESMP) and compile a monthly report detailing environmental and social performance for the period. It will include past performance, audit reports and monitoring data, planned action for mitigating anticipated risks and how recommendations made by WUC’s project environmental and social officers are being implemented. The Codes of Conduct, GM, C-ESMP and related safeguards will also be included in the bid documents as requirements for procuring the Contractor.

Other aspects that require special technical competence to be monitored, government oversight authorities are recommended to help with the monitoring. The recommended authorities according to their mandate include the Ministry of Youth, Empowerment, Sports and Culture for the engagement of the youth in the development process, Department of Gender Affairs to facilitate GBV issues and the Ministry of Health and Wellness through their district health management teams who are responsible for educating communities on all health issues including, communicable and non-communicable diseases.

Some institutions have also been consulted to administer the sub-project to achieve its objectives and minimise adverse impacts. These include the communities, the tribal administration of all the beneficiary villages and parastatals within the project area. The World Bank will supervise the implementation of the project’s environmental and social instruments and will assist with technical capacity building. In addition, WUC will provide technical support and participate in training and sensitization of stakeholders to enhance understanding of the national and the Bank’s environmental and social safeguard instruments.

## **1.7. GRIEVANCE MECHANISM**

The World Bank's Grievance Mechanism (GM) is a grievance mechanism managed by the World Bank. It provides a fast and accessible complaint mechanism for individuals and communities who believe that a World Bank-financed project causes harm to their community.

The GM considers a complaint admissible when it:

- Relates to an active Bank-supported project
- Alleges environmental and social harm caused or likely to be caused by the project
- Is submitted by a complainant, a group of complainants directly affected by the project, or their authorized representative

WUC is also has the responsibility to develop a GM that will enable it to address the complaints that are brought forward by the affected parties.

## **1.8. PUBLIC DISCLOSURE**

Disclosure of the ESIA documents for Category A sub-projects is mandatory and is to be done at a public place accessible to project-affected groups and local NGOs. The documents will be shared on WUC's website and World Bank external website. Furthermore, the project provides a forum for consultation and comments by project-affected groups ensuring balanced representation during the environmental and social assessment process and takes their views into account before finalizing project design and submission for final approval. WUC provides any relevant materials (process descriptions, maps, building plans, etc.) to participants in a timely manner and in a form and language that are understandable to the group being consulted and records and describes details of consultations held in the project screening form. This should be done in both ways – on the websites and by providing hard copies to the local councils where the proposed activities will be implemented.

## **1.9. CONCLUSIONS AND RECOMMENDATIONS**

The sub-project is recommended for implementation because the advantages of having a well-functioning system in town far outweigh the disadvantages or challenges that may be faced at construction stage, moreover this report has recommended mitigation measures for the negative impacts at all phases of the project. The following are major recommendations from the environmental and social impact assessment:

- Implement and monitor the recommended enhancement and mitigation measures as per the ESMP
- The Environmental and Social Management Plan (ESMP) should form part of the Contractor's documents and the Contractor to develop own Contractors' ESMP (C-ESMP) and Health and Safety Management Plan
- Continuous stakeholder engagement must be done during all phases of project implementation
- The Contractor and the Employer should both have a Grievance Mechanism (GM) for the community and the workers
- The Contractor's ESMP to Incorporate GBV, SEA, SH and VAC risk.

## 2. INTRODUCTION AND BACKGROUND

The Government of Botswana through Water Utilities Corporation (WUC) is undertaking the Botswana Emergency Water Security and Efficiency Project (BEWSEP) with funding from the World Bank. The Mambo Wastewater Treatment Plant (WWTP) is a sub-project under this project. The environmental and social policies of the World Bank (WB) and Botswana Environmental Assessment (EA) Act (2010) require the sub-project to conduct an Environmental and Social Impact Assessment (ESIA) with an Environmental and Social Management Plan (ESMP) in line with World Bank's Operational Policy Procedures and Standards.

### 2.1. BEWSEP Description and Development Objective

The Proposed Development Objective (PDO) of the project is to improve availability of water supply in drought vulnerable areas, increase the efficiency of WUC and strengthen wastewater management in selected systems. The project is organized under three components:

**Component 1:** To improve availability of water supply and efficiency

**Component 2:** To improve wastewater and sludge management

**Component 3:** Sector reforms and institutional strengthening

The BEWSEP has been classified by the World Bank as Category 'A' because of the Mambo WWTP which is likely to have significant adverse environmental and social impacts which are sensitive, diverse and unprecedented. The key risk is potential environmental impacts likely to be generated from rehabilitation and expansion works at the WWTP especially pollution of Dikgatlhong Dam downstream of the project area.

This report has been prepared as part of the ESIA for the Mambo WWTP located in the south eastern part of Francistown. The main aim of the ESIA is to establish and highlight key issues that the implementation of ESMP should focus on. The issues were developed from literature review, site survey, consultation meetings, interaction with feasibility study report and interviews with affected parties (APs) of the project and other relevant stakeholders.

The ESIA's free, fair and transparent consultation processes ensures that the interests of all stakeholders are considered to ensure that the design and construction of the sub project takes into consideration stakeholder inputs and safeguards the community and infrastructure investments from environmental and social disruptions.

This ESIA report is prepared in accordance with the requirements of section 7 and 8 of the Environmental Assessment Act of 2010 and World Bank safeguard policies with the purpose to guide implementation of the sub-project.

### 2.2. PROJECT DESCRIPTION

This sub-project entails the rehabilitation and expansion of Mambo WWTP to improve operational performance and limit pollution of downstream water sources.

#### 2.2.1. Nature of the Sewage

In a waterborne sewerage system, the sewage which flows down the pipes to the water care works consists mainly of water and only a relatively small number of solids (pollution). The water comes from flushing toilets, baths and showers and washing of food and clothes, etc. even

industrial effluents contain large quantities of water which has been used for washing, dilution, and/or flushing down the sewers.

On site information provided by WUC states that raw (untreated) sewage typically consists of:

- About 99.5% by volume or 99.9% by mass of liquid
- About 0.5% by volume or 0.1% by mass of soft organic solids
- A small proportion of sand, grit and stones
- Other intractable solids such as rags, plastic bags, bottle tops, stick, etc.

Various physical and biological parameters, as well as some chemical ones, are used to characterize sewage for the purposes of sewage treatment work design and operation.

### ***2.2.2. Physical Characteristics of Sewage***

#### **Solid content**

Physical sewage treatment processes are primarily concerned with solid-liquid separation; therefore, solids content and size range are of primary importance. The following measures of solids content are commonly used in sewage treatment:

- Total solids: the mass per unit volume of sample of all the solids after evaporation of the water at 103 - 105°C.
- Suspended solids: the mass per unit volume of sample of the solids retained on a 1-micron filter.
- Total dissolved solids: the mass per unit volume of sample of the solids passing a 1-micron filter.
- Settleable solids: are an approximate measure of the sludge which will settle out during plain sedimentation (i.e. settling without prior chemical coagulation) of sewage. Settleable solids will include grit, which is much heavier and usually removed first in a separate treatment stage.

Temperature is an important physical parameter which affects the rate of chemical and biological treatment processes and the solubility of gases in water. Sewage is generally warmer than the fresh water, due to the discharge of hot water to the sewers. It is usually colder than the air temperature in summer and warmer in winter.

### ***2.2.3. Chemical Characteristics of Sewage***

The principal parameters are those defining organic content, inorganic content and gases in solution.

#### **Organic Content**

Roughly 75% of suspended solids and 40% of total dissolved solids are organic, i.e. compounds of carbon with H, O and often with N, P and K as well, primarily of animal and vegetable origin. The most common types of organic compounds are proteins, carbohydrates, and fats.

Chemical Oxygen Demand (COD) is measured in a test in which the sewage sample is oxidised with a boiling acid dichromate solution. This is a very strong oxidising agent and so about 95% of all organic compounds are oxidised to CO<sub>2</sub> and H<sub>2</sub>O.

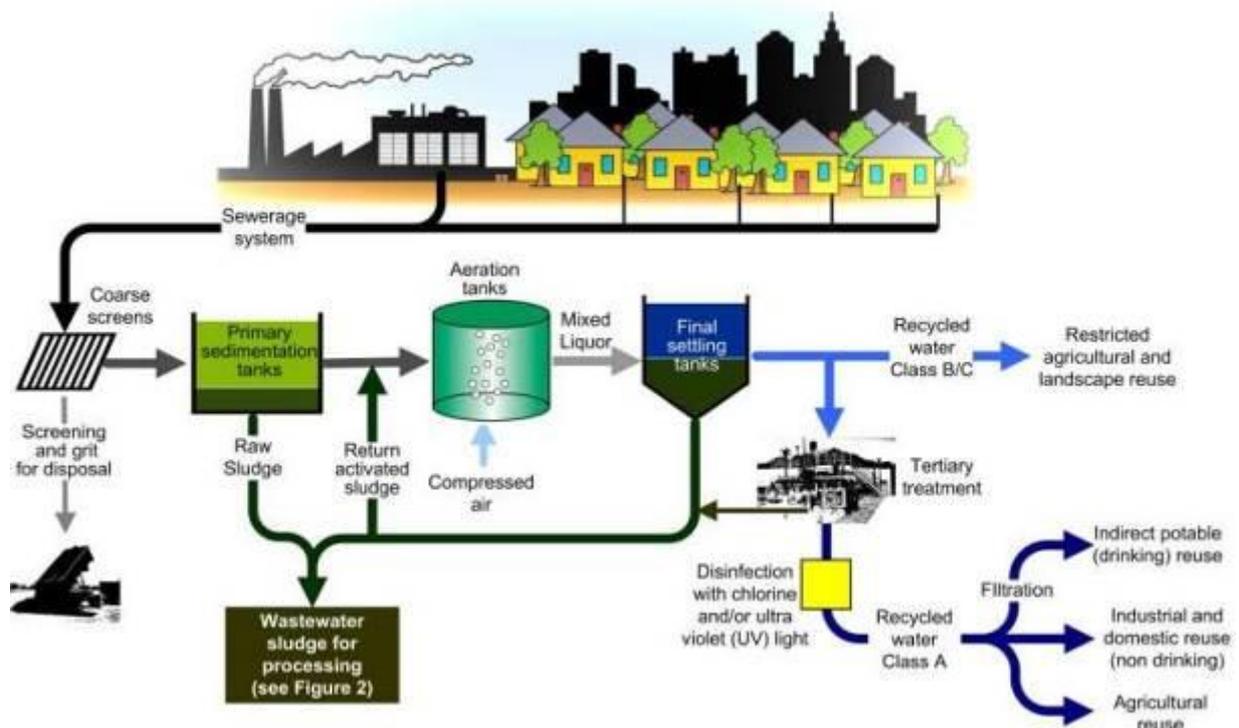
Biochemical Oxygen Demand (BOD) is measured by the oxygen consumed by bacteria in oxidising the sample over a set period of 5 days at a fixed temperature of 20°C and symbolised as BOD<sup>5</sup>.

Toxic compounds and heavy metals are usually only found in significant amounts in sewage with a high content of industrial effluents. Toxic chemicals such as cyanides and pesticides can disrupt biological treatment processes, while heavy metals (e.g. manganese) accumulate in sewage sludge and may limit its disposal on agricultural land.

#### 2.2.4. Biological Characteristics of Sewage

The principal micro-organisms of sewage treatment are the protists, especially bacteria, algae and protozoa. Viruses are also present; these are the smallest biological structures containing all the information necessary for their own reproduction and are obligate parasites.

The following figure depicts the typical treatment process which Mambo WWTP should follow.



Source: Recycling and Water Management, 2018

**Table 2-1: Typical Wastewater Treatment Plant Process**

### 2.3. DESCRIPTION OF MAMBO WASTEWATER TREATMENT PLANT

Mambo WWTP receives effluent from Francistown and greater area around the city via the existing sewer network system. Additionally, effluent from septic tanks and pit latrines is hauled by trucks to Mambo WWTP.

Mambo WWTP was designed for 15 000 mega litres per day (m<sup>3</sup>/d), and is based on a trickling filter system, which incorporates the following treatment steps:

- Primary treatment: screening, grit removal and oil and grease removal
- Primary treatment: two identical primary gravity settling tanks without the use of chemical coagulants
- Secondary treatment: trickling filters and humus tanks
- Tertiary stages: de-nitrification, chlorination
- Sludge digestion, sludge drying beds, biogas holder, flare

The main operational issues of the treatment plant are:

- It has not been refurbished since its commissioning in 2002.
- Some of its components and processes have never been operational since its commissioning.
- The current process is having poor quality treated effluent, which is being disposed to the environment and polluting downstream rivers and Dikgatlhong Dam.
- The plant capacity is 15 000 m<sup>3</sup>/d and it currently receives 9500 m<sup>3</sup>/d (Hydroplan Consulting Company, 2020), but due to ineffectiveness of the plant it is unable to process the waste to the satisfaction of BOS 93:2012 standard.
- The quality of the effluent from industries (containing chemicals and fat) cannot be completely broken down by the current processes.

## **2.4. COMPONENTS OF MAMBO WASTEWATER TREATMENT PLANT**

Mambo constitutes the following components in the Biological Treatment Plant:

### **2.4.1. Tanker Discharge Station**

The tanker station comprises a relatively large concrete slab, with walls on three sides to contain splashing. This slab slopes to a low drain point, which is located directly over the incoming main sewer line. Any wastes emptied onto this slab will therefore drain into the sewer and the centre of the Mambo WWTP for treatment.



**Plate 2-1: The manual deposition point of sewage and wastewater into Mambo**

### **2.4.2. Manual Protection Screen**

This is the first unit which the raw sewage passes through upon entering the treatment plant. Its sole purpose is to protect the screw pumps from damage which could be caused by large solid objects such as metal rods, animal hides etc. The large openings between the bars will allow all “normal” solids to pass through but are intended to stop the abnormally large items.

### **2.4.3. Screw Pumps**

The role of these pumps is to lift the sewage approximately 6 m, so as not to have to construct the subsequent units below ground level. The screw pump comprises double spiral flights welded

to a rigid central tube and are self-regulating. The findings from the feasibility study revealed that the pumps have reached the end of their life cycle. The wear of the screw pump is indicated, among other factors, by the gap between the screw blades and the cylindrical metal sheet, in which in Mambo WWTP varies between 25 and 50 mm.



**Plate 2-2: The manual protection screen and the screw pumps**

#### **2.4.4. Secondary Screens**

The role of the screens is to trap solids (rags, bottle tops, plastics and other non-biodegradable solids) which are then mechanically raked to remove from the flow as they can cause blockages in pipelines or pumps. Most of these objects (called screenings) will be removed in the primary screen, but some will still manage to pass through openings between the bars. For this reason, secondary screens are located after the degritters.



**Plate 2-3: Screens**

#### **2.4.5. Incinerator**

The type of waste trapped by the screens can only be disposed- off through incineration due to its hazardous nature. This destroys all pathogenic organizations, prevents fly breeding and odours and leaves only a very small volume of ash for burial. The incinerator is not working at the Mambo WWTP and this might increase spread of infectious diseases as undisposed screenings encourage disease carrying vectors like rodents and flies. pathogens either through handling or through flies.

#### **2.4.6. Degritters**

At this stage in the treatment process, the sewage still contains almost all of the solids-both organic and inorganic. If the inorganic solids (sand, grit, stones and metal objects) are not removed, they will settle down to low points in the following tanks and pipes. For this reason, the grit must be removed as early as possible in the process.

*“Vortex” Grit Removers* are in use at Mambo Water Care Works. The grit is air-lifted by means of air-lift pumps for separation in a grit dewatering device or grit classifier. This pump functions by blowing compressed air into the bottom of an open pipe. The residues from the degritters is deposited into the open ground (not contained) which is unsightly and health hazard.



**Plate 2-4: Degritters machine with residue**

#### **2.4.7. Oil/Grease Trap**

Sewage contains a proportion of fats, oils and grease. These constituents originate in private and commercial kitchens, fast food outlets, abattoirs and garages. All contributors other than private households should be equipped with grease traps, but if these are not regularly cleaned, oils, fats and grease escape to the sewers.

These products are undesirable at the treatment plant. Firstly, they coat tanks and pipes, particularly at the top water level where they leave grease marks and encourage bacterial and slimes growths.

The grease trap has been provided to remove most of these unwanted products. As sewage at Mambo WWTP is below the melting point of grease (and fats and oils) these light products float to the surface. The trap provided is a tank with a retention time, in which the outlet is taken from below the top water level. This allows sufficient time for the grease to float to the surface from

where it can be periodically removed. The oil/grease trap components are not working properly with insufficient trapping and removal of fats therefore leads to solidification of fats.



**Plate 2-5: Oil and Grease Trap Component**

#### ***2.4.8. Primary settling tanks***

The primary settling tanks are the first process in which a major quality improvement takes place. This is a solids/liquid separation phase in which most of the inorganic solids are removed. The inorganic solids which settle out represent about 1% of the total sewage flow by volume but contain about 40% of the organic pollution (measured in COD). This concentrated sludge is pumped to the digesters for anaerobic treatment, while the remaining 99% liquid phase continues on for further biological treatment.

Despite the earlier passage of the sewage through the oil/grease trap, the much longer retention time in the primary settling tank will result in some further light material floating to the surface. This scum is mechanically swept to the outside of the tank by a scum skimmer, from where it flows to the station drain system.

Due to the open nature of the primary settling tanks, storm water sometimes floods the tanks leading to overflowing and dilution of sewage. On the other hand, the scum and sludge from the primary settling tank cannot be pumped and this affects the working order of other components.



## Plate 2-6: Primary Settling Tank

### 2.4.9. Trickling Filters

These units are called the heart of the process, but they really function more as the 'stomach' (in that they use the organic pollution as food) or the 'lungs' (whereby they add oxygen to the sewage).

While the functioning of the trickling filter as biological units is extremely complex, the units themselves are simple. They consist of a large number of evenly sized stones, over which the settled sewage is sprayed. Bacterial growths (zoogeleal mat) occur on the surfaces of the stone, sometimes called media. As the sewage trickles down from top to bottom, it becomes aerated and the bacteria extract the foodstuff from it.



Plate 2-7: A section of the trickling filters

### 2.4.10. Secondary settling tanks

The secondary settling tanks also called humus tanks are the final process in which organic quality improvement takes place. This process is basically the same as the primary settling tanks being a solids/liquid separation phase. The main difference lies in the nature of the sludge solids which are settled out. In the secondary settling tank, the solids are pieces of zoogeleal matter that has fallen off the stone media in the trickling filters.



## Plate 2-8: Secondary Settling Tank

### 2.4.11. Chlorination

At this stage of the treatment process, the sewage is referred to as final effluent. Over 95% of the organic matter (COD) will have been oxidised to their inorganic components (CO<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub> etc.) and the water is now fit for release to the river.

Chlorine is a very powerful oxidant and kills off living cells (which are made of proteins) by oxidising these proteins into their inorganic salts. It is not selective in its action and will combine with any and all organic matter present in the effluent. For this reason, chlorination takes place at the very end of the treatment process, when the total organic content is at its lowest (obviously it is highest in the raw sewage).

Due to the inefficiency of the treatment system especially at this stage, the settled sewage sump does not work properly and is sometimes overworked, so it mixes waste with water from the chlorine tank. This highly contribute to the release of partially treated effluent into the environment and to the poor quality of the effluent.

### 2.4.12. Recycle water system

The chlorinated final effluent is of a sufficiently high quality to allow its re-use for watering parks and gardens and also for use in selected industries.



Plate 2-9: Recycle water pumps

Due to the breakdown of various components of the Mambo WWTP as discussed, effluent cannot be recycled for re-use due to the questionable status of its quality.

## 2.5. SEWAGE INFRASTRUCTURE

### 2.5.1. Francistown Sewer Networks

The sewer network consists of sewer lines with an approximate length of 400 km and about 2,000 manholes. Most homes in Francistown are built above the sewer line, and their lateral collection pipe works via gravitation. This means that the collection pipes are laid at a continuous downward

gradient to avoid clogging and to allow for a self-cleaning velocity before discharging into a manhole or a small tributary sewer which, in turn, discharges into the bigger sewer line or trunk sewer. All sewage collected in the sewer network is finally conveyed to Mambo WWTP.

### 2.5.2. Pump Stations.

There are 26 pumping stations in the Francistown sewer network. Nine of them make use of a wet-well (Table 4-2) and seventeen are installed dry (Table 4-1). The capacity of the pumping stations varies between 20 L/s to about 140 L/s. However, the pumping station, Gerald 3, is not yet operational yet and not included in the investigation. Most of them were built in the early 2000s and have never been refurbished or rehabilitated. All wet-well lift stations are equipped with Flygt submersible pumps, and the dry-well lift stations are equipped with Gorman-Rupp and Cornel self-prime pumps, driven via a belt by a foot-mounted squirrel cage motor manufactured by Motors and Generators Company (WEG).

All pump stations are accessible by road, and power is provided to each pumping station by the Botswana Power Corporation (BPC) national grid system. The pump starting mode in all the small pumping stations is Direct-on-Line, but Soft Starter and Delta – Star models are used for the bigger motors due to high inrush current. All pump stations are fenced and kept closed by padlocks except for the one at Tati-gulley. Big trucks can access the pump station compound to load or unload pumps, motor and other equipment. The compounds are not usually neat and clean, but full of grit and screened materials laying around the pump station yard. All dry-well pump houses have some sort of ventilation, and most wet-well pump stations are open to the air.

**Table 2-2: Existing Self – Priming Pumps**

Lift station	Pump Type	Rated power kw	RPM	Flow l/s	Head in m	Efficiency %	NPSH
Sos	T8	22	1050	51	17.4	52	1.59
Gerald 1	T4	15	1670	28.7	21.5.	50	2.92
Gerald 2	T10	75	1450	160	32.4	74	4.2
Gerald 3	NA	NA	NA	NA	NA	NA	NA
Dumela	T6	22	1500	28.7	30.7	43	3.12
Monarch M	T6	18	1280	28.7	21.7	48	3.12
Madzibalori	45TX	5.5	1160	22.9	9.94	51	1.25
River side 1	T4	5.5	1460	7.2	14.4	25	1.04
Tati- town	T3	3	1170	7.2	8.93	27	1.03
River side2	35TX	4	1610	3.2	10.1	26	0.74
Tati siding South	T4	18	1700	12.8	28.2	30	2.01
Tati Siding Main	T6	45	1320	79.9	26.1	57	2.05
Tati- Siding Boost	T6	15	1180	52.9	14.5	58	4.32
Shashe	T3	5.5	1170	28.7	9.19	52	2.91
Tonota	T10	75	1450	140	34	72	3.5
Majwanamantsho	T3	11	1870	20	20.1	41	2.29
Mandunyane	T3	7.5	1610	12.8	16	34	1.25

**Table 2-3: Lift stations with submersible pumps**

Lift station	Type pf pump	Rated power in KW	Flow l/s @BEP	Head in m	Efficiency %
Tati- Gaellie	Submersible	2.4	27.7	6	51.6
Marang 1	Submersible	30	147	6	58
Marang 2	Submersible	2.4	22.5	6	50
Malopo 1	Submersible	2.4	16.5.	10	52.6
Malopo 2	Submersible	5.9	29.7	10	51
Garden -View	Submersible	3.1	21.4	6	51.6
Monarch phase 6	Submersible	2.4	22.5	6	50
Monarch Cemetery	Submersible	3.1	18.1	9	52.3
PWD	Submersible	13.5	114	9	60.4

## 2.6. CHALLENGES EXPERIENCED AT THE MAMBO WWTP

There are several challenges currently encountered at the Mambo WWTP, and these are:

- a) The plant is not working properly and is therefore prone to overflowing and breakdowns. This has detrimental effect on the Tati river and consequently Dikgatlong Dam, as inadequately treated effluent is disposed into the river which subsequently affects residents of Patayamatebele who use the river for drawing potable water.
- b) The plant receives waste from different areas and usually substances not compliant with the treatment system are received; namely Botswana Meat Commission (BMC) brings a lot of fat; Knotex produces dyes; Francistown Abattoir brings fats and blood, Shell Oil Botswana disposes of a lot of waste oil. There are also chemical industries disposing into the treatment plant; F&G Botswana Company in Dumela Industrial manufactures perfumes from tobacco, the tar from their processes ends up clogging the pump station at Dumela. Some of these substances cannot be treated or broken down by the treatment plant, therefore these impacts negatively on the performance of the plant and the quality of treated wastewater.
- c) The incinerator is not working; hence waste material collected is taken to Francistown landfill. Accumulation of waste encourages the breeding of insects and rodents, especially in summer and this might lead to the spread of diseases.
- d) Sludge is stockpiled at the treatment plant and is not incinerated due to the broken-down incinerator.
- e) Primary screening and grit chamber: the speed of the sieves meant to pick solid waste is not in sync with the flow of wastewater (water flow is faster). This means some solid materials pass through this stage and reduce the effectiveness of the subsequent stages.
- f) Sludge pump: sludge cannot be pumped to the digester hence workers have to do it manually and this affects the working order of other components.

- g) Primary settling tanks: their performance is sometimes disturbed by storm water flooding.
- h) Secondary screening and conveyors: not effective in separating the scum from the wastewater.
- i) Denitrification tank: this process is currently isolated as sludge passes from primary settling tank and this impact on the removal of nitrates from the wastewater.
- j) Digester: this process is meant to reduce the amount of organic matter in the sludge as well as reduce disease causing microorganisms. Due to design flaw, the digester tank is currently in use but ineffective. This is why the plant is not able to use/sell fertilizer.
- k) Pump Stations: there are several pump stations that pump raw sewerage into Mambo WWTP from Francistown and surrounding areas. Issues surrounding the pump station range from blockages, overflows, submergence of pumps and offensive odours. These are mainly caused by flushing of inappropriate items down the drains by the community.
- l) There is no plant management plan for prevention of breakdown and purchase and replacement of old parts.

## **2.7. JUSTIFICATION OF THE SUB-PROJECT**

The objective of the proposed development is to improve operational performance of the Mambo WWTP and limit pollution of downstream water sources. The wastewater received from Francistown and Tati Siding is currently not treated to the required BOS 93:2012 Wastewater – physical, microbiological, chemical requirements. The effluent discharged to Tati river, which feeds into the Shashe river, and subsequently into the Dikgatlong Dam (50 km downstream) is high in *Escherichia coli*, Total Coliforms and Faecal Coliforms and Manganese content (Appendix 8).

The project aims to improve wastewater treatment process to ensure that these parameters are reduced to levels that are acceptable before discharged to the environment and reduce the risk of pollution to the environment, groundwater sources, and the downstream Dikgatlong Dam. The WWTP serves about 120 000 people as well as commercial and industrial users in Francistown and Tati Siding.

WUC of Botswana, in compliance with EIA Act of 2005 (which has since being replaced by the EA Act of 2010) commissioned a retrospective ESIA in 2013 in support of the designs for rehabilitation and expansion of the WWTP

The need to address environmental and social issues became urgent when WUC commissioned National Occupational Safety Association (NOSA) Health and Environment baseline audit revealed that the plant was releasing inadequately treated sewage into the Tati river, which in turn flows into the Dikgatlong Dam. A preliminary assessment was consequently undertaken in 2011, following which the Department of Environmental Affairs (DEA) required WUC to prepare a retrospective ESMP.

### **2.7.1. Purpose and Objectives of the ESIA**

The purpose this study is to establish and evaluate environmental and social impacts and come up with mitigation measures for the sub-project.

### **2.7.2. Objectives of the Study**

The objectives of this study are to:

- Inform the beneficiary communities and relevant stakeholders of the proposed sub-project.
- Assess the level of stakeholder interest for the project and enable stakeholder views to be taken into account in project design and social performance.
- Promote and provide, means for effective and inclusive engagement with project-affected parties throughout the project lifecycle on issues that could potentially affect them.
- Ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, appropriate manner and format.
- Seek their views and opinions regarding potential significant impacts of the project.
- Refine time and/or space boundaries for the ESIA.
- Facilitate an efficient assessment process that saves time and resources and reduces costly delays.
- Identify possible environmental and social impacts of the projects and propose mitigation measures.
- Consider reasonable and practicable alternatives.
- Allow for prioritization of issues to be addressed.
- Organize, focus and communicate the potential impacts and concerns, to assist with further analysis and decision making.

### **2.7.3. Approach and Methodology for Carrying out ESIA**

To achieve compliance with the local environmental legal requirements, the Environmental Assessment (EA) Act of 2010 and EA Regulations of 2012 were followed in the undertaking of this ESIA Study. Important steps or processes such as completing a project brief form by WUC, Identification of IAPs using stakeholder analysis matrix, advertisement of the public consultation meeting in mass media, public consultation through kgotla meetings, archaeological impact assessment clearance, and engagement of Botswana Environmental Assessment Practitioners Association (BEAPA) certified consultant were undertaken. Assessment of World Bank safeguard policies, legislation and regulations relevant to the project, both national and international. A social baseline data of the project area is gathered to understand the potential social impacts of the sub-project and it includes demographic features, main economic activities and livelihood patterns, identification of vulnerable groups, existing social protection etc. The environmental and social impact assessment is undertaken to ensure that the implementation of the proposed sub-project is achieved with minimal impacts on both the physical and social environment of the project area. The proposed sub- project will cause anthropogenic changes on the physical environment, of great concern will be the magnitude of the change, the significance of the features affected and the potential for natural recovery and longer term environmental and social harm.

The ESIA will ensure that the project operations are carried out in an environmentally and socially acceptable manner. This means that the proposed sub-project should result only in minimal or no disturbance to the environment and that the views and concerns of the Interested and Affected Parties (IAPs) are incorporated in the implementation of the project as much as it is practical. It is equally important for the environmental and social assessment process to identify and assess all potential impacts arising from the activities of the proposed sub-project and proposed mitigation

measures to minimize impacts on the social, physical, biological and economical aspects of the environment during the construction and operational phases of the project.

The ESIA is aimed at addressing the environmental and social issues arising from the sub-project activities. In order to realize the aims of the study the project team adopted the following methodology. A desktop study was carried out to review the existing environmental setting of the project area as well as the possible impacts associated with implementation of the proposed sub-project. A field survey was undertaken in April 2018 to get an understanding of the project area and to update the data obtained from desktop study, this survey included visual inspection of the surrounding environment (plants, soils, topography), water sample collection from the Tati river in which the effluent from the Mambo WWTP is disposed in.

Of prime importance, a stakeholder consultation process was undertaken so as to present the proposed sub-project to the IAPs and also to gather their views and concerns on it. The approach adopted included use of a questionnaire survey to interview some of the IAP such as central and local government officials, private companies that dispose industrial influent to the Mambo WWTP, selected individual home owners and the use of public gatherings to address the affected communities as a group.

Using the information assimilated from the above aspects of the study, potential impacts of the proposed project during the construction and operation phases were identified. Both the negative and positive impacts will be evaluated using ISO 14001:2015 which assists in objectively assessing environmental impacts during the detailed ESIA phase of the study.

An Archaeological Impact Assessment (AIA) was undertaken in line with the provisions of the Monuments and Relics Act (2001) in order to assess the project's potential harm to archaeological or cultural resources in the area and to come up with mitigation measures. The AIA report for the project site was submitted as a standalone report to the Department of National Museum and Monuments (DNMM) for review and approval, see Appendix 7.

## **2.8. PROJECT ACTIVITIES**

### **Mobilisation/Pre-Construction**

- Award of contract to a suitable contractor
- Finalisation of C-ESMP and all related documents such as Traffic Management Plan, COVID-19 Plan, Labour Plan, Procurement Plan
- Obtaining requisite permits/consents.
- Training of staff regarding GM and sensitization of communities to the GM
- Clearance of the working space.
- Erection of Labourer's camps and construction camps.
- Engagement of staff
- Transportation and offloading of equipment into the site.
- Procurement and transportation of material needed for the sub-project
- Community consultations including with the Village Development Committee (VDC).
- Installation of porter camps and offices within the Mambo WWTP perimeter fence.

## **Construction (12 months)**

### **Specific Rehabilitations Works**

- Dismantling of non-functional equipment
- Replacement of the screw pumps,
- Replacement of screens and preliminary treatment with a new, modern facility (screens, combined aerated grit and grease chamber),
- Rehabilitation of Primary Sedimentation Tanks and equipment,
- Building of a new sludge thickening tank,
- Rehabilitation of the existing Digesters,
- Rehabilitation of the existing Gas Holding Tank,
- Rehabilitation and modification of the existing Denitrification unit,
- Design and installation of mechanical works of the pump station,
- Design and installation of electrical works of the Mambo WWTP
- Design and installation of telemetry and SCADA system
- Refurbishment of Administration Block.
- Replacement of chlorination by UV disinfection

### **Specific Expansion Works**

- Building a new additional Primary Sedimentation Tank,
- Construction of eight new Trickling Filters and four humus tanks / secondary sedimentation tanks,
- Improvement of the construction of a new faecal sludge acceptance station,
- Construction of an additional new Digester,
- Construction of an additional new Gas Holding Tank,
- Construction of a Combined Heat and Power plant (CHP) for reducing energy cost
- Construction of a new Maintenance and Electrical workshop(s)
- Concrete casting of supporting structures

### **Operation (20 years)**

- Offloading of influent by sewage trucks at WWTP
- Movement of influent from the industries through sewage lines
- Screening of the influent to separate coarse material from liquid
- Incineration of the coarse material
- Sedimentation of the liquid influent to extract raw sludge
- Processing and drying of the raw sludge
- Processing in the aeration tank with compressed air
- Final separation of sludge in the settling tanks to extract raw sludge
- Disinfection of recycled water with chlorine
- Disposal of effluent into the river
- Testing of effluent to check compliance to standards

### **Decommissioning (12 months)**

- Pumping out of the extra wastewater and raw sewage to another WWTP
- Final treatment of the remaining influent
- Removal of electrical and mechanical equipment
- Chemical treatment of the machines and structures
- Breaking down of concrete structures
- Haulage of rubble from the WWTP to the landfill

- Land rehabilitation by backfilling with clean soil
- Re-vegetation of the disturbed area

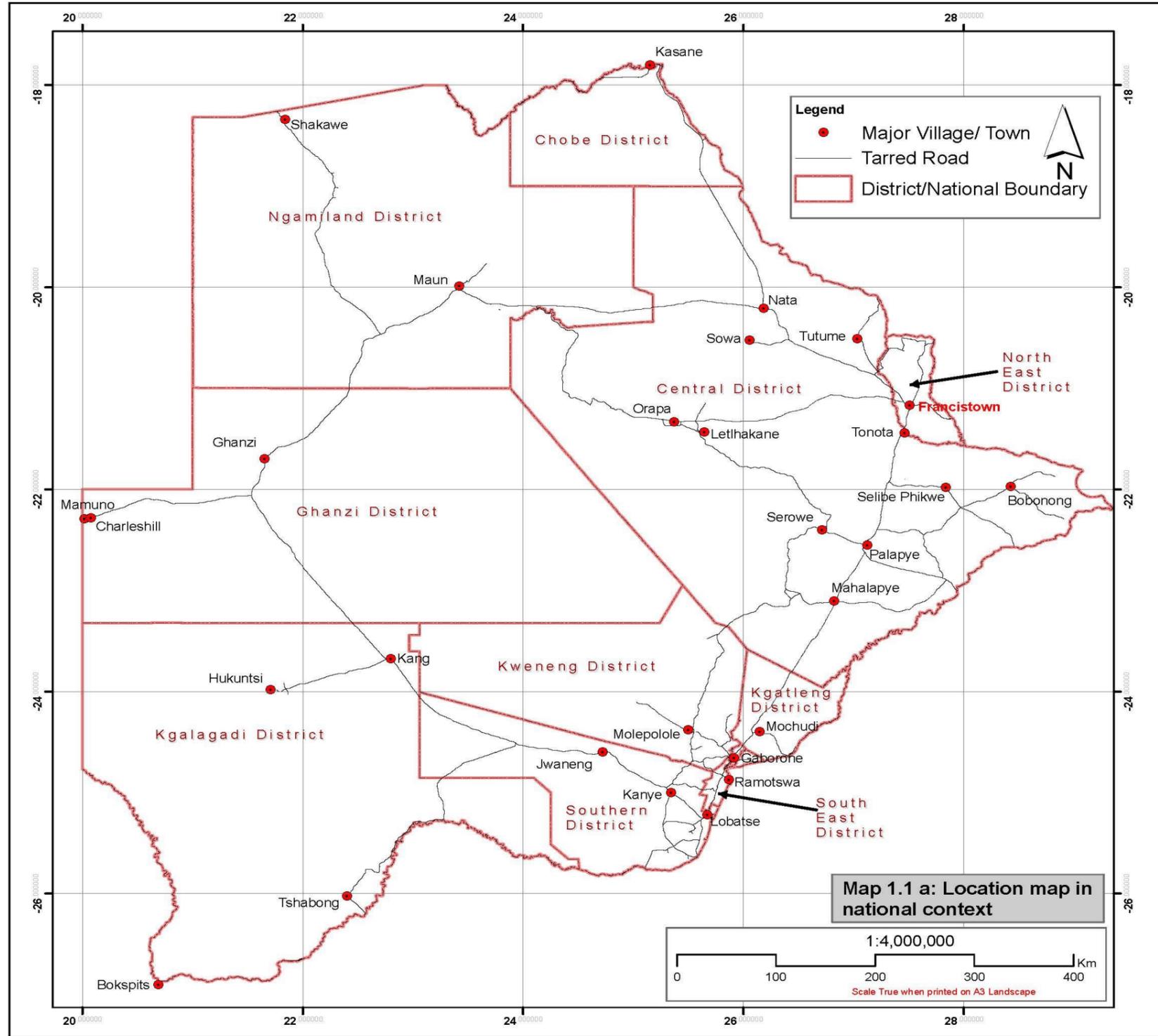
## **2.9. PROJECT LOCATION**

The City of Francistown is located in the North Eastern part of Botswana, joined to Gaborone by a 433 km A1 highway, see Figure 2-1. Mambo WWTP is located at the southern edge of Francistown on the eastern side of Lady Mary private farm. Tati river runs about 100 m from the treatment plant, see Figure 2-2. The plant treats wastewater from Francistown and Tati Siding (both domestic and industrial waste).

The siting of Mambo WWTP has complied with the guidelines for the selection of sites as recommended by the Department of Waste Management and Pollution Control (DWMPC). The Department recommended that:

- a) The area should not be zoned residential
- b) Ideally the site should not be rocky
- c) The site should be large enough to accommodate future extensions of the WWTP
- d) The site should be close enough to a stream where the treated effluent could be discharged into.
- e) The site be located close to farming lands where the treated water could be used for watering selected crops

WUC MAMBO WASTEWATER TREATMENT PLANT



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Table 2-4: Location of Mambo WWTP in a National Context

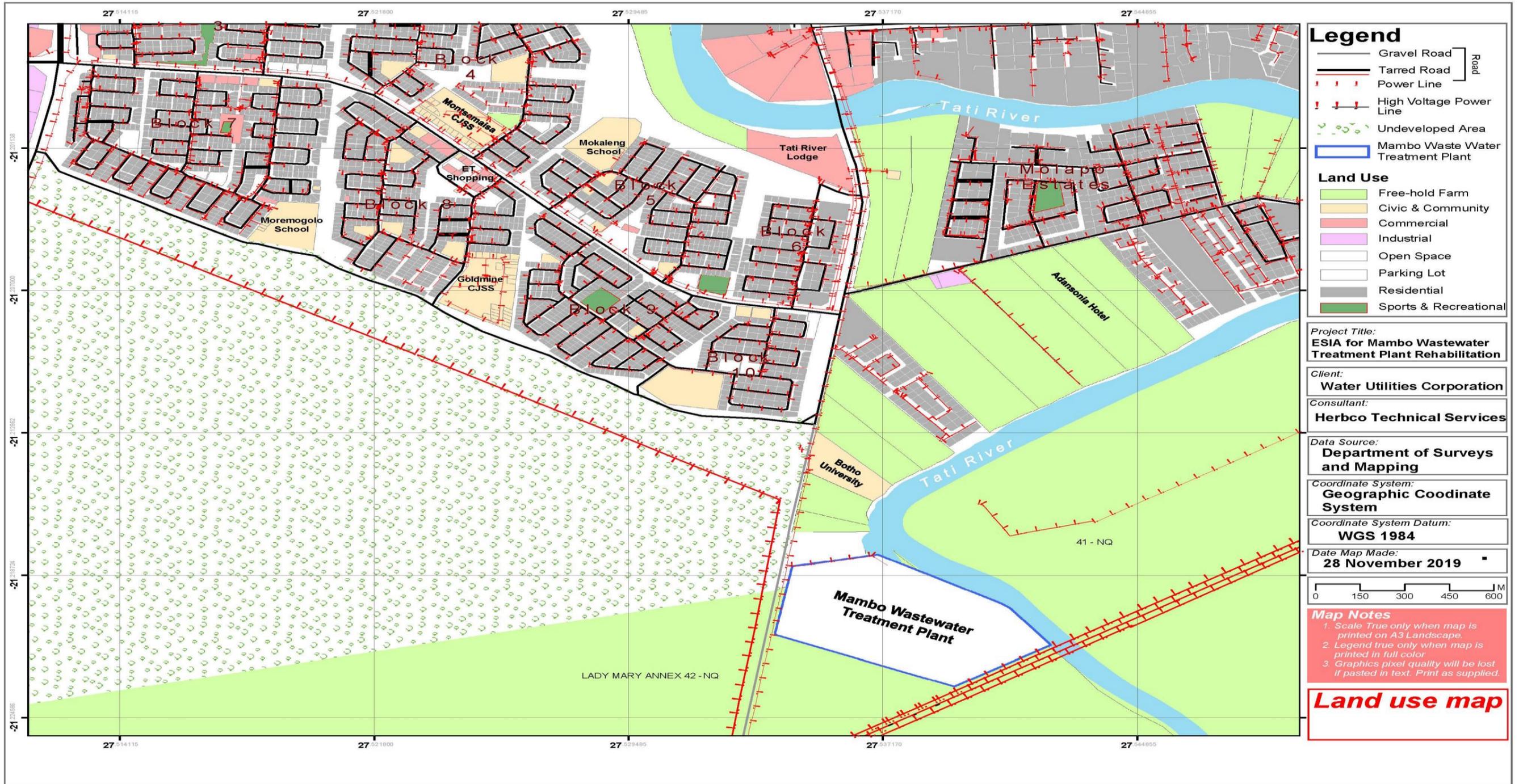


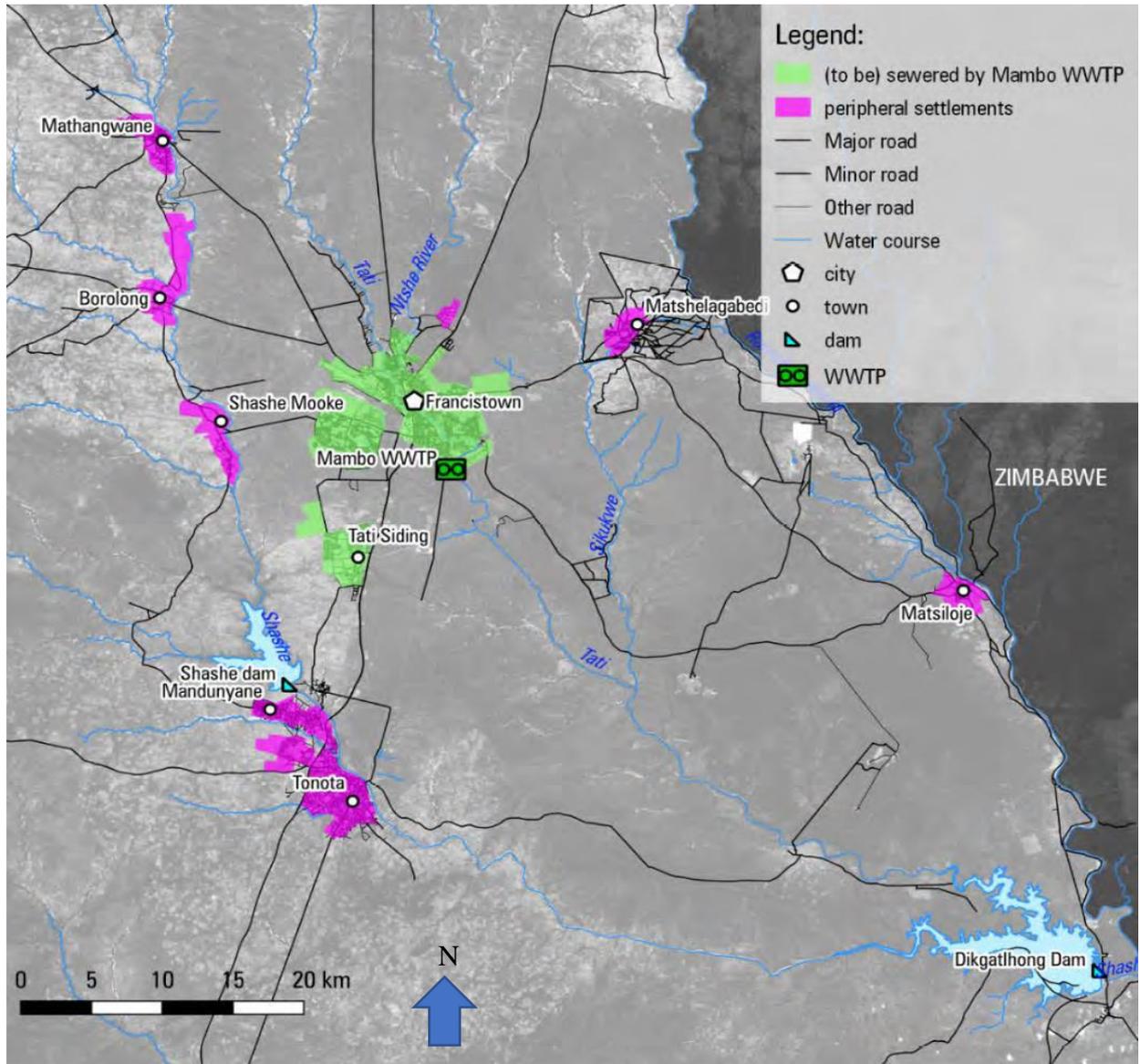
Table 2-5: Location of Mambo WWTP in Francistown

## 2.10. PROJECT BENEFICIARIES

The project area consists of Francistown and 8 surrounding villages namely (1) Tati Siding, (2) Tonota, (3) Mathangwane, (4) Borolong, (5) Sashe Mooke, (6) Mandunyane, (7) Matshelagabedi, and (8) Matsiloje. The towns in the project area are located between 20 and 45 km from Mambo WWTP, the number of beneficiaries are indicated below.

<b>Village</b>	<b>Number of female beneficiaries</b>	<b>Number of male beneficiaries</b>	<b>Total</b>
Tati Siding	3869	4328	8197
Tonota	12767	11240	24007
Mathangwane	3090	2893	5983
Borolong	2833	2436	5269
Shashe Mooke	2061	1967	4028
Mmandunyane	2157	2121	4278
Matshelagabedi	1782	1706	3488
Matsiloje	1539	1611	3150

Furthermore, except for Tati Siding, all other 7 villages are even located in different hydrological catchments as shown in the following Figure 2-6. The areas of Francistown and Tati Siding (green) are connected to the Mambo WWTP. The remaining areas (purple) are peripheral settlements and are served by onsite sanitation systems, such as pit latrines and septic tanks.



**Table 2-6: Project Catchment Area**

## **2.11. PROJET COMMENCEMENT AND ESTIMATED COST**

The sub-project is expected to commence in January 2022 with an estimated cost of P260,000,000.00 (USD 26,000,000.00) for 12 months after procurement due diligence and safeguards approvals. The pre-construction which will include selection and award of the contractor will take approximately 4 months followed by construction. The facilities are designed for a lifespan of 20 years.

## **2.12. ANALYSIS OF ALTERNATIVES**

Prior to the establishment of Mambo WWTP, Francistown was serviced by a ponds system. The growth of the population, extension of the sewer line reaching almost all inhabitants, businesses, institutions and the industry lead to increased projected flow, which was above the capacity of the pond system. Subsequently Mambo WWTP was planned in 1997 and commissioned in 2002 with a design capacity of 15,000 m<sup>3</sup>/d, or a population equivalent of 100,000 to 150,000 (Hydroplan Consulting Company, 2019).

The “Retrospective ESMP” concluded that the Mambo WWTP is inefficient, running beyond its operational capacity and a threat to public health. It recommended that the inefficiency of the Mambo WWTP be addressed by one of the following three options:

- i) Plant upgrade
- ii) Plant expansion and
- iii) Plant closure

### ***2.12.1. Plant Upgrade***

Upgrading of the Mambo WWTP involves replacement of the non-functional or ineffective plant components (equipment) at all stages of the treatment system. All components from tanker discharge bay, inlet works, preliminary treatment, primary treatment, biological treatment, pumping stations and biogas utilization system shall be assessed for functionality and possible need for replacement.

### ***2.12.2. Plant Expansion***

Mambo WWTP was planned in 1997 and commissioned in 2002 with a design capacity of 15,000 m<sup>3</sup>/d, or a population equivalent of 100,000 to 150,000, however the plant currently cannot cope with the volume of sewage it receives (to which surface run-off is added during rainfall season) and the composition of waste it receives (a large quantity of untreated industrial waste is received by the plant) due to the fact that most of its equipment meant to treat waste is dysfunctional. The expansion will involve increasing the capacity of the plant by putting up additional components in the plant to improve its functionality and enable it to cope with the capacity of the influent.

### ***2.12.3. Plant Closure***

This option involves the decommissioning of Mambo WWTP and finding an alternative location to set up another WWTP that can service Francistown and surrounding areas.

### ***2.12.4. Preferred Option***

The third option (plant closure) was rejected because it is considered unrealistic given the lack of current alternatives and the likelihood of worsening the situation in the short to medium term while a replacement option is put in place.

The 1<sup>st</sup> and 2<sup>nd</sup> options on rehabilitating and expanding the WWTP were therefore considered to be more pragmatic and cost effective.

The World Bank has agreed to support the rehabilitation and expansion of the WWTP as a means of protecting Botswana's water resources by averting the potential pollution of the Dikgatlong Dam. This involves addressing pollution of nearby water resources including groundwater, which is relied on by communities downstream of the WWTP and improving the quality of effluent, such that options for wastewater re-use can be expanded. To comply with the World Bank's safeguard policies a full scale ESIA would need to be prepared to address the gaps identified by the World Bank. In conclusion, the upgrading of the Mambo WWTP poses risks in that the plant has potential adverse environmental and social impacts on human populations or environmentally important areas. However, these adverse impacts can be mitigated by the application of effective mitigation measures.

#### **2.12.4.1. Recommended Measures and Options for Rehabilitation of WWTP**

This section describes and discusses recommended measures for each of the treatment stage in Mambo WWTP and, where technically feasible, different options are presented and discussed. Where a replacement of a unit is inevitable due to the poor condition, no further options are presented. These recommendations were done by Hydroplan Consulting Company in 2019 during the feasibility study.

##### *2.12.4.1.1. Tanker Discharge Bay*

Prior to the preliminary treatment stage, there is septic bay, which receive septic inflow from vacuum tankers.

The tanker station comprises of concrete slab, with walls on three sides to contain splashing. The slab slopes to a lower drain point, which is located directly over the incoming main sewer line. The drainage pipe from the slab into the main sewer is only 100 mm in diameter to prevent rapid slug of strong effluent from creating a severe chock load to the treatment plant. This bay is not equipped with a volume metering device and a sampling device.

The following three options are considered to improve the current situation of septic acceptance at the Mambo WWTP:

- The first option (A) is the installation of a septage acceptance station composed of screen, flow measurement and automatic collection of septic samples. The advantage of this system is that all necessary data are logged automatically and visible from the process control room. Another advantage is that the acceptance station can be equipped with an automatic sampler that collects samples automatically. A disadvantage of the system is that it is relatively expensive and requires frequent maintenance.
- A second option (B) is to have a pipe with a hose that can connect to the outlet pipe of the vacuum truck and dispose the content of the truck to the septic inlet through the pipe. Here, an electro-magnetic flow meter (MID) on the pipe to measure the inflow can be installed in the pipe, as well as a tap to take samples manually.

- The advantage of such system is that it is relatively inexpensive, and it requires minimal maintenance. A disadvantage may be that the samples of faecal sludge have to be taken manually.
- A third option (C) is to discharge the septic sludge directly into the digester through a septic acceptance station as shown above. The septic sludge will be pumped to a sludge thickener in front of the digesters. The sludge thickener will also be used for settled sludge of the primary and secondary clarifiers.

It was determined that about 50 m<sup>3</sup> of faecal sludge is disposed of at the Mambo WWTP, it can be assumed that this amount will remain approximately the same within the project horizon. On one hand the population is growing slowly (Francistown) to moderately (surrounding villages), on the other hand, sewers are being extended continuously and thus more household are being connected to a central sewer.

For options A and B, the sludge will be treated in the aerobic stage of the biological treatment as it is done currently, while in option C the faecal sludge is digested in the anaerobic stage. The influence on the digestion can be characterized as follows:

50 m<sup>3</sup>/d of faecal sludge with an assumed dry matter (DM) concentration of 2% (=20 kg/m<sup>3</sup>), results, after being thickened to 50 kg/m<sup>3</sup>, in a sludge volume of 20 m<sup>3</sup>/d. This amount would be the additional amount for the digesters. Requiring a hydraulic retention time of 20 d for the digestion, the additional sludge volume requires an additional digester volume of 400 m<sup>3</sup>.

The sludge liquor from the thickener will be returned to the pump pit feeding the trickling filters (Hydroplan Consulting Company, 2019). Option A is the preferred one because all necessary data are logged automatically and visible from the process control room and that the acceptance station can be equipped with an automatic sampler that collects samples automatically.

#### *2.12.4.1.2. Inlet Works*

##### **Screen**

Screening is used to remove large objects such as bone, plastic, bottles, rags, stones, branch of trees etc., which would otherwise block downstream pipes or damage equipment such as pumps, aerator and stirrers.

The hand-raked inlet screen has 138 mm spacing between bars and is the first unit which the sewage passes through upon entering the WWTP. The function of the screen is to protect the screw pump from large solid objects such as bone, metal road, stones; tree etc.

##### **Recommendation**

Reduce the gap between the bars to 50 mm, so that it will not only capture large items but medium size objects too. This reduction of the bar spacing may assist to reduce the load on the downstream mechanical screen.

##### **Screw Pumps**

The screw pumps installed are currently functional. However, it must be noted that the pumps have reached the end of their life cycle. The wear of the screw pump is indicated, among other factors, by the gap between the screw blades and the cylindrical metal sheet, which in the Mambo WWTP varies between 25 and 50 mm. Electro-mechanical equipment shall be replaced between 12.5 and 20 years of use.

Sheet metal cover has been provided to keep direct sun radiation away from the pump. The high surface temperature would not pose problem to the operating pump, which is cooled by wastewater being pumped. The stand-by pump, on the other hand, could bow slightly due to uneven heating on the side facing the sun. This could result in vibration and misalignment of the stand-by pump.

The pumps are operated based on the level in the pump sump, which results in frequent on-off cycles and peak loads to the primary (mechanical) treatment processes.

The recommended measure for the screw pumps is to replace the pumps since they have been operational since 2002.

The pump shall not be controlled by a level sensor in the pump pit anymore but shall be operated continuously. This will avoid the shock loads to the preliminary (mechanical) stage of the WWTP and ensure a continuous flow and more stable operation. Since the energy consumed by a pump is directly related to the flow Q that is being pumped, the energy consumption will be low at times when no or little wastewater is reaching the plant (Hydroplan Consulting Company, 2019).

#### *2.12.4.1.3. Preliminary Treatment (Mechanical Treatment)*

The preliminary treatment consists of two treatment lines of screens, sand and grit trap, and grease trap, of which one is not serviceable due to failed components, especially in the sand trap.

##### **Screens**

The mechanical screens are failing to remove suspended materials from the inlet channels. Scrapers are mainly dysfunctional, and part of the solids are being returned to the inlet channel. The conveyor is often operating without (transporting) screenings. The secondary screening stage is generally not required for efficient removal of solid materials.

##### **Sand/Grit Trap.**

The present sand trap is of PISTA type (round sand trap). The sand trap is overloaded and thus not working properly. It is overloaded because one of the two lines is not operational at all because sand removal is not functional due to mis-design of the sand removal pump and piping.

##### **Grease Trap**

The grease removal process is completely out of operation due to several deficiencies. The blower injecting air bubbles are not working, the scraper was mis-designed and is not capable of removing floating fats and grease.

The performance of preliminary treatment is negatively impacted by the hydraulic shock loads from the screw pumps frequently cycling on and off. A steadier flow would allow better functioning of the preliminary treatment units.

The double-stage screens and the PISTA-type sand trap are outdated technologies.

The options for the improvement of this stage are the following:

- 1.) Refurbishment of existing equipment by replacing electro-mechanical equipment to operate both lines
- 2.) Replacement of all screens by modern screens (belt filter screen, step screen or similar), and construction of combined, aerated grit and grease channels (two lines). The new screw pumps and new screens would be installed in the existing civil works, while grit and grease channel would be built next to existing structure.

- 3.) Combined compact screen, grit and grease removal devices that are stainless steel, pre-manufactured units. Three of these units would be required and be operated in parallel.

*2.12.4.1.4. Recommended Measures for the Improvement for a Preliminary, Mechanical Treatment:*

Hydroplan Consulting Company recommends replacing the screens and constructing a new grit/grease removal tank (Option 2).

After 20 years of operation of the mechanical treatment, it is recommended to update the technology to state-of-art machinery and design in to achieve and efficient grit and grease removal. The recommended process is beneficial for the treatment because in an aerated grit chamber, organic matter is being washed out from the grit.

The refurbishment of the existing system (Option 1) does not seem viable because of various reasons and advantages of a new unit.

- The double-set of screens are working highly inefficient and would require a replacement with a modern screen in order to meet requirements for the downstream processes. The maximum bar spacing shall be 10 mm. Also, modern screen units require only one screen per line. The screen behind the sand trap is considered obsolete.
- Another advantage of removing the existing screens is that the conveyer belt system can be decommissioned. Modern screens make use of a screenings press and the washed solids are disposed in a waste container directly. The collection of solid waste from the screens with the aim of burning the waste onsite is not recommended given the environmental impact of the (uncontrolled) incineration.
- The sand/grit removal stage makes use of an outdated technology. In addition, the circular grit trap is not aerated and, thus the organic fraction is not being separated from the settled solids that are removed by the grit classifier.
- The grease removal would require extensive rehabilitation effort in order to correct the design and make the unit operational, which would result in replacement of all electro-mechanical equipment and likely a new tank anyway.

The construction of a combined, compact unit (Option 3) is technically feasible. At this stage, it assumed that the costs are higher than costs of Option 2.

According to Hydroplan Consulting Company, it is not recommended to design and construct a preliminary treatment based on current flows because this unit would require extension or an additional unit in a few years.

○ **Primary Treatment**

The major problem with this important unit is the failing sludge removal because sludge pumps are not working in a sufficient way. That leads to a condition in which settled sludge is fouling in the tank (cold digestion). The black colour of the effluent is a typical indicator for such digestion processes. The pumps are airlift pumps, however, they have reached their End-of-Life and required spare parts are not even available in the market anymore.

An increased amount of scum, due to the raising gas bubbles from digestion at the bottom of the tank, is not removed efficiently from the surface.

Regarding the design of the tanks, it has to be noted that the retention time is approximately 1.6 hours (h) and a surface loading of 2.77 m/h. It must be assumed that the hydraulic condition lead reduction of BOD<sub>5</sub> (or COD) of 25% and dry matter (DM) removal of 50% only. Ideally, at a retention time of two hours and a surface loading rate of 1.5 -2 m/h, a removal of 33% of BOD<sub>5</sub> (or COD) and 70% of DM could be achieved.

### **Recommendations**

The entire electro-mechanical equipment of both settling tanks (pumps, motors, valves, scraper bridges, wheel track) require replacement. According to examination, the civil structure is in good shape and can be maintained for future use.

For the current design flow, no additional clarifier is necessary given that the existing two are functioning properly. In order to rehabilitate the existing settling tanks, the following measures imminent:

- A new sludge pumping station is required to remove the settled sludge. This measure is considered to be a very important measure because due to sludge fouling in the tank the performance of subsequent processes are negatively impacted.
- The pumping station will be designed as rectangular chamber in between the two existing tanks with an invert level below the tanks' depth. The chamber will be equipped with three, dry-installed, eccentric screw pumps removing sludge from the tanks.
- In addition, a sludge thickener will have to be designed and built.
- As emergency measure, it is recommended that WUC installs a submersible pump in the pump sump (central cylinder) of each tank to improve the primary treatment as soon as possible. This measure can be implemented on short-term as a temporary solution.

### **Biological Treatment**

#### ○ **General**

Biofilm processes (i.e. trickling filter, moving bed reactor, rotating biological contactor (RBC), biological aerated filter (BAF) in general require less space than activated sludge systems because the biomass is more concentrated, and the efficiency of the system is less dependent on the final sludge separation. A disadvantage with other biofilm processes is that they experience bio-clogging and build-up of head loss. It is therefore very important that the pre-treatment steps (screens, grit removal, grease removal, primary sedimentation) are working in a good and stable manner.

#### ○ **Denitrification Tank**

Since the Mambo WWTP was commissioned in 2002, the denitrification stage has never been operational. The design of the existing denitrification tank does not allow for proper sludge settling and removal.

If treated effluent will be re-used for agricultural purposes, in principal, a denitrification step is not needed since Nitrate is an essential nutrient for plant growth and thus a desired component in the treated effluent.

For times when agricultural re-use is not practised, a denitrification stage is highly recommended in order to protect the downstream waterbodies such as the Dikgatlong Dam. However, it has to be noted that denitrification is not required to comply with the Botswana discharge standard (BOS 93:2012) defining a Nitrate limit of 50 mg/L (as NO<sub>3</sub>) and Nitrite limit of 3 mg/L (as NO<sub>2</sub>).

For this scenario, a possible solution is to retrofit the existing denitrification tank for installation of a moving bed biofilm reactor (MBBR). Part of the tank would be separated, either by steel or concrete wall, and the new, smaller tank would be filled with special plastic carrier that provide surface where biomass can grow. The carriers are made of a material with a density close to the density of water ( $1 \text{ g/cm}^3$ ). An example is high density polyethylene (HDPE) which has a density close to  $0.95 \text{ g/cm}^3$ . The carriers will be mixed in the tank by a mixer and thus will have good contact between the substrate in the influent wastewater and the biomass on the carriers. MBBR systems don't need a recycling of the sludge since biomass is retained on the carrier material. Additional aeration is not necessary because bacteria use oxygen from Nitrate ( $\text{NO}_3^-$ ) and convert Nitrate to gaseous Nitrogen ( $\text{N}_2$ ), which gases out.

In the treatment process foreseen for Mambo WWTP, the denitrification remains a pre-denitrification process. The part of the existing tank that will not be used for denitrification could be used as a retention tank of the treated effluent and pump pit for the re-use scenario.

Another option is to realize denitrification with an activated sludge system making use of the existing basin. The existing basin will be split into two. The first tank will be a mixed, anoxic reactor, where denitrification will take place. From there, the wastewater will flow into the second basin where sludge is settled and removed. The effluent from the clarifier will flow to the pumping station and from there to the trickling filters. Part of the sludge will be recycled as return sludge into the anoxic reactor. The other part of the sludge will be pumped to the new sludge thickener and from there to the digesters.

The MBBR is the recommended measure because of several advantages as it:

- Has a smaller footprint and there is no additional sludge process that would require monitoring and control of the return/excess sludge.
- Consumes less energy than the activated sludge system.
- Allows for part of the basin to be used as storage tank for treated effluent.
- Requires less construction due to fewer installation of piping, pumps, and process control

The (re)use of the treated effluent and the corresponding regulation dictates the requirements regarding the removal of nitrogen, mainly Ammonium and Nitrate. The (total) nitrogen limit for irrigation according to Botswana standard (463:2011) is  $30 \text{ mg N/L}$  as  $\text{NO}_3\text{-N}$  ( $= 38 \text{ mg NH}_4\text{/L} = 133 \text{ mg NO}_3\text{/L}$ ). The nitrogen limit for discharge into Tati river, being an ephemeral river, is  $10 \text{ mg NH}_4\text{-N/L}$  and  $50 \text{ mg NO}_3\text{-N/L}$ . According to the parameter limits of the discharge standard, it is important to state that a nitrification process is required.

#### ○ **Pumping Station**

The pumping station is operational, however, the electromechanical machinery including pumps, motors, valves, sensors and electrical panels are beyond their life cycle and require replacement. The civil works are in acceptable condition and can remain in place for future use of the pumping station.

There is no feasible option to be considered other than a complete refurbishment of the pumping station.

#### ○ **Trickling Filters**

In general, the trickling filters are in appropriate conditions. Blockages that occur on a regular basis are due to the deficient primary clarification, which currently results in elevated effluent concentrations from the trickling filter.

The (re)use of the treated effluent and the corresponding regulation dictate the requirements regarding the removal of Nitrogen, mainly Ammonium and Nitrate. The (total) nitrogen limit for irrigation according to Botswana standard (463:2011) is 30 mg N/L as NO<sub>3</sub>-N (= 38 mg NH<sub>4</sub>/L = 133 mg NO<sub>3</sub>/L). The Nitrogen limit for discharge into Tati river, being an ephemeral river, is 10 mg NH<sub>4</sub>-N/L and 50 mg NO<sub>3</sub>-N/L. According to the parameter limits of the discharge standard, it is important to state that a nitrification process is required.

Assuming all six trickling filters being operational and a well-functioning primary treatment, the volumetric loading for the design flow of 15,000 m<sup>3</sup>/d is 0.225 kg BOD<sub>5</sub>/m<sup>3</sup>/d. For carbon reduction a maximum loading of 0.4 kg BOD<sub>5</sub>/m<sup>3</sup>/d is recommended. The trickling filter volume is appropriate for carbon removal; however, the volume is too small to achieve nitrification. For a proper nitrification process a maximum loading of 0.1 kg BOD<sub>5</sub>/m<sup>3</sup>/d is necessary. Using plastic material with a high surface area as carrier (filler) in the trickling filters, a volumetric loading of 0.15 kg BOD<sub>5</sub>/m<sup>3</sup>/d is acceptable.

The scenario presented above was calculated assuming the design flow of 15,000 m<sup>3</sup>/d (corresponding to 9,000 kg BOD<sub>5</sub>/d). In 2019/2020, flow is about 10,000 m<sup>3</sup>/d, corresponding to 6,000 kg BOD<sub>5</sub>/d. This equal, given a proper preliminary and primary treatment, a volumetric loading of 0.15 kg BOD<sub>5</sub>/m<sup>3</sup>/d. Given the planning horizon is 2040, additional measures are recommended to fulfil the above-mentioned discharge standards:

### **Recommended Measures**

- 1) Replacement of filler material (stones) with plastic material, preferably hanging substrate material (such as Sessil). Hanging material provides the advantage that clogging does not occur. The rip-resistant film strips are made from UV-resistant polyethylene. Usually a growth surface between 150 m<sup>2</sup>/m<sup>3</sup> and 200 m<sup>2</sup>/m<sup>3</sup> is selected.
- 2) Build additional trickling filters in order to achieve the required nitrification of Ammonium. Considering the above-mentioned recommendation for volumetric loading, the missing volume is 15,000 m<sup>3</sup> based on the usage of plastic material for all trickling filters. This volume corresponds to three additional trickling filters, each with a volume of 5,000 m<sup>3</sup>. Alternatively, if stone material in the existing trickling filters would remain and not be replaced with plastic filler, an additional trickling filter volume of 25,000 m<sup>3</sup> would be required. This would amount to five additional, plastic-filled trickling filters.
- 3) Hydroplan Consulting Company recommended that the stone fillings with plastic material be installed as a medium-term measure as load on Mambo WWTP increases with population growth. In addition, additional new trickling filters are required in order to guarantee sufficient nitrification. Note that the scenario presented above was calculated assuming the design flow 15,000 m<sup>3</sup>/d (corresponding to 9,000 kg BOD<sub>5</sub>/d). In 2020, flow is about 10,000 m<sup>3</sup>/d, corresponding to 6,000 kg BOD<sub>5</sub>/d). This equal, given a proper preliminary and primary treatment, a volumetric loading of 0.15 kg BOD<sub>5</sub>/m<sup>3</sup>/d.

#### ○ **Humus Tanks**

Secondary clarifiers are working properly and are hydraulically designed to reach the recommended retention time of 2.5 hours. No deficiencies were observed and therefore no recommendations for refurbishment or rehabilitation was made in regard to the humus tanks.

#### ○ **Chlorination**

The treated effluent shall be re-used in the future. The most likely re-use scenario is irrigation for public parks, the golf course, and agricultural re-use. For these uses, chlorination is not the recommended technology since Chlorine is harmful for plants and microorganisms in soil. It is therefore recommended to replace the chlorination process by UV disinfection.

#### ○ **Digesters**

The sludge digesters are fed without a prior sludge thickening process. On this reason the volume of the digesters is not sufficient. Mixers in the tank are not designed correctly, and in addition, the heating required for a proper digestion was not designed and installed (Hydroplan Consulting Company, 2019). Recommendations by Hydroplan Consulting Company:

- Construction of sludge thickener near the digesters for primary, excess sludge (humus tanks), and faecal sludge. The thickening process increases the dry solids content from 2.5% (primary sludge) and 2% (excess sludge) to 5%.
- All mechanic and electric equipment is to replace including pipe works (gas and sludge).
- Installation of a heating system, so that the digesters can be operated at a temperature between 35°C and 38°C continuously.
- Insulation of the upper part of the digester (concrete) in order to improve energy efficiency.
- Installation of new mixers with a shaft of appropriate length for sufficient mixing of digester's content.

### **Biogas Utilization**

#### ○ **Gas Holding Tank**

Gas holding tank was never operational and it was found to be incompletely equipped. Inside, the gas balloon is not installed or missing.

Hydroplan Consulting Company recommended that a gas balloon and all necessary accessories (pressure indicators, shutoff valves, flow meter, gas sensors for monitoring of Methane content) be installed for safe operation of a gas storage.

#### ○ **Gas Cleaning**

There is no gas cleaning station installed. In order to be able to use the gas, a gas cleaning (gas drying, removal of H<sub>2</sub>S) is mandatory.

#### ○ **Gas Utilization**

The gas can be used as source for the heating of the digesters. Alternatively, a Combined Heating Power plant (CHP) could be constructed to produce electrical and thermal energy. In that case, the thermal energy would be used for heating the digesters. The recommendation is the construction of CHP near the digesters and gas holding tank.

#### ○ **Gas Flare**

The gas flare is required to burn off the gas when the regular utilization is out of operation. Checking the gas flare was not possible. Since it has not been used in almost 20 years, it is safe to assume that the flare needs to be replaced.

## 2.13. SITUATIONAL ANALYSIS

Currently the plant discharges highly contaminated water into the Tati river and this subsequently impacts on downstream users of the resource. Water quality tests were undertaken, and the following conclusions made:

The water samples collected and were taken to WUC and the Department of Water Affairs (DWA) accredited laboratories for analysis. The samples were analysed for physical, chemical and microbiological requirements as per the BOS 93: 2012 standard.

The aim of the assessment was to establish the baseline effluent water quality at Mambo WWTP and effluent being discharged into the environment (Tati river) to obtain data that can be used to form basis for planning the control measures to eliminate or minimize pollution to water and environment after the expansion.

### Results

#### 2.13.1. CHEMISTRY AND METALS

**Table 2-7: Water Quality for Mambo Wastewater Treatment Plant (20 February 2018)  
Point 1 (Mambo Wastewater Treatment Plant)**

POSITION	UNITS	RESULTS	MAXIMUM ALLOWABLE LIMITS	REMARKS	
1.	Iron (Fe)	Mg/L	1.21	2	Exceeded limit
2.	Manganese (Mn)	Mg/L	7.31	70	Exceeded limit
3.	Magnesium (Mg)	Mg/L	0.12	0.1	Exceeded limit
4.	Sodium (Na)	Mg/L	105.07	400	Exceeded limit
5.	Potassium (K)	Mg/L	19.11	50	Exceeded limit
6.	Calcium (Ca)	Mg/L	32.44	100	Exceeded limit

**Table 2-8: Water Quality for Mambo Wastewater Treatment Plan (20 February 2018)  
Dikgatlhong Dam Point**

POSITION	UNITS	RESULTS	MAXIMUM ALLOWABLE LIMITS	REMARKS	
1.	Iron (Fe)	Mg/L	0.19	2	Exceeded limit
2.	Manganese (Mg)	Mg/L	5.65	70	Exceeded limit
3.	Magnesium (Mg)	Mg/L	0.07	0.1	Exceeded limit
4.	Sodium (Na)	Mg/L	6.99	400	Exceeded limit
5.	Potassium (K)	Mg/L	4.93	50	Exceeded limit
6.	Calcium (Ca)	Mg/L	23.51	100	Exceeded limit

### 2.13.2. Microbiology

Table 2-9: Microbiology of the effluent at different points (20 February 2018)

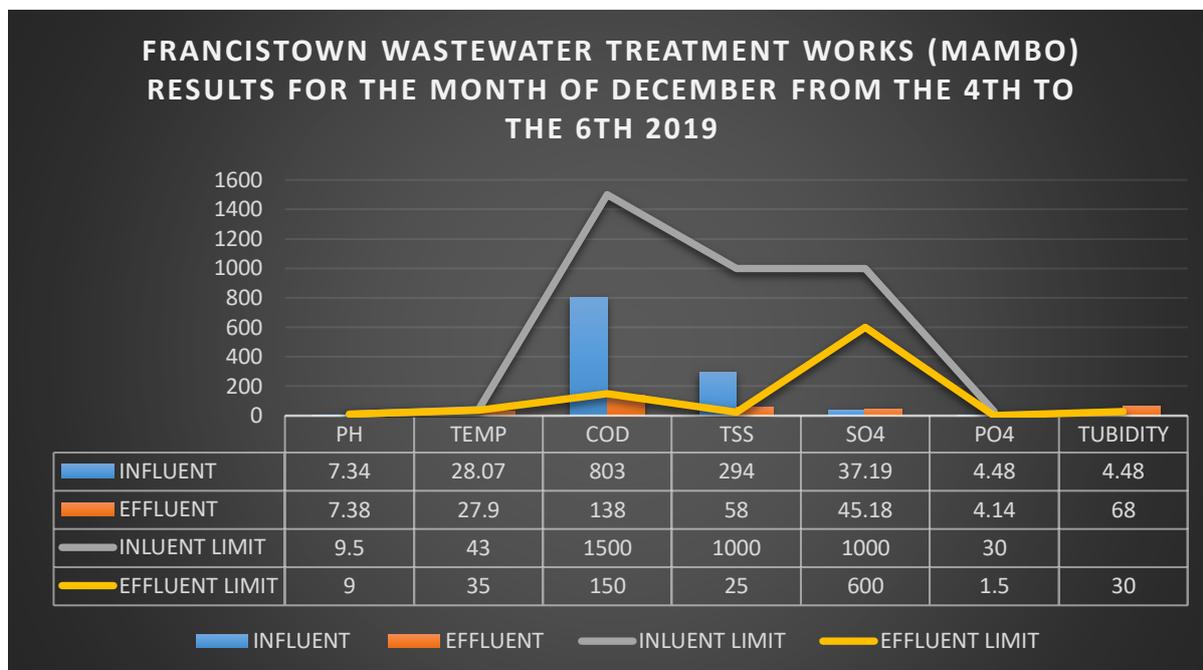
PARAMETER	BOS 93:2012 COMPLIANCE STANDARD	MAMBO EFFLUENT- POINT 1	TATI RIVER - POINT 2	TATI RIVER- POINT 3	TATI RIVER- POINT 4	DIKGATLHONG DAM POINT 5	REMARKS
<i>E. Coli</i> , CFU/100ml	ND (irrigation water <1000)	1 167 000	11 600	2 425	4 400	625	Exceeded limit
Total Coliforms, CFU/100ml	20 000	2 115 000	31 800	21 400	15 900	2 200	Exceeded limit
Faecal Coliforms CFU/100ml	500	1 426 000	16 700	5 350	6 400	625	Exceeded limit

### 2.13.3. Influent and Effluent Analysis from Mambo Treatment Plant

Below are the results from WUC on December 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> December 2019 were analysed to see the difference in the content parameters of influent and effluent wastewater discharge at Mambo WWTP.

Table 2-10: Mambo results for the month of December 2019

FRANCISTOWN WASTEWATER TREATMENT WORKS (MAMBO) RESULTS FOR THE MONTH OF DECEMBER FROM THE 4 <sup>TH</sup> TO THE 6 <sup>TH</sup> 2019							
PARAMETERS	PH	TEMP°C	COD	TSS	SO4	TURBIDITY	PO4
			INFLUENT				
<b>LIMIT FOR INFLUENT</b>	9.5	43	1500	1000	1000		30
	7.21	27.7	790	264	33.44	472	4.72
	7.32	28.9	630	276	34.06	470	3.95
	7.48	27.6	988	342	44.08	480	4.76
<b>AVERAGE INFLUENT</b>	7.34	28.07	803	294	37.19	474	4.48
			<b>EFFLUENT</b>				
<b>LIMIT FOR EFFLUENT</b>	9	35	150	25	600	30	1.5
	7.28	27.2	127	59	44.61	70	3.54
	7.35	28.2	138	65	45.56	68	4.67
	7.52	28.3	148	51	45.38	65	4.21
<b>AVERAGE EFFLUENT</b>	7.38	27.9	138	58	45.18	68	4.14



**Table 2-11: Mambo WWTP influent and effluent testing results for the month of December 2019**

Source: WUC

The wastewater results from WUC were shared with the project team and no significant difference was recorded for the physical parameters, however the level of Phosphate in the water discharged into streams is above the allowable limit. The parameters that were tested were for both influent and effluent, and the data was recorded in December from the 4<sup>th</sup> to the 6<sup>th</sup> 2019.

### **2.13.3.1. Discussion of Results**

The results of this water analysis indicate levels of most metal and chemistry parameters assessed are within the allowable limits. However, Magnesium (Mn) has exceeded the required level by 0.02. The microbiological content of the effluent at different points show that the acceptable limits according to BOS 93: 2012 standard.

## **2.14. ANCILLARY WORKS FOR THE REHABILITATION OF MAMBO WWTP**

### **2.14.1. Construction Camp**

The construction activities in Mambo shall be manned by the consultant engineer and contractor whom shall have their offices housed within the yard of Mambo WWTP. There will be no permanent structures but only porter camps for offices. Accommodation shall be sourced from town since Francistown is a City.

### **2.14.2. Access Roads**

Mambo WWTP is within the boundaries of Francistown, the road leading to the WWTP is tarred and going through the south-eastern side of Francistown. The traffic bringing all materials and equipment will be using this road.

### **2.14.3. Rubble Disposal**

Francistown has a functional landfill site in Dumela industrial site where construction rubble shall be disposed.

### **2.14.4. Sludge**

Mambo wastewater treatment plant has sludge beds here where treated sludge is stored before being recycled for usage in the agricultural industry.

### **2.14.5. Aggregate Materials**

Francistown has a number of commercial aggregate sites, one owned by Panda in Monarch and one owned by PPC in the outskirts of Francistown, there are also private borrow pits in the outskirts of Francistown which aggregate material can be purchased from.

### 3. POLICY, LEGISLATIVE AND ADMINISTRATIVE FRAMEWORK

#### 3.1. INTRODUCTION

The Environmental and Social Impact Assessment for this sub-project were developed with reference to key policy, legal and administrative instruments of Botswana and World Bank Safeguard policies. In this section several policies, Acts and administrative instruments were reviewed to guide the implementation of the project.

**Table 3-1: Policy, Legislation and Administrative Framework**

**(a) World Bank Policies Triggered**

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<b>World Bank Policies Triggered</b>		
	<i>OP 4.01 Environmental Assessment</i>	<p>Environmental Assessment is one of the 10 safeguard policies of the World Bank. The objective of the World Bank Environment and Social Safeguard Policies is to improve decision-making, to ensure that project options under consideration are sound and sustainable, and that project affected people have been properly consulted.</p> <p>The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01. The World Bank system assigns a project to one of three project categories, as defined below:</p> <ul style="list-style-type: none"> <li>• Category A: An ESIA is normally required because the project may have diverse significant impacts (projects in this category are forestry, large industrial plants, irrigation and drainage, mineral development (including oil and gas), pipelines (oil, gas, and water), resettlement, rural roads, tourism, urban development, large transmission lines, etc.).</li> <li>• Category B: A limited environmental analysis is appropriate, as the project may have specific environmental impacts. Projects in this category include agro-industries (small scale), aquaculture &amp; marine culture, small industries, mini-hydropower station, public facilities (hospitals, schools, housing complexes, rural</li> </ul>	<p>Mambo WWTP rehabilitation will have diverse significant impacts in the environment because it is a wastewater plant that operates at large industrial level and it disposes the effluent into a river. This policy puts in Category A of OP 4.01.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<p>electrification, telecommunications, small-scale tourism, rural water supply, etc.)</p> <ul style="list-style-type: none"> <li>• Category C: Environmental analysis is normally unnecessary, as the project is unlikely to have significant environmental impacts. Projects in this category include education, family planning, nutrition, institutional development, technical assistance, etc.</li> </ul>	
	<i>OP 7.50 Projects on International Waterways</i>	<p>This policy applies to the following types of international waterways:</p> <p>(a) any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states, whether Bank members or not;</p> <p>(b) any tributary or other body of surface water that is a component of any waterway described in (a) above; and</p> <p>(c) any bay, gulf, strait, or channel bounded by two or more states or, if within one state, recognized as a necessary channel of communication between the open sea and other states and any river flowing into such waters.</p>	<p>Mambo WWTP utilises the Tati river for disposal of effluent. Tati river is a tributary of Limpopo river which runs along Botswana, South Africa, and Zimbabwe.</p>
	<i>OP 4.11 Physical cultural resources</i>	<p>This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices.</p>	<p>An AIA was undertaken for the Mambo WWTP site and for pump stations in an effort to investigate if there are any physical cultural resources. No trial trenching was done; however, the construction stage may result in deep excavations of which chance finds may be encountered.</p>
	<i>OP 4.10 Indigenous People</i>	<p>This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. The Bank requires the borrower to engage in a process of free, prior, and informed consultation.</p>	<p>This policy is not triggered by this sub-project because there are no indigenous people in the sub project area.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>OP 4.12 Involuntary Resettlement</i>	The objectives of the World Bank Policy on Involuntary Resettlement, are to avoid or minimize involuntary resettlement; to make any resettlement activities a sustainable development program, including through project benefit-sharing and meaningful consultation of affected persons.	This policy is not triggered by this sub-project, there will be not relocation of people and properties.
	<i>OP 4.37 Dam Safety</i>	When the Bank finances a project that includes the construction of a new dam, it requires that the dam be designed and its construction supervised by experienced and competent professionals. It also requires that the borrower adopt and implement certain dam safety measures for the design, bid tendering, construction, operation, and maintenance of the dam and associated works.	This policy is not triggered because there is no construction of dam involved in this sub-project.
	<i>World Bank Group Environmental Health and Safety (EHS) Guidelines.</i>	<p>The Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group are technical referenced documents and industry-specific examples of good international industry practice. The guidelines are categorised into the general and industry specific.</p> <p>The EHS Guidelines for Water and Sanitation are relevant to this sub-project because they include information relevant to the operation and maintenance of (i) potable water treatment and distribution systems, and (ii) collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities.</p> <p>This sector specific EHS guidelines recommends that treatment or pre-treatment to neutralize or remove toxic chemicals should ideally take place at the industrial facility itself, prior to discharge of the effluent to the sewer or water body. Consider collaboration with public authorities in the implementation of a source control program for industrial and commercial users to ensure that any wastewater discharged to the sewer system can be effectively treated. Over and above the sector specific guideline the following general guidelines will be adopted and utilized by the contractors</p>	For the Mambo WWTP sub-project the relevant industry specific will be Water and Sanitation Guidelines. General Guidelines to be adopted and utilized by the contractors and other project implementers includes Environmental, Occupational Health and Safety, Community Health, and Safety, Construction and Decommissioning. The General Guidelines include several numerical emission guidelines relevant to the sub-project. These include Noise, Air Emissions and Ambient Air Quality and Radiological Hazards, amongst others.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		and other project implementers; Environmental, Occupational Health and Safety, Community Health, and Safety, Construction and Decommissioning.	
	<i>Grievance Mechanism (GM)</i>	The GM outlines a process for documenting and addressing project grievances (and complaints) that may be raised by affected persons or community members regarding specific project activities, environmental and social performance, the engagement process, and/or unanticipated social impacts resulting from project activities. It describes the scope and procedural steps and specifies roles and responsibilities of the parties involved.	For this project, the WUC and the contractor will ensure that all complaints will be communicated to and registered by the Contractor's nominated representative usually the Contractor's Community Liaison Officer (CLO) in the site daybook immediately upon receipt, including details of the complainant, attempts to resolve the complaint, the resolution of the complaint and outcome.

**(b)Water Utilities Corporation (WUC) Internal Documents**

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>Trade Effluent Agreement</i>	<p>This agreement is established under the WUC Act of 1970 and provides an understanding between the Corporation and a specific industry and trade, regarding the quality of effluent discharged into the public sewers. It also establishes fees and charges appropriate for the acceptance and treatment of trade effluent of a quality in excess of that expected from typical domestic waste.</p> <p>Obligations to users of public sewer systems are outlined in the agreement and some of them are:</p> <ul style="list-style-type: none"> <li>• Subject the effluent before it is discharged to the sewer, to such pre-treatment as will ensure that the effluent conforms to standards.</li> <li>• Restrict the discharge of effluents to certain specified hours and the rate of discharge to a specified maximum and to install at their own expense such tanks.</li> <li>• Install a separate drainage installation for the conveyance of industrial effluent and to discharge the same into a sewerage</li> </ul>	<p>WUC should ensure that all industries which use the sewer system that connect to Mambo WWTP have signed the Trade Effluent Agreement and are adhering to it.</p> <p>WUC should undertake regular inspections of major industries sewer connections.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<p>system through a separate connecting sewer as directed by the Corporation.</p> <ul style="list-style-type: none"> <li>• Construct at his own expense in any drainage installation conveying industrial effluent to the sewer one or more inspection, sampling or metering chambers.</li> </ul>	
	<i>Water Utilities Corporation (WUC) Policy on Safety Health and Environment (SHE)</i>	The Corporation attaches the greatest importance to the health and safety of its employees. It is the duty of management and equally the personal duty of employees to prevent and avoid injury to self and others, to minimise any forms of loss, the elimination of all occupational health hazards and the protection and conservation of the environment. Any contravention of safety procedures shall be treated as a serious offence which shall constitute grounds for appropriate disciplinary action.	WUC should ensure that their facility does not put at risk the safety and health of downstream users of water in the Tati river by ensuring that water released is of good quality.
	<i>National Occupational Safety Association (NOSA) Integrated Five Star System</i>	The new NOSA integrated Five Star system is a risk management program, whose primary objective is to provide world class occupational safety, health and environmental risk management on international standard. The system covers areas like occupational health, occupational hygiene, risk management, safety management and environmental risk management. Its criteria include hazards identification and risk management, standards and procedures development, compliance with procedures, standards and national legislation compliance. The Corporation's affiliation to NOSA is of great importance in the light of the global trends on occupational safety, health and environmental management.	WUC should adhere to their own good quality systems which will prevent poor maintenance of the WWTP which puts the occupation health of workers at risk.
	<i>Water Utilities Corporation (WUC) Draft Environmental Management Policy</i>	<p>This is the Corporation's policy to manage and operate water and wastewater resources, treatment and supply infrastructure, and associated works under its mandate in an environmentally prudent manner to ensure social equity, economic efficiency and ecological sustainability. The Corporation pursuant to these ideals ensures the protection and conservation of the water and environment through the operation of its infrastructure in a manner that does not detrimentally impact on the surrounding communities and the ecology.</p> <p>The policy further stipulates the responsibilities of the Corporation in fulfilling the set objectives as follows:</p>	WUC Environmental Policy aims to protect the environment in which they operate in. One of their objectives is the manage wastewater in a manner that will sustain the environment as such it is imperative that at no point should water not meeting the minimum standard be disposed into the environment.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<ul style="list-style-type: none"> <li>• Implement and maintain an Environmental Management Programme in accordance with the ISO 14001 and other relevant standards.</li> <li>• Manage and operate its water and wastewater resources in a manner that will sustain the environment.</li> <li>• Prevent and control pollution of its water and wastewater resources.</li> <li>• Integrate EIA process in the planning, design, development and management of its wastewater resources and associated works.</li> <li>• Diversify the use of its water resources for eco-tourism and other secondary uses.</li> <li>• Promote water conservation.</li> </ul>	

#### (b)Development Plans

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>National Development Plan 11 (NDP11)</i>	Some of the national challenges outlined in NDP11 which have relevance to this project include: <ul style="list-style-type: none"> <li>• Scarcity of water resources</li> <li>• Increased generation of waste and rising pollution levels</li> </ul>	WUC should in line with the challenges outlined by the NDP strive to stop pollution by not releasing water that does not meet the minimum requirements as well as maximizing on recycling of wastewater for other uses.
	<i>City of Francistown Development Plan (1997-2021)</i>	The Francistown Development Plan (1997-2021) is a long-term planning document with a 24-year time horizon. Although it is primarily a physical development guide, it also provides broad policy statements and strategies that deal with major issues of housing, employment, social amenities and infrastructure.	Francistown is growing as such WUC should ensure that the WWTP should be able to process all wastewater from the City and surrounding areas.
	<i>Development Control Code (2013)</i>	The Development Code is a set of planning regulations (which are legally binding) aimed at controlling land use activities. <ul style="list-style-type: none"> <li>• Development regulations cover the following land use areas:</li> <li>• Residential land use</li> <li>• Commercial land use</li> <li>• Industrial land use</li> <li>• Open space</li> </ul>	WUC should adhere to the objective of preventing of airborne emissions and water borne discharges by ensuring that the WWTP is operating as it was designed and servicing it regularly.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<ul style="list-style-type: none"> <li>• Civic and community land use</li> <li>• Mixed land use</li> <li>• Advertisement</li> </ul> <p>As part of the guiding principles for the land use areas, environmental protection objectives are stated. In summary some of the key objectives include:</p> <ul style="list-style-type: none"> <li>• Reduction in dependence on non-renewable and scarce resources,</li> <li>• Prevention of airborne emissions and water borne discharges i.e. the control of pollution at source</li> <li>• Conservation of energy and resources</li> <li>• Aesthetic considerations and sensitivity of building characteristics to the natural environment</li> <li>• Consideration for neighbours</li> <li>• Provision of suitable space for the storage and collection of refuse</li> <li>• Landscaping and management of open space</li> <li>• Appropriate sanitation provision</li> <li>• Control of site boundary setbacks</li> </ul>	
	<p><i>Botswana National Master Plan for Wastewater and Sanitation (BNMPWWS)</i></p>	<p>Volume 10: <i>Environmental Impact Assessment</i> of the BNMPWWS is the most relevant to this sub-project. This volume describes the effluent characteristics of the various wastewater treatment plants and assess the environmental impact of existing wastewater treatment facilities to determine options for future action.</p> <p>The BNMPWWS outlines some of the following advantages pertaining to the use of wastewater:</p> <ul style="list-style-type: none"> <li>• It is a source that has less capital works associated with its development and therefore has less intrinsic cost to the consumer.</li> <li>• It is well located adjacent to the major developments centres in the country.</li> </ul>	<p>WUC should ensure that as part of the upgrade of the facility there are measures put in place for the recycling of water and waste generated from the facility.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<ul style="list-style-type: none"> <li>• It's probably the only potential water source that increases its yield in time.</li> <li>• It can contribute towards deferring costly capital investment in the development of new water sources.</li> <li>• It provides a proportionate offset to demand of precious potable water supplies.</li> <li>• It encourages resource conservation.</li> <li>• It provides an ideal watering medium within built fertilizer and nutrients for enhanced crop production and allows for multiple uses of land for agriculture.</li> <li>• It can provide areas of aesthetic community value, such as golf courses, parks and garden</li> </ul>	

**(c) Botswana Legislation and Policies**

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>Environmental Assessment Act (2010)</i>	<p>The EA Act specifies the general framework to be implemented through statutory orders and guidelines from the Minister responsible for the environment as well as identify the proper implementing agencies and ensure that adequate administrative procedures are in place.</p> <p>EIA seeks to provide the decision makers with an indication of the likely consequences of their developmental activities. Decision-makers should consider environmental impact as one of the issues to be addressed in decision making in order to balance the competing demands of development and environmental protection and to provide for environmentally sound policies, programmes and projects. Furthermore, environmental impact assessment allows government to consult the interested public on particular planned policies, programmes or projects.</p>	Extensive public consultations were undertaken with affected communities, over and above the mandated Kgotla meeting as per the EA Act of 2010. This included Focus Group Meetings.
	<i>Environmental Assessment Act (2020)</i>	This Act is an amendment of the EA Act 2010 which is aimed at improving the review durations and shortening of the EIA process. This Act is likely to be put in effect in May 2021.	This Act is relevant to this project because it contains the reduced public review duration that is likely to affect this project should it be effected in May 2021.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>Monuments and Relics Act (2001)</i>	All archaeological sites and to some extent historic sites are protected under the Monuments and Relics Act (2001). This Act requires that an AIA is undertaken for all major development projects and that a Development Permit is obtained from the National Museum before any construction can take place. Section 18 prohibits any alteration, damage or removal from original site of any national monument, relic or recent artefact. The same Act also recognizes the fact that the alteration, damage or removal of monuments and relics may occur through developments. Section 19, therefore, provides for pre-development archaeological impact assessments and mitigation where planned developments are likely to disturb the earth's surface.	An AIA was undertaken and there were no issues with the site.
	<i>Emergency Powers (Covid-19) Amendment No. 4 Regulations, (2020)</i>	These Regulations were put into effect in recognition of the risks posed by the Covid-19 pandemic and in exercise of the powers conferred on the Minister of Finance and Economic Development by Regulation 3 of the Emergency Powers (Covid-19) Regulations, 2020.	The regulations shall be observed during the project implementation.
	<i>Water Utilities Corporation Act (1970)</i>	The Act was enacted to provide for the establishment of WUC and for the supply and distribution of water within the Shashe Development Area and elsewhere. The Act details out the day to day running of the Corporation such as the roles and responsibilities of the Board of Directors, officers, employees and agents. It further elaborates on the functions, powers and duties of the Corporation in service provision such as principles of financial operations, assessment of charges, accounts/audits and annual reporting.	The site is already connected to the WUC supply network. Treatment of waste does not require use of potable water from the facility.
	<i>Forestry Act (1968)</i>	The Act provides for the protection of the forests and forest produce for the purposes of preserving the forest ecosystem and valuable species of trees. The Forest Act regulates the use of forestry resources and under this Act; areas can be designated as forest areas. The Act prescribes the procedures for utilization of forestry products, highlights rights and privileges granted to local communities, and identifies those species to be granted protected status on state, tribal and private land.	The project area is not in a protected forest area and is currently characterized by relatively mixed <i>Acacia</i> vegetation.
	<i>Herbage Preservation (Prevention of Fires) Act (Cap 38:04) (1977)</i>	This Act provides for the prevention and control of bush fires.	The Act is useful in preventing forest fires around the project area. A forest fire has been reported in 2011 that ravished the project

No.	Document/Legislation	Mandate	Relevance to the Sub-project
			area. It is therefore important to put measures in place that will avoid altogether the occurrence of fires and also there should be quick and effective response strategies to fire as stipulated in the Strategy on Disaster Preparedness and Management for WUC.
	<i>Agricultural Resources Conservation Act (Cap 35:06)(1979)</i>	The Act provides for the conservation and improvement of agricultural resources. Under the Act, the Agricultural Resources Board has powers to issue conservation orders and make conservation regulations for a wide range of purposes including the preservation of vegetation, forestation or reforestation and drainage. Agricultural resources include soils, water, plant life and vegetation, animal life and animals including birds, reptiles, fish and insects in their relation to agriculture.	With the disposal of untreated wastewater into the environment, animal and plant life are affected, this therefore calls for immediate action to rectify the operational deficiencies at Mambo WWTP.
	<i>Atmospheric Pollution (Prevention) Act (Cap 65:03) (1971)</i>	This Act, introduced in 1971, seeks to control the emission of 'objectionable matter', which is defined in Section 2 as "smoke, gases including noxious or offensive gases, vapours, fumes, grit, dust or other matter capable of being dispersed or suspended in the atmosphere which is produced or is likely to be produced by any industrial process".	Odour that is sometimes generated by the plant contributes to air pollution and measures should be put in place to address and contain this situation in the expansion and improvement of the plant.
	<i>Waste Management Act (1998)</i>	<p>The objective of this Act is to promote the standards of waste management in Botswana in order to prevent harm to human, animal and plant life, to minimize environmental pollution and to conserve natural resources.</p> <p>The DWMPC is charged with the responsibility of regulating, coordinating and promoting co-operation on waste management among public and private bodies.</p> <p>Local authorities such as the Francistown City Council is empowered to collect and dispose all household waste in their area except waste which is situated at a place which in the opinion of the local authority is isolated, inaccessible or which is produced in such small quantities that the cost of collecting it would be high, or the person who controls the waste is capable of collecting it. The waste collection and disposal system should be</p>	This Act is important and should be considered especially because operational activities generate waste materials such as screenings and sludge. This needs to be managed and disposed of at appropriate sites or areas. It is believed that the Plant's upgrade will improve the quality of the treated wastewater disposed from at Mambo WWTP to meet the required standard.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<p>environmentally sound and be able to utilise the valuable resources, which may be recovered from the waste.</p> <p>The Act also prohibits littering in any public place and imposes a duty on local authorities to clean public places. In order to make the Act effective; enforcement powers are provided, for example, to the Director of the DWMPC, to obtain any information from anybody in order to carry out his functions under the Act. Any authorised officer of the Department may enter any premises for the purpose of conducting a search and may seize any item during the course of an investigation in connection with the keeping, treating and disposal of waste. A general penalty of a fine of P14 000 or a term of imprisonment not exceeding 10 years or both may be imposed on a person who is found guilty of depositing waste on land which gives rise to the pollution of the environment or harm to human, animal or plant life.</p>	
	<i>Public Health Act (2013)</i>	<p>This Act relates to the well-being of the country's citizens by making provisions for public health. Essentially it makes notification of certain diseases compulsory and seeks to prevent and control the spread and introduction of communicable diseases within and into the country.</p> <p>It also seeks to regulate sanitation. In addition, it provides for the protection of water supplies.</p> <p>Part IX section 57 of the Act makes it mandatory for public health officers to take all practicable and lawful measures to ensure the purity of any public water supply which has the right to be used for drinking or other domestic purposes and to take action against any persons found polluting any such supply or streams. This Act compels that clean and hygienic environment is created at the work site and workers educated on clean behaviour at home and workplace to avoid or minimize the opportunity of falling sick and to spread communicable diseases.</p>	<p>Working conditions in wastewater conditions is dangerous as well as hazardous, the occupational safety of workers should be given priority by ensuring that they have protective clothing, and the working environment is as safe as possible. WUC is currently a member of the Reference Group co-ordinating the formulation of the National Occupational Health and Safety Policy, which will govern the protection and medical surveillance of workers depending on the type of hazards.</p>
	<i>Water Works Act (1962)</i>	<p>This is an Act to provide for the constitution of water authorities in townships, to confer certain duties and powers upon such water</p>	<p>Even though for the operation of Mambo WWTP, WUC is not abstracting water from any water works, it is imperative to take note</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<p>authorities, to provide for the acquisition of existing waterworks and to provide for matters incidental thereto.</p> <p>The Act also stipulates the duties and powers of the Water Authority regarding acquisition of rights to water, construct and manage works for supplying water, in acquisition of existing waterworks and provision of compensation where private properties are affected.</p>	<p>of this Act as they are the governing body overlooking the provision and reticulation of water and wastewater to the public.</p>
	<i>Water Act (1967)</i>	<p>This is an Act formulated to define the ownership of any rights to the use of water; to provide for the grant of water rights and servitudes and to make provision incidental thereto. The Water Apportionment Board is the overseer for the implementation of this Act appointed by the minister. The Act states that no person shall divert, dam, store, abstract, use or discharge any effluent into public water or for any such purpose construct any works, except in accordance with a water right under this Act.</p>	<p>This Act is particularly important and should be adhered to as currently Mambo WWTP is disposing sewage into the river. It should be ensured that wastewater is treated up to required standard to avoid pollution of water courses. There are stated penalties for contravention of this Act.</p>
	<i>Factories Act (1978)</i>	<p>This Act among others emphasise on the health, safety and welfare of individuals operating in an industry.</p> <p>Part VII of the Act, Sections 53 and 54 present the need for protective clothing. The Act states that where employees are exposed to wet conditions or any such environment liable to cause injuries, they should be provided with necessary suitable gloves, footwear, goggles, head or face coverings. Where electric welding is done, workers should be provided with safety spectacles to avoid exposure of the individual's eyes to the electric arch flash.</p>	<p>Protective clothing is to be supplied to the workers and they should always be encouraged to use them.</p>
	<i>Acquisition of Property Act (1955)</i>	<p>This Act empowers the State President to acquire property where its acquisition is deemed necessary or expedient (a) in the interest of defence, public safety, public order, public health, town and country planning or land settlement or (b) in order to secure the development or utilization of that or other property for a purpose investigated to be beneficial to the community. Compensation in relation to such acquisition is payable on agreed terms or in accordance with the provisions of the Act.</p>	<p>There are no properties to be affected by the sub-project.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>Special Economic Zone Act (2015)</i>	An Act to make provision for the establishment, development and management of special economic zones; for creating a conducive environment for local and foreign investment; to facilitate expansion of employment opportunities, attainment of economic growth targets.	This Act is relevant to this project because the expansion of the Mambo WWTP capacity has to take into consideration the planned special economic zones that will in future also utilise Mambo WWTP through the sewage network.
	<i>Employment Act, 2010</i>	Part of the mandate of this Act is protection of wages for employees. Section 75 states as follows “Wages earned by an employee under his contract of employment shall, where it is reasonably practicable to do so, be paid before the expiry of the third working day immediately after the last day of the wage period in respect of which the wages are payable or, where it is not so practicable, as soon as it is reasonably practicable to do so: Provided that, in the case of the completion of the period of employment, the total wages and other payments which may be due to an employee shall, where it is reasonably practicable to do so, be paid to him before the expiry of the third day immediately after the day on which the period of employment was completed or, where it is not so practicable, as soon as it is reasonably practicable to do so.”	This Act is relevant to this project at construction phase, the contractor shall be compelled to follow the law and pay the employees in line with the Act.

**Botswana Standards**

	<i>Wastewater Discharge Standards (BOS 93: 2012)</i>	<p>The Standard establishes the physical, microbiological and chemical parameters for the discharge of wastewater into the environment. The parameters are presented below whereas the details on the upper limits of parameters can be obtained from BOS 93: 2012. Any discharge of wastewater into the environment should comply with the prescribed discharge standards.</p> <table border="1"> <thead> <tr> <th>PHYSICAL AND MICROBIOLOGICAL REQUIREMENTS</th> <th>CHEMICAL MACRODETERMINANTS</th> <th>CHEMICAL MICRO DETERMINANTS</th> </tr> </thead> <tbody> <tr> <td>Temperature</td> <td>Free and saline ammonia (N)</td> <td>Arsenic (As)</td> </tr> </tbody> </table>	PHYSICAL AND MICROBIOLOGICAL REQUIREMENTS	CHEMICAL MACRODETERMINANTS	CHEMICAL MICRO DETERMINANTS	Temperature	Free and saline ammonia (N)	Arsenic (As)	It is evident from the test results that treated wastewater from Mambo WWTP does not comply with the standards as set by BOBS (see Appendix 7). It is imperative therefore that measures are put in place such as upgrading of the plant to bring the quality of the wastewater to standard. The Standard will be used in conjunction with WBG EHS Guideline on Wastewater and Ambient Water Quality.
PHYSICAL AND MICROBIOLOGICAL REQUIREMENTS	CHEMICAL MACRODETERMINANTS	CHEMICAL MICRO DETERMINANTS							
Temperature	Free and saline ammonia (N)	Arsenic (As)							

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	Wastewater quality requirements for irrigation. (BOS 463:2011)	The Standard describes the water quality requirements for irrigation. The specification of physical, microbiological and chemical parameter are irrespective of the source of the water and thus apply to a treated wastewater.	Some farmers along the Tati river harvest the effluent water from the river and use it for agricultural purposes. It is also used to irrigate the golf course in Francistown.																																				

**(d) Botswana Policies**

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>National Policy on HIV/AIDS (1998)</i>	The National Policy on HIV/AIDS prevention and care outlines the national response to the epidemic in Botswana. It describes the role of national leaders, various government Ministries, Community Based Organisations (CBOs), persons living with HIV/AIDS and individual community members in the national response. The policy forms the basis on which a National Strategic Plan will be developed. Within the National Strategic Plan different ministries and organisations will formulate their sectoral plans and projects for implementation. The policy and strategic plan will provide	HIV education should be provided to workers during construction and this should include voluntary testing.

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		mechanisms for resource mobilization and allocation, monitoring and coordination of AIDS prevention and care activities in the country.	
	<i>National Policy on Natural Resources Conservation and Development (1990)</i>	<p>This is Government Paper No. 1 approved in 1990. The primary goal of the policy is to increase the effectiveness with which natural resources are used and managed so that beneficial interactions are optimized and harmful environmental side effects are minimized. The policy identifies five key areas of environmental concern, which requires solutions. This policy provides the framework and principles through which natural resources can be managed. For instance, it provides the following framework for the management of some environmental issues:</p> <ul style="list-style-type: none"> <li>• Improved planning and administrative measures in the interest of both protecting water resources against pollution and improving multi-purpose use.</li> <li>• Recycling of treated effluent to conserve water.</li> <li>• Promoting a system of incentives to encourage recycling to reduce land, air, and water pollution.</li> </ul>	The policy is very important in guiding the operation of the Mambo WWTP as degradation of the environment has to be prevented and concrete measures put in place to reduce, <i>inter alia</i> , water pollution, air pollution, and avoiding activities that will reduce the aesthetic appeal of the environment.
	<i>Botswana Vision 2036</i>	<p>The general purpose of vision 2036 is to achieve prosperity for all through its four pillars which are: Sustainable economic development, human and social development, sustainable environment, governance peace and security.</p> <p>Vision 2036 Pillar 2: “Human and social development” states that Botswana will be a moral, tolerant and inclusive society that provides opportunities for all. The nation will promote equal opportunities for all and ensure that prosperity is widely shared through active participation, leaving no one behind.</p> <p>Vision 2036 Pillar 3: “Sustainable Environment” states that sustainable and optimal use of our natural resources will have transformed our economy and uplifted our people’s livelihoods. Achieving this aspiration will involve observing the ecosystem’s carrying capacities, applying limits to acceptable changes, and promoting maximum sustainable yield for renewable resources.</p>	<p>Vision 2036 is relevant to this project because this project is aimed at improving people’s lives at social level by provision of wastewater services.</p> <p>This project further realises the pillar 3 which is “sustainable environment” by provision of recycled water which fulfils the pillar’s statement of promoting maximum sustainable yield for renewable resources.</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
	<i>Revised Guidelines of Ipelegeng, 2012</i>	Ipelegeng is a Government initiative or programme whose main objective is to provide short term employment support and relief whilst at the same time carrying out essential development projects that have been and prioritized through the normal development planning process. The programme has been in existence since independence in the 1960s and was declared a permanent programme and a poverty eradication strategy in 2008 through Directive CAB 19 (A) of 2008. Projects and the manner in which they are implemented satisfies maintenance, relief and development requirements.	The sub-project will employ unskilled labour in the surrounding villages therefore reducing pressure on the Ipelegeng Project.
	<i>Domestic Violence Act, 2008</i>	This is an Act to provide protection of survivors of domestic violence. Domestic violence in this act includes economic abuse, physical abuse, emotional abuse, verbal abuse, psychological abuse, harassment, intimidation, sexual abuse, stalking, and unlawful detainment.	This Act is relevant to this project because at construction stage, it is an economic activity that results in labour influx which result in social competition. The social competition plays a role in fuelling domestic violence.
	<i>Children's Act, 2009</i>	This is an Act to make provision for the promotion and protection of the rights of a child, for the promotion of physical, emotional, intellectual and social development and general well-being of children; for the protection of children, for the establishment of structures to provide for care, support, protection and rehabilitation of children.	This Act is relevant to this project because where there is influx of labour, children especially girl child is subjected to inter-generational relationship due to economic pressures. In homes, unreported cases of child abuse are on the rise because of protection of abusive breadwinners. This Act also prohibits child labour.
	<i>Revised Destitute Person's Policy, 2002</i>	This policy was established in 1980 as a response to the gradual erosion of the traditional safety net. It is managed by the Ministry of Local Government' Department of Social Protection (DSP), Division of Destitute Persons and Old Age Pension. The program was intended to serve the few who have absolutely no other sources of support but also covers other people in need. The program classifies the destitute persons as either permanent or temporary. The Destitute Persons Program has become the focus of concerns about dependency since at least 2008 when the Department of Social Services (DSS) released a report detailing the increasing numbers of destitute adults in Botswana. This prompted the	The Mambo WWTP is situated in Francistown and affects some villages in Greater Francistown and downstream. Patayamatebele village which is downstream and solely relies on water pumped from Shashe river is in danger of being high affected by poor quality of effluent that is discharged on the river. The village has a small population, with majority of the population relying on social programs like Ipelegeng and

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		<p>government in 2009 to adopt a policy that “able-bodied” destitutes who were receiving support from the Destitute Persons Program should be transferred to the Ipelegeng public works program. The assessment of the Destitute Persons Program concluded that 8,765 of its beneficiaries were able-bodied and could be moved to the Ipelegeng public works program. By 2010, about two-thirds of these workers had been moved to the Ipelegeng program.</p>	<p>Destitute Persons Program. It is therefore imperative that implementation of the project considers all possible ways to protect the community and reduce any risks or negative effects that can disturb or interrupt the daily lives of the community when the project is on.</p>
	<p><i>National Gender on Gender and Development</i></p>	<p>The National Policy on Gender and Development identifies a range of issues, system and institutions in which the same opportunities should be availed to women and men to maximize their potential as human beings and valuable citizens of Botswana. The long term goal of the policy was to reduce inequalities for both women and men. This policy was created to replace the Women in Development Policy.</p>	<p>The policy is relevant to this sub-project because the employment process during construction should afford the same opportunities for both men and women. No gender discrimination will be allowed.</p>
	<p><i>African Union Agenda, 2063</i></p>	<p>African Union Agenda 2063 is a shared framework for inclusive growth and sustainable development for Africa to be realized in the next fifty years. It is a continuation of the pan-African drive over centuries, for unity, self-determination, freedom, progress and collective prosperity pursued under Pan-Africanism and African Renaissance. It builds on and seeks to accelerate the implementation of past and existing continental initiatives for growth and sustainable development.</p> <p>One of the things it seeks to achieve is to harness the continental endowments embodied in its people, history, cultures and natural resources, geo-political position to effect equitable and people-centred growth and development.</p>	<p>It is relevant to this sub-project because it seeks to accelerate the implementation of past and existing continental initiatives for growth and sustainable development.</p>
	<p><i>Sustainable Development Goals (SDGs)</i></p>	<p>The 2030 Agenda and its seventeen Sustainable Development Goals (SDGs) build on Millennium Development Goals (MDGs) and encompass the eradication of poverty and hunger and improved health and nutrition, reduction of inequality, the building of peaceful, just and inclusive societies, the protection of human rights, the promotion of gender equality and the</p>	<p>Employment creation that will be fulfilled by the sub-project will go a long way in achieving eradication of poverty and hunger and improved health and nutrition. The employment process that does not</p>

No.	Document/Legislation	Mandate	Relevance to the Sub-project
		empowerment of women and girls, and the lasting protection of the planet and its natural resources.	discriminate against gender promotes protection of human rights and gender equality.
	<i>Francistown Revitalization Plan</i>	<p>The focus was on the design of a revitalization strategy for the Blue-Jacket Street Corridor, Francistown.</p> <p>The concern underpinning the initiative is that the economy of Francistown is currently sluggish. The intention is to enhance economic opportunities for local entrepreneurs, both large and small.</p> <p>The study area, which is some 274 hectares in extent, covers the area from the BMC intersection through Haskins Road and Grey Street, to the four-way intersection on the road to the Zimbabwe boarder. Although this is longer than Blue-Jacket street, for the purposes of brevity this area is named as the Blue-Jacket Corridor.</p>	Mambo WWTP will take into consideration the Francistown Revitalisation Plan, through the population projections up to 2040 and commercial growth, the planned capacity of the WWTP has projected that it shall be double by 2040 to cater for the economic and commercial growth.
	<i>Francistown Urban Development Plan 4</i>	The Francistown's UDP 4 is the blueprint of the development path of this District from 2017 to 2023. It was carved by the community of Francistown with the conviction that their aspirations and needs will have been realized at the end of the Plan's period. The Plan seeks to place Francistown's development at par not only with the national but also with international development level, taking into account the Francistown's Vision 2022, national development priorities, emerging issues and the SDGs among the other things.	In terms of capacity, Mambo WWTP must take into consideration any future development that is considered under Francistown Urban Development Plan 4. Sewage infrastructure is a critical part of the development plan.

**Table 3-2: Gap Analysis of Environmental and Social Safeguards Policies**

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
<b>Objectives</b>	<p><b>Environmental Assessment, OP 4.01</b></p> <p>To help ensure the environmental and social soundness and sustainability of investment projects.</p> <p>To support the integration of environmental and social aspects of projects into the decision-making process.</p>	<p><b>EA (Amendment) Act, 2020 &amp; Environmental Assessment Regulations, 2021</b></p> <p>The act requires that all the developmental interventions be subjected to an environmental impact assessment. The Environmental Impact Statement (EIS) developed from the EIA study must include an Environmental Management Plan (ESMP) and is subject to review and approval by the Department of Environmental Affairs (DEA)</p>	<p>There are no gaps identified both WB Safeguard Policies and Botswana regulations will be applied.</p>
<b>Objectives</b>	<p>To design and implement projects in a way that fosters full respect for Indigenous Peoples’ dignity, human rights, and cultural uniqueness and so that they: (a) receive culturally compatible social and economic benefits; and (b) do not suffer adverse effects during the development process.</p>	<p>Botswana does not have legislation on Indigenous Peoples</p> <p>Nevertheless, in its statement to the UN Permanent Forum on Indigenous Peoples (UNPFII) in April 2019, the Government of Botswana stated “the promotion and protection of human rights remains a top priority for the Government of Botswana. And attaches great importance to the 1948 Universal Declaration on Human Rights, Declaration on the Rights of Indigenous Peoples and other regional and international human rights Instruments”.</p>	<p>Policy not relevant to the sub-project</p>
<b>Objectives</b>	<p><b>Physical Cultural Resources- OP 4.11</b></p> <p>To assist in preserving physical cultural resources and avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, and</p>	<p><b>Monuments and Relics Act (2001)</b></p> <p>Preserves and ensures sustainable use of historical as well as archaeological resources. Section 18 (1) of the Act makes it an offence for anyone to make an alteration to, destroy or damage any</p>	<p>No gaps identified. It is undertaken under Archaeological Impact Assessment.</p>

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
	religious (including graveyards and burial sites), aesthetic, or other cultural significance.	archaeological remains without the written consent of the relevant authorities. The Act, in section 19 (2), makes it a pre-requisite for anyone wishing to undertake any major development to conduct an Archaeological Impact Assessment (AIA).	
<b>Objectives</b>	<p><b>Involuntary Resettlement OP 4.12</b></p> <p>To avoid or minimize involuntary resettlement and, where this is not feasible, to assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.</p>	<p><b>Acquisition of Property Act (1971)</b></p> <p>The acquisition of property, provides for “authorising the acquisition of property for public and other purposes, and for settling the amount of any compensation to be paid, or any matter in difference”.</p> <p><b>The Land Control Act (1975)</b></p> <p>The Act regulates the transactions, which involves the sale and purchase of agricultural land, provides for the control of transactions in agricultural land</p>	No gaps identified OP 4.12 will be used with local legislations, to be noted that the policy was assessed not relevant to the sub-project.
<b>Screening</b>	<p>The WB will classify all projects into one of four classifications: high risk, substantial risk, moderate risk or low risk.</p> <p>To determine risk level of a project, the followings are considered: type of investments, location, sensitivity, and scale of the project; the nature and magnitude of the potential E&amp;S risks and impacts; and the capacity and commitment of the Borrower (including any other entity responsible for the implementation of the project) to manage the E&amp;S risks and impacts in a manner consistent with the ESSs. An ESRS (Environmental and Social Risk Summary) is</p>	<p>This is the initial stage of the EIA process where the developer submits a project brief to the DEA for screening to determine whether a detailed EIA is required before implementation of the proposed development.</p> <p>In line with the Act, the regulations provide for two levels of screening, the Mandatory list, and DEA Discretionary list.</p> <p>All activities listed under the mandatory list would be required to carry out a detailed EIA, whilst the DEA using the set criteria, will determine which</p>	The World Bank policies national laws will be applied.

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
	prepared to specify the E&S instruments to be prepared. ESRS at Concept Stage is disclosed.	projects would require an EIA under the Discretionary list.	
<b>ESA instrument</b>	<ul style="list-style-type: none"> <li>+ Depending on the project risks and impact, a range of instruments and procedures required to meet the ESSs' objectives, these include: Environmental and Social Impact Assessment (ESIA), ESMF, ESMP; environmental and social audit, cumulative impact assessment; and social and conflict analysis. The WB provides general guidance for implementation of each instrument.</li> <li>+ Based on information provided by the Borrower, the WB will conduct E&amp;S due diligence for all projects requesting for WB support.</li> <li>+ The Borrower will be required to prepare, submit, and disclose the Environmental and Social Commitment Plan (ESCP), and Stakeholder Engagement Plan (SEP) before appraisal.</li> </ul>	<p>The DEA recommendation after receiving the project brief is determined by the Act, and the regulations. The DEA may recommend Strategic Environmental Assessment (SEA), a detailed EIA, an EMP, Waste Management Plan (WMP), or the project may proceed with conditions</p> <p>For the proposed project a detailed EIA was recommended and the study was undertaken in 2008 and revised in 2016</p>	Both processes will be fulfilled
<b>Independent Expert</b>	<ul style="list-style-type: none"> <li>+ For high risk and complex project, the Borrower may be required to retain independent ESA experts not affiliated with the project to carry out ESA.</li> <li>+ For high risk projects, especially those related to dam safety, the Borrower should also engage an advisory panel of independent, internationally recognized environmental</li> </ul>	<p>An environmental assessment practitioner registered and certified by the Environmental Assessment Practitioners Board (EAPB) shall be engaged to undertake all the environmental assessment statements mentioned above</p> <p>A list of all registered and certified environmental assessment practitioners are found in EAPB website.</p>	<p>WUC duly appointed a certified EAPB consultant.</p> <p>The Sub-project is not of a high risk and complex nature and therefore the normal review processes will be instituted</p>

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
	<p>specialists to advise on aspects of the project relevant to ESA.</p> <p>+ Experts/consulting firm will be selected through bid process under strict observation of the WB.</p>		
<p><b>Public consultation, stakeholder engagement, and GM</b></p>	<p>+ During the ESA process, the Borrower consults project affected groups and interested parties about the project's environmental aspects and takes their views into account.</p> <p>+ In line with OP 4.01 and OP 4.10 preparation of a Stakeholder Engagement Plan (SEP), information disclosure, and establishment and operations of a GM are required to ensure adequate consultation and transparency.</p> <p>+ Consultation/stakeholder engagement is carried out throughout project life</p> <p>GM+ If indigenous communities are present and adversely impacts, free, prior, and meaningful consultation (FPIC) is required.</p> <p>+ For meaningful consultations, the Borrower provides relevant project documents in a timely manner prior to consultation in a form and language that are understandable and accessible to the group being consulted.</p> <p>+ Minutes of the public meetings are included in the reports.</p>	<p>Public Participation is a structured meeting, called in accordance with Section 7, during which the public who are likely to be affected by the proposed activity are given the opportunity to express their opinions and concerns about the proposed activity. The public must be informed about the nature of the project, its benefits, and dis-benefits so they can be empowered to make informed comment.</p> <p>In designing the consultation plan, the applicant should consider relevant methods for consulting different stakeholders including the following,</p> <ul style="list-style-type: none"> <li>• Questionnaire, polls and surveys; to determine public attitudes and perceptions on various issues</li> <li>• Advertisement; public notices describing the details of the project and issues involved placed at accessible locations.</li> <li>• Mass media; use of newspapers, TV and Radio coverage to reach a large population of the community.</li> <li>• Leafleting; Brochures, leaflets and information sheets distributed to the public as a quick and easy method of providing general information.</li> </ul>	<p>+ Conduct ESIA consultation as per the EA Act and regulations, taking cognizance of WB requirements, such as compliance to the COVID-19 protocols, during presentation of ESMP, VCP and the RAP and during consultation. The results from consultation will be incorporated into the ESIA/ESMP, VCP and RAP or can be submitted as an annex.</p> <p>+ If consultation with vulnerable communities is required, consultation with WB specialist will be made to ensure that the consultation is adequate.</p>

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
		<ul style="list-style-type: none"> <li>• Personal Contact; direct discussions between project staff and individuals interested in the effects of the project.</li> <li>• Community presentations; presentation given by the developers specific community groups.</li> <li>• Workshops; Generally most effective for discussing and identifying solutions to problems, scoping of potential impacts and creating other plans of action.</li> <li>• Public meetings; meetings by the developer to make a presentation describing the project and relevant issues, which is then followed by questions and answers.</li> <li>• Public hearing and Enquiries; more formal than public meetings.</li> </ul> <p>Institutional stakeholder consultation is undertaken through questionnaires, and telephone interviews</p>	
<b>Disclosure</b>	<ul style="list-style-type: none"> <li>+ The Borrower disclose ES documents at project sites;</li> <li>+ The WB will disclose documentation relating to the E&amp;S risks and impacts of high risks and substantial risks projects prior to project appraisal.</li> <li>+ The WB disclose E&amp;S documentation based on the Borrower's authorization. Once the WB officially receives the report, it will make the EA report in English available to the public through the Bank external website.</li> </ul>	<p>Public Notice: A public hearing is a special meeting which allows the public to make submissions on an EIS before DEA make a final decision on its approval, rejection or deferment.</p> <p>A notice of the public hearing must be published in the mass media using the official languages for a period of not less than 10 days prior to conducting the public hearing.</p> <p>The final report is subjected to public review process as per section 10 (2) of the Act</p>	<p>+Follow DEA Act and regulations requirements and WB requirements.</p> <p>All , ESIA/ESMPs, RAPs be publicly disclosed both in English and local languages.</p>

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
		<p>The public review notification advert is placed in the government Gazette, and a newspaper circulating at least once a week for four consecutive weeks inviting written comments and or objections from Interested and Affected Parties likely to be affected by the proposed activity. The advert should be written in both English and Setswana</p>	
<p><b>Clearance procedure</b></p>	<p>Review and clearance of ES documents will follow upfront agreements between the Borrower and the WB. If the Bank is not satisfied that adequate capacity exists on the part of the Borrower, all High Risk and, as appropriate, Substantial Risk subprojects will be subject to prior review and approval by the Bank until it is established that adequate capacity.</p>	<p>Review and authorization of environmental statement is done by the DEA, after they consider it to have adequately identified and assessed anticipated impacts associated with the proposed activity</p> <p>According to Section 14 of the EA Act, after reviewing the statement, the competent authority may;</p> <ul style="list-style-type: none"> <li>a. Grant authorization to the developer with such terms and conditions as the competent authority considers necessary, where the statement sufficiently identifies the environmental impacts emanating from the project and mitigation measures to ameliorate those impacts, with such terms and conditions as the competent authority considers necessary; or</li> <li>b. Request for additional information, where the statement is deemed not to sufficiently identify the environmental impacts emanating from the project and mitigation measures to ameliorate those impacts; or</li> </ul>	<p>The Sub-Project has already been approved by the DEA.</p> <p>WB's review and clearance of the ESIA/ESMP will be required before implementation of the Sub-project</p>

EA Process Stage	WB (Operational Principles )	Botswana Environmental Assessment Requirements	Sub-Project Gap Filling Measures
		c. Reject the statement, where the developer fails to satisfy the conditions of (b) above.	
<b>ESA supervision</b>	<p>+ During project implementation, ensuring compliance is the responsibilities of the Borrowers. Borrowers shall carry out E&amp;S requirements and monitoring E&amp;S compliance in accordance with project legal agreement (including the ESCP) and providing regular monitoring report to the Bank.</p> <p>+ The Bank carry out E&amp;S monitoring proportionately to the potential E&amp;S risks and impacts. The Bank carry out regular implementation support mission including E&amp;S implementation monitoring. The E&amp;S monitoring and reporting is based on provisions and arrangement specified in the loan agreement and described in the other project documentation, to determine whether the Borrower's compliance with environmental covenant (primarily with EMP) is satisfactory.</p> <p>+ Based on the result of monitoring, any corrective and preventive actions will be identified and incorporated into an amended ESCP in a manner acceptable to the Bank. The borrower will implement, monitor and report on these actions following the amended ESCP.</p>	<p>During project implementation, ensuring compliance is the responsibilities of the Developer.</p> <p><b>Procedures (steps) in designing a monitoring programme;</b></p> <ul style="list-style-type: none"> <li>• Identify the scope of the monitoring and the aspects such as water quality, disease vectors and social dislocation that require monitoring</li> <li>• Define the objectives for the monitoring of each of these aspects.</li> <li>• Define the boundaries and select maps and plans, and sites of observation, measurement and sampling</li> <li>• Select key indicators for direct measurement or observation.</li> <li>• Define how the data will be analyzed and how the analysis will be presented.</li> <li>• Make decisions on the level of accuracy required in the data. Set the minimum requirements for monitoring air, water, soil, and noise</li> <li>• A monthly monitoring report should be submitted to DEA for review</li> </ul>	<p>Follow the approved ESMP/ESIA of the Sub-Projects and monitor accordingly</p>

## **4. SUMMARY OF ARCHEOLOGICAL IMPACT ASSESSMENT**

### **4.1. HISTORICAL BACKGROUND**

Francistown is located in the north east part of Botswana. The dominant tribe in that region is Bakalanga. A journey into prehistoric times in Bukalanga shows that the original Bakalanga people descended from Leopards Kopje farmers. These people occupied areas covering parts of north eastern Botswana, western and southern Zimbabwe, adjacent parts of South Africa and Mozambique by around AD 1000 (Emmanuel 2012). These ancestral Bakalanga people reared cattle and goats and grew crops such as millet, melons and beans. They made clay pots and smelted iron into farming implements and household utensils. Van Waarden (1998) demonstrates that they traded in ivory, furs and feathers with the Indian Ocean coast for goods such as glass beads, cotton clothes and other ornaments that originated as far as Asia.

The majority of these prehistoric Bakalanga villages have been discovered in Botswana in areas close to major rivers such as Motloutse, Shashe, Tati and Tutume and around the Makgadikgadi Pans. Closer inspection of these villages shows that they were usually built on terraced hilltops with stone walls built around them. These walls were built as an outward expression of prestige and power in a similar fashion that rich and well-to-do people prefer to build perimeter walls around their homes today in Bukalanga. The most outstanding ruins of these ancestral Bakalanga people are found at Nyangabgwe, Selolwe hills and Sekukwe Kop in and around Francistown respectively, Phanga Hills near Sebina and at Letsibogo Dam (Mabuse, 2012).

### **4.2. FIELD SURVEY**

This comprised a comprehensive field survey of the area earmarked for developments. Surveys comprised of walking the area with detailed surface inspection of the ground. This stage of assessment was done in order to confirm the presence or absence of archaeological signatures; their character, extent and possible impact by the development. A camera was used to take pictures of important features in and around the proposed areas, whereas the Geographical Positioning System (GPS) was used to pick the coordinates.



**Plate 4-1: Part of the Team Surveying the Area**

The Department of National Museum and Monuments (DNMM) (previously as the National Museum and Art Gallery) has a site classification system, which is used to assess an archaeological site's relative importance as follows:

- 1 = Preserve at costs
- 2 = Preserve if possible, otherwise extensive salvage work
- 3 = Test excavation to determine whether further work is necessary
- 4 = Systematic representative sampling sufficient
- 5 = No further archaeological work required.

This system is used to grade sites encountered within the proposed development area.

#### **4.3. RESULTS OF THE SURVEY**

The focus of the archaeological investigation was within the primary areas where the proposed refurbishment of the WWTP will take place. Survey of the earmarked area was conducted in and around the surrounding areas. The project area is already impacted by existing infrastructure surrounding it. The area has been demarcated by a fence which is manned by security guards. Nothing of archaeological or historical significance was encountered during survey, within the proposed areas of development. The area was vegetated with grass due to the recent rainfall in the area. Quartz is most dominant in the area; however no stone tools were found. The project area is ranked No 5 under the Botswana National Museum grading system.

#### 4.4. CONCLUSION AND RECOMMENDATIONS

The AIA survey revealed nothing of archaeological, historical and cultural significance within the Mambo WWTP in Francistown. The latter was found to be disturbed by existing development.

- Nothing of archaeological importance was found during survey. This is possibly because most parts of the project area and its surroundings are already disturbed by previous infrastructural developments. The site is ranked 5 denoting that there is no further archaeological work required. The developer is therefore required to carry out archaeological watching brief and report any chance finds to DNMM.
- In case of chance finds, the Monuments and Relics Act of 2001 and OP 4.11 outlines the chance finds procedure which is that all works must be halted and an accredited Archaeologist or the DNMM be notified immediately. They will assess the chance finds and recommend an appropriate mitigation. (Chance finds procedures must be followed, see appendix ??)
- WUC must obtain a permit prior to any clearing or construction taking place.
- All these would be done to meet the requirements of the Monuments and Relics Act, 2001 of the laws of Botswana. This Act protects all archaeological and historic monuments and sites in the country whether they are recorded in the National Museum site register or not. The Act also recognises the fact that the alteration, damage or removal of monuments and relics may be occasioned through authentic developments. Section 19, therefore provides for pre-development archaeological impact and mitigation where planned developments are likely to disturb the earth's surface.

## **5. ENVIRONMENTAL AND SOCIAL BASELINE OF THE PROJECT**

### **5.1. INTRODUCTION**

The following chapter presents a description of the project site including its location and regional setting as well as the prevailing biophysical and socio-economic background. The study area is located in Francistown, and surrounding villages that feed into the Mambo WWTW such as Tati Siding in the North East District and the affected areas such as Patayamatebele and Dikgathong Dam. Francistown being the major commercial, industrial and administrative centre in the northern part of the country extends its influence to Sowa, Selebi-Phikwe, parts of Ngamiland, Central, North East and Chobe Districts. It is also the nearest city to Zimbabwe and Zambia. It is the second largest administrative centre after Gaborone and serves as the regional headquarters for most Central Government Ministries and Departments.

### **5.2. BIOPHYSICAL ENVIRONMENTANT OF THE PROJECT AREA**

This section of the report presents a description of the biophysical and socio-economic issues pertaining to the project area.

#### ***5.2.1. Temperature***

Data from the Meteorological Services from 1993 to mid-2016 indicates that the mean maximum monthly temperature in the project area ranges from 21.8°C (July) to 33.8°C (January) and the mean monthly minimum temperature also range from 5.0°C (July) to 19.2°C (February) (Chart 5.1 and 5.2).

Bacteria in wastewater treatment systems function best within a certain temperature range, typically between 20 – 35°C. With temperatures at the low-end bacteria can still function albeit slowly however at the upper end and beyond bacteria slows down and eventually cease to function.

The following can be undertaken to reduce temperature:

- Reclamation and re-use for irrigation
- Covering the primary settling tanks to limit solar radiation
- Require industrial customers to subject their influent to pre-treatment requirements (TEA)
- High temperatures can have negative impacts in sewage treatment, yet it is important for the satisfactory performance of sludge drying beds and drying of screenings.

#### ***5.2.2. Rainfall***

The main rainy season is from November to March with October and April being transitional months. More than 90% of all rainfall occurs during the summer months of October – April, the winter period May – September accounting for only 3 – 5% of the annual rainfall.

A summary of the Long-term mean rainfall at 2 stations closest to the area is presented in Table 5-1. The long-term mean annual rainfall ranges from 430 mm at Tonota to about 479 mm in Francistown and shows a general increase in rainfall from south towards the north.

**Table 5-1: Long-term Mean Monthly Rainfall for Selected Stations**

Station	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Tonota	96.0	92.2	39.4	19.2	4.5	2.4	0.7	0.2	6.2	21.1	57.8	58.2	424.8
Francistown	102.3	86.1	67.0	23.2	7.2	3.7	0.7	0.8	5.6	24.1	66.5	92.6	479.8

*Source: Department of Meteorological Services, 2019*

If the Mambo WWTP plant received excess volumes due to stormwater, excess wastewater may be discharged directly into local bodies of water before it has been treated. This discharge is a public health hazard due to the potential for triggering waterborne illnesses.

### **5.2.3. Infiltration Water**

According to the feasibility study by Hydroplan Consulting Company, concerning most of the sewers, the ground water level is usually below 30m. However, along the Tati river, the depth of the ground water can vary between 6 to 10m. The deepest sewer line is about 8 m, so it can be safely stated that most of the sewer lines which are not located directly along the river are above the ground water level. Only some of the collectors next to the river could be affected, but only during the raining season. Also, the flow measurements at the WWTP did not show any significant infiltration flows during the night, consequently, for the present study, no infiltration water has been considered.

### **5.2.4. Average Dry Weather Flow (ADWF)**

The result shown by Hydroplan Consulting Company of the flow projection of the Average Dry Weather Flow (ADWF) is shown in the following Table. It has to be noted that industrial discharges to the sewer network are included in those numbers. The estimated average wastewater flow for Francistown for 2019 is 10,463 m<sup>3</sup>/d and 1,102 m<sup>3</sup>/d for Tati Siding, resulting in a total of 11,565 m<sup>3</sup>/d. For 2020, a total of 11,878 m<sup>3</sup>/d are estimated as wastewater flow and, for the design horizon (of the treatment works), 2040, an ADWF of 19,685 m<sup>3</sup>/d is projected.

**Table 5-2: Projection of Domestic ADWF (m<sup>3</sup>/d) for Francistown and Tati Siding**

Town	ADWF - wastewater production [m <sup>3</sup> /d]						
	2019	2020	2025	2030	2035	2040	2060
Francistown	10,463	10,713	11,966	13,538	15,317	17,330	31,835
Tati Siding	1,102	1,166	1,533	1,769	2,041	2,354	4,675
<b>TOTAL</b>	<b>11,565</b>	<b>11,878</b>	<b>13,499</b>	<b>15,307</b>	<b>17,358</b>	<b>19,685</b>	<b>36,511</b>

Source: Hydroplan Consulting Company, 2019

### 5.2.5. Peak Dry Weather Flow

The wastewater flow varies according to the season of the year, the weather conditions, and the day of the week and the time of the day. It has to be noted that an hourly peak flow accounts for the unsteady distribution of the ADWF over the course of the day. It does not change the total volume of wastewater discharged to the Mambo WWTP.

**Table 5-3: Peak Dry Weather Flow in m<sup>3</sup>/h**

Town	PDWF - wastewater production [m <sup>3</sup> /h]						
	2019	2020	2025	2030	2035	2040	2060
Francistown	852	870	958	1,060	1,174	1,300	2,200
Tati Siding	132	139	176	198	223	251	452
<b>TOTAL</b>	<b>984</b>	<b>1,008</b>	<b>1,133</b>	<b>1,258</b>	<b>1,397</b>	<b>1,552</b>	<b>2,652</b>

Source: Hydroplan Consulting Company, 2019

### 5.2.6. Peak Wet Weather Flow

The peak wet weather flow accounts for stormwater infiltration and inflow to the sewer system. In case of stormwater discharging to the WWTP, the daily flow is increased. The result of the estimation is shown in the Table below.

**Table 5-4: Peak Wet Weather Flow in m<sup>3</sup>/h**

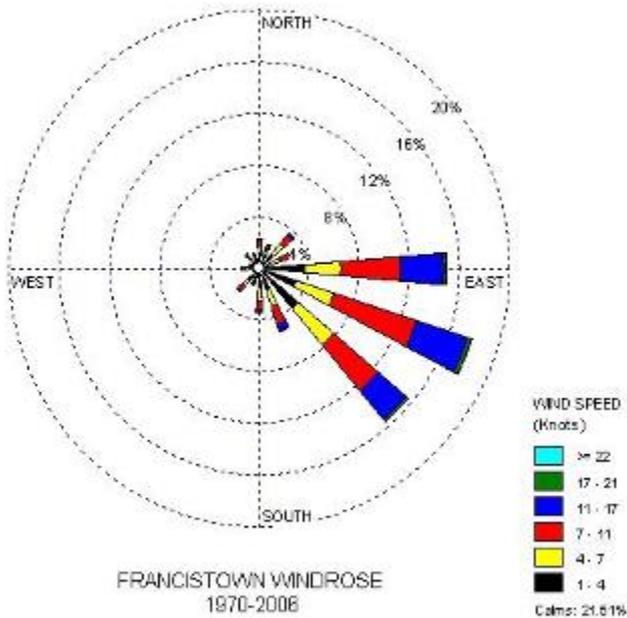
Town	PWWF - wastewater production [m <sup>3</sup> /h]						
	2019	2020	2025	2030	2035	2040	2060
Francistown	980	1,000	1,101	1,219	1,350	1,495	2,530
Tati Siding	152	159	202	228	256	289	520
<b>TOTAL</b>	<b>1,132</b>	<b>1,160</b>	<b>1,303</b>	<b>1,447</b>	<b>1,607</b>	<b>1,784</b>	<b>3,050</b>

Source: Hydroplan Consulting Company, 2019

### 5.2.7. Wind Direction

From the available wind rose for Francistown Meteorology Division as shown in Figure 4.2 below, it is observed that the general wind direction is from the east and south-east to west and north/south-west respectively. The most frequent are 11-17 knots occurring 12-16% of the period.

Winds of 7-11 knots occur 8-12% of the period and winds of less than 7 knots occur about 4-8% of the time from all directions.



**Table 5-5: Wind Rose for Francistown**

*Source: Department of Meteorological Services: Climate Data Division (2018)*

Wind direction will carry odour to wherever the wind blows, therefore the improvement of the condition of the plant will minimize/eliminate odour. Close to the plant there is Botho University and Adansonia Hotel, as such it is vital that the plant should always work in optimal conditions to prevent fouling of ambient air.

### 5.2.8. Geology

The geology of the project area lies within a region of Precambrian rocks, mainly of the basement complex. The area is composed largely of quartzite-metamorphosed basic and ultra-basic rocks (granitic gneisses) (DTRP, 2011).

There are surface expressions of the basement rock (granites) in many locations in the area. Generally, they exhibit a north-east to south-west strike. The exposure appears flush/ with the ground surface in most locations. However, at one location it appears as an outcrop above the ground surface, less than a meter in height. The rock appears fractured making its location

a point of groundwater recharge.

However, as it is limited in extent, the potential of aquifer contamination via these rocks is minimal. It is more likely to increase the cost of any excavation (blasting) in the area. The project location falls within the Archaean greenschist metavolcanics, see Figure 5-2 below.

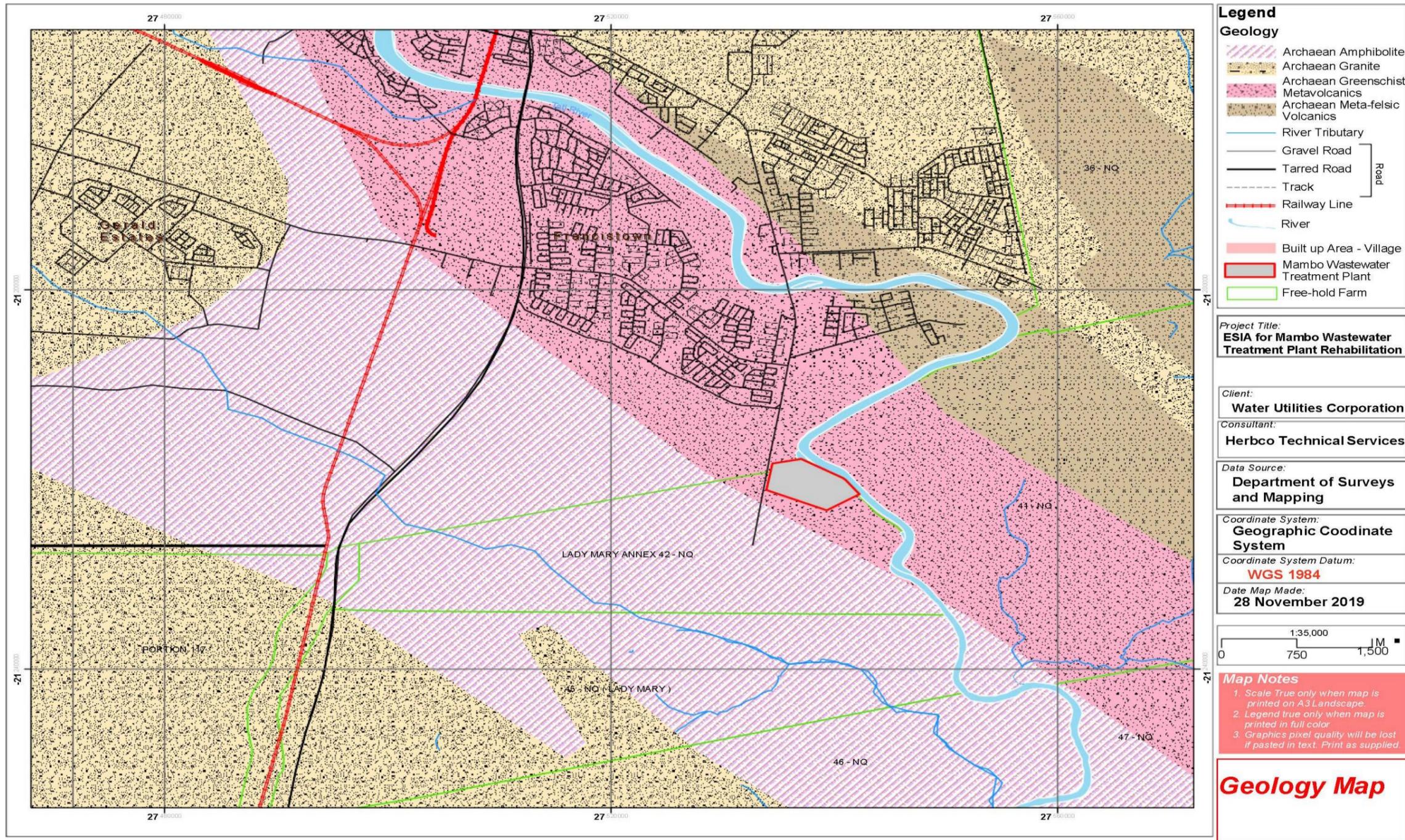


Table 5-6: Geological Map of the Project Area

### **5.2.9. Soils**

Soils in the Francistown area have been mapped and described by the Soil Mapping Advisory Service, 1985. The dominant soil types are regosols and luvisols. Their texture varies from loamy sand and sandy loam to sandy clay and clay loam. The general soil depth in this area is about 50 cm although pockets of much deeper soil can be found.

The soils of the project area are characterized by their low water holding capacity and low nutrient content. The topsoil does not usually hold water and has low infiltration capacity. This makes these soils highly vulnerable to soil erosion. The project location falls within the chromic luvisols as indicated in **Figure 5-3** below.

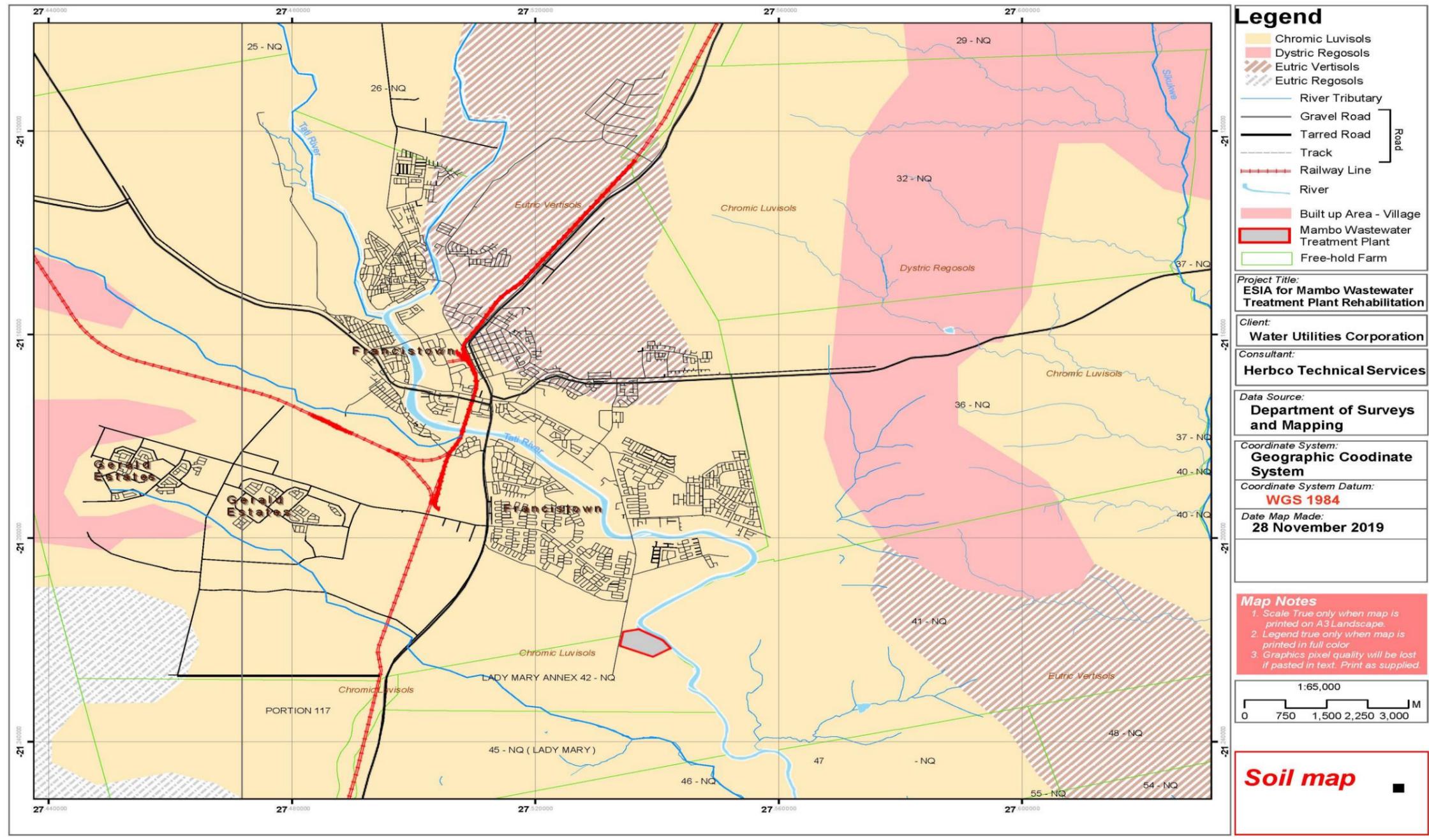
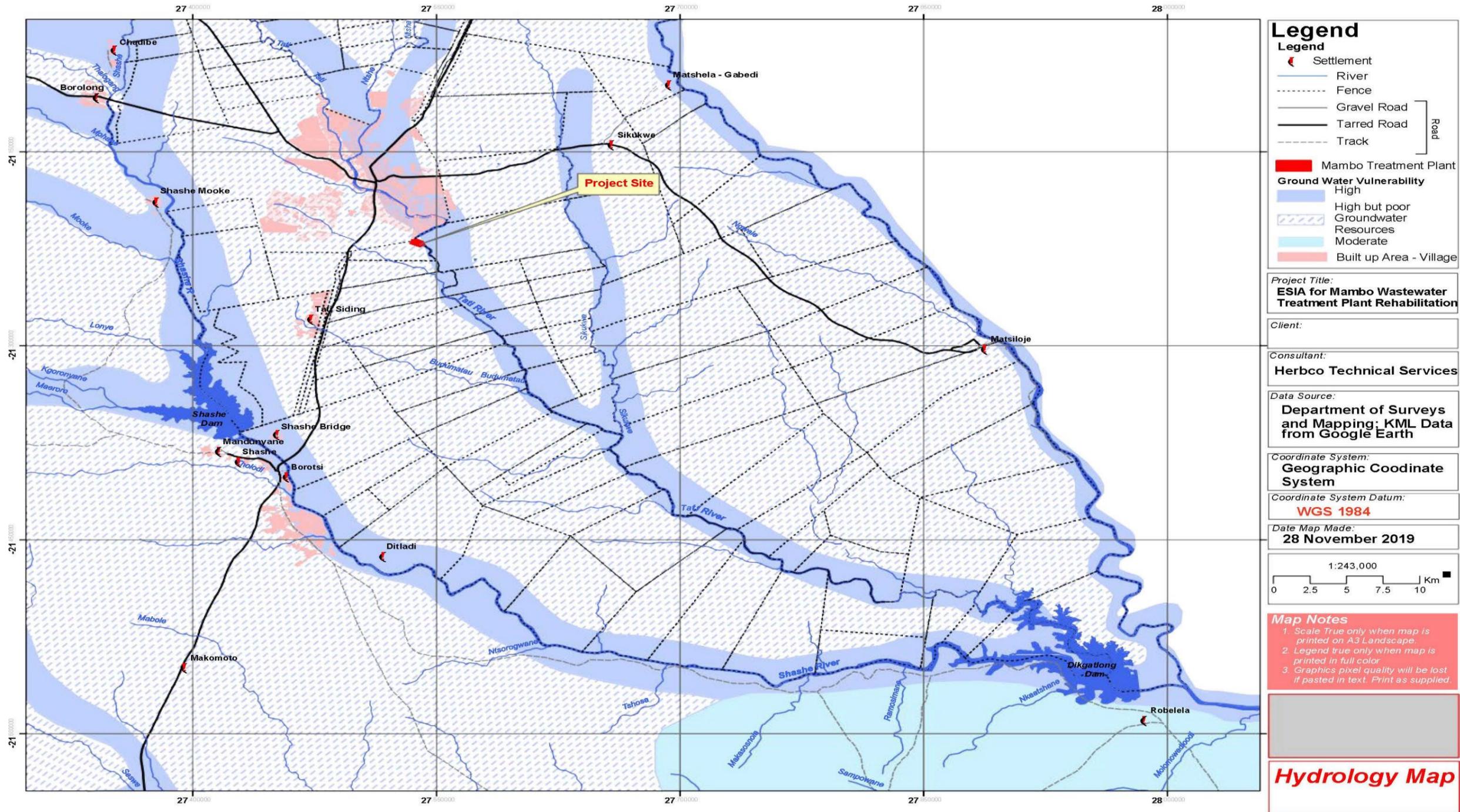


Table 5-7: Soils Map of the Project

#### **5.2.10. Topography and Drainage**

Francistown lies on a generally flat area at an altitude of 990 m above sea level (Francistown City Council, 2003). The ground rises at a gradient of 1% to the north of the Tati river and a similar, though not so clearly defined gradient to the south. The northern edge of the city's developed area is bounded by a range of hills and kopjes (small, isolated hills) which are predominantly rock outcrops. The most prominent, the Nyangabwe Hill rises to a height of 105 m above the surrounding plain. To the south of the Tati river, there are no major physical features, but gently undulating bush landscape is featured. (Francistown City Council, 2003).

The Tati, Shashe and Ntshe river channels are the dominant physiographic features in the city of Francistown and effectively divide the city into three parts. Tati river which is below the confluence of Shashe and Ntshe rivers cross the City in a south easterly direction. Shashe river defines the western boundary in Gerald Estate. Mambo WWTP discharges effluent into Tati river. **Figure 5- 4** is the hydrology map around the project area.



h  
Table 5-8: Hydrology Map of the Project Area

### 5.2.11. Vegetation

Francistown lies within the hardveld zone characterized by the predominance of tree savannah with Mopane (*Colophospermum mopane*) and *Acacia* species such as *Acacia nigrescence* prevailing (DTRP, 2011). It is also noted that *mophane* bush tends to give way to acacia thorn at lower riverine areas. The vegetation of the locality of the WWTP can be designated as mixed Mopane/*Acacia* and tree savanna, with generous grass cover, see Figure 5-5 and Figure 5-6 below.



**Table 5-9: Vegetation Characteristics at Mambo WWTP**

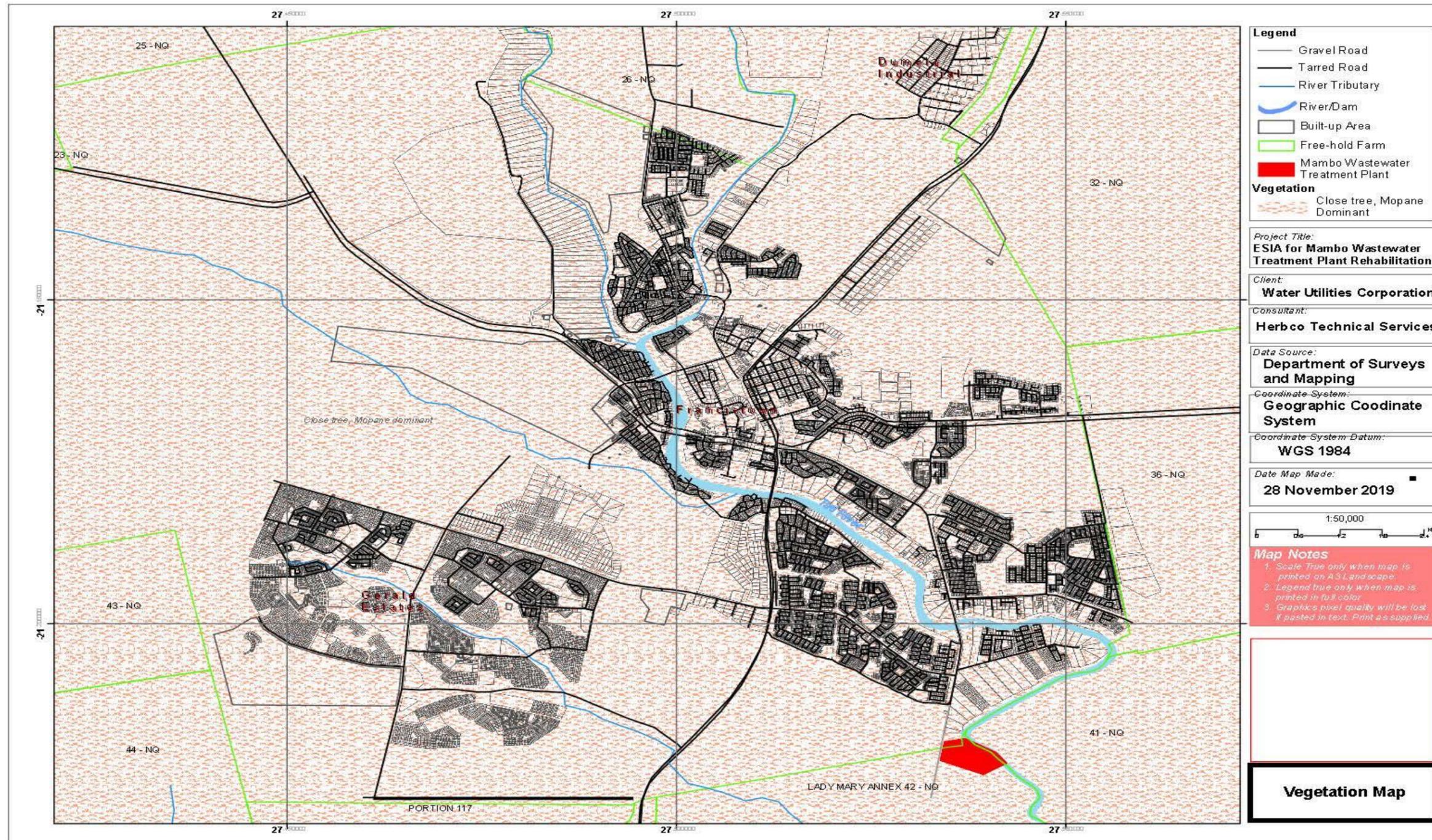


Table 5-10: Vegetation Map of the Project Area

## 5.3. SOCIAL BASELINE DATA

### 5.3.1. Population

Since the founding of Francistown as a gold mining and railway centre in the nineteenth century, the city's population has consistently shown an increase. Within the national framework, Francistown remains Botswana's second largest urban centre with approximately 4.8 percent of the country's urban population compared to 4.9 percent in 2001. The 2001 statistical figures reveal that Francistown contained a population of 83 023 persons. The City also experienced the highest density in the whole country, which stood at 825 persons/km<sup>2</sup> during the 1991 period. The available statistics indicate that the Francistown's population increased from 18,613 in 1971 to 31,035 in 1981, 65,244 in 1991, and 83,023 in 2001 and finally 98 961 in 2011. Central Statistics Office (2005) estimates that the population currently stands at 116,927 by 2020. Population of Tati Siding is projected to be 12 595 by 2020. Patayamatebele is had a population of 372 by 2011 and projected to be 430 by 2020.

**Table 5-11: Projected Populations for Francistown**

Place	2015	2016	2017	2018	2019	2020	2021
Botswana	1,954,491	1,976,398	2,003,867	2,031,513	2,059,352	2,087,397	2,115,654
Francistown	108,602	110,100	111,870	113,597	115,281	116,927	118,540

Source: CSO, 2011

### 5.3.2. Livelihoods and Employment

Francistown started as a mining town 1800, and the boom sustained it up to the late 1900 when gold deposits started dwindling.

The City's previous boom in mining is dated as far as 1930, till activities has seen the once remote town transform into a city of prominence and great achievements in terms of the growing employment rates and improved economic status (Department of Town and Regional Planning (2011).

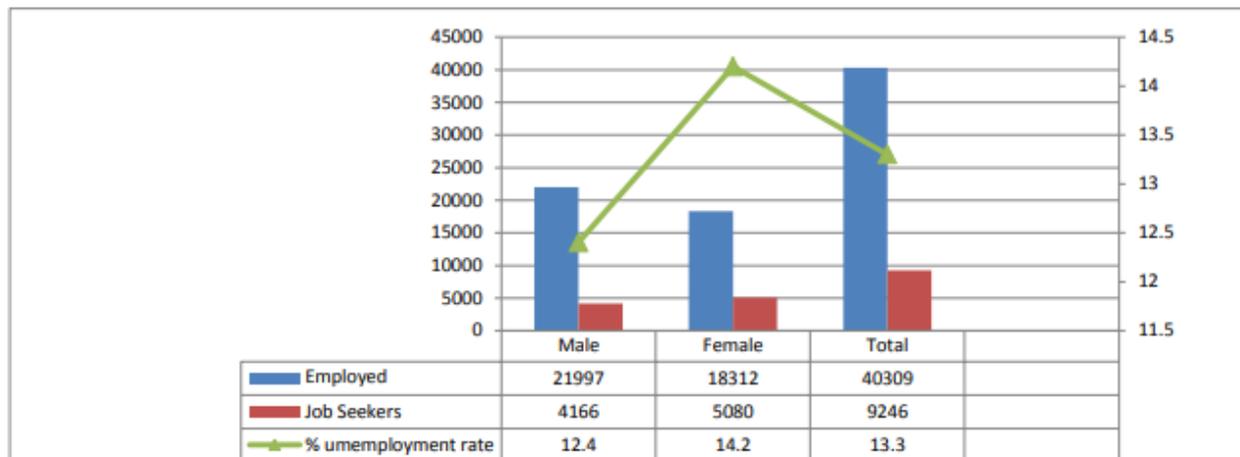
The increase in economic activities at (especially opening up of factories and new businesses) will put pressure on the capacity and efficiency of the treatment plant to handle and treat various parameters produced by these establishments. Although at current the mining industry is closed, that did not cause urban-rural migration, so the volume of the influent received at the Mambo WWTP is still expected to rise.

Due to its well-developed transportation links the city has encouraged the growth of a large wholesale sector serving most parts of Northern Botswana including parts of Caprivi Strip, Zambia and Zimbabwe (Francistown City Council). Shopping tours operate from Bulawayo and as far away as Lusaka to Francistown. It serves as a retail centre for settlements as far as 200

km away resulting from the regular bus services. These include Tati Siding, Tonota, Mathangwane and Ramokgwebana.

Unemployment rate for Francistown was estimated at 13.3 percent in 2011. In comparison with males, females were more unemployed. Figure 1-2 reveals that unemployment rate was 14.2 percent for females and 12.4 percent for males in 2011. In comparison with Gaborone and other towns in Botswana, Francistown has the highest unemployment rate, followed by Jwaneng at 12.7 percent and Orapa had the lowest unemployment rate of 8.2 percent.

However, Francistown’s unemployment rate was lower than the national unemployment rate of 17.8 percent. The high unemployment rate of Francistown compared to Gaborone and other towns is as a result of a high influx of rural-urban migrants with the hope of securing employment. Though Francistown has roads and infrastructure, investors are still not attracted to it due to a high low-income population as a result of the movement of people from the surrounding rural areas flocking into the City in search of employment (Statistics Botswana, 2011).



Source: Statistics Botswana, 2011

**Table 5-12: Employment by Gender in Francistown**

### 5.3.3. Ethnicity and Social Cohesion

The project area covers North Eastern part of Botswana where a wide spectrum of different groups live side by side with each other. In Francistown the predominant tribal/ethnic group is Bakalanga. However, there are other ethnic groups that live in Francistown like Bangwato, Ndebele, Batalaote, Babirwa, Bahurutshe and other groups that are found throughout Botswana. Although these ethnic groups are not as dominant as Bakalanga in Francistown region, the ethnic groups like elsewhere in the country live side by side in harmony with each other. Among all the ethnic groups living in this area, no indigenous or vulnerable communities (Basarwa) have been identified that dwell in this area. Even though the OP4.10 policy has been triggered for the project, it is not relevant to this sub-project. Health Services

The City has three types of health facilities categorized by the level of services provision. These are one referral hospital, namely, Nyangabwe Hospital; three major clinics, namely, Jubilee, Donga and Area W, which operate 24 hours a day; ten other clinics; and, four health posts. The clinics managed through District Health Management Team lead by a Public Health Specialist. The District has eight Infectious Disease Care Clinics (IDCC's). These offer clients with HAART. Clients have easy access to these facilities, personnel and to HIV related programs such as HAART, CHBC, TB, testing, ASRH, Sexual Transmitted Infections management and condom distribution. Francistown also has one Private Health Centre (Tati river clinic) and 15 private clinics that augment the public health facilities.

Francistown is one of the hardest hit areas in the country in terms of the HIV/AIDS scourge. Latest figures in relation to HIV prevalence contained in the Botswana AIDS Impact Survey (BAIS) IV of 2013 show Selebi-Phikwe leading followed by Francistown and the resort township of Kasane in the Chobe region. In 2003, NACA *et.al.* (2003) reported that the city's HIV/AIDs prevalence was as high as 45.8 per cent. A survey carried out in 2004 however shows drastic declines in the HIV prevalence in the city from the 45.8 percent to 24.6 percent (NACA *et. al.* 2004) which indicates 46.3 reduction rate

HIV/AIDS as a national problem has been declared a National disaster. All programs and projects are therefore expected to mainstream HIV/AIDS awareness in them. HIV/AIDS as a disease of national concern that has been declared a national disaster, is for this reason that the government has adopted a multi stakeholder approach in its fight against HIV/AIDS therefore no project is too small to mainstream HIV/AIDS issues in its implementation.

#### **5.3.4. Prevalence of water borne diseases**

Francistown are experienced high cases of diarrhoea in 2011 and 2012 with high numbers of 1189 and 1186 respectively. There was a decline in 2013 by 51.1% to make the cases 607. From 2014 to 2017 there was a significant decline by an average of 58.4%.

**Table 5-13: Diarrhoea recorded cases in Francistown area (2011-2017)**

Area	2011	2012	2013	2014	2015	2016	2017
Francistown	1189	1186	607	379	347	307	387

Source: Statistics Botswana (2018)

Diarrhoea related death are as indicated in the following table from 2011 to 2017

**Table 5-14: Diarrhoea death cases recorded in Francistown are (2011-2017)**

Area	2011	2012	2013	2014	2015	2016	2017
Francistown	4	20	14	1	0	1	2

Source: Statistics Botswana (2018)

#### **5.3.5. POVERTY LEVELS AND EMPLOYMENT**

Due to its well-developed transportation links the City has encouraged the growth of a large wholesale sector serving most parts of Northern Botswana including parts of Caprivi Strip, Zambia and Zimbabwe. Shopping tours operate from Bulawayo and as far away as Lusaka to Francistown. It serves as a retail centre for settlements as far as 200 km away resulting from the regular bus services. These include Tati Siding, Tonota, Mathangwane and Ramokgwebana.

Despite the relatively high average income per capita, Botswana is still plagued by many development problems common to low income countries, and cities like Francistown are the most affected. Inequality is high with a per capita consumption Gini co-efficient of 0.649 in 2009/10 in relation to an acceptable range of 0.4.

On the other hand, poverty levels in Botswana have been falling steadily from 30.6% in 2002/03 to 19.3% in 2010.

Generally, unemployment rate in Botswana has been decreasing at a marginal rate, with urban areas having less unemployment rates than the rural areas. In the year 2009/10 female unemployment rate in all cities and towns was higher than that of males with 16.8% and 10.2% respectively. As per statistics Botswana 2011 unemployment in Francistown is almost double that of Gaborone. In 2010, unemployment among the youth was as high as 25%. To date unemployment in Francistown is still a concern as the youth are mostly affected. Employment opportunities are usually temporary, or contract basis, mostly from construction companies, involved in infrastructure development.

### **5.3.6. ACCESS SOCIAL PROTECTION**

Government of Botswana has public programs that exist to address the risks and vulnerabilities of its citizens. Most of the programs are being implemented by public agencies, in some cases with the cooperation of development partners and civil society organizations, though virtually all programs are financed by the Government.

#### **5.3.6.1. Orphans Care Program**

This program was launched in 1999 and in terms of expenditures is currently one of the largest assistance programs in Botswana. It is managed by the MLGRD's Department of Social Protection (DSP), Division of Child Services. It is designed to respond to the needs of orphans, including those for food, clothing, shelter, education, protection, and care and currently City of Francistown Council Social and Community Development Unit is the implementer of this program in Francistown.

Orphans receive a food basket and other items (such as a school uniform, clothing and a transportation allowance), orphans are also provided with psychosocial support from MLGRD's social workers.

Starting in 2009, the MLGRD replaced the delivery of the food basket with a smartcard (called a coupon) that gives the beneficiary the possibility of acquiring the specified foodstuffs at

participating shops. The smartcard uses fingerprint verification (biometrics) to authorize each transaction. It gives the beneficiaries a choice of when and, to some extent, where they purchase their food.

#### **5.3.6.2. Destitute Persons Program**

This Program was established in 1980 as a response to the gradual erosion of the traditional safety net. It is managed by the MLGRD's DSP, Division of Destitute Persons and Old Age Pension. The program was intended to serve the few who have absolutely no other sources of support but also covers other people in need. The program classifies the destitute persons as either permanent or temporary. The permanently destitute are those whose age or physical or mental conditions render them completely dependent. They are therefore eligible for benefits for life but require an annual recertification by social workers. The temporarily destitute are those who are incapacitated by ill health or natural disasters and are thus unable to support themselves in the short term.

The benefits provided by the Destitute Persons Program are a coupon (a smartcard similar to the one used for the Orphan Care Program) to buy food and a cash allowance for non-food, access to social services, and various subsidies. The food coupon and the cash are provided monthly.

#### **5.3.6.3. The Veterans Program**

The Veterans Program. This pension was introduced in 1998 for veterans of World War II and their survivors (spouses and children up to the age of 21). The program is managed by the MLGRD's DSP, Division of Destitute Persons and Old Age Pension and is implemented by the offices of the District Commissioner in various districts. The benefit provided by the program is a monthly cash transfer. The payments are made through the Post Office using a checkbook-like leaflet. The Program offer some protection to survivors in that, when the direct beneficiary dies, the transfer is given to the surviving wife or, if there is more than one, the transfer is divided among the surviving wives.

#### **5.3.6.4. Old Age Pension (OAP)**

The Old Age Pension (OAP) was established in 1996. It is a universal transfer that benefits all those aged 65 and older. It is managed by the MLGRD's DSP, Division of Destitute Persons and Old Age Pension.

#### **5.3.6.5. Needy Children and Needy Students.**

These two programs are managed by the MLGRD's Department of Social Services and implemented by local governments. Under the Destitute Persons, the CHBC, and the Remote Area Development Programs, beneficiaries with "needy students" receive uniforms, the payment of room and board in a private house, support for transportation to and from school when the classes begin and end, tuition exemptions, and help with other fees (such as PTA

and pot fees). Transfers of clothing to “needy students” are procured and delivered by local authorities. The Needy Children Program is for needy youths who are out of school, including orphans that are 18 years and over and no longer qualify for the Orphan Care Program but still are considered to have needs. They are provided with support depending on their needs, which can be extended until they are 29 years old.

#### **5.3.6.6. Transfers to NGOs and other CSOs**

The MLGRD transfers funds to various organizations that cater to children, youth, and other groups at risk. These include organizations that manage children’s homes, homes for abused women, rehabilitation homes for drug addicts, and homes for the elderly. The MLGRD also funds organizations that provide counselling and help to reintegrate children in conflict with the law back into society.

#### ***5.3.7. LITERACY AND EDUCATION***

The Government has undoubtedly committed itself to, among the other things improve access to preschool education; providing ten years of basic education for all; increasing access to higher secondary and tertiary education; expanding vocational and technical training; and promoting life-long learning. Moreover, Government has also provided both educational facilities and human resource to improve the standard of education. The City provides all four levels of education accessible to Francistown residents and its surrounding areas (pre-school, primary, junior/senior secondary and tertiary).

##### **5.3.7.1. Pre-school Education**

In Francistown, there are currently 62 Day Care Centres of which 47 are privately owned, 6 are run by Non-Governmental Organizations and, 6 are run by different Churches and the remaining 3 are operated by the Ward Development Communities in different localities. There are problems with the operations of Day Care Centres in Francistown. The main one is the unavailability of Civic and Community plots, which results in unlawful operations of Day Care Centres in residential areas and ultimately causing high demand for change of land use to Day Care Centres.

##### **5.3.7.2. Primary School Education**

There has been expansion of primary school education with targets of achieving universal access to primary education. There is a total of 20 government primary schools and 4 private primary schools in Francistown. Out of the 20 government primary schools, only one school, namely, Centre for Deaf, offers special education.

##### **5.3.7.3. Secondary Education**

There are 9 secondary schools in Francistown of which 7 are junior secondary schools while 2 are senior secondary schools. The junior secondary schools are Donga, Goldmine,

Montsamaisa, Mmei, Setlalekgosi, Selolwe Hill and Selepa. The senior secondary schools are Mater Spei College and Francistown Secondary School.

### **5.3.8. SOCIAL INCLUSION OF YOUTH, WOMAN AND OTHER VULNERABLE GROUPS**

#### **5.3.8.1. Youth Empowerment**

Botswana has developed a National Youth Policy which enabled youth development in Botswana to be undertaken within the framework of the National Youth Policy of 1996 and the National Action Plan for Youth, 2001-2010. The overall objective of the framework was to ensure that the youth were given every opportunity to reach their full potential both as individuals and as active citizens of Botswana, this policy addresses new challenges such as HIV and AIDS, emerging issues such as Science, Information and Technology and Environmental Conservation and Protection. The Policy has also been aligned to recent national, regional and international policies and programmes that address youth development.

#### **5.3.8.2. Woman Empowerment**

Botswana's National Policy on Gender and Development was developed in March 2015 and designed to address the social inequities that still survive economically and socially. Priority areas include poverty prevention and economic development, social protection, the promotion of democracy, freedom from violence and the protection of vulnerable groups. The recognition of gender equality and legal involvement is important because it lends credence to the cause and serves to empower women in Botswana.

The Gender Affairs Department has sanctioned programs dedicated to the coordination and development of gender equality throughout the republic. The Women's Economic Empowerment Programme and the Women's Grant are two such examples. These agendas provide seed money for women's groups to help jumpstart women-led small business projects.

The presence of women in the business sector and in leadership positions is important, especially when it comes to women's empowerment in Botswana

### **5.3.9. OCCUPATIONAL HEALTH AND SAFETY**

WWTP operators are exposed to a variety of hazardous chemical agents, contained within the effluents and the reagents used in the wastewater processing, or generated during the wastewater's treatment. These chemical agents may cause acute poisoning, chemical accidents (e.g., skin burns, injury to the eyes, etc.) damage to the respiratory system, allergies, dermatitis, chronic diseases, etc. Wastewater treatment plant operators may be injured by slips, trips and falls on wet floors; by falls into treatment ponds, pits, clarifiers or vats and by splashes of hazardous liquids; they may suffer cuts and pricks from sharp tools, contusions, etc. They are exposed to hazards related to work in confined spaces. Other common hazards include electric shock, explosions, entanglement in moving machinery. It is important workers

are provided with appropriate protective clothing for protection against diseases and accidents. During construction workers will be exposed to excessive dust, raw sewage or foul odour, occupational accidents.

### **5.3.10. WATER SUPPLY**

Shashe Dam is the source of drinking water for Francistown and the surrounding villages and towns such as Francistown, Tati Siding, Mathangwane, Matsiloje, Matshelagabedi etc. Shashe Dam is located about 30 km south of Francistown and was constructed under the Second Water Supply Project. The construction of the dam began in 1970, and it was opened in 1973. The dam is a zoned embankment with a height of 32 m. The length of the dam is 3.5 km. The reservoir has a total capacity of 85 Mm<sup>3</sup>, based on a catchment area of 3,650 km<sup>2</sup>. The surface area has a size of 3,200 ha with a maximum length of about 15 km and a width of 4.2 km. With a full supply level of 971.46 m amsl., its yield is estimated at between 61,100 m<sup>3</sup> /d and 71,200 m<sup>3</sup> /d. From this resource, also Francistown is supplied by a water distribution network with a length of about 1,954 km and 45,000 house connections.

According to the population and housing census data published in 2011, 93.4% and 83.3% of the households in the North East District and the Central District respectively have access to safe drinking water. With regards to Francistown, 99.7% of the households have access to safe drinking water.

### **5.3.11. POWER SUPPLY**

The Botswana Power Corporation (BPC) is responsible for the provision and maintenance of power to the City. Francistown gets its electricity supply from the thermal station at Morupule (DTRP, 2006). The power is transmitted over head. Local distribution lines are also strung overhead within road reserves within the built-up areas.

The Mambo WWTP is connected to the local power grid as some components of the plant use electricity and for the offices. Should upgrading or expansion of the plant take place, there might be a need to augment the current capacity of the power supply.

## **6. STAKEHOLDER CONSULTATIONS**

### **6.1. INTRODUCTION**

This section discusses the objectives, methods and results of consultations undertaken with Interested and Affected Parties (IAPs) as well as relevant institutional stakeholders.

### **6.2. STAKEHOLDER MATRIX**

Interested and Affected Parties (IAPs)	Role
Francistown City Council (Physical Planning Unit)	Physical planning of the City to determine proper locations of the infrastructural developments.

Francistown City Council (Department of Environmental Health)	Responsible for carrying out measures for protecting public health, including administering and enforcing legislation related to environmental health and providing support for reducing health and safety risks.
Local Farmer (Butch Rennie)	He owns a farm along the Tati river.
WUC-Department of Water and Wastewater	Project Proponent
World Bank	Project Funder
Department of Waste Management and Pollution Control	Waste management and pollution control advise
Nortex Industries	Input on wastewater pre-disposal processes (in-house processes)
Shell Oil Botswana	Input on wastewater pre-disposal processes (in-house processes)
Botswana Meat Commission	Input on wastewater pre-disposal processes (in-house processes)
Department of Water Affairs (DWA)	Technical advice on water pollution
Department of Wildlife and National Parks	Advice on animals found in the area
Botswana Power Corporation (BPC)	Input on provision of BPC sleeves
Department of Environmental Affairs (DEA)	EA Component Authority
Botswana Telecommunication Communications (BTC)	Input on provision of BTC Sleeves

### 6.3. OBJECTIVES OF CONSULTATIONS WITH IAPs

The consultations served a number of purposes which included informing the IAPs about the proposed sub-project, providing a forum for soliciting their views and concerns about the project, obtaining expert opinion on certain issues, and obtaining technical information pertaining to the sub-project.

The following World Bank objectives must be adhered to:

- To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties.

- To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance.
- To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them.
- To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.
- To provide project-affected parties with accessible and inclusive means to raise issues and grievances, and allow Borrowers to respond to and manage such grievances
- To ensure consultations are inclusive of all groups and gender ( men, women youth, vulnerable persons, PAPs etc.)

#### 6.4. CONSULTATION METHODOLOGY

Several strategies were used to identify and reach out to all IAPs. The strategies used for consultations were as follows:

- Publication of a notice in *The Daily Newspaper* on 26<sup>th</sup> January 2018 informing the public about the ESIA study including the objectives of the sub-project, the anticipated impacts and venues for public meetings. Kgotla meetings were also held within affected communities on the dates and time indicated in Table 6-1. Due to a number of challenges including rain and low turn up, out of the six advertised meetings, only three were held on the initial scheduled dates, namely Gerald Kgotla, Tatitown Kgotla and Patayamatebele Kgotla. The other three wards were held on different dates as agreed with the ward leadership and they were widely advertised with the mobile loudspeaker a night before they were held and the turn up was always more than 20 people.
- Furthermore, to extend the consultation coverage a number of focused group meetings were held in other wards of Francistown as stipulated in Table 6-1, this meeting assisted the consultation process to reach large groups because ward Councilors were used as media to mobilise the community to attend the meetings and the turn up was also impressive.

**Table 6-1: Date and Venue for Public Meeting**

VENUE	ADVERTISED DATE	ACTUAL DATES	TIME	FEMALE PARTICIPANTS	MALE PATICIPANTS	TOTAL PARTICIPANTS
Tati-siding Kgotla	19/02/2018	28/02/2018	09:00hr	29	12	41
Gerald Kgotla	19/02/2018	19/02/2018	14:00hr	42	31	73
Tatitown Kgotla	20/02/2018	20/02/2018	09:00hr	39	24	63
Monarch Kgotla	20/02/2018	23/02/2018	08:00hr	160	56	216
Donga Kgotla	21/02/2018	23/02/2018	10:00hr	30	24	54

Patayamatebele Kgotla	22/02/2018	22/02/2018	09:00hr	25	21	46
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**Table 6-2: Focus Group Meetings**

VENUE	DATE	TIME	FEMALE PARTICIPANTS	MALE PARTICIPANTS	TOTAL PARTICIPANTS
Block 1 Park (Boikhutso)	12/02/2018	09:00hr	48	60	108
Block 1 Ikageleng	14/02/2018	14:00hr	71	31	102
Satellite Community Park	15/02/2018	09:00hr	38	31	69
Somerset East Park	16/02/2018	09:00hr	107	87	194
Block 9 community park	23/02/2018	14:00hr	21	15	36

- Written submissions requesting attendance of meetings by technical personnel from Local and central Government and Parastatals to seeking specific technical information about the project.
- Individual interviews with the business owners along the project area.
- Placing notices about the meetings on the notice boards at the *Kgotlas* of affected communities
- Making a public announcement around the village on the intended meeting.
- Undertaking a public consultation at the *Kgotlas*.
- Consulting with *Dikgosi* of Francistown and Tati Siding

#### **6.4.1. Questionnaires for Institutions**

Several national and local Government departments and other service institutions were consulted regarding the proposed sub-project. These included the Francistown City Council and Sub District Council departments of Physical Planning, Environment Health, Botswana Telecommunications Corporation, Botswana Power Corporation, Department of Waste Management and Pollution Control (DWMPC), Department of Water Affairs (DWA), Shell Oil, Nortex, Department of Wildlife and National Parks (DWNP) and WUC.

#### **6.4.2. Publicity**

In line with the EA Act 2011, a notice about the project was placed in *The Daily News* on 26<sup>th</sup> January 2018 (Appendix 2) at least 21 days before the public consultation meetings. Furthermore, a public notice was also placed at the five Kgotla and other strategic locations within Francistown and Tati Siding. The notice was published in English and Setswana.

Among other things, the notice contained the following information:

- A brief description of the proposed project
- The main project components.
- The anticipated negative and positive benefits resulting from the proposed sub-project.
- The intended date and venue of meeting which were due to be held at Tati Siding *Kgotla*, Gerald *Kgotla*, Tatitown *Kgotla*, Monarch *Kgotla*, Donga *Kgotla* and Patayamatebele *Kgotla* from the 19<sup>th</sup> February to 23<sup>rd</sup> February 2018. All meetings were scheduled at times proposed by the Village Development Committee (VDC) chairperson or Kgosi.

#### **6.4.3. Broadcasting of Meetings**

The ESIA consultants drove around in Francistown, Tati Siding and Patayamatebele the night and morning before the meetings using a public address system to urge residents to attend the public consultative meetings. The announcements were carried out between 18:00hr and 20:00hr when it was expected that most people would be in their homes after coming from work. The contents of the announcement were principally the following:

- Informing the people about the sub-project.
- Inviting people to attend the meeting and outlining the purpose of the meeting.
- Stating the time and venue for the meeting.
- The public notice that was pasted in various locations is attached as Appendix 2.

#### **6.4.4. Written Submissions to Stakeholders**

Written submissions were also sent to stakeholders to inform them about the sub-project and the public meetings and to obtain specific technical information about the project area from specialist departments and details of the submissions are presented in Appendix 7. Other consultation methods used was house to house questionnaires to selected locations in Francistown (Appendix 4) and also focused group meetings in Francistown to supplement the *Kgotla* meetings (Appendix 5).

### **6.5. OUTCOME OF PUBLIC CONSULTATIONS**

The outcome of the consultations with the community and institutional organizations is presented below. These issues are to be considered in the undertaking of the ESIA study and the preparation of the Environmental and Social Management Plan (ESMP). The minutes of the meetings are attached as Appendix 5.

**Table 6-3: Summary of Issues Raised by Affected Communities**

<b>Gender of the Participant</b>	<b>Issues Raised</b>	<b>Response</b>
<i>Female</i>	- Appreciated the sub-project as it will improve	- They responded by assuring that the rehabilitation and expansion of the plant will

Gender of the Participant	Issues Raised	Response
	the efficiency of the Plant and reduce drain blockages and offensive smell coming from the plant.	curb problems such as blockages and offensive smell.
<i>Male</i>	- Social issues like crime, teenage pregnancies and family breakdowns may increase during upgrade of the Plant.	- The environmental and social monitoring officer usually invites health and social specialists to educate the employees about these sensitive issues. If need be the public is invited for issues involving the public.
<i>Male</i>	- <i>Kgosi</i> , VDC and councillor should be involved in the sub-project in order to deal quickly with any disputes.	- The issue will be included in the ESIA Report as part of the GM implementation.
<i>Female</i>	- Unfair recruitment by contractors, priority is usually given to foreigners.	- In cases where skills are available locally, the local people must be given priority. The unskilled labour should strictly be reserved for the locals.
<i>Female</i>	- The expansion of the Plant should not affect the operations of the existing infrastructure.	- The plant shall be rehabilitated stage by stage to insure that the functioning of the sewage system is not greatly disturbed.
<i>Female</i>	- Community should take responsibility for the utilisation of sewer lines.	- It is true and important that the community must understand that the sewer system needs to be taken care of first by the community by ensuring that what is disposed in the sewer is not what can spoil the good functioning of the sewer system.
<i>Male</i>	- Unsatisfactory service by WUC in attending the leakages that occur in the sewage network and this end up putting the uncomprehending children's health in danger and this emits horrible odours in the air that affect them.	- WUC appreciated the delays that sometime occur in attending the leakages. The situation must improve.
<i>Female</i>	- The poor quality of portable water used in Patayatebele.	- WUC has decided to refurbish Mambo WWTP to improve the effluent quality disposed into the Tati river. WUC is planning to supply Patayamatebele with water from Ditladi village via a pipeline.
<i>Male</i>	- Sewer networks in not reaching some parts of the village in Tati Siding.	- WUC is aware of that fact and has made an application to the Government in 2016 in order to extend the sewer network to some

Gender of the Participant	Issues Raised	Response
		parts of Tati Siding but they have not yet been responded to.

**Table 6-4: Summary of Institutional Stakeholder Consultations**

Stakeholder	Issues Raised
<i>Grindrod Petrologistics</i>	- Grindrod Petrologistics fully support the implementation of the Trade Effluent Agreement because it will ensure that only tested and approved effluent will be disposed into the system leading to Mambo WWTP.
<i>Bolux Milling</i>	- Bolux milling who are currently not operational in food processing have accepted that the trade effluent agreement can improve the quality of the effluent from their factory.
<i>Department Physical Planning</i>	- According to the Francistown Development Plan 1997-2021 under development proposals, it is indicated that the sewage master plan for the City has already been prepared.
<i>Department of Waste Management and Pollution Control (DWMPC)</i>	- The Mambo WWTP project must observe the following legal instruments, Waste Management Act of 1998, Air Pollution Prevention Act of 1971, Waste and Sanitation Policy of 2001, Botswana Strategy for Waste Management 1998, Wastewater Discharge Standard BOS 93.
<i>Skip Hire</i>	- Skip Hire as a waste collection company emphasised that they collect a lot of waste from different companies who are clients of the Mambo WWTP, therefore it is the responsibility of those companies to ensure that waste collected is of the standard required by WUC.
<i>City of Francistown Council, Public Health Unit</i>	- The expansion of the Mambo WWTP will benefit the users because the improved quality of the effluent will not pollute the environment.
<i>Department of Water Affairs (DWA)</i>	- DWA stated that no actual penalties have been directed towards WUC for Mambo WWTP poor effluent quality, but the water quality analysis repeatedly depicts undesirable quantities in various parameters.
<i>Nortex Textiles</i>	- Nortex Textiles emphasised that the common salt used in the dyeing process is higher than set standard of Total Dissolved Solids (TDSs) in the Trade Effluent Agreement. This can only be rectified by dilution with other trade effluent from the City.
<i>Neighbouring Property Owner</i>	- Sometime the treated water released by the Mambo WWTP is very black and contains many particles in it, but without that water it would not be possible to water their Golf Course.
<i>Local Farmer (Mr. Butch Rennie)</i>	- He was concerned that water pumped from boreholes next to Tati river is being consumed by human and animals.

More details of Institutional consultations are in Appendix 3.

## **6.6. CONTINUOUS STAKEHOLDER ENGAGEMENT PLAN (SEP)**

### ***Objectives***

The Stakeholder Engagement Plan (SEP) seeks to define a technically and culturally appropriate approach to consultation and disclosure as the project in in progress. The goal of this SEP is to improve and facilitate continuous decision making and create an atmosphere of understanding that actively involves project affected people and other stakeholders in a timely manner and for the purpose of possible project alterations, and that these groups are provided sufficient opportunity to voice their opinions and concerns that may influence project decisions. The SEP is a useful tool for managing communications between the project and its stakeholders. Grievance Mechanism (GM) is also a useful tool that that engages the community in a continuous basis.

**Table 6-5: Continuous Stakeholder Engagement Plan**

Activity	Timing	Engagement Activity and Methodology	Targeted Stakeholder	Engagement Objectives
Public Review	October 2021	Public review	Francistown Community	Get the opinions of the community and other stakeholders about the project and the report.
Pre-Construction	November 2021	Focus group meetings	Ward Development Committees	For them to assist with employment of unskilled and semi-skilled labour and identification of CLOs
Pre-Construction	November 2021	One on one meeting	Grindrod Petrologistics	Update on project progress
Pre-Construction	November 2021	One on one meeting	Bolux Milling	Update on project progress
Pre-Construction	November 2021	One on one meeting	Department Physical Planning	Update on project progress
Pre-Construction	November 2021	One on one meeting	Department of Waste Management and Pollution Control (DWMPC)	Update on project progress
Pre-Construction	November 2021	One on one meeting	Skip Hire	Update on project progress
Pre-Construction	November 2021	One on one meeting	City of Francistown Council, Public Health Unit	Update on project progress
Pre-Construction	November 2021	One on one meeting	Department of Water Affairs (DWA)	Update on project progress
Pre-Construction	November 2021	One on one meeting	Nortex textiles	Update on project progress
Pre-Construction	November 2021	One on one meeting	Neighbouring Property Owner	Update on project progress
Pre-Construction	December 2021	One on one meeting	Local farmers	Update on project progress
Construction	January 2022	Questionnaire	SEZA	For them to assist with detailed sewage plans of their planned developments.
Construction	January 2022	Focus Group Meeting	Francistown Youth Group	Update on the progress of the project
Construction	February 2022	Focus Group Meeting	Francistown Women	Update on the progress of the project

Construction	February 2022	Focus Group Meeting	Audination Department of issues of people with disability. And other NGOs.	Update on the progress of the project
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The main issues raised by the communities of Francistown was unsatisfactory service by WUC in attending the leakages that occur in the sewage network and this ends up putting the uncomprehending children's health in danger and emits horrible odours in the air that affect them. Patayamatelebe complained of poor quality of the portable water they are being supplied with. Tati Siding residents indicated that the sewer networks in not reaching some parts of the village in Tati Siding.

## 7. IDENTIFICATION AND ASSESSMENT OF POTENTIAL IMPACTS

The proposed sub-project will have some impacts, both positive and negative on the biophysical and socio-economic environment of the project area. This chapter presents the potential impacts of the proposed developments.

### 7.1. Impact Identification and Assessment

Different methods of impact assessment have been considered, the first one being Leopold Matrix. **Leopold matrix** is a framework method for assessing the environmental impact of a project. The novelty in this method, refers to the evaluation of planned project activities relative to a group of criteria related to: significance (spatial dispersion), probability and duration of impact.

It is widely applicable in carrying out an ESIA for different types of projects. Given that it has been used for many decades now, its major principles are known to scientific and professional circles, thereby implying that the elaboration of the obtained results will be understandable to many scientists and experts.

Impact factors are evaluated separately for each environmental component and scored on a scale from 0 to 5 for impact magnitude, according to the following scale:

- 0 – no observable effect;
- 1 – low effect;
- 2 – tolerable effect;
- 3 – medium high effect;
- 4 – high effect;
- 5 – very high effect (devastation).

The second method considered is **Qualitative Risk Analysis**, this method is the one adopted, and accepted by the DEA (EA Competent Authority) as part of the approval of the Scoping Report and Terms of Reference for the ESIA (October, 2020), because it provides a clear assessment of all the negative and positive impacts that result from the proposed development, and thus a clear indication as to whether the project should proceed.

This method works by assessing the anticipated significance of the impacts associated with the project as follows:

Significance of Environmental Impact = Probability x Consequence

The consequences of impacts are described by considering the:

Severity / Magnitude of impacts

Spatial extent and

Duration of the impacts

So that Consequence = severity + duration + spatial scale

Probability refers to an assessed probability of the occurrence of the predicted impact. The ranking scale for measuring the consequence of impacts and their significance is given in the table below.

**Table 7-1: Consequence and probability ranking scale**

Severity/Magnitude	Duration	Spatial Scale	Probability
10-Very high/ don't know	5-Permanent	5-International	5-Definite/don't know
8-High	4-Long term (impact ceases after operational life)	4-National	4-Highly probable
6-Moderate	3-Medium term (4-40 years)	3-Regional	3-Medium probability
4-Low	2-Short term (0-3 years)	2-Local	2-Low probability
2-Minor		1-Site only	1-Improbable
0-None	1-Immediate		0-None

The highest Significance score or Significance Point (SP) is 100. The significance of environmental effects is then classified as follows:

SP > 60 High environmental significance

SP = 30 to 60 Moderate environmental significance

SP < 30 Low environmental significance

#### **7.1.1. Mobilisation/Pre Construction and Construction Stage**

The activities associated with this stage include the following

- Award of contract to a suitable contractor
- Finalisation of C-ESMP and all related documents such as TMP, COVID-19 Plan, Labour Plan, Procurement Plan
- Obtaining requisite permits/consents.
- Training of staff regarding GM and sensitization of communities to the GM
- Clearance of the working space.
- Erection of construction offices within Mambo WWTP perimeter fence
- Engagement of staff
- Transportation and offloading of equipment into the site.
- Procurement and transportation of material needed for the sub-project
- Community consultations including with the Village Development Committee (VDC).
- Drainage of the influent and sludge removal to clear way for construction

#### **Specific Rehabilitations Works**

- Dismantling of non-functional equipment
- Replacement of the screw pumps,
- Replacement of screens and preliminary treatment with a new, modern facility (screens, combined aerated grit and grease chamber),
- Rehabilitation of Primary Sedimentation Tanks and equipment,
- Building of a new sludge thickening tank,

- Rehabilitation of the existing Digesters,
- Rehabilitation of the existing Gas Holding Tank,
- Rehabilitation and modification of the existing Denitrification unit,
- Design and installation of mechanical works of the pump station,
- Design and installation of electrical works of the Mambo WWTP
- Design and installation of telemetry and SCADA system
- Refurbishment of Administration Block.
- Replacement of chlorination by UV disinfection

### Specific Expansion Works

- Installation of porter camps and offices
- Building a new additional Primary Sedimentation Tank,
- Construction of eight new Trickling Filters and four humus tanks / secondary sedimentation tanks,
- Improvement of the construction of a new faecal sludge acceptance station,
- Construction of an additional new Digester,
- Construction of an additional new Gas Holding Tank,
- Construction of a Combined Heat and Power plant (CHP) for reducing energy cost
- Construction of a new Maintenance and Electrical workshop(s)
- Concrete casting of supporting structures

Impacts associated with Mobilisation/Pre-Construction stage and Construction are as presented in the Table 7-2 and Table 7-3 respectively:

Table 7-2: Impacts of Pre- construction stage according to their categories	Categories													
	P	N	D	ID	LT	ST	Re	NRe	C	NC	R	IR	Rg	L
<b>Social</b>														
Creation of Employment	X		X			X		X	X		X		X	
Boost to the local economy	X		X			X		X	X		X			X
Noise Pollution		X	X			X	X			X		X		X
Increase in Crime		X		X		X	X		X		X			X
COVID-19 Incidences		X	X			X	X		X		X		X	
HIV/AIDS Prevalence		X		X		X	X		X			X	X	

Where:

Positive=**P**, Negative=**N**, Direct=**D**, Indirect=**ID**, Long Term=**LT**, Short Term=**ST**, Recurring=**Re**, Non-Recurring=**NRe**, Cumulative=**C**, Non-Cumulative=**NC**, Reversible=**R**, Irreversible=**IR**, Regional=**Rg** and Local=**L**

Table 7-3: Impacts of construction stage according to their categories	Categories													
	<i>P</i>	<i>N</i>	<i>D</i>	<i>ID</i>	<i>LT</i>	<i>ST</i>	<i>Re</i>	<i>NR</i> <i>e</i>	<i>C</i>	<i>NC</i>	<i>R</i>	<i>IR</i>	<i>Rg</i>	<i>L</i>
<b>Social</b>														
Creation of Employment	X		X			X		X	X		X		X	
Boost to the Local Economy	X		X			X		X	X		X			X
Noise Pollution		X	X			X	X			X		X		X
Increase in Crime		X		X		X	X		X		X			X
COVID-19 Incidences		X	X			X	X		X		X		X	
HIV/AIDS Prevalence		X		X		X	X		X			X	X	
Potential Increase in GBV, SEA, SH and VAC		X		X	X		X		X			X	X	
Disruption of Utilities		X	X			X		X		X	X			X
Occupational Health and Safety Issues		X	X			X	X		X		X			X
Community Health and Safety Issues		X	X			X	X		X		X			X
<b>Environmental</b>														
Disruption of Archaeological Artefacts		X	X			X		X		X	X			X
Land pollution by Waste Mismanagement		X	X			X		X		X	X			X
Dust Pollution		X	X			X	X			X		X		X
Contamination due to Oil and Fuel Spillages		X	X			X		X		X	X			X

Where:

Positive=**P**, Negative=**N**, Direct=**D**, Indirect=**ID**, Long Term=**LT**, Short Term=**ST**, Recurring=**Re**, Non-Recurring=**NRe**, Cumulative=**C**, Non-Cumulative=**NC**, Reversible=**R**, Irreversible=**IR**, Regional=**Rg** and Local=**L**

### 7.1.1.1. Pre-Construction and Construction Impacts

- **Creation of employment**

The wastewater treatment plant expansion will bring about great employment opportunities to the local community and aspiring professionals in Botswana. The contractor will also engage sub-contractors for some specialist services hence employment opportunities will increase and significant number of people can have income emanating from this sub-project. This positive impact has direct benefits in the employed people although it will be a short-term benefit because at the end of construction a lot of people will be laid off and that means at this stage it is a non-recurring impact. The employment benefit does not only cover Francistown but Batswana across the country that qualify to be employed by the project hence it is regional benefit that will cumulate overtime within the project duration together with the boost to the local economy.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	2	2	5	70	High

#### 7.1.1.1.1. Boost to Local Economy

This sub-project will require supplies and services from local businesses in order for it to be successful in terms of production and employee's welfare. This service shall be sourced from local business that have the capacity to competitively serve the sub-project. This also include local business that offer services, materials and labour to the project. This is a positive impact and it is indirect benefit as long as the success or growth of this businesses are dependent on this project at construction stage. It is non-recurring because when the project construction is finished, a decline in the income of this businesses that depended on the main project will be realised. This benefit will be local because it will mainly benefit businesses and the people that are in Francistown.

#### 7.1.1.1.2. Noise Pollution

At this stage of construction, the sub-project will be using machinery and heavy vehicles. A lot of noise shall be produced from this operation by machinery and heavy vehicles. Haulage of materials from the outskirts of Francistown shall contribute to escalation of noise levels as the vehicle pass near residential. Too much noise is negative impact because it can be a nuisance to the community residing and working in the vicinity of the construction site. The noise will directly affect the people as it is a disturbance to daily productivity in offices and disturbance to good night sleep. In cases where it is in the vicinity of learning centres like Botho University which is located 700 m from the project site , it is a disturbance to student concentration in the learning process. The noise impact is short term because of the duration of the project, it will be experienced throughout the duration of the construction in a reoccurring manner but once the construction stage in over, this impact shall be eliminated. This is a localised impact because it shall be experienced by the people who work and live in the vicinity of the project area, the nearest residential are located 1km north of the project site. Noise pollution has some

irreversible consequences because time lost due to disturbance by noise shall never be recovered but rather the lost opportunity may or may not be recovered at a later date.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	5	60	High

#### 7.1.1.1.3. Crime Increase

Where an economic activity such as construction is being undertaken, there is always an influx of people from different parts of the country in search for employment opportunities or any income generating activity that shall be boosted by the existence of the sub-project. Theft of fuel and machinery parts may be experienced in contractor's camps and workshop. Increase in crime is indirectly influenced by the existence of the sub-project because the victims became a target due to their affiliation to the project by employment or business.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	3	4	52	Moderate

#### 7.1.1.1.4. Spread of COVID-19

Covid-19 pandemic has hit the world communities. It is respiratory illness that affects the lungs and spread through the air. At current the vaccine for this pandemic has started to roll out, the entire adult population from 40 years upwards have been vaccinated except for those who chose not to be vaccinated. Young adults above 35 are currently being vaccinated. 65 percent of the target population has already been vaccinated at the moment. The frontline workers and vulnerable professional like teachers are currently being vaccinated. The effect of -COVID-19 has not only affected negatively the health of people but also the economies of the world and normal social interactions.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	4	4	4	72	High

#### 7.1.1.1.5. HIV/AIDS Prevalence

The influx of people into the project area seeking for income generating opportunities has an influence in the prevalence of HIV/AIDS. Workers and residents tend to get involved in short term and casual relationships. Alcohol abuse also tends to escalate and result in escalated casual relationships in which the risk of unprotected sexual encounters is highly probable.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	4	4	4	72	High

*7.1.1.1.6. Potential Increase in Gender Based Violence, Sexual Harassment, Exploitation and Abuse and Violence Against Children Cases*

The influx of labour in the community has downstream effects because of the social competition the foreign locals bring into the community. Possibilities of families breaking apart because of intruding of the people with financial power who may intend to displace current spouses is high. Violence Against Children (VAC) also goes on the rise especially for girl child who are still in school who are normally enticed by material things and end up engaging in inter-generational abusive relationships. This leaves long term negative impacts because it is related to rise in HIV/AIDS and teenage pregnancies. Violence against children also occurs in homes where the breadwinner abuses children and cases not reported due to fear of loss of benefits that the breadwinner brings in the house.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	5	4	3	51	Moderate

*7.1.1.1.7. Dust Pollution*

At this stage of construction, the sub-project will be using machinery and heavy vehicles. Much dust shall be produced from this operation by machinery and heavy vehicles. Haulage of materials from the outskirts of Francistown shall contribute to escalation of dust levels as the vehicle use dirt roads. Too much dust is negative impact because it can be a nuisance to the community residing and working in the vicinity of the construction site and can cause respiratory diseases to the workers. Dust will directly affect the people. The noise impact is short term because of the duration of the sub-project, it will be experienced throughout the duration of the construction in a reoccurring manner but once the construction stage in over, this impact shall be eliminated. This is a localised impact because it shall be experienced by the people who work and live in the vicinity of the project area. Dust pollution is reversible because dust suppression mitigation measures can be applied.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	5	60	High

*7.1.1.1.8. Utility Service Disruption*

Mambo WWTP services a population of over 100 000 people at capacity of 15000 litres per day and currently there is no alternative to this service in the Francistown region. This rehabilitation and expansion project has the potential to interrupt this continuous service and this might result in effluent over loading at the pump stations and result in spill flooding of the untreated sewage into the open environment. This will in turn result in health risks, undesirable odours in the city, pollution to soil and groundwater resource by the untreated sewage.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	2	3	5	75	High

*7.1.1.1.9. Destruction of Archaeological Artefacts or Places with Archaeological Significance*

Preservation of existing archaeological sites within the project area: the construction of infrastructure services has potential to disturb and unearth unknown archaeological and cultural heritage. Even though no archaeological sites or high significant material were encountered within the project area appropriate archaeological monitoring should be undertaken during the construction stage to put into action appropriate measures in line with the guidelines from the DNMM should any material of archaeological importance be found on site.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	3	2	3	33	Moderate

*7.1.1.1.10. Land Pollution*

Different forms of solid and liquid waste including excavation spoil, construction waste, garbage and oil spills from construction equipment will be generated. Areas alongside the project area become centres of intense trading which leave in its trail serious sanitation problems. Waste is generated on site and this will not only directly and negatively impact the aesthetics of the area, but has potential to directly pollute soil and water resources over prolonged periods. Inadequate waste disposal may lead to an environment which is breeding ground for diseases and this is a long-term concern of national interest because once there is an outbreak of any disease, the whole nation is at risk because people's movement is not only restricted to their local area.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
1	3	4	4	32	Moderate

*7.1.1.1.11. Soil and Groundwater Contamination due to Hydrocarbon Spillages*

The use of machinery that requires mechanical power could result in oil spillages. There is a possibility of soil, surface water and groundwater pollution from fuels and lubricants at the site and camp site and along the haulage routes. Use of vehicles and machines in good working conditions and the use of a single off-site fuelling point will ensure that hydrocarbon spillages are minimized. This impact directly affects the soil and groundwater resource which in turn becomes an indirect impact in the lives of the people or farmers that may utilize this polluted resources in the long run. If this resources are not remediated to be user friendly this impact shall be long term to the lives of the people because the consequences shall be felt even after the project has been decommissioned.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	3	2	4	44	Moderate

#### 7.1.1.1.12. Sludge Handling

During construction, faecal sludge can pose a serious environmental problem if not handled with care. It can result in undesirable odours and attraction of disease vectors. Spillages can result in soil, surface water and groundwater contamination and this will be a detrimental negative impact as it is not easy to treat water that has already been disposed into the environment.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	3	2	4	44	Moderate

#### 7.1.1.1.13. Occupational Health and Safety Issues

The occupational safety, health and environmental issues arise when there is a large number of people working in a restricted area and there is machinery involved. At this stage of the project, there will be machinery used to dismantle some parts of the plant which might pose a danger to the users and other employees. The WWTP has uncovered grit removal tanks which may pose a danger to the employees that could fall into them. It is suggested that they be barricaded during construction. There is also danger of infections to the employees due to the high microbial activity in the treatment plant. Possible overflows of semi treated materials in an open environment may contaminate soil and water sources especially given that the Plant is located near the river.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	1	1	4	48	Moderate

#### 7.1.1.1.14. Community Health and Safety Issues

As the sub-project occurs within communities there is likelihood of the project activities affecting the community. The more pronounced impacts that could be affecting the nearby communities will be dust, noise, and diseases owing to the nature of the project. The diseases could be HIV/AIDS, COVID-19 brought by increased labour influx to the project area and waterborne diseases from mismanagement of sewage products.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	1	1	4	48	Moderate

#### 7.1.1.1.15. Potential Labour Influx

The construction will create employment opportunities as local community and aspiring professionals in Botswana will move to Francistown in search of new opportunities, about 75

employees are expected to be employed by the construction company for this project. With the current unemployment rate in Botswana, people are looking for every job opportunity that is available, this will potentially result in an influx of labour in Francistown. The local community may feel competition both at social and employment level. This negative impact has potential indirect effects on the local people because of its contribution to the issues of gender-based violence (GBV) and violence against children (VAC). Although the construction phase is short term, the downstream impacts on the community can remain for a long term.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	2	3	2	22	Low

### **7.1.2. Operational Phase**

When the WWTP expansion is complete, the treatment process of raw water will be effective. Effluent discharged into the Tati river will be that of an acceptable standard as per BOB's requirements. However, operation of the plant still has some environmental and social issues as presented in Table 7-4 below:

The activities associated with this stage include the following:

- Offloading of influent by sewage trucks at WWTP
- Movement of influent from the industries through sewage lines
- Screening of the influent to separate coarse material from liquid
- Incineration of the coarse material
- Sedimentation of the liquid influent to extract raw sludge
- Processing and drying of the raw sludge
- Processing in the aeration tank with compressed air
- Final separation of sludge in the settling tanks to extract raw sludge
- Disinfection of recycled water with chlorine
- Disposal of effluent into the river
- Testing of effluent to check compliance to standards

**Table 7-4: Impacts of operation stage according to their categories**

Impacts	Categories													
	P	N	D	ID	LT	ST	Re	NRe	C	NC	R	IR	Rg	L
<b>Social</b>														
Creation of Employment	X		X			X		X	X		X		X	
<b>Environmental</b>														
Air pollution		X	X		X		X		X		X			X
Improved Quality of the Effluent	X		X		X		X		X		X		X	
Pollution by inadequately treated effluent		X	X		X		X		X		X			X
Pollution caused by solid waste		X	X			X	X		X		X			X
Air pollution and odors		X	X			X	X			X	X			X
Accidents and injuries		X	X		X		X		X		X			X
Chemical Exposure and hazardous atmosphere		X	X		X		X		X		X			X
Pathogens and vectors		X	X			X	X		X		X			X

Where:

Positive=**P**, Negative=**N**, Direct=**D**, Indirect=**ID**, Long Term=**LT**, Short Term=**ST**, Recurring=**Re**, Non-Recurring=**NRe**, Cumulative=**C**, Non-Cumulative=**NC**, Reversible=**R**, Irreversible=**IR**, Regional=**Rg** and Local=**L**

### **7.1.2.1. Operational Impacts Explained:**

#### *7.1.2.1.1. Employment Opportunities*

The WWTP's operation will bring about employment opportunities and career growth to the WUC employees, as well as aspiring professionals in Botswana employed by sub-contractors or service providers who are engaged by WUC. This positive impact has direct benefits on those employed on long term basis because the plant will be in operation until the targeted year 2040. The employment benefit covers Botswana across the country, who qualify to be employed by the sub-project, hence it is a national benefit that will cumulate over time, within the project's operational life. This will indirectly positively impact the local economy.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	5	3	4	72	High

#### 7.1.2.1.2. Air Pollution

Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (such as from industrial discharges), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols, Odors from treatment facilities can also be a nuisance to workers and the surrounding community

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	4	48	Moderate

#### 7.1.2.1.3. Improved Quality of the Effluent

The effluent that is currently released by Mambo WWTP into the Tati river does not meet the requirements set by BOBS as demonstrated in section 2.13 in Chapter 2. This makes the water resource in the river unsafe for human consumption as well as dangerous to domestic and aquatic life. The community of Patayamatebele is at risk when the Plant is dysfunctional, as their potable water is drawn from the same river the WWTP discharges in. The rehabilitation of Mambo WWTP is intended to solve this problem. It is expected that during the operation phase of this sub-project, the quality of the effluent should be within the prescribed BOS quality standards. The improved quality of the effluent should have positive effects on the horticultural projects that intend to utilise this water. The availability of this good quality effluent could potentially be a big saving for some projects, as the purchase of potable water would no longer be required.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	4	3	4	68	High

#### 7.1.2.1.4. Pollution by inadequately treated Liquid Effluents

Treated wastewater (liquid effluents) may be reused for irrigation or other purposes or disposed subject to regulatory oversight. If not re-used, treated wastewater can be discharged to the rivers, large surface water bodies, smaller closed surface water bodies, and wetlands and lagoons.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	5	3	4	72	High

#### 7.1.2.1.5. Pollution causes by solid waste

Solids removed from wastewater collection and treatment systems may include sludge and solids from cleaning of drainage and sewer collection systems (including seepage systems), screening solids, and sludge from various unit operations used for wastewater treatment.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	4	48	Moderate

#### 7.1.2.1.6. Air Pollution and Odors

Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, volatile organic compounds (such as from industrial discharges), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols, odors from treatment facilities can also be a nuisance to workers and the surrounding community.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	4	48	Moderate

#### 7.1.2.1.7. Accidents and Injuries

Work at water and sanitation facilities is often physically demanding and may involve hazards such as open water, trenches, slippery walkways, working at heights, energized circuits, and heavy equipment. Work at water and sanitation facilities may also involve entry into confined spaces, including manholes, sewers, pipelines, storage tanks, wet wells, digesters, and pump stations. Methane generated from anaerobic biodegradation of sewage can lead to fires and explosions.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	1	1	4	48	Moderate

#### 7.1.2.1.8. Chemical Exposure and Hazardous Atmosphere

Wastewater may contain potentially hazardous chemicals depending on the source water quality, drinking water treatment processes, and industries discharging to the sewer, including include chlorinated organic solvents and pesticides, PCBs, polycyclic aromatics, petroleum hydrocarbons, flame retardants, nitrosamines, heavy metals, asbestos, dioxins, and radioactive materials. In addition, workers may be exposed to hydrogen sulfide, methane, carbon monoxide, chloroform, and other chemicals generated during wastewater treatment. Oxygen may be displaced or consumed by microorganisms, thus resulting in an oxygen deficient environment in areas where wastewater or wastewater residues are processed.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	4	48	Moderate

#### 7.1.2.1.9. Pathogens and Vectors

Workers and staff at wastewater and sludge treatment facilities and fields where treated wastewater or sludge is applied, as well as operators of sludge collection vehicles, can be exposed to the many pathogens contained in sewage. Processing of sewage can generate bioaerosols which are suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	2	4	48	Moderate

#### 7.1.3. Decommissioning Phase

The activities aligned to the decommissioning works include the following:

- Pumping out of the extra wastewater and raw sewage to another WWTP
- Final treatment of the remaining influent
- Removal of electrical and mechanical equipment
- Chemical treatment of the machines and structures
- Breaking down of concrete structures
- Haulage of rubble from the WWTP to the landfill
- Land rehabilitation by backfilling with clean soil
- Re-vegetation of the disturbed area

The closure of the Plant simply means that no effluent shall be received into the Mambo WWTP. This will allow sewage that is already at the Plant to be treated until it is depleted and properly treated effluent that meets BOBS standard to be deposited into the Tati river. Once the sewage has been eradicated, the Plant must be cleaned first to ensure that no sewage is remaining that might contaminate the environment during dismantling of the facilities for an alternative land use. The following are the impacts that are associated with decommissioning activities of the sub-project.

**Table 7-5: Impacts of Decommissioning Stage According to their Categories**

<i>Impacts</i>	<i>Categories</i>													
	<i>P</i>	<i>N</i>	<i>D</i>	<i>ID</i>	<i>LT</i>	<i>ST</i>	<i>Re</i>	<i>NR e</i>	<i>C</i>	<i>N C</i>	<i>R</i>	<i>IR</i>	<i>R g</i>	<i>L</i>
<b><i>Social</i></b>														
<i>Creation of Employment</i>	X		X			X		X	X		X		X	
<i>Boost to the local economy</i>	X		X			X		X	X		X			X
<i>Noise Pollution</i>		X	X			X	X			X		X		X
<b><i>Environmental</i></b>														
<i>Land pollution by waste mismanagement</i>		X	X			X		X		X	X			X
<i>Contamination due to oil and fuel spillages</i>		X	X			X		X		X	X			X
<i>Increased potential for soil erosion</i>		X	X		X		X		X		X			X
<i>Potential labour influx</i>		X	X			X	X		X		X		X	
<i>Potential Increase in GBV, SEA, SH and VAC</i>		X		X	X		X		X			X	X	
<i>Occupational health and safety issues</i>		X	X			X	X		X		X			X

Where:

*Positive=P, Negative=N, Direct=D, Indirect=ID, Long Term=LT, Short Term=ST, Recurring=Re, Non-Recurring=NR<sub>e</sub>, Cumulative=C, Non-Cumulative= NC, Reversible=R, Irreversible=IR, Regional=R<sub>g</sub> and Local=L*

### **7.1.3.1. Decommissioning Impacts**

#### *7.1.3.1.1. Employment Creation*

Decommissioning of the WWTP will create employment opportunities to the local community and aspiring professional in Botswana. The maintenance contractor will also engage sub-contractors for some specialist services hence employment opportunities will be created and other people will potentially derive an income from this project at this stage. This positive impact has direct benefits to those employed, although it will be a short-term benefit. That means at

this stage it is a non-recurring impact. The employment benefit does not only cover Francistown but Batswana country-wide that qualify to be employed by the sub-project. Hence it is regional benefit that will cumulate over time, within the project duration, together with the boost to the local economy.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	3	4	52	Moderate

#### 7.1.3.1.2. Local Economic Boost

Care and maintenance will require supplies and services from local businesses in order for it to be successful. These services shall be sourced from local businesses that have the capacity to competitively service the sub-project. This also includes small local business that offer food services, rentals and laundry services to the employees of the project.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	2	3	3	33	Moderate

#### 7.1.3.1.3. Noise Pollution

At the decommissioning stage, the sub-project will require machinery and heavy vehicles for dismantling of facilities. Much noise shall be produced from this operation by machinery and heavy vehicles. Excessive noise is negative impact because it can be a nuisance to the community residing and working in the vicinity of the construction site. The noise will directly affect the people as it is a disturbance to daily productivity in offices and disturbance to good night sleep. As is the case with this sub-project, where it is in the vicinity of learning centres, for example Botho University, it is a disturbance to student concentration in the learning process.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	1	2	4	44	Moderate

#### 7.1.3.1.4. Land Pollution by Waste Mismanagement

Different forms of solid and liquid waste will be generated by the sub-project. This includes excavated spoil, sludge from the plant, rubble waste, waste asphalt, garbage and hydrocarbon spills. Areas alongside the road become centres of intense trading, which can leave in its trail serious sanitation problems. Waste will be generated on site and this will not only directly and negative impact the aesthetics of the site and surrounding area, but has the potential to directly pollute soil and water resources over prolonged periods.

Inadequate waste disposal may lead to an environment which is breeding ground for diseases. This is a long-term concern of national interest because once there is an outbreak of any disease, the whole nation is at risk because people's movement is not locally restricted. Contamination or infection of soil and groundwater by microbes has a potential detrimental effects on animal

life. The continued generation of waste on site increases the risk of pollution, as pollution incidents keep recurring. This problem will become cumulative if control measures are not properly implemented to reverse the situation.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	2	2	3	42	Moderate

#### 7.1.3.1.5. Contamination Due to Oil and Fuel Spillages

The use of machinery that requires mechanical power could result in oil spillages. There is a possibility of soil, surface water and groundwater pollution from fuels and lubricants at the site and camp site, as well as along the haulage routes. Use of vehicles and machines in good working condition and the use of a single off-site fuelling point will ensure that hydrocarbon spillages are minimized.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
8	2	3	0	0	Low

#### 7.1.3.1.6. Increased Potential of Soil Erosion and Dust Pollution

The use of machinery and dismantling of facilities loosens the soil and increases its vulnerability to wind erosion. Soil erosion is a negative impact that has a direct link to the creation of gullies and small streams as well plant propagation disturbance. If not prevented or mitigated it has long term negative effects on the terrain properties and vegetation coverage of the ground.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	1	2	3	27	Low

#### 7.1.3.1.7. Potential Labour Influx

The decommissioning of the plant will create employment opportunities as local community and aspiring professionals in Botswana will move to Francistown in search of new opportunities.. This will potentially result in an influx of labour. The local community may feel competition both at social and employment level. This negative impact has potential indirect effects on the local people because of its contribution to the issues of gender-based violence (GBV) and violence against children (VAC). Although the decommissioning phase is short term, the downstream impacts on the community can remain for a long term.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
6	2	3	2	22	Low

#### 7.1.3.1.8. Potential Increase in Gender Based Violence, Sexual Harassment, Exploitation and Abuse and Violence Against Children Cases

The influx of labour in the community has downstream effects because of the social competition the outsiders bring into the community. Possibilities of families breaking apart because of the intrusion of the people with financial power who may intend to displace current spouses is high. Violence against children (VAC) can also potentially increase especially for school-going girls who can be enticed by material things and end up engaging in abusive, inter-generational relationships. This leaves a bad footprint long after the project has been decommissioned because it is related to the rise in HIV/AIDS and teenage pregnancies. VAC also occurs in homes where the breadwinner abuses children and cases are not reported due to fear of loss of benefits that the breadwinner brings in the house.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	5	2	3	51	Moderate

#### *7.1.3.1.9. Occupational Health and Safety Issues*

Occupational safety, health and environmental issues rise when there are many people working in a confined space and machinery is involved. At this stage of the sub-project machinery will be used to dismantle parts of the plant which might pose a danger to the users and other employees. The WWTP has uncovered grit removal tanks which may pose a danger to the employees who could potentially fall into them. It is suggested that they be barricaded during construction. There is also danger of infections to the employees due to the high microbial activity in the treatment plant. Possible overflows of semi treated materials in the open environment may contaminate soil and water sources, especially given that the Plant is located near the river.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	1	1	4	48	Moderate

#### *7.1.3.1.10. Community Health and Safety Issues*

As the sub-project occurs within communities there is likelihood of the project activities affecting the community. The more pronounced impacts that could be affecting the nearby communities will be dust, noise, and diseases owing to the nature of the project. The diseases could be HIV/AIDS, COVID-19 brought by increased labour influx to the project area and waterborne diseases from mismanagement of sewage products.

Severity	Duration	Spatial Scale	Probability	Significance	Significance
10	1	1	4	48	Moderate

## **7.2. Impact Mitigation Measures**

The next table shows how negative impacts shall be mitigated and how positive impacts shall be enhanced at all stages of the sub-project. Formulation of the impact mitigation measures took into consideration guidance from the World Bank Group Environmental, Health and Safety (EHS) Guidelines. The World Bank Group EHS Guidelines together with the local guidelines will govern the contractor's obligations to environmental performance during the construction works. More specifically, the following were considered for coming up with adequate mitigation or enhancement measures for the Mambo WWTP sub-project.

Pre-Construction Phase	
Impact	Mitigation/Enhancement
Employment Creation	- Give locals priority for unskilled jobs.
Boost to the Local Economy	- Purchase project supplies and support services from local suppliers.
Noise Pollution	- Stick to the daytime working hours between 06h00 to 18h00. - Fit all loud machinery with silencers.
Increase in Crime	- The contractor should provide private security.
HIV/AIDS Prevalence	- Provide HIV/AIDS education to the employees. - Provide free condoms at the construction site. - Implement the Health and Safety Plan.
COVID-19	- Practice social distancing. - Wear face masks in public. - Wash hands regularly with water and soap. - Sanitise hands with alcohol based sanitizers. - Monitor temperatures of everyone entering the facility by temperature measuring at the gate. - Provide an isolation room/ sick bay at the camp for infected persons or suspected cases.
Construction Phase	
Impact	Mitigation/Enhancement
Boost to the Local Economy	- Purchase project supplies and support services from local suppliers.
Noise and Dust Pollution	- Stick to the daytime working hours between 06h00 to 18h00. - Fit all loud machinery with silencers. - Ensure dust suppression at work areas.
Increase in Crime	- The contractor should provide private security
COVID-19	- Practice social distancing. - Wear face mask in public. - Wash hands regularly with water and soap. - Sanitise hands with alcohol based sanitizers. - Monitor temperatures of everyone entering the facility by temperature measuring at the gate. - Keep a register (including contact details) of persons entering the site.

HIV /AIDS Prevalence	<ul style="list-style-type: none"> <li>- Provide HIV/AIDS education to the employees.</li> <li>- Provide free condoms at the construction site.</li> <li>- Contractor to devise a Health and Safety Management Plan and adhere to it.</li> </ul>
Potential Increase in GBV, SEA, SH and VAC	<ul style="list-style-type: none"> <li>- Provide social welfare education to the employees.</li> <li>- The contractor should engage a social worker once a month for educational purposes to the employees.</li> <li>- Implement the project GM.</li> </ul>
Disruption of utilities	<ul style="list-style-type: none"> <li>- Inform the community a day before the utilities are interrupted by the construction activities.</li> <li>- Implement the project GM.</li> </ul>
Disruption of archaeological artefacts	<ul style="list-style-type: none"> <li>- A monitoring archaeologist must be engaged to monitor ground-breaking activities.</li> <li>- If any suspected archaeological material (chance finds) is encountered during construction, report immediately to the monitoring archaeologist and to DNMM and follow outlined Chance Find Procedures.</li> </ul>
Land Pollution by Waste Mismanagement	<ul style="list-style-type: none"> <li>- Provide segregated waste bins on construction site.</li> <li>- Engage a licensed waste collector to collect waste on weekly basis.</li> <li>- Provide portable flushable toilets where water system toilets are not functioning on site.</li> </ul>
Contamination Due to Hydrocarbon Spillages	<ul style="list-style-type: none"> <li>- Use machinery and vehicles in good condition.</li> <li>- A maintenance workshop should have an impermeable concrete base.</li> <li>- Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery to prevent spillages from getting in contact with the ground.</li> </ul>
Occupational Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a full-time SHE Officer to coordinate all SHE activities.</li> <li>- Adhere to Health and Safety Plan.</li> </ul>
Community Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a fulltime SHE officer to coordinate all SHE activities.</li> <li>- Implement GM.</li> </ul>
<b>Operation Phase</b>	
<b>Impact</b>	<b>Mitigation/Enhancement</b>
Creation of Employment	<ul style="list-style-type: none"> <li>- Give locals priority for unskilled jobs.</li> </ul>
Air Pollution	<ul style="list-style-type: none"> <li>- The WWTP equipment must be up to standard and always functioning in order for the plant to always produce high quality effluent that does not have bad odour.</li> <li>- Implement Operation and Maintenance Plan.</li> </ul>

<p>Improved Quality of the Effluent</p>	<ul style="list-style-type: none"> <li>- The WWTP equipment must be up to standard and always functioning for the plant to always produce high quality effluent.</li> <li>- Routine effluent testing to ensure compliance to BOS 93: 2012 and guidance from WBG EHS Guideline - Wastewater and Ambient Water Quality.</li> <li>- Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio-filters, chemical scrubbers, etc.) as needed to reduce odors.</li> <li>- Where necessary, consider alternate aeration technologies or process configurations to reduce volatilization.</li> </ul>
<p>Pollution by inadequately treated Liquid Effluents</p>	<ul style="list-style-type: none"> <li>- Minimize bypass of the treatment system by using separate storm water and wastewater systems, if possible, and providing capacity sufficient to treat peak flows</li> <li>- Implement an industrial source control program which includes monitoring and effective regulatory enforcement</li> <li>- Collaborate with public officials to select appropriate treatment technologies</li> <li>- Maintain wastewater treatment facilities and achieve effluent water quality consistent with applicable national requirements or internationally accepted standards and consistent with effluent water quality goals based on the assimilative capacity and the most sensitive end use of the receiving water.</li> <li>- Treat greywater, if collected separately from sewage, to remove organic pollutants and reduce the levels of suspended solids, pathogenic organisms and other problematic substances to acceptable levels based on applicable national and local regulations.</li> <li>- Greywater lines and point of use stations should be clearly marked to prevent accidental use for potable water quality applications</li> <li>- Consider re-use of treated effluent for irrigation purposes</li> <li>- Treated wastewater quality for land application or other uses should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and BOS 463:2011.</li> <li>-</li> </ul>

<p>Pollution causes by solid waste</p>	<ul style="list-style-type: none"> <li>- Select appropriate sludge treatment technologies, considering, the quantity and sources of sludge, available resources for capital expenditures, training, operations and maintenance, availability of skilled operators, maintenance personnel, and the desired disposal methods or end uses of the treated solids.</li> <li>- Land application or other beneficial re-use of wastewater treatment plant residuals should be considered but only based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO)<sup>19</sup> and BOS 463:2011.</li> </ul>
<p>Air Pollution and Odors</p>	<ul style="list-style-type: none"> <li>- Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio-filters, chemical scrubbers, etc.) as needed to reduce odors and otherwise meet applicable national requirements and internationally accepted guidelines.</li> <li>-</li> </ul>
<p>Accidents and Injuries</p>	<ul style="list-style-type: none"> <li>- Install railing around all process tanks and pits. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available</li> <li>- Use PFDs when working near waterways</li> <li>- Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance</li> <li>- Use fall protection equipment when working at heights</li> <li>- Maintain work areas to minimize slipping and tripping hazards</li> <li>- Use proper techniques for trenching and shoring</li> <li>- Implement fire and explosion prevention measures in accordance with internationally accepted standards</li> <li>- Establishment of work zones so as to separate workers from traffic and from equipment as much as possible.</li> <li>- Reduction of allowed vehicle speeds in work zones.</li> <li>- Use of high-visibility safety apparel for workers in the vicinity of traffic</li> <li>- For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing motorists</li> <li>- Locate all underground utilities before digging.</li> </ul>

Chemical Exposure and Hazardous Atmosphere

- Implement a training program for operators who work with chlorine and ammonia regarding safe handling practices and emergency response procedures
- Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance.
- Prepare escape plans from areas where there might be a chlorine or ammonia emission
- Install safety showers and eye wash stations near the chlorine and ammonia equipment and other areas where hazardous chemicals are stored or used
- If source water contains radioactive substances, locate water treatment units and water treatment sludge areas as far as possible from common areas (e.g., offices)
- Conduct radiation surveys at least annually, especially in areas where radionuclides are removed
- Limit wastes entering the sewer system to those that can be effectively treated in the wastewater treatment facility and reduce the amount of air-strippable hazardous compounds entering the system by controlling industrial discharges (e.g., by permit or similar system). Analyze incoming raw wastewater to identify hazardous constituents,
- Ventilate enclosed processing areas and ventilate equipment, such as pump stations, prior to maintenance.
- Use personal gas detection equipment while working in a wastewater facility.
- Continuously monitor air quality in work areas for hazardous conditions (e.g., explosive atmosphere, oxygen deficiency)
- Periodically sample air quality in work areas for hazardous chemicals. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to limit worker exposure, for example collection and treatment of off-gases from air stripping
- Prohibit eating, smoking, and drinking except in designated areas
- Rotate personnel among the various treatment plant operations to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials.

Pathogens and Vectors	<ul style="list-style-type: none"> <li>- Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods</li> <li>- Provide and require use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes</li> <li>- Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps to minimize chemical and radionuclide exposure</li> <li>- Encourage workers at wastewater facilities to wash hands frequently</li> <li>- Provide worker immunization (e.g., for Hepatitis B and tetanus) and health monitoring, including regular physical examinations.</li> <li>- Avoid handling screenings by hand to prevent needle stick injuries</li> <li>- Maintain good housekeeping in sewage processing and storage areas</li> <li>- Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, especially composting facilities, facility because of their greater risk of infection.</li> </ul>
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Decommissioning Phase	
Impact	Mitigation/Enhancement
Creation of Employment	<ul style="list-style-type: none"> <li>- Give locals priority for unskilled jobs.</li> </ul>
Boost to the Local Economy	<ul style="list-style-type: none"> <li>- Purchase project supplies and support services from local suppliers.</li> </ul>
Noise Pollution	<ul style="list-style-type: none"> <li>- Stick to the daytime working hours between 06h00 to 18h00</li> <li>- Fit all loud machinery with silencers.</li> </ul>
Land Pollution by Waste Mismanagement	<ul style="list-style-type: none"> <li>- Provide segregated waste bins on construction site.</li> <li>- Engage a licensed waste collector to collect waste on weekly basis.</li> <li>- Provide portable flushable toilets where water system toilets are no functioning on site.</li> </ul>
Contamination Due to Oil and Fuel Spillages	<ul style="list-style-type: none"> <li>- Use machinery and vehicles in good condition.</li> <li>- A maintenance workshop should have an impermeable concrete base.</li> <li>- Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery to prevent spillages from getting in contact with the ground.</li> </ul>
Increased Potential for Soil Erosion	<ul style="list-style-type: none"> <li>- Working ground must be kept compact by sprinkling with water compacting with heavy duty rollers.</li> </ul>
Potential Labour Influx	<ul style="list-style-type: none"> <li>- Give priority to locals for unskilled job.</li> </ul>

Potential Increase in GBV, SEA, SH and VAC	<ul style="list-style-type: none"> <li>- Provide social welfare education to the employees.</li> <li>- The contractor should engage a social worker once a month for educational purposes to the employees.</li> </ul>
Occupational Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a full-time SHE officer to coordinate all SHE activities.</li> </ul>
Community Health and Safety Issues	<ul style="list-style-type: none"> <li>- Have a full-time SHE officer to coordinate all SHE activities.</li> <li>- Implement GM.</li> </ul>

## **8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

This Chapter presents an Environmental and Social Management Plan (ESMP), which provides a tool for proactive management of the environmental and social aspects of the proposed sub-project. The ESMP is designed to minimize the significance of the potential negative impacts and enhance positive impacts by moderating their spatial extent and duration. This tool also provides guidelines to be followed in ensuring that the environmental and social issues discussed in this ESIA Report are to be taken into consideration during the construction, operation and decommissioning of the project.

### **8.1. Environmental and Social Management Plan Issues**

The issues to be considered in the ESMP (See Table 8-1 up to 8-3) are associated with the activities undertaken during the pre-construction construction, operation and decommissioning phases of the sub-project. Issues highlighted on the mitigation measures could serve as ESMP aspects.

**Table 8-1: Environmental and Social Mitigation Plan (Pre-Construction Phase)**

Activities	ESMP Issue/ Environmental Impact	Mitigation/ Enhancement Measure	Objective	Estimated Cost	Resource Required	Implementing Agency
<p><i>Clearance of the working space and laydown areas</i></p> <p><i>Installation of portacabins and offices</i></p> <p><i>Transportation and offloading of plant and equipment into the site</i></p>	<p><i>Creation of employment</i></p>	<p><i>Give locals priority for unskilled jobs</i></p>	<p><i>To empower locals people with work skills and experience</i></p>	<p><i>P500,000.00</i></p>	<p><i>Running capital</i></p>	<p><i>Contractor</i></p>
<p><i>Purchase of the food supplies</i></p> <p><i>Renting of accommodation</i></p> <p><i>Laundry services</i></p> <p><i>Maintenance supplies</i></p> <p><i>Purchase of PPE</i></p>	<p><i>Boost to the local economy</i></p>	<p><i>Purchase project supplies and support services from local suppliers</i></p>	<p><i>To empower local business</i></p>	<p><i>P1,000 000.00</i></p>	<p><i>Running capital</i></p>	<p><i>Contractor</i></p>
<p><i>Clearance of the working space and laydown areas</i></p>	<p><i>Noise pollution</i></p>	<p><i>Stick to the daytime working hours between 6am to 6pm.</i></p>	<p><i>To eliminate noise at night when people are sleeping</i></p>	<p><i>P10,000 000.00</i></p>	<p><i>Engine silencers</i></p>	<p><i>Contractor</i></p>

<p><i>Installation of portercabins and offices</i></p> <p><i>Transportation and offloading of plant and equipment into the site</i></p>		<p><i>Fit all loud machinery with silencers</i></p>	<p><i>To reduce the noise emitted by machinery engines</i></p>			
<p><i>Transportation and offloading of equipment into the site</i></p>	<p><i>Increase in crime</i></p>	<p><i>Provide security at the construction site</i></p>	<p><i>To guard the construction premises against crime</i></p>	<p><i>P500,000.00</i></p>	<p><i>Security personnel</i></p>	<p><i>Contractor PIU</i></p>
<p><i>Interactions between employees and the community</i></p>	<p><i>HIV /AIDS Prevalence</i></p>	<p><i>Provide HIV/AIDS education to the employees.</i></p> <p><i>Provide free condoms at the construction site.</i></p> <p><i>Implement the Health and Safety Plan</i></p>	<p><i>To prevent the spread of HIV/AIDS infections due to interaction between project employees and the community.</i></p> <p><i>To protect sexually active individuals against infections due to unprotected sex</i></p>	<p><i>P5,000.00</i></p>	<p><i>Nurse</i></p> <p><i>Condoms</i></p>	<p><i>Contractor PLO PIU</i></p>

<i>Social interactions</i>	<i>COVID-19</i>	<p><i>Practice social distancing</i></p> <p><i>Wear face masks in public</i></p> <p><i>Wash hands regularly with water and soap</i></p> <p><i>Sanitise hands with alcohol based sanitizers</i></p> <p><i>Monitor temperatures of everyone entering the facility by temperature measuring at the gate.</i></p> <p><i>Keep a register (with contact details) of everyone entering the facility.</i></p> <p><i>Provide an isolation room/ sick bay at the camp for infected persons.</i></p>	<i>To reduce or combat the spread of COVID-19</i>	<i>P3,000.00</i>	<p><i>Face masks</i></p> <p><i>Water and soap</i></p> <p><i>Alcohol-based sanitisers</i></p> <p><i>Thermometers</i></p> <p><i>COVID register at facility entrance</i></p>	<i>Contractor</i>
<b>Total Cost</b>					<b>P3,008,000.00</b>	

**Table 8-2: Environmental and Social Mitigation Plan (Construction Phase)**

Activities	ESMP Issue/ Environmental Impact	Mitigation/ Enhancement Measure	Objective	Estimated Cost	Resource Required	Implementing Agency
<p><i>Movement of heavy machinery and the use of cranes</i></p> <p><i>Concrete casting of supporting structures</i></p>	<i>Creation of employment</i>	<i>Give locals priority for unskilled jobs</i>	<i>To empower locals people with work skills and experience</i>	<i>P1,000 000.00</i>	<i>Running capital</i>	<i>Contractor</i>
<p><i>Purchase of the food supplies</i></p> <p><i>Renting of accommodation</i></p> <p><i>Laundry services</i></p> <p><i>Maintenance supplies</i></p> <p><i>Purchase of PPE</i></p>	<i>Boost to the local economy</i>	<i>Purchase project supplies and support services from local suppliers</i>	<i>To empower local business</i>	<i>P5,000 000.00</i>	<i>Running capital</i>	<i>Contractor</i>
<p><i>Installation of new equipment</i></p> <p><i>Movement of heavy machinery and the use of cranes</i></p>	<i>Noise pollution</i>	<p><i>Stick to the daytime working hours between 6am to 6pm.</i></p> <p><i>Fit all loud machinery with silencers</i></p>	<i>To eliminate noise at night when people are sleeping</i>	<i>P25,000 000.00</i>	<i>Engine silencers</i>	<i>Contractor</i>

<i>Concrete casting of supporting structures</i>			<i>To reduce the noise emitted by machinery engines</i>			
<i>Transportation and offloading of equipment into the site</i>	<i>Increase in crime</i>	<i>Provide security at the construction site</i>	<i>To guard the construction premises against crime</i>	<i>P5,000 000.00</i>	<i>Security personnel</i>	<i>Contractor</i>
<i>interactions between employees and the community</i>	<i>HIV/AIDS prevalence</i>	<i>Provide HIV/AIDS education to the employees.</i>  <i>Provide free condoms at the construction site.</i>  <i>Implement the Health and Safety Plan</i>	<i>To prevent the spread of HIV/AIDS infections due to interaction between project employees and the community.</i>  <i>To protect sexually active individuals against infections due to unprotected sex</i>	<i>P50,000.00</i>	<i>Nurses</i>  <i>Condoms</i>	<i>Contractor (Responsible for implementation of Health and Safety Plan)</i>  <i>DHMT (Responsible for provision of free condoms and Provision of HIV/AIDS Education.)</i>
<i>Social interactions</i>	<i>COVID-19</i>	<i>Practice social distancing</i>  <i>Wear face masks in public</i>  <i>Wash hands regularly with water and soap</i>	<i>To reduce or combat the spread of COVID-19</i>	<i>P50,000.00</i>	<i>Face masks</i>  <i>Water and soap</i>  <i>Alcohol-based sanitisers</i>	<i>Contractor</i>

		<p><i>Sanitise hands with alcohol based sanitizers</i></p> <p><i>Monitor temperatures of everyone entering the facility by temperature measuring at the gate.</i></p> <p><i>Keep a register (with contact details) of everyone entering the facility.</i></p> <p><i>Provide an isolation room/ sick bay at the camp for infected persons.</i></p>			<p><i>Thermometers</i></p> <p><i>COVID register at facility entrance</i></p>	
<i>Social Interactions</i>	<i>Potential Increase in GBV, SEA, SH and VAC</i>	<p><i>Provide social welfare education to the employees.</i></p> <p><i>Engage a social worker once a month for educational purposes to the employees</i></p>	<i>To empower and educate the employees on social welfare</i>	<i>P50,000.00</i>	<i>Nurse</i>	<i>Contractor</i>

<p><i>Dismantling of non-functional equipment at the WWTP</i></p> <p><i>Drainage of the effluent to clear way for construction</i></p>	<p><i>Disruption of utilities</i></p>	<p><i>Inform the community a day before the utilities are interrupted by the construction activities.</i></p>	<p><i>To alert the public to be ready for shortage of utility supply on that particular day</i></p>	<p><i>P5,000.00</i></p>	<p><i>Mobile public address system</i></p>	<p><i>Contractor</i></p>
<p><i>Concrete casting of supporting structures</i></p>	<p><i>Disruption of archaeological artefacts</i></p>	<p><i>A professional and experienced monitoring archeologist must be engaged to monitor ground breaking activities.</i></p> <p><i>If any suspected archeological artefacts (chance finds) are encountered during construction, report it immediately to the monitoring archeologist and the DNMM.</i></p>	<p><i>To watch for archaeological chance finds</i></p> <p><i>To enable the competent authority to secure or salvage the archaeological resource for preservation</i></p>	<p><i>P25,000.00</i></p>	<p><i>Registered archaeologist</i></p> <p><i>Registered Archaeologist</i></p>	<p><i>Contractor</i></p>
<p><i>All activities</i></p>	<p><i>Land pollution by waste mismanagement</i></p>	<p><i>Provide segregated waste bins on construction site.</i></p>	<p><i>To allow for separation and containment of waste according to the waste type</i></p>	<p><i>P25,000.00</i></p>	<p><i>Waste bins, 6 m<sup>3</sup> skip</i></p>	<p><i>Contractor</i></p>

		<p><i>Engage a licensed waste collector to collect waste on weekly basis.</i></p> <p><i>Provide portable flushable toilets where water system toilets are not functioning on site</i></p>	<p><i>To dispose waste at a designated licensed waste facility</i></p> <p><i>To contain human waste and keep it ready for disposal</i></p>		<p><i>Licensed waste carrier</i></p> <p><i>Portable flushable toilets</i></p>	
<i>Moving the sludge to the sludge beds</i>	<i>Handling of faecal sludge</i>	<p><i>Lime or another disinfectant shall be used to clean slabs or pedestals to mitigate the unpleasant odour.</i></p> <p><i>All the desludging equipment shall be maintained and checked before starting the desludging process to avoid any delay so that less exposure to odour in the surrounding environment.</i></p> <p><i>If there is a delay in collection of sludge, then lime may be added to the barrel to raise the</i></p>	<i>To reduce the odour and prevent spillages</i>	<i>P500,000.00</i>	<i>De-sludging equipment to be recommended by the design engineer (no extra cost)</i>	<i>Contractor</i>

		<p><i>pH and stop the biological activity (which will stop the production of methane inside the barrel). However, if lime is being added, the concerned officials must be informed.</i></p> <p><i>Hydrated lime can be used to treat accidental spillage of sludge near the pit. The accidental spillages should be covered with a layer of soil about two inches of thickness. No chlorine</i></p> <p><i>or lime should be added inside the pit, which will inhibit the degradation process.</i></p> <p><i>Planting of trees within the perimeter of the project area should be considered during the construction stage, thereby forming windbreakers.</i></p>				
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		<i>If an effective buffer is provided between project area and nearby houses, it will reduce the impact of odour.</i>				
<i>Movement of heavy machinery and the use of cranes</i>  <i>Maintenance of Machinery</i>	<i>Contamination due to hydrocarbon spillages</i>	<i>Use machinery and vehicles in good condition</i>  <i>A maintenance workshop should have an impermeable concrete base.</i>  <i>Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery.</i>	<i>To prevent hydrocarbon leakages due to poor maintenance of machinery</i>  <i>To prevent spillages from getting in contact with the ground.</i>	<i>P45,000.00</i>	<i>Maintenance team</i>  <i>Impermeable rubber mats</i>	<i>Contractor</i>
			<b>Total</b>	<b>P36,705,000.00</b>		

**Table 8-3: Environmental and Social Mitigation Plan (Operation Phase)**

Activities	EMP Issue/ Environmental Impact	Mitigation/ Enhancement Measure	Objective	Estimated Cost	Resource Required	Implementing Agency
<p><i>Offloading of influent by sewage trucks at the WWTP</i></p> <p><i>Movement of influent from the industries through sewage lines</i></p> <p><i>Screening of the influent to separate coarse material from liquid</i></p> <p><i>Incineration of the coarse material</i></p>	<p><i>Creation of employment</i></p>	<p><i>Give locals priority on unskilled jobs</i></p>	<p><i>To empower locals people with work skills and experience</i></p>	<p><i>P1,000,000.00 per annum</i></p>	<p><i>Running capital</i></p>	<p><i>Project Developer (WUC)</i></p>

<p><i>Sedimentation of the liquid influent to extract raw sludge</i></p> <p><i>Processing and drying of the raw sludge</i></p> <p><i>Processing in the aeration tank with compressed air</i></p> <p><i>Final separation of sludge in the settling tanks to extract raw sludge</i></p> <p><i>Disinfection of recycled water with chlorine</i></p> <p><i>Disposal of effluent into the river</i></p>	<p><i>Air pollution</i></p>	<p><i>The WWTP equipment must be up to standard and always functioning in order for the plant to consistently produce high quality effluent that does not have bad odour.</i></p> <p><i>Incineration of unprocessed solids</i></p> <p><i>Use of Biofiltration</i></p>	<p><i>To prevent bad odor that would be emitted from the plant operations and release poorly treated effluent</i></p>	<p><i>P 2,000,000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project (WUC)</i></p>	<p><i>Developer</i></p>
<p><i>Disinfection of recycled water with chlorine</i></p> <p><i>Disposal of effluent into the river</i></p>	<p><i>Improved quality of the effluent</i></p>	<p><i>The WWTP equipment must be up to standard and always functioning in order for the plant to consistently produce high quality effluent.</i></p>	<p><i>To ensure that the effluent released from the plant meets the standards for wastewater re-use.</i></p>	<p><i>P1,500000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project (WUC)</i></p>	<p><i>Developer</i></p>

<p><i>Disinfection of recycled water with chlorine</i></p> <p><i>Disposal of effluent into the river</i></p>	<p><i>Pollution by inadequately treated Liquid Effluents</i></p>	<p><i>Minimize bypass of the treatment system by using separate storm water and wastewater systems, if possible, and providing capacity sufficient to treat peak flows</i></p> <p><i>Implement an industrial source control program which includes monitoring and effective regulatory enforcement ( Trade Effluent Agreements)</i></p> <p><i>Collaborate with public officials to select appropriate treatment technologies</i></p>	<p><i>To reduce the chances of releasing the inadequately treated effluent into the open environment.</i></p>	<p><i>P1, 000 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project Developer (WUC)</i></p>
<p><i>Final separation of sludge in the settling tanks to extract raw sludge</i></p>	<p><i>Pollution causes by solid waste</i></p>	<p><i>Select appropriate sludge treatment technologies, considering, the quantity and sources of sludge, available resources for capital expenditures, training,</i></p>	<p><i>To reduce pollution on the land that is caused by inadequately treated solids.</i></p>	<p><i>P500, 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project Developer (WUC)</i></p>

		<p><i>operations and maintenance, availability of skilled operators, maintenance personnel, and the desired disposal methods or end uses of the treated solids.</i></p> <p><i>Land application or other beneficial re-use of wastewater treatment plant residuals should be considered but only based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO)19 and BOS 463:2011.</i></p>				
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<p><i>Processing in the aeration tank with compressed air</i></p> <p><i>Final separation of sludge in the settling tanks to extract raw sludge</i></p>	<p><i>Air Pollution and Odors</i></p>	<p><i>Cover emission points (e.g., aeration basins, clarifiers, sludge thickeners, tanks, and channels), and vent emissions to control systems (e.g., compost beds, bio-filters, chemical scrubbers, etc.) as needed to reduce odors and otherwise meet applicable national requirements and internationally accepted guidelines.</i></p>	<p><i>To prevent bad odor that would be emitted from the plant operations and release poorly treated effluent</i></p>	<p><i>1,000 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project Developer (WUC)</i></p>
<p><i>Offloading of influent by sewage trucks at the WWTP</i></p> <p><i>Movement of influent from the industries through sewage lines</i></p> <p><i>Screening of the influent to separate</i></p>	<p><i>Accidents and Injuries</i></p>	<p><i>Install railing around all process tanks and pits. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw</i></p>	<p><i>To prevents accidents and injuries.</i></p>	<p><i>P500, 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project Developer (WUC)</i></p>

<p><i>course material from liquid</i></p> <p><i>Incineration of the course material</i></p>		<p><i>bags are readily available</i></p> <p><i>Use PFDs when working near waterways</i></p> <p><i>Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance</i></p> <p><i>Use fall protection equipment when working at heights</i></p> <p><i>Maintain work areas to minimize slipping and tripping hazards</i></p> <p><i>Use proper techniques for trenching and shoring</i></p>				
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		<p><i>Implement fire and explosion prevention measures in accordance with internationally accepted standards</i></p> <p><i>Establishment of work zones so as to separate workers from traffic and from equipment as much as possible.</i></p> <p><i>Reduction of allowed vehicle speeds in work zones.</i></p> <p><i>Use of high-visibility safety apparel for workers in the vicinity of traffic</i></p> <p><i>For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing motorists</i></p>				
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		<i>Locate all underground utilities before digging.</i>				
<p><i>Offloading of influent by sewage trucks at the WWTP</i></p> <p><i>Movement of influent from the industries through sewage lines</i></p> <p><i>Screening of the influent to separate coarse material from liquid</i></p> <p><i>Incineration of the coarse material</i></p>	<p><i>Chemical Exposure and Hazardous Atmosphere</i></p>	<p><i>Implement a training program for operators who work with chlorine and ammonia regarding safe handling practices and emergency response procedures</i></p> <p><i>Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance.</i></p> <p><i>Prepare escape plans from areas where there might be a chlorine or ammonia emission</i></p> <p><i>Install safety showers and eye wash stations near the chlorine and</i></p>	<p><i>To prevent exposure to chemicals and hazardous atmosphere</i></p>	<p><i>P1 000 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p>	<p><i>Project Developer (WUC)</i></p>

		<p><i>ammonia equipment and other areas where hazardous chemicals are stored or used</i></p> <p><i>Conduct radiation surveys at least annually, especially in areas where radionuclides are removed</i></p> <p><i>Limit wastes entering the sewer system to those that can be effectively treated in the wastewater treatment facility and reduce the amount of air-strippable hazardous compounds entering the system by controlling industrial discharges (Trade Effluent Agreements). Analyze incoming raw wastewater to identify hazardous constituents,</i></p>				
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		<p><i>Ventilate enclosed processing areas and ventilate equipment, such as pump stations, prior to maintenance.</i></p> <p><i>Use personal gas detection equipment while working in a wastewater facility.</i></p> <p><i>Continuously monitor air quality in work areas for hazardous conditions (e.g., explosive atmosphere, oxygen deficiency)</i></p> <p><i>Periodically sample air quality in work areas for hazardous chemicals. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to limit worker exposure,</i></p>				
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		<p><i>for example collection and treatment of off-gases from air stripping</i></p> <p><i>Prohibit eating, smoking, and drinking except in designated areas</i></p> <p><i>Rotate personnel among the various treatment plant operations to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials.</i></p>				
<p><i>Offloading of influent by sewage trucks at the WWTP</i></p> <p><i>Screening of the influent to separate coarse material from liquid</i></p>	<p><i>Pathogens and Vectors</i></p>	<p><i>Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods</i></p> <p><i>Provide and require use of suitable personal protective clothing and equipment to prevent</i></p>	<p><i>To prevent exposure to pathogens and vectors by employees.</i></p>	<p><i>P500 000.00</i></p>	<p><i>Functioning WWTP equipment</i></p> <p><i>PPPE</i></p>	<p><i>Project Developer (WUC)</i></p>

<p><i>Incineration of the course material</i></p>		<p><i>contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact with spray and splashes</i></p> <p><i>Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps to minimize chemical and radionuclide exposure</i></p> <p><i>Encourage workers at wastewater facilities to wash hands frequently</i></p>				
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		<p><i>Provide worker immunization (e.g., for Hepatitis B and tetanus) and health monitoring, including regular physical examinations.</i></p> <p><i>Avoid handling screenings by hand to prevent needle stick injuries</i></p> <p><i>Maintain good housekeeping in sewage processing and storage areas</i></p> <p><i>Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, especially composting facilities, facility because of their greater risk of infection (use of medical examinations to ascertain).</i></p>				
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			<b>Total Cost</b>	<b>P1,000,000.00 per annum and additional P3,500,000.00</b>		

## 8.2. Monitoring and Auditing

Monitoring is the activity undertaken to provide specific information on the characteristics and functioning of environmental and social variables in space and time. This involves monitoring the achievement of targets or the performance of certain management actions concerned with the sub-project. Key Performance Indicators (KPIs) are essential for the monitoring of the environmental and social actions. The monitoring table also provides suggestions with regards to agencies to be responsible for monitoring the environmental actions. It is essential that environmental auditing be undertaken periodically. Auditing is the process of comparing the impacts predicted in an Environmental Impact Statement (EIS)/ ESIA Report with those, which occur after implementation to assess the extent to which the impact(s) conforms to those predicted in the ESIA. It is essential that periodic audits are performed to confirm whether the purpose or benefits anticipated are being realized. If they are not, then corrective measures must be put in place.

The monitoring plan will be adhered to and to which recourse can be made in the event of perceived undesirable impacts. The plan will be continually updated and improved to cater for residual and unanticipated impacts and any measures that prove to be ineffective. This may include modifying the causal activity as necessary without changing overall project design.

If a non-compliance has occurred or recommended thresholds are exceeded, a written notice shall be delivered to the project proponent describing the non-compliance and requiring compliance within a specified period. If non-compliance persists at the expiration of the specified period of time, the project may be halted, and the client and other authorities may be asked to take action. The monitoring plan is presented in Table 8-4 to Table 85. The nature of some environmental incidents will require specialist services for clean-up, sampling, removal or management. The following basic incident responses should be followed in the event the recommended thresholds are exceeded:

**Identify:** Identify the environmental incident and make sure the area is safe for staff and public.

**Stop:** Respond immediately and act to stop the incident from spreading or escalating

**Contain:** Contain any material which has or may have escaped.

**Clean up:** Clean up as much as possible and seek assistance where required.

**Report:** Report to the client and other authorities

**Table 8-4: Environmental and Social Monitoring Table (Pre-Construction Phase)**

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
<i>Creation of Employment</i>	<i>Number of people employed.</i>	<i>Francistown</i>	<i>Local people being employed.  Minimum wage observed</i>	<i>Employee registry</i>	<i>Contractor Department of Labour and Social Security (DLSS) Herbco Technical Services</i>	<i>Monthly</i>	<i>Submit report every 6 months to DEA  Submit labour annual returns to DLSS</i>	<i>Advised that 55% of the labour must be local people</i>	<i>Report to DLSS for mediation.</i>
<i>Boost to the Local Economy</i>	<i>Number of people who are employed and the number of beneficial businesses.</i>	<i>Francistown</i>	<i>Local people benefiting by selling food supplies and accommodation rentals to the company employees.</i>	<i>Observe growth of small business depending mostly on the existence of the project</i>	<i>Contractor  Herbco Technical Services</i>	<i>Monthly</i>	<i>Submit report every 6 months to DEA</i>	<i>Advice is that 30% supplier's budget should be reserved for local businesses.</i>	<i>Re-assess business to give local more opportunity.</i>
<i>Noise Pollution</i>	<i>Noise levels</i>	<i>Project site and haulage routes</i>	<i>Noise levels not exceeding 85 dB</i>	<i>The use of decibel sound level meters to measure the noise intensity levels of machinery</i>	<i>Contractor DEA DOHS Herbco Technical Services</i>	<i>Daily</i>	<i>Submit report every 6 months to DEA</i>	<i>World Health Organization (WHO) Guidelines on community noise.</i>	<i>Replace the silencers. Review operation hours</i>

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
								85 decibels	
Increase in Crime	Number of criminal activities related to the project and employees	Francistown	No criminal activities at the project site	Record of criminal activities	Contractor Botswana Police	Daily	Report immediately to Police	Zero tolerance for crime	Engage the police for investigation and criminal prosecution
HIV /AIDS Prevalence	Number of employees affected.	Project site	No new infections	Regular medical check-up for the employees and voluntary HIV/AIDS Testing	Contractor District Health Management Team (DHMT)	Once a year	Report to the local clinic when there is incidence.	Zero new infections	Report immediately to the local health authorities or local clinic for treatment.
COVID-19	Number of infected people  Body Temperature of individuals entering and	Francistown  Project Site	No new COVID infections  All Body Temperatures should be below 37.4°C	Testing and contact tracing  Temperature check every on entry and every exit	DHMT  Project Proponent	Monthly  Daily	Report immediate suspicious cases to the nearest clinic  Report immediately to the nearest	Zero tolerance for new infections  37.4°C	Stop work, quarantine and test possible new infections  Stop work, quarantine and test possible new infections.

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
	<i>leaving the premises</i>						<i>clinic for testing</i>		<i>Quarantine the one who tested positive for 14 days. Do another (preferably polymerase chain reaction (PCR) test after 10 days of the previous test.</i>

**Table 8-5: Environmental and Social Monitoring Table (Construction Phase)**

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
Creation of Employment	Number of people employed.	Francistown	Local people being employed.  Minimum wage observed	Employee registry	Contractor Department of Labour and Social Security (DLSS) Herbco Technical Services	Monthly	Submit report every 6 months to DEA  Submit labour annual returns to DLSS	Advised that 55% of the labour must be local people	Report to DLSS for mediation.
Boost to the Local Economy	Number of people who are employed and the number of beneficial businesses.	Francistown	Local people benefiting by selling food supplies and accommodation rentals to the company employees.	Observe growth of small business depending mostly on the existence of the project	Contractor  Herbco Technical Services	Monthly	Submit report every 6 months to DEA	Advice is that 30% supplier's budget should be reserved for local businesses.	Re-assess business to give local more opportunity.
Noise Pollution	Noise levels	Project site and haulage routes	Noise levels not exceeding 85 dB	The use of decibel sound level meters to measure the noise intensity levels of machinery	Contractor DEA DOHS Herbco	Daily	Submit report every 6 months to DEA	World Health Organization (WHO) Guidelines on community noise.	Replace the silencers. Review operation hours

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
								85 decibels	
Increase in Crime	Number of criminal activities related to the project and employees	Francistown	No criminal activities at the project site	Record of criminal activities	Contractor Botswana Police	Daily	Report immediately to Police	Zero tolerance for crime	Engage the police for investigation and criminal prosecution
HIV /AIDS Prevalence	Number of employees affected.	Project site	No new infections	Regular medical check-up for the employees and voluntary HIV/AIDS Testing	Contractor District Health Management Team (DHMT)	Once a year	Report to the local clinic when there is incidence.	Zero new infections	Report immediately to the local health authorities or local clinic for treatment.
COVID-19	Number of infected people  Body Temperature of individuals entering and leaving the premises	Francistown  Project Site	No new COVID infections  All Body Temperatures should be below 37.4°C	Testing and contact tracing  Temperature check every on entry and every exit	DHMT  Project Proponent	Monthly  Daily	Report immediate suspicious cases to the nearest clinic  Report immediately to the nearest clinic for testing	Zero tolerance for new infections  37.4°C	Stop work, quarantine and test possible new infections  Stop work, quarantine and test possible new infections

Environmenta l Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommen ded Action if Threshold is Exceeded
									<i>Quarantine the one who tested positive for 14 days. Do another test(preferably polymerase chain reaction after 10 days of the previous test.</i>
<i>Potential Increase in GBV, SEA, SH and VAC</i>	<i>Number of people incidents of GBV, SEA, SH and VAC</i>	<i>Francistown</i>	<i>No GBV, SEA, SH and VAC</i>	<i>Police record and Social Worker records</i>	<i>Contractor</i>	<i>Monthly</i>	<i>Report immediately to police and the Bank</i>	<i>Zero tolerance</i>	<i>Report to police for investigation and criminal prosecution</i>
<i>Disruption of Utilities</i>	<i>Number of times utilities are disrupted by the project</i>	<i>Francistown</i>	<i>The community should be aware of disruption of utilities</i>	<i>Record of complaints regarding utility disruptions</i>	<i>Contractor Herbco</i>	<i>Daily</i>	<i>Monthly Report to DEA</i>	<i>No existing standard</i>	<i>Grievance Redress Mechanism must be put in place for the community to launch their concern</i>

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
<i>Disruption of Archaeological Artefacts</i>	<i>Number of damaged/ destroyed objects with archaeological significance</i>	<i>Project site and haulage routes</i>	<i>No archaeological finds should be damaged or destroyed</i>	<i>Recording the number damaged / destroyed of artefacts and the number of encounters.</i>	<i>Contractor Herbco DNMM</i>	<i>Daily</i>	<i>Immediate report to DNMM for conservation measures.</i>	<i>Once discovered Monuments and Relics Act, 2001</i>	<i>Stop work and report immediately to DNMM for conservation.</i>
<i>Land Pollution by Waste Mismanagement</i>	<i>Waste volume</i>	<i>Project site and surrounding</i>	<i>Clean work environment and surrounding</i>	<i>Collection of waste in containers of known volume</i>	<i>Contractor DWMPC Herbco</i>	<i>Daily</i>	<i>Monthly report to DWMPC</i>	<i>ASTM D5231-92(2016)  Zero tolerance for waste lying around uncontained.</i>	<i>Increase the frequency of waste collection and disposal.</i>
<i>Contamination Due to Hydrocarbon Spillages</i>	<i>Total Petroleum Hydrocarbons (TPH) in a volume of contaminated soil.</i>	<i>Project site and haulage routes</i>	<i>Oil free surface and sub-surface soil</i>	<i>Inspect vehicles and machinery to ensure that no oil leaks are occurring.  Collection of the contaminated soil in a</i>	<i>Contractor  Department of Waste Management and Pollution Control(DWMPC) Herbco</i>	<i>Daily</i>	<i>Submit report every 6 months to DEA and DWMPC</i>	<i>Cleanup standard for petroleum hydrocarbons: Part 1.  TPH gasoline should not</i>	<i>Collect the soil for biological treatment.</i>

Environmental Impact	Parameters to be Monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended Action if Threshold is Exceeded
				<i>graduated container for TPH testing.</i>				<i>exceed 600 mg/kg</i>	

Table 8-6: Environmental and Social Monitoring Table (Operation Phase)

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
<i>Creation of Employment</i>	<i>Number of people employed.</i>	<i>Francistown</i>	<i>Local people being employed.  Minimum wage observed</i>	<i>Employee registry</i>	<i>Project Developer.</i>	<i>Monthly</i>	<i>Submit annual labour returns to DLSS</i>	<i>No existing standard.</i>	<i>Rectify by following contractual agreement and labour law</i>
<i>Air Quality</i>	<i>Detectable odour</i>	<i>Sludge digester</i>	<i>The sludge smell should not be detected from a detected</i>	<i>Smell</i>	<i>Project Developer</i>	<i>Monthly</i>	<i>Self-monitoring reports to WUC</i>	<i>DS post thickener content must be treated below 7%</i>	<i>Take on well treated sludge to the sludge beds. Return the other for retreatment.</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
			<i>from a distance of 1 km</i>						
<i>Improved Quality of the Effluent (Biological)</i>	<i>E. Coli, Colony Forming Unit(CFU)/100 ml</i>	<i>Effluent release point</i>	<i>Final effluent E. Coli must be below 1000 CFU/100ml</i>	<i>Sampling from effluent point and lab testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS93:201 2 E-Coli must be below 1000 CFU/100ml</i>	<i>Apply UV disinfection</i>
<i>Improved Quality of the Effluent (Biological)</i>	<i>Total Coliforms CFU/100ml</i>	<i>Effluent release point</i>	<i>Total Coliforms of effluent must not exceed 2000 CFU/100 ml</i>	<i>Sampling from effluent point and lab testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS93:201 2 Total Coliforms of effluent must not exceed 2000 CFU/100 ml</i>	<i>Apply UV disinfection</i>
<i>Improved Quality of the Effluent (Biological)</i>	<i>Faecal coliforms CFU/100ml</i>	<i>Effluent release point</i>	<i>Faecal Coliforms of effluent must not</i>	<i>Sampling from effluent point and lab testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS93:201 2 Faecal Coliforms of effluent</i>	<i>Apply UV disinfection</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
			<i>exceed 500 CFU/100 ml</i>					<i>must not exceed 500 CFU/100 ml</i>	
<i>Improved Quality of the Effluent (Biological)</i>	<i>BOD<sub>5</sub> content</i>	<i>Effluent release point</i>	<i>BOD<sub>5</sub> should not exceed 30 mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS 93:2012 BOD<sub>5</sub> should not exceed 30 mg/L</i>	<i>Apply UV disinfection</i>
<i>Improved Quality of the Effluent (Biological)</i>	<i>COD (filtered)</i>	<i>Effluent release point</i>	<i>COD should not exceed 75 mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS 93:2012</i>	<i>Apply UV disinfection</i>
<i>Improved Quality of the Effluent (Biological)</i>	<i>COD (Unfiltered )</i>	<i>Effluent release point</i>		<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS 93:2012</i>	<i>Apply UV disinfection</i>
<i>Improved Quality of the Effluent (Chemical)</i>	<i>Iron (Fe)</i>	<i>Effluent release point</i>	<i>Iron content should not exceed 2 Mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS463:2011 Iron content should not</i>	<i>Ensure that the industrial influent is pretreated before being</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
								exceed 2 Mg/L	conveyed to Mambo WWTP, Trade Effluent Agreement must be put in use and monitored.
Improved Quality of the Effluent (Chemical)	Manganese (Mn)	Effluent release point	Manganese content should not exceed 70 Mg/L	Sampling effluent and laboratory testing	Project Developer	Quarterly	Self-monitoring reports to WUC	BOS463:2011 Manganese content should not exceed 70 Mg/L	Ensure that the industrial influent is pretreated before being conveyed to Mambo WWTP, Trade Effluent Agreement must be put in use.
Improved Quality of the Effluent (Chemical)	Magnesium (Mg)	Effluent release point	Magnesium content should not exceed 0.1 Mg/L	Sampling effluent and laboratory testing	Project Developer	Quarterly	Self-monitoring reports to WUC	BOS463:2011 Magnesium content should not	Ensure that the industrial influent is pretreated before being conveyed to

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
								<i>exceed 0.1 Mg/L</i>	<i>Mambo WWTP, Trade Effluent Agreement must be put in use.</i>
<i>Improved Quality of the Effluent (Chemical)</i>	<i>Sodium(N a)</i>	<i>Effluent release point</i>	<i>Sodium content should not exceed 400 Mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS463:20 11 Sodium content should not exceed 400 Mg/L</i>	<i>Ensure that the industrial influent is pretreated before being conveyed to Mambo WWTP, Trade Effluent Agreement must be put in use.</i>
<i>Improved Quality of the Effluent (Chemical)</i>	<i>Potassium (K)</i>	<i>Effluent release point</i>	<i>Potassium content should not exceed 50 Mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS463:20 11 Potassium content should not exceed 50 Mg/L</i>	<i>Ensure that the industrial influent is pretreated before being conveyed to Mambo WWTP, Trade</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
									<i>Effluent Agreement must be put in use.</i>
<i>Improved Quality of the Effluent (Chemical)</i>	<i>Calcium (Ca)</i>	<i>Effluent release point</i>	<i>Calcium content should not exceed 100 Mg/L</i>	<i>Sampling effluent and laboratory testing</i>	<i>Project Developer</i>	<i>Quarterly</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS463:20 11 Calcium content should not exceed 100 Mg/L</i>	<i>Ensure that the industrial influent is pretreated before being conveyed to Mambo WWTP, Trade Effluent Agreement must be put in use.</i>
<i>Improved Quality of the Effluent (Chemical)</i>	<i>Nitrogen (N)</i>	<i>Effluent release point</i>	<i>Nitrogen content should not exceed 25 Mg/L</i>	<i>Sampling and laboratory testing</i>	<i>Submission of report every 6months to DEA and DWMPC</i>	<i>Daily</i>	<i>Self-monitoring reports to WUC</i>	<i>BOS463:20 11 Nitrogen content should not exceed 30 Mg/L</i>	<i>Service or replace components of the denitrification zone</i>

### **8.3. Decommissioning and Closure Plan**

This section sets out in broad terms the plan for the closure, decommissioning and rehabilitation of the affected areas. The main objective of this plan is to meet the obligations as outlined by laws of Botswana and World Bank Guideline for Decommissioning. The closure plan identifies above ground structures that must be demolished and how land that has been disturbed will be rehabilitated.

#### **8.3.1. Objectives**

The main objective of closure plan is to ensure that the site is returned to as close to its original state as is possible at the end of the project. The following considerations therefore have to be borne in mind:

1. The site is made safe for both humans and animals.
2. The site be physically, chemically and biologically stable.
3. The remaining impacts are of an acceptable level without deteriorating overtime.
4. The closure is achieved in an efficient and cost-effective manner with minimal socio-economic upheaval.

#### **8.3.2. The Decommissioning or Closure Plan is Abridged as Follows**

- A. Return land to its pre-development state where possible.
- B. Make area safe for humans and animals.
- C. Make the area stable and sustainable.
- D. Demolish all unwanted remaining infrastructure.
- E. Rehabilitation of all disturbed land surfaces where practically possible.
- F. All vehicles, plant and workshop equipment will be removed.
- H. Submission of closure report to the Client.
- K. Environmental monitoring and maintenance to continue for every six months until the sub-project is officially closed.

#### **8.3.3. Managing Decommissioning Impacts**

The process of closure and decommissioning the site will lead to some environmental impacts which will be managed in the manner as shown in Table 8-7 up to 8-8.

**Table 8-7: Environmental and Social Mitigation Table (Decommissioning)**

Activities	EMP Issue/ Environmental Impact	Mitigation/ Enhancement Measure	Objective	Estimated Cost	Resource Required	Implementing Agency
<p><i>Pumping out of the extra wastewater and raw sewage to another WWTP</i></p> <p><i>Final treatment of the remaining influent</i></p> <p><i>Removal of electrical and mechanical equipment</i></p> <p><i>Breaking down of concrete structures</i></p>	<i>Creation of Employment</i>	<i>Give locals priority on unskilled jobs</i>	<i>To empower locals people with work skills and experience</i>	<i>P10,000,000.00</i>	<i>Running capital</i>	<i>Contractor</i>
<p><i>Rental of local house</i></p> <p><i>Laundry services</i></p> <p><i>Food catering services</i></p>	<i>Boost to the local economy</i>	<i>Purchase project supplies and support services from local suppliers</i>	<i>To empower local business</i>	<i>P 2 000 000.00</i>	<i>Running capital</i>	<i>Contractor</i>

<i>Purchase of spare and materials from local suppliers</i>						
<i>Breaking down of concrete structures</i> <i>Haulage of rubble from the WWTP to the landfill</i> <i>Land rehabilitation by backfilling with clean soil</i>	<i>Noise pollution</i>	<i>Stick to the daytime working hours between 6am to 6pm.</i> <i>Fit all loud machinery with silencers</i>	<i>To eliminate noise at night when people are sleeping</i> <i>To reduce the noise emitted by machinery engines</i>		<i>No extra cost</i> <i>Engine silencers</i>	<i>Contractor</i>
<i>Pumping out of the extra wastewater and raw sewage to another WWTP</i> <i>Breaking down of concrete structures</i> <i>Haulage of rubble from the WWTP to the landfill</i>	<i>Land pollution by waste mismanagement</i>	<i>Provide segregated waste bins on construction site.</i> <i>Engage a licensed waste collector to collect waste on weekly basis.</i> <i>Provide portable flushable toilets where water system toilets are not functioning on site.</i>	<i>To allow for separation and containment of waste according to the waste type</i> <i>To dispose waste to a designated licensed waste facility</i> <i>To contain human waste and keep it</i>	<i>P 25 000.00</i>	<i>Waste bins, 6 m<sup>3</sup> skip</i> <i>Licensed waste carrier</i> <i>Portable flushable toilets</i>	<i>Contractor</i>

			<i>ready for disposal</i>			
<p><i>Haulage of rubble from the WWTP to the landfill</i></p> <p><i>Maintenance of machinery and vehicles</i></p>	<p><i>Contamination due to hydrocarbon spillages</i></p>	<p><i>Use machinery and vehicles in good condition</i></p> <p><i>A maintenance workshop should have an impermeable concrete base.</i></p> <p><i>Emergency maintenance of machinery and vehicles on site should be done where an impermeable rubber mat has been placed under the vehicle or machinery.</i></p>	<p><i>To prevent hydrocarbon leakages due to poor maintenance of machinery</i></p> <p><i>To prevent spillages from getting in contact with the ground.</i></p>	<p><i>P 25 000.00</i></p>	<p><i>Maintenance team</i></p> <p><i>Impermeable rubber mats</i></p>	<p><i>Contractor</i></p>
<p><i>Removal of electrical and mechanical equipment</i></p> <p><i>Breaking down of concrete structures</i></p> <p><i>Land rehabilitation by backfilling with clean soil</i></p>	<p><i>Potential labour influx</i></p>	<p><i>Give priority to locals on unskilled job</i></p>	<p><i>To empower locals people with work skills and experience</i></p>	<p><i>P 5 000 000.00</i></p>	<p><i>Running capital</i></p>	<p><i>Contractor</i></p>

<i>Re-vegetation of the disturbed area</i>						
<i>Socialization between project employees and the community</i>	<i>Potential Increase in GBV, SEA, SH and VAC</i>	<i>Provide social welfare education to the employees.  Engage a social worker once a month for educational purposes to the employees</i>	<i>To empower and educate the employees on social welfare</i>	<i>P25 000.00</i>	<i>Social worker (To be engaged by contractor)</i>	<i>Contractor</i>
<i>Removal of electrical and mechanical equipment  Chemical treatment of the machines and structures  Breaking down of concrete structures  Haulage of rubble from the WWTP to the landfill</i>	<i>Occupational Health and Safety Issues</i>	<i>Have a fulltime SHE officer to coordinate all SHE activities.</i>	<i>To ensure that all occupational health and safety rule are followed to the latter.</i>	<i>P100 000.00</i>	<i>SHE officer</i>	<i>Contractor</i>
			<b>Total Costs</b>	<b>P17,175,000.00</b>		

**Table 8-8: Environmental and Social Monitoring Table (Decommissioning)**

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
<i>Creation of Employment</i>	<i>Number of people employed.</i>	<i>Francistown</i>	<i>Local people being employed.  Minimum wage observed</i>	<i>Employee registry</i>	<i>Contractor DLSS</i>	<i>Monthly</i>	<i>Submit report every 6 months to DEA  Submit labour returns yearly to DLSS</i>	<i>The report recommends 55% of the labour force to be local people</i>	<i>Report to DLSS for mediation.</i>
<i>Boost to the local economy</i>	<i>Number of people who are employed and the number of beneficial businesses.</i>	<i>Francistown</i>	<i>Local people benefiting by selling food supplies and accommodation rentals to the company employees.</i>	<i>Observe growth of small business depending mostly on the existence of the project</i>	<i>Contractor</i>	<i>Monthly</i>	<i>Submit report every 6 months to DEA</i>	<i>Advice is that 30% supplier's budget should be reserved for local businesses.</i>	<i>Re assess business to give local more opportunity.</i>
<i>Noise Pollution</i>	<i>Noise levels</i>	<i>Project site and haulage routes</i>	<i>Noise levels not exceeding 85 dB</i>	<i>The use of decibel sound level meters to measure the noise Intensity</i>	<i>Contractor DEA</i>	<i>Daily</i>	<i>Submit report every 6 months to DEA</i>	<i>WHO Guidelines on community noise.</i>	<i>Replace the silencers.</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
				<i>levels of machinery</i>				85 dB	
<i>Land pollution by waste mismanagement</i>	<i>Waste volume</i>	<i>Project site and surrounding</i>	<i>Clean work environment and surrounding</i>	<i>Collection of waste in containers of known volume</i>	<i>Contractor DWMPC</i>	<i>Daily</i>	<i>Monthly report to DWMPC</i>	<i>ASTM D5231-92 (2016)  Zero tolerance for waste lying around uncontained.</i>	<i>Increase the frequency of waste collection and disposal.</i>
<i>Contamination due to oil and fuel spillages</i>	<i>Total Petroleum Hydrocarbons (TPH) in a volume of contaminated soil.</i>	<i>Project site and haulage routes</i>	<i>Oil free surface and subsurface soil</i>	<i>Inspect vehicles and machinery to ensure that no oil leaks are occurring.  Collection of the contaminated soil in a graduated container for TPH testing.</i>	<i>Contractor DWNPC</i>	<i>Daily</i>	<i>Submit report every 6 months to DEA and DWMPC</i>	<i>Cleanup standard for petroleum hydrocarbons: Part 1.  TPH gasoline should not exceed 600 mg/kg</i>	<i>Collect the soil for biological treatment.</i>

Environmental Impact	Parameters to be monitored	Monitoring Location	Key Performance Indicators	Methods of Monitoring	Responsible Agents	Frequency of Monitoring	Reporting Mechanism	Threshold	Recommended action if Threshold is exceeded
Potential labour influx	Number of people employed.	Francistown	Local people being employed.  Minimum wage observed	Employee registry	Contractor DLSS	Monthly	Submit report every 6 months to DEA  Submit labour returns yearly to DLSS	No existing standard.	Report to DLSS Security for mediation.
Potential Increase in GBV, SEA, SH and VAC	Number of people incidents of GBV, SEA, SH and VAC	Francistown	No GBV, SEA, SH and VAC	Police record and social worker records	Contractor	Monthly	Report immediately to police	Zero tolerance	Report to police for investigation and criminal prosecution
Occupational Health and Safety Issues	Number of accidents and injuries	Project site and haulage routes	No accidents recorded.	Records of near misses and any occurring accident.	Project Developer	Daily	Report to Botswana Police on once there is accident occurrence for legal action.	BOS OHSAS 18001:2007  Zero Tolerance	Train more SHE representatives to enforce safety rules.

## **9. GRIEVANCE MECHANISM (GM)**

### **9.1. Introduction**

A Grievance Mechanism (GM) is necessary for addressing the concerns of Project Affected People and other stakeholders. It is anticipated that some of these grievances may include eligibility criteria, compensation entitlements for loss of livelihood and use of land.

The mechanism for grievance redress includes:

- Provision for the establishment of a Grievance Committee (see GC members below)
- Multiple grievance uptake locations and multiple channels for receiving grievances
- Fixed service standards for grievance resolution, include adjudication process and process of handling situations related to gender-based violence/sexual exploitation and abuse
- Prompt and clear processing guidelines (including reviewing procedures and monitoring system)
- A timeframe for responding to grievances
- A reliable and effective reporting and recording system
- Procedure for assessing the grievance
- Grievance escalation process.

Opportunities to access the GM using languages and formats that is culturally acceptable to the VCs. The GM is designed with the objective of solving disputes at the earliest possible time before they escalate. In addition, World Bank OP 4.12 emphasizes that the PAPs should be heard and as such, they must have access to a fair, transparent and accessible means to address their concerns and views related to the project. Furthermore, the mechanism should be effective in addressing grievances at the sub-project-level so that grievances are not referred through the court system for resolution, especially since the court system may not be financially accessible to all and may add cost and time burdens.

### **9.2. General Principles and Key Aspects of the GM**

The sub-project has put in place an extra-judicial mechanism for the management of grievances and disputes. The VCs will be able to trigger this mechanism, while still being able to resort to the judicial system. Key aspects of the GM are:

- The community including VCs need to be informed about the GM and how they can make use of this process.
- Grievances will be recorded using a Grievance Form (in local language, also available in English). Grievance Forms will contain details regarding the grievance as well as the name and address of the applicant, application date, type of application and the name of the persons receiving the grievance. The forms will be logged in a register where they will be tracked through to final resolution.

- Complainant will receive notification that their grievance has been received (if complainant is known) in writing.
- Grievance monitoring log (which includes actions taken, corrective measures (See Appendix 11).
- Closure sheet, copy of which will be handed to the complainant after he/she has agreed to the resolution and signed off.
- The PIU will maintain a digital grievance database, containing the logs and records of all grievances received, with an indication of the respective status of a grievance (i.e. resolved, not resolved, pending, etc.), in addition to a hard copy (See Appendix 11).
- Resolution options will be developed through unilateral proposal, bilateral discussion and/or third party mediation. If a complaint is not legitimate the case will be closed without agreement with the complainant. Any response will be communicated clearly either orally or in writing, and a grievance case will only be closed when an agreement with the complainant is reached.
- Community members including VCs will have access to third party legal advice, through referral to Botswana Legal Aid, at no cost. Information on access to legal advice will be communicated to the affected people.

### **9.3. Management Functions and Responsibilities**

During the implementation phase of the sub-project, the mechanism for grievance redress shall include:

- Provision for the establishment of a grievance redresses committee with a sitting allowance budgeted for the Grievance Redress Committee (GC) members.
- Multiple grievance uptake locations and multiple channels for receiving grievances (project hotline, project website, Facebook page, WhatsApp blasts, WUC PIU office, Kgosi and VDC, grievance box at the Kgotla).
- Fixed service standards for grievance resolution which include adjudication process.
- Prompt and clear processing guidelines: including reviewing procedures and monitoring system
- A timeframe for responding to grievances
- A reliable and effective reporting and recording system (grievance register, complaints logbook – hard copy)
- Procedure for assessing and responding to the grievance.

### **9.4. Responsibilities for Implementing Stakeholder Engagement Activities**

The WUC PIU in consultation with the respective community will appoint Community Liaison Officers (CLOs) in project area settlements/settlements where there are project works, to conduct stakeholder outreach during project implementation and respond to any grievances or complaints that may arise. The CLOs will act as key points of contact to bring project grievances from PAPs, stakeholders, construction workers, residents, and community members to the GC. They will liaise with the WUC Safeguards Team to inform them of all

complaints and outcomes. The CLO will contact the PIU Safeguards Team in case a complaint is not resolved within two weeks after receiving the alert. The PIU Safeguards Team will go to the field to obtain further information and resubmit the case to the GC. The complainant will be notified that further information is being collected and kept informed about the status.

**a. Community Liaison Officers (CLOs)**

The WUC PIU will in consultation with the Francistown community appoint CLOs. The CLO(s) will be situated in the project area, where there are project works, will be designated to receive, review, record and address project related complaints. Every week, the CLO will consolidate complaints and submit to the GC. Their contact information will be published and communicated via public announcements and information sharing about the project, (radio, television and newspapers, community meetings, etc.), to conduct stakeholder outreach during project implementation and respond to any grievances or complaints that may arise. Key functions of the CLO are:

- Creation of an awareness on the existence of the sub-project and GM.
- Act as the key point of contact to bring grievances from project affected people, construction workers, local residents, and community members to the GC.
- Register the grievance/complaints on the Grievance Logbook and acknowledge receipt within 5 days.
- Respond back to the beneficiary's queries/complaints lodged, giving their status and/or their outcome if they had been resolved.
- Ensure that all queries/complaints from beneficiaries have been formally recorded following the existing procedures.
- Review and evaluate grievances/complaints and ensure that complainant is given feedback on the grievance/complaint resolution within 14 days .
- Conduct community consultations to provide inputs into the GM.
- Facilitate communication which in the form of reports WUC PIU and Project Contractor and distribution of information, education and communication material to the community including VCs.
- Represent the sub-project during Kgotla meetings.
- Represent the interests of vulnerable individuals and groups following consultations with them to better understand their concerns and issues, and keep notes and records of such meetings.
- Making sure the recommendations of the GC are implemented and advising WUC PIU during ESMP and RAP implementation, and contractors to make any appropriate adjustments to their works.
- Work closely with the WUC Principal Sociologist and Environmental Officer and flag any issues of concern as well as report incidents as they occur.
- If a concern of a highly sensitive nature is raised such as gender based violence (GBV) or Sexual Harassment Exploitation and Abuse (SHEA), VACs, the CLO shall invoke the special procedures related to GBV/SHEA/VACs and will ensure the the anonymity and confidentiality of the survivor.

In addition to the CLO, the sub-project will make available grievance forms in every settlement (at the Kgotla office) as an accessible venue for filing a grievance and a Grievance Box. In collaboration with the communication and IT team for the project, the WUC telephone hotline and website will be also available to receive complaints anonymously or they can identify themselves. Every week, the CLO will collect forms filled out to submit them to the GC and record them in the grievance logbook.

The WUC PIU Safeguards Team will work closely with the WUC communication and IT Team, who will oversee compiling complaints received on social media, website and WUC hotline. A meeting will be held at least one time per month to review complaints and submit them to the GC. For illiterate persons, CLO will assist them to write and submit complaints. To be sure that the adequate confidentiality will be kept, the sub-project will issue a code of conduct (COC) for the CLO(s).

**b. The Grievance Committee (GC)**

The GC be responsible for receiving and resolving in a fair, objective, accountable, effectively, timely and accountable manner. All concerns or complaints raised by project affected persons (PAPs) in the communities during all phases of the project lifecycle.

**c. Composition and Membership of the Grievance Committee (GC)**

The Project Grievance Redress Committee (GC) will meet as and when required, at least once per month. Complaints will be submitted to the Project GC. In this regard, a GC will be established with defined terms of reference.

Specific GM for conflict prevention and resolution at the sub-project level has been devised in consultation with the affected communities, including Vulnerable Communities (VCs) and has received their broad community support. In projects where there are VCs, there will be at least one on the GC as agreed with the VCs during consultations.

The GC, shall maintain all records from complaint to final decisions made by the GC for future reference, with an accurate and up to date grievance logbook (the PLO is to ensure the logbook is accurate and ensure they have a copy of updates to the logbook). The GC shall also ensure that public participation and consultation is always a part of the process to promote understanding, transparency, trust in the project, accountability and mitigate against unnecessary complaints and disputes. The Chairman of the GC will rotate amongst the committee members depending on the issues to be considered by the Committee. The GC members include:

- 2 Contractor CLO (one man and one woman)
- Waste Collection Companies Representatives
- Water Utilities Corporation Representative
- Two Local Representatives (One man and one woman)
- ES Monitoring Consultant (Secretary)
- Social Worker
- Police Officer

- Community Development Officer

The WUC PIU Safeguards Team Members will attend meetings when there is a matter that requires their urgent attention.

The broad responsibilities of the GC include:

- Publicize the grievance management procedures.
- Receive, review, investigate and keep track of grievances referred to them by the CLO.
- Adjudicate grievances
- Monitor and evaluate the fulfilment of agreements achieved through the GM.

**d. Project Liaison Officer (PLO)**

The environmental safeguard monitoring consultant for the sub-project will be tasked with the role of Project Liaison Officer (PLO). Their contact information will be published and communicated via public announcements and information sharing about the sub-project, (radio, television and newspapers, community meetings, etc.), to conduct stakeholder outreach during project implementation and respond to any grievances or complaints that may arise. Key functions of the PLO include:

- Attend to households issues regarding the reconstruction works and facilitate the liaison between the beneficiary (households), local communities (community buildings) and the project team.
- Ensure prompt communication of concerns and issues about the sub-project to the project team (not the Contractors).
- Assist the project communication team with all communication matters and to provide feedback on the effectiveness of the messages and means of communication used.
- Assist project team to arrange meetings and location of meeting for any consultation with the community.
- Monitor the implementation of the ESMP and report progress at onsite Project Progress Meetings.

**e. The Contractor**

During the implementation, Contractors shall work in line with the World Bank Standards on Environmental, Social, Health and Safety (ESHS) and Occupational Health and Safety (OHS) in the workplace and on their relationship with affected communities. Labour Influx may occur at the project site due to high unemployment rates and it will have an effect on the implementation ES and OHS Standards to prevent and manage associated risks of Gender Based Violence (GBV), Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), Violence Against Children, and HIV/AIDS.

The Contractor has to ensure compliance to the application of the GBV, GBV, SEA, SH and VAC COC to make sure that the project meets its ESHS and OHS objectives, as well as preventing

and/or mitigating the risks of GBV, SEA, SH and VAC on the project and in the local communities. Contractors should make sure these COC are adopted by those working on the project and are meant to create:

- Awareness of the ESHS and OHS expectations on the project.
- Common awareness about GBV, SEA, SH and VAC and ensure a shared understanding that they have no place in the project.
- A clear system for identifying, responding to, and sanctioning GBV, SEA, SH and VAC incidents.

Three codes of conduct must be adhered to in this project

- Company COC: Commits the company to addressing GBV, SEA, SH and VAC issues;
- Manager's COC: Commits managers to implementing the COC, as well as those signed by individuals; and,
- Individual COC: COC for everyone working on the project, including managers.

These codes of conduct will be explained and displayed in the work sites, workers and affected communities will be sensitized prior to works start. The CLO will work closely with WUC PIU safeguards team to bring to the GC all complaints and special cases which affect the COC.

For issues regarding GBV, SEA, SH and VAC, the Response Protocol which is the mechanisms set in place to respond to cases of GBV, SEA, SH and VAC will be implemented. By doing that, the Contractor will first establish a GBV, SEA, SH and VAC Compliance Team (SSVCT). The GBV (SSVCT) will include, as appropriate to the sub-project, at least four representatives ('Focal Points') as follows:

1. A safeguards specialist from the WUC.
2. The OHS manager from the Contractor (or someone else tasked with the responsibility for addressing GBV, SEA, SH and VAC on the Contractor's side) with the time and seniority to devote to the position.
3. The PLO (also known as the supervision consultant); and,
4. A Social Worker with experience in Sexual Harassment, Exploitation and Abuse (SHEA), including GBV, SEA, SH and VACs (the 'Service Provider').
5. A Police Officer from the local Police Station

#### **9.5. Community Level Grievance Mechanism**

Local communities have existing traditional and cultural GMs. It is expected that some disputes at the community level may be resolved using these mechanisms, without the involvement of the Project, Contractor(s), and or Government representatives at local and national level should. The extended family, settlement and/or Kgosi may be involved at this level. This may be more suitable for issues and concerns that are minor. For example, if the Contractor needs to recruit housekeepers or other human resource needs, he or she can choose among the resumes collected by the community. The community and Contractor will be informed that the principle of non-discrimination and fairness as per the Botswana Labour Law will apply in the selection. Also, if the company wants to compensate the community for using their sand, gravel or because of the impact of its activity (dust dispersion), those

grievances can be solved at the community level, without the GC, if the community so chooses.

### **9.6. Project Level Grievance Mechanism**

Many project related grievances during the works are minor and site-specific. Often, they revolve around nuisances generated during construction such as noise, dust, vibration, workers disputes, etc. They can be resolved easily on site. However, regarding disputes that include differences between households over land, or boundaries, even on issues triggered indirectly by the sub-project during its lifecycle, the GM will have a body, the GC to address disputes.

Other issues that are potential grievances may involve access to property arrangements, or Gender Based Violence, Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH) and Violence Against Children (VACs) for workers, contractors and/or community members during construction phase. Most of these cannot be resolved immediately and on site and in the case of SEA/SH, require specific interventions and processes to protect the safety, well-being and identity of survivors.

### **9.7. GM Procedures**

The community will be informed and sensitized about the use of an existence of the GM (through radio notices, TV, community meetings, community signage, Kgotla, CLOs, PLOs) of the various uptake options where complaints can be submitted. The WUC PIU Safeguards Team will meet every two weeks with the communication and IT team to review all complaints from social media, websites and hotline and inform the complainants within three days that complaints have been received and the procedures they must follow.

The WUC PIU Safeguards Team will then organize a meeting for the GC to meet at the soonest to ensure compliance with the timeline for responses to complainants.

If the identity of the person who submitted a grievance is known, the GC must inform them within three days of the decision or when a decision is to be expected. The date of this outreach is to also be logged into the grievance log. The GM will commit decisions to be finalized within two weeks of date of receipt and complainants will be notified and will record the complainant's comments about decision. If the complainant is not satisfied, they will be notified about escalation procedures.

Notices and signage will be erected at all sites providing the public information on the sub-project and summarising the GM process, including contact details of the relevant CLO. All complainants should be free to lodge a complaint in one or as many of the uptake stations noted above.

A Complaints Register (or Grievance Log) will be at the WUC PIU Safeguards Office and settlement Kgotla office with CLOs, but also with Contractors, who will log the: i) details and nature of the complaint (include categorization of sensitive/urgent, non-sensitive); ii) the

complainant name and their contact details if known; iii) date the complaint was received; iv) corrective actions taken in response to the complaint; v) the date the response was made available to the community and the complainant; vi) the resolution; vii) the response of the complainant if response was acceptable to them or not; viii) the name of the person who received the complaint and location/method the complaint was lodged. This information will be included in quarterly WUC Safeguards Team progress reports to the World Bank. The CLOs are responsible for ensuring that they collect all grievances so that they can update the PIU logbook and their logbook.

### 9.8. The Grievance Structure

The structure or steps of the grievance mechanism includes:

- Multiple and accessible uptake stations to receive complaints (text, phone number, project website, mailing address, grievance box, others, communication to CLO, VDC, Kgosi) and account for vulnerable or disadvantaged individuals (persons with disabilities, elderly, illiterate, lack access to phone/computer, etc.)
- Receive, register and acknowledge complaint in logbook
- Screen and establish the foundation of the grievance
- Implement and monitor decision
- Notify complainant of outcome and obtain feedback on acceptability
- If grievance is not escalated, conclusion to redress grievance and note in logbook
- Advise for a judicial proceedings as last resort if necessary
- Document the experience for future reference
- Notify the community (community boards, on project website, CLO, community meetings) about various complaints and outcomes without naming names).

A step-by-step process, with duration of each stage from the reception of the complaint to the notification of the resolution, with suggested timeframe and responsibilities is indicated in **Figure 12**.

### 9.9. Grievance Process

The steps of the grievance mechanism consist of:

The Aggrieved Party (AP) will take his/her grievance to the CLO who will endeavour to resolve it immediately.

Where AP is not satisfied, the CLO will refer the grievance to the GC.

Receive, register and acknowledge complaint - CLO.

- Screen and establish the foundation of the grievance - CLO.
- If it is an easy non complicated grievance, notify the complainant of the result and obtain a response if the resolution is satisfactory – CLO.
- If it is complicated grievance, escalate to the GC - CLO.
- Notify the complainant of the result and obtain a response if the resolution is satisfactory. If not, inform the complainant of escalation process - CLO.
- Implement and monitor proposed resolution action.
- Advise for judicial proceedings as last resort if necessary

- Document the experience for future reference.

Where the traditional and administrative procedures fail to resolve disputes, the AP has the right to take the matter to the courts in accordance with the Constitution of Botswana, other national laws, and the World Bank's policies.

The process is highlighted in Table 9-1 with suggested timeframe and responsibilities.

**Table 9-1: Grievance Mechanism (GM) Process**

Step	Process	Description/Required Action	Completion Timeframe	Responsible Agency/Person
1.	Receipt of complaint	Document date of receipt, name of complainant, nature of complaint	1 day	CLO (Community Liaison Officer)
2.	Acknowledgement of grievance	By letter, email, phone	1-5 days	CLO
3.	Investigation and Analysis Screen and Establish the foundation / merit of the grievance	Visit the site; listen to the complainant/community; assess the merit	7-14 days	GC members including the CLO, complainant and his/her representative
4.	Mediation Implement and monitor a redress action	Where complaint is justified, identify and carry out the redress	21-30 days or at a time specified in writing to the complainant	CLO, WUC Social and Environmental Safeguard Specialists to coordinate the implementation of redress action
5.	Inform complainant and community (use of community boards, newspaper, radio, what's app group, Facebook page) to inform community of grievance outcome and solicit response from complainant if claim has been fully addressed or not.	Where complainant is not satisfied, inform complainant of escalation process.  If satisfied or not, ensure grievance logbook is updated.	1-2 days after making a decision on a grievance by the GC	CLO
6.	Extra intervention for a dissatisfied scenario	Review the redress steps and conclusions, provide intervention solution	2-4 weeks of receiving status report	MLMWS, PLO, Social and Environmental Officers, and GC to review and react
7.	Legal Assistance Judicial Adjudication	Complainant has the option to take complaint to court of law	No fixed time	Complainant

8.	Grievance Closure	Implement agreed resolutions and sign them off as closed	No fixed time	WUC
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### 9.10. Escalation of Grievances

If the complaint is not resolved to the satisfaction of the aggrieved party by the GC, it will then be referred by the WUC PIU Project Coordinator or to the Project Steering Committee (PSC). The PSC will be composed of the:

- CEO – WUC
- Technical Services Director
- Water Resources Director
- Chief Financial Officer
- Senior Manager – Supply Chain
- Controls Coordinator
- Corporation Secretary
- Project Coordinator
- Project Planner

The PSC will meet when required to address escalated grievances and will be required to address the concern within 30 days. Should measures taken by the PSC fail to satisfy the complainant, the aggrieved party is free to take his/her grievance to the Botswana judicial courts.

### 9.11. Judiciary Level Grievance Mechanism

The project level GM process will not impede affected persons access to the legal system. At any time, the complainant may take the matter to the appropriate legal or judicial authority as per the laws of Botswana. However, the quality and effectiveness of the judicial system should be assessed, as well as issues related to accessibility and affordability.

### 9.12. For Sensitive Issues Regarding Sexual Exploitation and Abuse, Sexual Harassment or Violence Against Children

An exceptional or *ad hoc* meeting will be called the day after receiving this information. The GC, the PSC, the Contractor, and local authorities of the locality where this issue occurs will all meet as a plenary. At all times, the approach for such issues will follow a survivor-centred approach and the anonymity of the survivor will remain intact. In addition, the survivor will have been informed of options such as receiving psycho-social support, medical assistance and other services as required.

For those issues, the mechanisms set in place to respond to cases of GBV, SEA, SH and VAC will be implemented. By doing so, the contractor will first establish a 'SEA, SH and VAC

Compliance Team' GBV (SSVCT). The GBV (SSVCT) will include, as appropriate to the project, at least four representatives ('Focal Points') who can either be male or female as follows:

- Community Liaison Officer (CLO)
- OHS manager from the Contractor, or someone else tasked with the responsibility for addressing GBV, SEA, SH and VAC with the time and seniority to devote to the position
- Supervision Consultant (PLO)
- Social Worker
- Police Officer

### **9.13. Capacity of Local Institutions to Address Grievances and Disputes**

The following local institutions are involved in addressing grievances and disputes:

- Ward Development Committee (WDC): The ward parliament has the responsibility to monitor developmental projects in their settlement. The interest of the community are their priority as per their mandate.
- Kgosi: The tribal leader and is also an ex-offio member of the Ward Development Committe and is a key figure in mediating among community members.
- Project Resident Engineer: As the head of the project, the engineer is responsible for ensuring that it is implemented smoothly.
- Supervising Project Engineer: Ensures that The Project Resident Engineer and ESIA Consultants are implementing the project as per their approved documents.
- Project Liaison Officer (PLO; social and environmental safeguards monitors): Has a responsibility to ensure that all the ESIA/ESMP mitigation measures and plans are implemented accordingly.
- Community Liaison Officer (CLO): Liaises btween the Project Officials/ Grievance Redress Committee and the Community. Reports all grievances to the GC.
- Grievance Redress Committee (GC): Has a responsibility to ensure that all grievances are addressed timely and properly recorded.
- Water Utilities Corporation (WUC): Has a responsibility to ensure that the objectives of the project are delivered as promised.

### **9.14. Good Communication and Information Sharing Practice**

Community members, including the Vulnerable Community and other marginalized groups and individuals can:

- Report to the CLO who will be based at the Kgotla.
- Report by phone to CLO/Resident Engineer (RE).
- Send an sms to the CLO/RE
- Place their grievances in an accessible grievance/complaints boxes in community areas which will be checked daily. For those who cannot write, CLO will facilitate submission of a grievance and will be guided by a ethical code of conduct to respect the privacy of the complainant
- Contact the Project Team by email (there will be a designated project email address for this purpose) and via the website. This will enable users to submit their grievances anonymously.

- Make use of the community WhatsApp group, which will be created for the community members who want to be informed on updates of the sub-project.

All complaints must be acknowledged for receipt regardless if they are anonymous. Community boards and the project website will list complaints that were submitted (without names) and will include expected date of response. Once the response is determined, the response with the original complaint will also be posted on the community boards and on the project website.

The GRC will be appointed to oversee the grievance process to ensure that all grievances are logged correctly and the GC is notified.

There will be specific training for the GC and the CLO to ensure quality control of the GM process. The CLO are community volunteers who are chosen by the Village Development Committee to liaise with the project on behalf of the community. They given a monthly stipend by the Client and there will be two (2) CLOs, male and female, in this sub-project, both based in Francistown.

### 9.15. Monitoring

The grievance log that will be used to monitor and track the GM and which will be reviewed regularly for accuracy and compliance to the GM process. The logbook and at times, correspondence between the Contractor and PLOs in addressing grievances will also be reviewed by the World Bank safeguards specialists undertaking project supervision.

**Table 9-2** below shows the costing of the GM Implementation for vulnerable communities.

**Table 9-2: Costing of the GM Implementation**

No.	Activity	Timeframe	Budget (Pula)/ USD	Responsibility
<b>GM Implementation and Monitoring</b>				
1.	Allowances for GC members for those who are not employees of the project	Throughout the Project	(P500.00 per sitting) x Members x Once month x 12 months x 9 P 36,000.00 (USD 3,600.00)	WUC
2.	Monthly Stipends for CLO(s)	Throughout the Project	(P600.00 per month) x 12 months x 2 people P 14,400.00 (USD 1,440.00)	WUC
3.	GM publicity material and stationery	Throughout the Project	Budgeted for under ESMP	Contractor
4.	Capacity building and awareness for all representatives on GM as well as the community SEA/SH mapping activities and compliance team	Throughout the Project	P 100,000.00 (USD 10,000.00)	Contractor
<b>Total</b>			<b>P 150,400.00</b>	

	<b>(US\$ 15,400.00)</b>	
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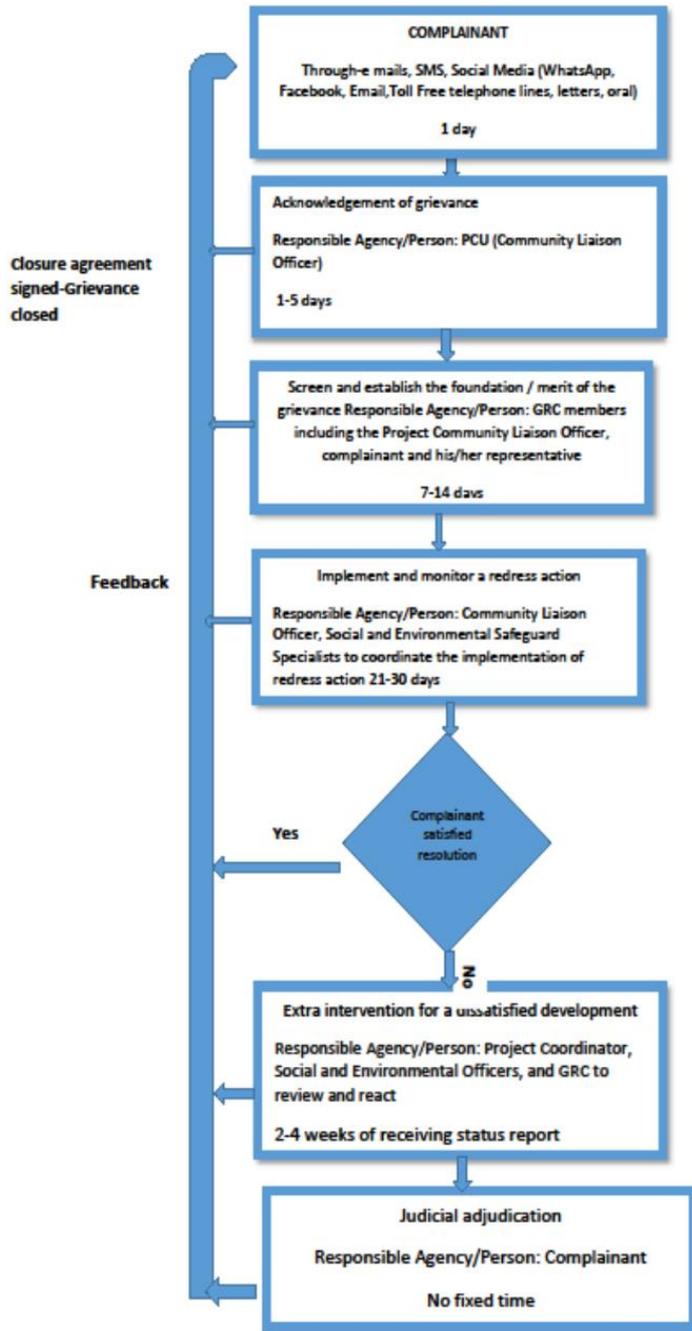


Figure 9-1: Grievance Mechanism (GM) Process

## 10. CONCLUSIONS AND RECOMMENDATIONS

### 10.1. CONCLUSIONS

This ESIA Report has identified the significant impacts that will be caused by the proposed project. The issues were identified through the process of stakeholder engagement which included public *kgotla* meeting in Francistown and surrounding areas and consultation with key IAP such as local and central government officials. Furthermore, there was the desktop study and reconnaissance field work which assisted in establishing the potential impacts. The review of the relevant legislations and applicable policy documents as well as the assessment of the environmental baseline of the project area was carried out in order to establish possible significant impacts. A detailed description of the proposed sub-project was also done so as to identify all potential environmental and social impacts from the proposed project. Water sampling was done and tests carried out to establish the compliance of the effluent from Mambo and it was found that the effluent from Mambo WWTP does not meet the required BOBS standard (BOBS 463:2011 and BOS 93:2012).

This study has evaluated the identified impacts and recommended mitigation measures for them and it is concluded that the adverse impacts are mitigable hence the sub-project can go to implementation stage.

Relevant concerns, views and issues raised by the community, government institutions and interested and affected parties consulted have been considered.

### 10.2. RECOMMENDATIONS

The sub-project is recommended for implementation because the advantages of having a well-functioning system in town far outweigh the disadvantages or challenges that may be faced at construction stage, moreover this report has recommended mitigation measures for the negative impacts at all phases of the project.

- The ESMP should form part of the Contractor's documents.
- Continuous stakeholder engagement must be done during the project implementation
- The contractor and the Employer should both have Grievance Redress Plan for the community
- Develop automatic shutdown actions through an emergency shutdown system for significant spill scenarios so that the facility may be rapidly brought into a safe condition.
- Ensure adequate personnel training in oil spill prevention, containment and response.
- Hazardous waste disposal must be carried out by an approved waste contractor and he should provide way bills for inspection.
- No washing of concrete transporting vehicles on site or at the camp site unless in a bunded area provided frequently cleared of cementations waste.

- Provide refuse bins and skips at convenient intervals for disposal of waste within the construction camp. The skip rental company to be contracted to frequently (weekly or as the skips are full, whichever occurs first) service the skips. Individual skips for different types of waste e.g. domestic waste, building rubble, etc should be provided.
- Train all personnel on site on the importance and use of personnel protective clothing such as reflective overalls, steel toe boots, helmets and nose masks.
- Recruit as many local people as possible especially in the semi-skilled and unskilled category.
- Selling of alcohol by hawkers should be prohibited, and anyone found in contravention of this condition should be immediately removed from site. Francistown City Council should hasten issuing of temporary trading licenses to hawkers to ensure credibility of the sellers.
- Traffic management should be of paramount interest, especially the management and control of truck parking, exit and entrance during construction.
- All construction vehicles should be fitted with flashing/warning lights and those hauling construction materials should be covered at all time.
- It should be insured that accesses to properties are not blocked at no time during construction, otherwise temporary crossing structures should be built to enable residents to enter and exit their properties.
- If during construction, archaeological artefacts are discovered, work on that particular section of the fence should be stopped whilst proper investigations are carried out. The NMM should be informed as soon as possible, so that they can carry out timely surveys.
- WUC's Trade Effluent Agreement requirements should be adhered to.
- Security at the WWTP should be intensified during construction by having round the clock presence of security personnel, installation of surveillance cameras, access control into the facility and at the loading and offloading bays.
- The contractor must arrange the cancellation of any temporary services upon completion of works.
- Fences, barriers and demarcations associated with the construction phase are to be removed from the site upon completion of works.
- The contractor must repair any damage that the construction works have caused to neighbouring properties upon completion of works.
- Meeting is to be held on site between the engineer, supervising environmentalist and the contractor to approve the remediation activities and to ensure that the site has been restored to a condition approved by the RE and supervising environmentalist.

In addition to the suggested mitigation and enhancement measures, the Environmental, Social, Health and Safety (ESHS) Enhancements for Standard Procurement Documents (SPDs) and Standard Bidding Documents (SBDs), with a new procurement framework, came into force in 2016 and 2017. The ESHS enhancements for SPDs and SBDs shall be applicable to this sub-project.

The following is required for all bidders/ proposers/ contractors and the relevant shall:

- Set out clearly the minimum expectations of ESHS performance from the outset, to ensure that all Bidders/Proposers are aware of the ESHS requirements;
- Submit as part of their Bid/Proposal an ESHS Code of Conduct that will apply to their employees and sub-contractors, and details of how it will be enforced. The suitability of the COC will be assessed and discussed as part of the Bid/Proposal evaluation and negotiations;
- The successful Bidder/Proposer is required to implement the agreed COC upon contract award;
- Submit, as part of their Bid/Proposal, ESHS Management Strategies and Implementation Plans required to manage the key ESHS risks of the project;
- The suitability of these strategies and plans will be assessed as part of the Bid/Proposal evaluation, and discussed during pre-contract discussions, as appropriate. These strategies and plans will become part of the Contractor's project specific Environmental and Social Management Plan (C-ESMP);
- Particular conditions of the contract include provisions relating to the C-ESMP, include:
  - A requirement that the contractor shall not commence any Works unless the REis satisfied that appropriate measures are in place to address ESHS risks and impacts;
  - At a minimum, the contractor shall apply the plans and ESHS Code of Conduct, submitted as part of the Bid/Proposal, from contract award onwards.

**11. REFERENCES**

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