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WATER UTILITIES CORPORATION

TERMS OF REFERENCE

FOR THE

**ENGINEERING DESIGN AND TENDER DOCUMENTATION FOR FRANCISTOWN
WATER SUPPLY INFRASTRUCTURE UPGRADING,**

TENDER No. WUC xxx (2019)

APRIL 2019

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1 INTRODUCTION

1.1 Background

Botswana is a land locked country and a member of Southern African Development Community (SADC) (See Appendix 1, Map of Botswana). The surface area is approximately 582,000 km², roughly the size of France or Texas in the US. About two thirds of the country is covered by the Kalahari Desert, rainfall ranges from 200 mm per annum in the desert to about 600 mm per annum in the North and North Eastern parts of the country. The population is estimated to be 2.1 million (2011 census) and is sparsely spread across the country with the biggest villages along the South East – North East Corridor. Gaborone which is the capital city has a population of about 270,000 accounting for 11% of the county's population. Botswana has been hailed as one of the success stories of Africa with an annual per capita GDP of about US \$ 14, 800, compared to US \$ 70 at independence in 1966. The mining sector remains the main engine of growth for the Botswana economy. The sector contributes 40% of GDP, 75% of export earnings and over 55% of total government revenues.

Botswana is water stressed and has suffered from repeated droughts. The 2015-2016 El-Nino related drought has affected Botswana and its regional trade partners quite significantly. Lower export receipts and higher food import costs caused Gross Domestic Product (GDP) growth to turn negative in 2015 (-0.3%) and entailed large budgetary shortfalls (a fiscal deficit of 6.3% of GDP in 2015). Thus, Botswana has become increasingly resource constrained and funding is required to finance the infrastructure investments to increase the supply of water to areas affected by the drought. Substantial investments are required to align water security requirements with the growing demands of Botswana's increasingly prosperous population. Greater rainfall variability and declining groundwater availability suggest that additional investment in surface water infrastructure will be a priority, including additional storage and transmission, interlinking surface and groundwater supplies and developing water transfer schemes. It should also be noted that many villages are small and scattered and water must be transported over long distances (often at high cost), thus the task of responding to recurrent droughts is further compounded.

Given the current low water security of Botswana, low service coverage and high-water losses, the Government of Botswana has applied for a loan from the World Bank for implementing the Botswana Water Security and Efficiency Project. The project is to be implemented in the period 2017 to 2020. The project development objective 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 has three components being: Component 1: Improve availability of water supply and efficiency of services; Component 2: Improve wastewater and sludge management; and Component 3: Sector reform and institutional Strengthening.

One of the sub-projects under Component 1 is to implement the actions planned in the Francistown Water Supply Master Plan Report, last carried out in 2002. The scope of work includes designing and construction for upgrading the primary water infrastructure.

The proposed works will optimize the existing water supply scheme to ensure adequate and reliable water supply to the population of the Greater Francistown area over a 20-year design horizon.

1.2 Corporate Profile

Water Utilities Corporation (WUC) is a state-owned enterprise established in 1970 through an Act of Parliament to provide water in urban areas. The mandate of the Corporation was expanded in 2009 under the Water Sector Reforms Programme to include management of water and wastewater services in the villages previously managed by the Department of Water Affairs and Local Authorities.

The Corporation is a Parastatal organization wholly owned by the Botswana Government. A Board of Directors appointed by the Ministry of Land Management, Water and Sanitation Services is the overall authority responsible for policy formulation and oversight on the operations of the corporation. WUC has nine departments; Chief Executive's Office, Technical Services, Operations, Sustainability and Water Resources, Corporate Services, Finance, Shared Services, Human Resources and Internal Audit. The Operations department is further broken down into 16 Management Areas that are spread across the country. The Heads of Departments report to the Chief Executive Officer.

1.3 Corporate Governance

Water Utilities Corporation subscribes to and is committed to the accepted practices of good governance and international best practice. In all its undertakings, the Corporation shall not tolerate fraud, corruption, malpractice or maladministration.

The Corporation further commits to preventing, detecting and timely responding to issues of fraud, corruption, malpractice or maladministration, and expects its employees, suppliers, contractors,

consultants, general members of the public to be fair and honest in their dealings with the Corporation.

The Corporation maintains an open-door policy, where issues relating to fraud, corruption, malpractice or maladministration can be freely reported through the hotline/tip-off anonymous program and/or Internal Audit. Issues can be reported through; writing, email, telephone or in person.

2 PURPOSE OF THE PROJECT

The aim of the project is to ensure supply of sufficient quantity of drinking water for the population of The Greater Francistown Area, i.e. The City of Francistown, the Tonota Cluster Villages (Tonota, Mandunyane, Semotswane, Shashe Bridge, Foley, Ditladi & Patayamatebele), Mathangwane Cluster Villages (Mathangwane, Chadibe, Borolong, Shashe Mooke, Makobo, Natale & Jamataka), Tati Siding, and Matsiloje cluster Villages (Matsiloje, Matshelagabedi & Matopi), as well as raw water supply to Tati Nickel mine, Mupane Gold Mine and the proposed Sese Coal mine & Power Station.

The main purpose of the project is for the Engineering Consultant to design and prepare tender documents for the water supply infrastructure upgrading of the Greater Francistown water demand area. The review will provide the outline of the Capital Works Programme required for the Corporation to meet the development water needs of a rapidly expanding Greater Francistown area.

The Consultancy services will address the changes required to the medium to long term proposals included in the 2000 report, brought about by changed circumstances. An example of this is the Self-Help Housing Agency (SHHA) upgrading, identification of squatter relocation areas and serviced plots for residential, commercial, institutional and industrial purposes in Gerald Estates. Other factors to be considered is the need to continue to upgrade all infrastructure facilities in order that the city can maintain its role as a communications center and continue to accommodate the anticipated urban growth. The above should consider the population projection (2020-2040) produced by the Central Statistics Offices as well as the findings and recommendations of more recent studies both complete and on-going. These studies include among others, the completed National Water Master Plan (Department of Water Affairs) the Water Use and Affordability Study (Water Utilities Corporation), the North South Carrier Water Project reports (Water Utilities Corporation) which recommends the delinking of Selebi-Phikwe from Shashe dam, study on effluent re-use (Ministry of Local Government Lands and Housing).

Other highly influential studies being updated by the Department of Town and Regional Planning will be the Greater Francistown Development Plan 1997-2021, the Matsiloje Development Plan 2007-2031, Mathangwane/Chadibe/Borolong/Shashe Mooko Development Plan 2012-2036, and the Shashe Bridge Development Plan 2008-2032.

3 OBJECTIVES OF THE SERVICE

To critically examine current infrastructure, resources and operational philosophy against current and future estimated water demands for the Greater Francistown water demand area. The full intent being to make recommendations for possible additional and/or improvements to the existing infrastructure required to safeguard the security of water supply to the Greater Francistown Area over a 20 years design horizon.

The services will encompass the following activities;

- (i) To review capability of the existing Water Supply scheme resources and Infrastructure (all components) against the current project area population.
- (ii) To study the water demands for all the villages, The City of Francistown and the Mines, supplied by the water scheme and project them to the design horizon and develop the appropriate strategies for meeting the demands through use of the Shashe Dam surface water resources, as well as integrating the eastern Botswana surface water sources, to augment water supply to the Greater Francistown area.
- (iii) To carry out the preliminary engineering design and the detailed engineering design to services needed to improve the Greater Francistown Area water supply scheme.
- (iv) To carry out environmental and social impact assessment of the water scheme upgrading works, to ensure the identified impacts are mitigated accordingly.
- (v) To carry out the survey and geotechnical investigation needed for the engineering design preparation.

4 BACKGROUND OF PROJECT AREA

The Francistown water supply system currently serves a population of some 102 000 people within the city, together with an additional population of some 51 000 people inhabiting adjacent peri-urban and satellite areas. Francistown is the oldest town in Botswana and second in size to

the capital, Gaborone. It is the commercial, administrative and communications center for the central part of the country and has a significant role as a manufacturing center. The town is situated 430 km north of Gaborone at latitude 21° 11' South longitude 27° 32' east and is at approximately 1000 metres above sea level.

The principal geographical features at Francistown are the Tati River and its confluence with Ntshhe River, the railway line which runs approximately North-South through the city and the Nyangabwe Hill.

The water supply for Francistown is the responsibility of Francistown Management Center of the Water Utilities Corporation. In addition to owning and operating the source works, which are located at Shashe Dam, some 25 km south of Francistown, and all water supply facilities for the Greater Francistown Area.

The source currently serving The Greater Francistown area is the Shashe dam of 85 Mm³ capacity on the Shashe River. There are two Villages, Patayamatebele and Matopi, that are supplied from well points on the Tati and Ramokgwebana Rivers respectively. The two Villages had initially been planned to be supplied from the Robelela Water Treatment Works (WTW) at the Dikgathong Dam, but subsequent engineering reviews suggested that it would be sustainable in the long term to supply the two Villages from the Shashe Dam water source by gravity as opposed to pumping from the Robelela WTW.

4.1 Shashe Water Treatment Works

The Shashe Water Treatment Works (WTW) supplies water to the City of Francistown, Tonota Cluster Villages, The Mathangwane Cluster Villages, Matsiloje and Matshelagabedi Villages. The current production demand is 43 Mega Liters per Day (ML/d), versus the Treatment Works nominal capacity of 48 ML/d.

The current annual increase in water demand is 6%. It is envisaged that by the end of 2021, the water demand for the Greater Francistown Area will have surpassed the nominal capacity of the water treatment facility.

The 600mm \varnothing draw off pipe from the Shashe Dam has a capacity of 68 ML/d. During periods when Selibe Phikwe, Phoenix and Mupane mines are being supplied from Shashe, the raw water

inflow to the Shashe WTW becomes limited to about 35ML/day (lower than the current production demand). There are also prospects of supplying 8ML/d of raw water to the proposed Sese Coal Mine and power Station.

Among the major works that ought to be undertaken during Francistown Water Scheme Design Review, would be to increase the outlet capacity of the water intake at the Shashe Dam.

The same recommendations were narrated by Stephenson and Associates, in the Dams Management and Operating Rules report of June 2006.

4.2 Historical Water Sales

Accurate records of water sales date back to 1979/80 when Water Utilities Corporation took over the Francistown water supply system. However, it was not until 1982, with the commissioning of the Shashe to Francistown system that an unrestricted supply was available within the town.

This data is published in summarized form in the Water Utilities Corporation Annual Reports, where sales for the preceding year, ending on 31st March, are provided.

4.3 Historical Growth

The recorded historical growth in water sales during the first decade up to 1990 was 4.8% and increased to 5.4% during the period 1990 to 2016. The current annual increase in water demand is 6%.

The gradual growth rate is due to among others:

- i. The development of the Gerald Estate residential and industrial Areas.
- ii. The influx of people to Villages around the City of Francistown, as they opt to reside in peri-urban areas and commute to the City.
- iii. Urban sprawl owing to re zoning of free hold land in the periphery of the City of Francistown.

4.5 Tariffs

It has always been the policy of the Corporation to apply a structured tariff, where essential water use is priced at or below cost, with a cross subsidy being obtained by charging large scale consumers at a higher rate. The higher rates thus apply to industry, and to luxury water use by domestic consumers, for such non-essential activities as garden watering and to a lesser extent car washing and maintaining swimming pools.

The tariff is set by Water Utilities Corporation with the approval of the Minister of Land Management, Water and Sanitation Services, and is intended to achieve full cost recovery and to meet financial performance criteria set down under current loan covenant agreements. The tariff is based on an economically efficient rising block structure that ensures that consumers are aware of the high opportunity cost of water in Francistown.

4.5 Previous Planning

In the past the development of Francistown has always been based upon individual new development areas. Initially, these development areas were relatively small and were well defined. In each case, a water supply feasibility study was carried out, leading to the identification of the optimum concept and layout for providing water services to the development. Facilities were then designed accordingly and constructed to schedule, resulting in the timely availability of a water supply to all new consumers. At its time, each development was intended to be the ultimate, and there was therefore no inbuilt provision for future extensions. Areas catered for in this way included the successfully completed Phase 4 residential and Industrial Areas. This approach to the provision of services gave rise to a somewhat piecemeal pattern of expansion. In 1995 the Department of Town and Regional Planning approved general layout plans for Gerald Estates Development Plan. This was a far larger expansion area and plan than any of its predecessors and was based upon development to the west of the railway line, where no previous development had been permitted.

The plan allowed for a tripling in the aerial extent of Francistown and is again considered to represent the ultimate limits to which the city of Francistown would be permitted to grow. It is

expected of the pre-investment study to recognize the ultimate development of Gerald Estates and the ever-increasing supply to peri-urban areas.

The first phase of the Gerald Estates Infrastructure development was constructed and commissioned in 2002.

In July 2001 WUC commissioned GIBB Botswana to prepare the Francistown Water Master Plan Update 2000 Pre-Investment Study, (FTWMP) being an update of the 1987 Water Master Plan. The Draft Final Report was issued in February 2002 followed by the Final Report in August 2002. GIBB Botswana was subsequently appointed for the detailed design phase. The principal objectives of the study were to optimize operational efficiency within Francistown water supply system, to review existing and projected resource potential and to make recommendations on a development strategy to meet the Francistown water demand projections up to year 2020.

The third and last review of the Francistown Water Supply Master Plan (FWSMP) was implemented in 2005, and the upgrading works broadly entailed:

- i. Refurbishment and extension of the existing water treatment works at Shashe, including the provision of a sludge treatment plant
- ii. Construction of a new treatment stream at Shashe of capacity 24 ML/day, with planning for additional 24 ML/day (The current nominal capacity of the Shashe WTW is 48ML/day).
- iii. Construction of a new clear water pump station at Shashe of with variable capacity of up to 36 ML/day
- iv. Laying of a new 600 mm nominal bore rising main from Shashe to Francistown of length 20.3 km
- v. Laying of a new 900 mm nominal bore spine main through the Gerald Estates development of total length 13 km
- vi. Construction of 20 ML of bulk storage at Gerald Estates, with planning for 40 ML.
- vii. Connection of the existing distribution pipework in Blocks 5 and 6 of Gerald Estates to the new spine main
- viii. Connection of the Phase IV development south of the Tati River, Tati River South and Tatitown to the Gerald Estates distribution system
- ix. Replacement of the existing Dumela transfer pumps at Area L
- x. Upgrading of the existing Francistown distribution pumps at Area L
- xi. Provision of a standby generating plant at Area L in Francistown.
- xii. Provision of a second power supply to the Shashe WTW.

5 CURRENT SITUATION

5.1 Existing Primary Water Supply Assets

Shashe Dam is the sole raw water source for the Greater Francistown area, it is WUC's fifth largest dam after the Dikgatlhong, Gaborone, Letsibogo and Thune dam. The 85 Million cubic metres (Mm³) dam is one of Botswana's reliable dams in that it overflows almost every year.

The Shashe Water Treatment Works has a nominal treatment capacity of 48 Million Liters per day (ML/day) and is currently operating at 90% capacity (43 ML/day). It supplies water to the City of Francistown as well as villages in the periphery such as Tonota, Tati-Siding, Mathangwane Cluster and the Matsiloje/Matshelagabedi cluster villages.

The potable water storage capacity in the city of Francistown is 45 ML (24 ML active, and 21 ML dormant), which translates to about 32 hour's storage. Stand by power generators are provided at the Area "L" dormant storage site, to enable for continuous pumping during periods of power failure.

Tonota waterworks has a total storage of 9ML, versus the current water demand of about 4ML/day for the Tonota cluster villages.

The water demand for the Mathangwane cluster Villages has surpassed the transmission capacity for the water scheme of 2.2 ML/day, and the demand is estimated to be above 3ML/day. The bulk storage reservoir at the Mathangwane waterworks is 1.6 ML.

Matsiloje and Matshelagabedi are fed from the Francistown water distribution network, by gravity to the individual villages' service reservoirs.

The Village of Tati siding is connected to the Francistown Water Reticulation system, by means of a floating system on the 600/900mm pumping main. The Village gets water on the pumping main tap off during pumping, and on cessation of pumping, the water gravitates back from the Gerald Estates 20ML reservoir to the village.

5.2 Water Transmission Mains

The water transfer pipelines from Shashe WTW to the City of Francistown are:

- a) A 350mm pumping main along the A1 road, about 7km Asbestos Cement (AC) and 14km Steel.
- b) A 500mm pumping main along the A1 road, 15km Ductile Iron (DI) and 6km AC.
- c) A 600 mm DI nominal bore rising main from Shashe to Francistown of length 20.3 km
- d) A 900 mm DI nominal bore spine main through the Gerald Estates development of total length 13 km.

Transmission mains to other demand areas, are uPVC pumping and gravity mains ranging from 160mm to 400mm.

6 PREVIOUS STUDIES RELATED TO THE PROJECT AREA.

- i. The National Water Master Plan Review of 2006.
- ii. Greater Francistown development Plan 1997 to 2021
- iii. Francistown Water Master Plan Update 2000 Pre-Investment Study
- iv. Matsiloje Development Plan 2007-2031,
- v. Mathangwane/Chadibe/Borolong/Shashe Mooke Development Plan 2012-2036,
- vi. Shashe Bridge Development Plan 2008-2032.
- vii. Dams Management and Operating Rules report of June 2006.
- viii. Design Study and Tender Documentation for the Mathangwane Cluster Villages 2018

7 SCOPE OF WORK AND DETAILED DESCRIPTION OF TASKS

7.1 General

This section describes WUC's current perception of the tasks, which the Engineering Consultant needs to undertake in order to satisfactorily achieve the objectives of the assignment. The outline is not intended to place limitations on the Consultant's activities, but instead, it is expected that having examined these, the Consultant will incorporate such additional items as he deems necessary to complete the assignment in an effective manner.

7.2 Detailed Description of tasks

The Consultant needs to undertake amongst others the tasks below, in order to satisfactorily achieve each of the objectives of the assignment.

Task 1: Consolidation of previous studies/inception report.

The Engineering Consultant shall review all previous studies related to the project area, and the capability of the existing Greater Francistown Water Supply scheme resources and Infrastructure (all components) against the current project area population. The Consultant will also study existing water supply infrastructure for the water demand area, to develop appropriate strategies for their capacities to handle additional incoming water from the water transfer scheme. All available documentation should be consolidated in the inception report and used to prepare the services detailed work plan. The water demands for the City of Francistown and all the villages supplied by the water scheme and project them to the design horizon and develop the appropriate strategies for meeting the demands using the existing water resource.

Task 2: Evaluate Capacity of the existing water source

The Engineering Consultant shall review the capacity of the abstraction system from the Shashe dam against the recommended safe yield of the Dam, as well as the projected water demand for the design period. Assess alternative water sources for augmenting water supply to the Greater Francistown Area, as well as integration of the Eastern Section surface water resources.

The Francistown Water Supply Master Plan Update 2000 Study assessed the 1:20 year yield of Shashe Dam as 68 ML/day. This was deemed enough to meet the projected water demands including existing mines in the Greater Francistown Area up to Year 2021.

The envisaged expansion of the Water Treatment Facility, and the prospects of raw water supply to the proposed Sese Coal Mine and Power Station, will necessitate provision of augmenting the Greater Francistown Area with the Eastern Section Surface water resources, by integration of the Dikgathong Dam to the Greater Francistown Area.

Task 3: Infrastructure Review

The consultant shall review capability of the existing Francistown Water Supply scheme resources and Infrastructure (all components) against the current project area population. The Consultant shall carry out an initial assessment of the project both by visiting the villages concerned, assessing the existing infrastructure for its condition and capacity.

At the end of this assessment the Consultant will submit an “Appraisal report” to the employer detailing his findings, shortcomings in the existing scheme and documentation and suggestions for improvements along with a complete programme of works up to assignment completion. This report should also include proposal of the staff input required for the suggested improvements, indicating the staffing criteria and period of engagement for each personnel for every task.

Assess the condition of the existing equipment and installations and recommend any refurbishment and/or replacement needs. To assess and make recommendations on the noted constraints of the scheme.

Task 4: Water Demand Analysis

- a) To study the water demands for the City of Francistown and all the villages supplied by the water scheme and project them to the design horizon and develop the appropriate strategies for meeting the demands using the existing water resource.
- b) Update on short term, medium- and long-term water demands based upon the 2011 Population Census Analysis and Projections.
- c) Review capability of existing resources and infrastructure (all components) against estimated water demands.
- d) Presentation of alternative future primary and secondary water supply infrastructure works.
- e) Financial impact analysis
- f) Dynamic Network analysis of the Francistown Water Supply Distribution system
- g) Implication of an expansion of the Corporation’s water supply assets on recurrent expenditure and man power needs.

Task 5: Alternative Analysis – Preliminary Engineering Design

Following acceptance by the Corporation of the Consultant’s recommendations relating to possible solutions and upgrading needs from the inception report, an alternative analysis and a preliminary design of the Water Supply Scheme should be prepared with the accuracy required to evaluate the possible alternatives for improving the system and obtain reliable preliminary cost estimate with an accuracy consistent to the referred design phase. cost estimates and fair view

of the total concept. The alternative analysis must be based on conceptual/ preliminary engineering designs. The analysis must consider technical, social, environmental, economic and regulatory aspects, recommending the preferred alternative to be detailed.

- a) Adequate consideration shall be given to the use of alternative materials for all design components. The Design shall provide the simplest possible and economically feasible alternative.
- b) They shall explain each alternative proposal considered during Preliminary Design. This shall include a detailed description, preliminary layout maps, and preliminary estimates of capital and recurrent costs up to the design horizon. The capital costs shall not only include the cost of materials and labour, but also overheads, preliminaries and general and contingencies. A summary of advantages and disadvantages of the various options where applicable.
- c) Carry out detailed surveys and production of plans showing land acquisitions required for the implementation of the works in a form suitable for submission to Land Board or other relevant authorities. The Consultant shall submit these drawings and relevant information to the Land Authority and obtain the necessary servitude and way leave for routing of pipelines once approved by the client. Detailed design of all project components such as intakes, pump works, concrete works, pipelines, reservoirs etc., mechanical and electrical elements and monitoring and control equipment. Relevant structural and hydraulic calculations as well as material and bar bending schedules shall be included in the Final Design Report.

The Preliminary Design Report must communicate amongst others the following;

- i. Lay-outs showing all the components of the proposed upgrades i.e. (pipelines, reservoirs, pump stations, etc.) indicating existing and proposed works.
- ii. Plans depicting the overall dimensions of the main components of the system.
- iii. Design calculations to determine the main dimensions of the system components;
- iv. Data and results of all test work including simulation models;
- v. Cost estimates of the recommended option.
- vi. Identification of any land rights requirements (if any).

Task 6 Environmental and Social Impact Assessment and Monitoring.

The Environmental and Social impact will consider the design alternative selected in Task 5, and the information provided by the preliminary engineering design.

The goal of this task is to conduct an environmental and social impact assessment of the actions proposed for expanding the Francistown Water Supply Scheme. The consultancy services shall focus the environmental and social license of all proposed activities, taking into consideration the requirements of the Botswana environmental legislation, the World Bank Safeguard Policies and the World Bank Group (WBG) Environmental, Health and Safety Guidelines. The analysis must include assessments for land acquisition and/or involuntary resettlement for servitudes and compensations.

To achieve the above goals, the ESIA shall focus on the following;

- (a) Review existing and available information.
- (b) Assess the environmental sustainability of the proposed works and its associated infrastructure.
- (c) Evaluate potential pollution hazards and propose mitigation measures in the form of an EMP.
- (d) Formulate and execute an effective public consultation program commensurate with the nature of the project.
- (e) Submit two copies of draft Scoping Report and Terms of Reference to WUC for comments and final report to DEA for review in accordance with Regulation 6 and 7 Environmental Assessment Regulations, 2012 respectively.
- (f) Prepare a Resettlement Action Plan including inventory of all lands, property and infrastructure to be affected including their valuation that will assist the process of potential compensation.
- (g) Survey and prepare an inventory of all land uses likely to be affected by the project.
- (h) Periodically update and/or advise WUC on issues that need to be addressed during the design stage.
- (i) Organize and Conduct Stakeholder meetings on monthly basis up to the end of the project. These will ensure that proper communication is distributed to both the client and all other relevant authorities;
- (j) Conduct Archaeological Impact Assessment (AIA) and submit the final report to Department of National Museum Monuments and Art Gallery for approval,

- (k) Prepare a draft detailed ESIA Report with Environmental Management Plan (EMP) and Social Impact Assessment Report inclusive and submit to WUC for comments.
- (l) The social impact assessment should be inclusive of vulnerable groups such as women, children, people with disabilities, the poor and the elderly.
- (m) Assess if there are vulnerable communities in the project area and if present, prepare a Vulnerable Community Plan for them.
- (n) Establish if there is a likelihood of labour influx to the project and have its mitigation measures clearly articulated
- (o) A clear Grievance Redress Mechanism of the project should be articulated in the report and monthly reports thereof.
- (p) Submit the final ESIA Report to DEA for review and approval.
- (q) Conduct environmental monitoring and supervision during construction through monthly inspections and audits as per the approved EMP.
- (r) Submit Monitoring monthly Reports to WUC and DEA.

The environmental studies should include an archaeological impact assessment. In keeping with the Botswana Government's concern with environmental issues, the Consultant will be required to fully investigate environmental, social, archaeological and other impacts that may be associated with the proposed works. The assessments will also have to comply with World Bank safeguard requirements on physical cultural resources.

In line with good governance as pertaining to the EIA Act, it might be ideal for the Consultant to engage an independent EIA specialist to undertake all EIA aspect of the project. The consultant will be expected to comment and advice on this bearing in mind the cost implications and considering that the project is executed in some areas which are already developed.

Should the EIA be carried out by a specialist other the one engaged by the Consultant, the Consultant shall liaise as much as possible with the specialist to inform his design and construction methods throughout the project cycle.

The Consultant will be expected, on approval by the Corporation of his preliminary design, produce the detailed design for the Water scheme upgrading works. The Design of the enhancement works must be inclusive of all its components such as, processes, plants, pumping plants, equipment, conveyance systems, storage systems, control systems, monitoring systems, security systems, implementation strategies etc. To transfer water to the desired destinations in the most efficient and cost-effective manner.

The Consultant shall proceed with the “Design” and produce “Draft Final Design Report” through to the “Final Design Report” including all requisite designs, drawings, reports etc. all to the Client’s satisfaction. Progression from each design stage will be authorized by the client. The consultant will be expected to study the water demands for City of Francistown all the villages supplied by the water scheme and project them to the 20 years’ design horizon and develop the appropriate strategies for meeting the demands through the existing water resources, as well as alternative means of supplying and/or augmenting water supply. He shall be expected to assess and make recommendations on the noted constraints of the scheme. The Consultant will also study existing water supply systems for the villages to develop appropriate strategies for their capacities to handle additional incoming water from the available water sources.

It is also important that close consultation is maintained with relevant bodies such as the WUC, Ministry of Land Management & Water and Sanitation Services, Ministry of Local Government and Rural Development (MLGRD) and Department of Town and Regional Planning, Department of Water Affairs, Roads Department, Department of Mines, and all other departments, authorities, community organs deemed important for this project. The Consultant shall also produce Operations and Maintenance Manuals for the scheme.

During the detailed design stage, the Consultant is required to design the scheme within the following guidelines:

- a) The designs shall propose an appropriate and simple operated and maintained installation. Investigation of Topography, geology, soil conditions, vegetation and monthly climatic variations including temperature, rainfall and evaporation.
- b) Investigation of existing and proposed infrastructure, institutional, industrial and commercial development, availability of electricity.

- c) Produce detailed drawings for the proposed raw water abstraction, treatment and transfer scheme, which will be the property of the client and can be used anywhere else without authority and further payment to the consultant.
- d) All materials, pipes, valves, fittings, pumps, etc., used in the scheme, shall meet the requirements of the relevant Botswana Bureau of Standards (BoBS), South African Bureau of Standards (SABS), British Standards (BS) or any other internationally recognized specifications, and test certificates shall be produced as proof of compliance.
- e) All pumps that are provided in the process should be electrically driven and must have a specific guarantee period, and the system shall have diesel power generator sets on stand-by.
- f) Approval of the design of the scheme by the client shall not relieve the Consultant of his liability to ensure that the scheme delivers required amount of water from the sources to all designated water demand areas in the Greater Francistown Area.
- g) Carry out detailed surveys and production of plans and profiles, as well as the precise siting of all installations including but not limited to various elements of intakes and pipe routes.
- h) The Consultant shall liaise as much as possible with EIA consultant to inform his design and construction methods throughout the project cycle.

The Consultant is also required to provide the following:

- i. Capital cost of the recommended options, accuracy L: -5%; H: +10%.
- ii. The annual running cost of the scheme e.g. costs of consumables and power consumption. The annual maintenance costs.
- iii. State factors which may affect the effectiveness of the scheme.
- iv. The preparation of draft and approved Final Construction Drawings. Approved Final Construction Drawings shall be prepared in reproducible form on approved permanent material and electronically. The drawings shall be dimensioned in metric units and produced on "A1" metric format. These drawings shall typically include but not be limited to:
 - v. Plans of existing Water supply system,
 - vi. Key plans, showing location, general arrangement and schematic layout of the recommended proposal,
 - vii. Plans and longitudinal sections of the pipelines, pipe trenching and bedding details,
 - viii. Plans indicating locations where electrical power is required.

- ix. Detailed setting out and construction drawings for all project components including details of pipe connections, bar bending schedules,
- x. Details of road, railway and river crossings of pipelines,
- xi. Various chamber details and connections for different types of fittings,
- xii. Auxiliary items such as culverts, anchor and thrust blocks, marker posts, fences etc.

Task 8 Tender Documentation and Management.

The Consultant shall progress to Preparation of Tender Documents only after Client's written approval of the Final Design Report and after receiving specific direction to proceed to the next stage.

The Consultant shall be responsible for tender documentation, tendering, evaluation up to and including recommendation to award. Any such direction stated above, may include special instructions which shall be complied with. Draft and Final Tender documents shall consist of:

- a) Instructions to tenderers, which shall not form part of the contract documents, should among others include:
 - (i) Details of documents to be submitted with tenders, including a programme and a general description of the arrangements and methods of construction together with tenderers' legal and financial status, technical experience, key personnel and equipment available for use on the contract,
 - (ii) The place, date and time for the delivery of tenders,
 - (iii) Instructions and arrangements for visiting site,
 - (iv) Instructions on whether tenders on alternative designs will be considered, and if so the conditions under which they may be submitted,
 - (v) Notes drawing attention to any special Conditions of Contract, materials and methods of construction to be used and unusual site conditions,
 - (vi) Instructions on completion of the Bill of Quantities,
 - (vii) Production of tender and performance bonds.

- b) Form of tender and Conditions of Contract comprising:

- (i) Part I - General Conditions, in accordance with the provisions of the Bank Harmonized Edition of the Conditions of Contract for Construction prepared and copyrighted by the International Federation of Consulting Engineers (Fédération Internationale des Ingénieurs-Conseils, or FIDIC), FIDIC 2010-All rights reserved.
 - (ii) Part II - Conditions of Particular Application, setting out variations and additions to Part 1.
- c) Specifications comprising:
- Standardized South African Bureau of Standards Specifications SABS 1200,
 - Project Specifications which set out:
- Variations and additions to the relevant Standardized Specifications that are applicable to the Works / Scheme,
- ii) Particular Specifications for sections for which no Standard Specification exists,
 - iii) Any other relevant or additional clauses.
- d) Bill of Quantities (BOQ) drawn up in accordance with procedures set down in South African Bureau of Standards (SABS) 1200. The Method of Measurement used shall be as specified in clause 8.1.1 of SABS 1200 A - General. The specific clause(s) in the Standard or Project Specification(s) to which the bill item refers to shall be indicated in a separate column in the BOQ.
- e) Complete construction drawings.
- f) Data affecting the execution of works such as site investigation reports available to the Employer, details of access etc.
- g) The Form of Agreement.
- h) The Performance Bond.

Recommendation for contract supervision and time schedule for project completion

8 CONSULTANT QUALIFICATION

8.1 CONSULTANT EXPERIENCE

The Consultant must have completed at least two (2) similar works in terms of scope, complexity and value. Previous or current assignments on projects of similar background in Botswana and/or other countries with similar characteristics for the past 10 years as lead consultant should be documented.

For Consultants domiciled in Botswana, they must be PPADB registered in the following category: Code 303 (Civil Engineering) Sub-Code 08 (Water Supply). International consultants must submit Certificate of Incorporation/relevant registration documents from the respective countries.

8.2 KEY PERSONNEL

All key staff required should be registered with relevant regulatory bodies from their countries or must be eligible to be registered by Engineers Registration Board (ERB) of Botswana before the start of the project. Details of key staff are as follows;

The Project Manager and other key personnel required for the assignment and their qualifications are as follows

Table 1: Key Personnel

KEY PERSONNEL	QUALIFICATIONS	ESTIMATED TIME INPUT (MAN MONTHS)
Project Manager	Qualification (B. Eng. /B.Sc., Project Management, Engineering), 15 Years or more relevant experience. Should have been a Project Manager in at least 2 projects of similar nature and magnitude	8
Design Engineer (Water/Hydraulics)	Qualification (B. Eng. /B.Sc., Civil/Water Engineering), At least 10 Years relevant experience. Should have been a design engineer (Water/Hydraulics) in at least 2 projects of relevance to this assignment	12
Design Engineer (Civil & Structural)	Qualification (B. Eng. /B.Sc., Civil/Structural Engineering), At least 10 Years relevant experience. Should have been a Design Engineer (Civil/Structural) in at least 2 projects of	12

	relevance to this assignment. Experience in water retaining structures is required.	
Geotechnical Engineer/ Specialist	Qualification (B. Eng. /B.Sc., Civil, Geotechnical Engineering or related), Registered with relevant professional body. At least 10 Years relevant experience. Should have been a Geotechnical Engineer/ Specialist in at least 2 projects of relevance to this assignment. <i>In a case of engagement of specialist company, a full company profile must be submitted to indicate relevant credentials of proposed staff.</i>	8
Environmental Specialist	Qualification (B. Eng. /B.Sc., Environmental Engineering /Science or equivalent), Registered with relevant professional body. At least 10 Years relevant experience. Should have been an Environmental Specialist in at least 2 projects of relevance to this assignment. <i>In a case of engagement of specialist, a full company profile must be submitted to indicate relevant credentials of proposed staff.</i>	8
Water Resources Specialist	Qualification (Minimum B Eng. in Civil Engineering, with specialization in hydrology/water resources management or equivalent) Registered with relevant professional body. At least 15 Years relevant experience in water resources management, including the development of water master plans and feasibility studies for large water supply schemes.	8

The above staff is indicative. The consultant may propose additional key and non-key staff to ensure successful completion of the task. However, the consultant should ensure that the financial proposal includes these additional staff. The consultant must provide all required staff to carry out all the stated tasks and other duties in the project.

9 PROJECT OFFICE

The Consultant will be expected to operate from his premises and will undertake all such necessary visits to the project area as necessary.

It is expected that all cost and overheads associated with such an establishment will be clearly presented to ensure fair and just assessment of the consultancy costs.

10 OBLIGATIONS OF THE CLIENT

The Client shall:

- a. Supply free of charge all available pertinent data and information requested by the Consultant that is in its possession. This will include reports of previous studies both for the Corporation and other organisations which are relevant to this assignment and are stored in the Corporation Library. The Client, however, shall not be held responsible for the documents' accuracy and correctness. The Consultant, where necessary, shall verify the accuracy and correctness of such data supplied to him.
- b. Assist the Consultant to obtain required approvals, licenses and permits from central or local government departments or statutory authorities having any jurisdiction over or connection with the Works and services.
- c. Give prompt consideration to all reports, proposals, recommendations, drawings sketches, specifications, tenders, contracts and any other documents relating to the Project submitted by the Consulting Engineer to the Client so as not to cause delay to the performance of the services of the Consulting Engineer.
- d. Assist the Consultant to obtain all necessary entry and exit visas, residence permits, exchange permits, and any other documents required for their stay in the Botswana.
- e. Assist in facilitation of prompt clearance through customs of any property required for the Services.
- f. The Corporation will attach staff to the project that will assist the consultant on the assignment. The attached staff will be for assistance only, any failure or delays on the study the attached staff will not be held responsible, all risks remains on the hands of the consultant. The client also expects capacity building of the attached staff by the consultant.

- The Client shall make available to the Consultant free of charge such professional and support counterpart personnel, to be nominated by the Client. However, the Client reserves the right to withdraw their services.
- Professional and support counterpart personnel shall work under the exclusive direction of the Consultant. If any member of the counterpart personnel fails to perform adequately any work assigned to such member by the Consultant that is consistent with the position occupied by such member, the Consultant may request the replacement of such member. The Client shall reserve the right to replace such personnel

11 OBLIGATIONS OF THE CONSULTANT

The obligations of the consultant are below.

- a. The consultant will be responsible for the application for work permits for all staff and all associated risks will remain with the consultant. None approval of work permits shall not attract costs to the client or relieve the consultant of the contractual obligations.
- b. Health insurance of the consultant staff will be covered under the consultant's expenses.
- c. The consultant must make sure that all staff that require registration must be registered before commencing of the project e.g. technical personnel must be registered with Engineers Registration Board (ERB).
- d. The consultant is liable to monitor the quality of the project. All quality controls must be set by the Consultant and approved by the Client.
- e. The Consultant must adhere to all the relevant standards and make sure that the
- f. Designs meet the national standards or internal standards or best practices where there are no national standards.
- g. The consultant will be responsible for the accommodation and transportation of their staff.

- h. The consultant must include all activities to be covered by the assignment.
- i. The Consultant shall provide appropriate expert professional personnel and exercise all reasonable skill, care and diligence in the performance of the Services. The Consulting Engineer shall carry out all his responsibilities in accordance with the highest ethics and general practices of his profession.
- j. The Consultant shall in all professional matters act as a faithful adviser to the Client.
- k. The Consultant shall arrange regular meetings with the Client to keep him abreast of the Consultant's progress in the performance of his duties.
- l. The Consultant shall obtain Client's approval to engage specialist consultants or contractors directly to perform services necessary to enable the Consultant to perform the services required of him
- m. The Consultant shall sign all drawings and other documents certifying to their correctness and bear responsibility for their work.
- n. The copyright of all documents prepared by the Consultant in connection with this Assignment rests with the Client.
- o. All reports, maps, drawings, notes, calculations, computer software developed for this study, aerial photographs, specifications, statistics and other technical data compiled or prepared and other material used in performing the services shall be the property of the Client and shall be delivered to the Client before final payment can be made and shall not be used for any purpose not related to the services under this Agreement without the prior written approval of the Client.
- p. The Consultant shall establish an office in Botswana during the execution of the project.

12 DELIVERABLES

The consultant must submit all deliverables in a report form (also in CD format) and make presentations to the client where required. All reports shall be in 'A4' format, bound with cover page clearly stating the project name. All drawings must be in minimum A3 format. WUC review period shall be up to fourteen (14) working days after submission of reports. The table below details deliverables in this assignment:

Table 2 Details of deliverable and time lines

Item	Deliverables	By When
1.	Task 1 -Inception report	Within 2 weeks after contract signing
2.	Tasks 2, 3 & 4.	Within 4 months after contract signing
3.	Task 5 – Alternative Analysis – Preliminary Engineering Design Draft	Within 4 months after concluding tasks 2, 3 and 4.
4.	Task 5 – Alternative Analysis – Preliminary Engineering Design – Final Version.	1 month after approval of the task 5 preliminary report.
5.	Task 6 – Environmental and Social Impact assessment.	5 months after approval of the Preliminary Engineering Design.
6.	Task 7 - Final Design Report (Detailed Engineering Design)	2 months after approval the Preliminary Engineering Design.
7.	Complete set of final Drawings in reproducible form for Employer's approval	1 month after approval of Draft Design Report
8.	Draft Tender documentation	To be submitted with ESIA report
9.	Final Bill of Quantities	3 weeks after Final Design Report
10.	Final Tender documentation including final drawings & BoQ	1 month after approval of Final Design Report

Table 3 – Time Activity chart for the deliverables.

	Time (months)	1	2	3	4	5	6	7	8	9	10	11	12	13
Activity														
Task 1 - Inception	1/2 month													
Task 2,3 & 4	4 months													
Task 5	4 months													
Task 6	5 months													
Task 7	2 months													
Task 8	3 months													
Total Duration	15 months													

13 PAYMENT SCHEDULE

Payment will be made after approval of the Final Reports. The first payment will be made after approval of the Inception Report. The proposed payment schedule for the consultancy are as in the table below.

Table 4 Payment Schedule

Item	Deliverables	Payment (% of total for this phase)
1.	Task 1 - Inception report	10%
2.	Tasks 2,3 and 4 Final Report	5%
3.	Final Design Report including Final Drawings, Final Bill of Quantities, as well as ESA (Tasks 5,6 & 7)	55%
4.	Final Tender documentation	25%
5.	Tender Adjudication Reports	5%

14 STANDARDS AND DESIGN CRITERIA

The Corporation has a guideline outlining parameters used for designing water supply infrastructure, but this is not a Corporation policy document. The guideline consists of some other parameters which are more of specifications than of design. The Corporation has a set of specifications and standard details which the Consultant will be expected to refer to in addition to his own.

There are some parameters, which by nature of the study will be reviewed and these are not limited to the following; peak factors, unit consumption, water losses, pipeline friction factors, pipe materials and sizes, valves and meters. The Consultant is encouraged to request deviation if he is able to justify such deviation. The adoption of new parameters shall be with the agreement of the Corporation.

Existing installations should, wherever possible, be incorporated in the future system, or at least phased out over a period of time, rather than immediate replacement assumed.

The scheme shall be designed with a maximum degree of uniformity, simplicity and standardization.

Under no circumstances should there be any deviation from the Corporations Standards and Design criteria without any consultation/approval of the Corporation.

15 INFORMATION AND LIAISON

Maps and Development Plans of the project area are available from the Department of Surveys and Mapping (DSM) and the Department of Town and Regional Planning (DTRP). The Consultant will be responsible for procuring all mapping required for this project. The Consultant is advised to include in his financial proposal any additional topographical work considered necessary to obtain supplementary information of the project area for the purposes of the project.

Much of the information on the subject is available via published reports both for the Corporation and other agencies including the NWMP.

Co-operation with the Authorities. The Consultant shall liaise with all authorities involved in the project. The Corporation shall be represented in the project by the Technical Services Director (TSD) who shall maintain continuous and direct liaison with the Project Team. The Consultant will provide a senior team leader, who will be their representative for the duration of the project, and he will consult and liaise with the client on all matters. A Steering Committee will be formed with representatives from the Corporation.

16 DURATION OF THE ASSIGNMENT

Since there will be several parties involved in the project whose views and interests are to be considered and reflected in the study, the schedule must allow for enough time for the discussion and approval of the various reports. The estimated review period by the client is 10 days.

The total project period will be thirteen(**13**) months, which includes the time required for examination and approval of the different reports. Where consultants believe that this period can be shortened, they could state this with reasons.

The Consultant shall commence work not later than one calendar month from the date of the notice to proceed. The Consultant shall submit to the Corporation the reports and documents covering all the work performed by him as described in these terms of reference. All reports shall be presented in quantities as prescribed in Table 2 above and

shall include all the relevant data, maps, diagrams and other documents as appropriate. In addition, the final report version and all related maps, diagrams or drawings shall also be submitted in electronic duplicable formats as required. This shall be further developed and confirmed during the execution of the Consultancy.

17 REPORTING

The Corporation shall be represented in the project by the Projects Manager (PM) who shall be appointed by the Technical Service Director. The Project Manager shall maintain continuous and direct liaison with the WUC Project Team. The day-to-day running of the project will be coordinated by Project Manager and all communication shall be done through the Project Manager. The Consultant shall provide a Team leader, who will be their representative for the duration of the project. The Team Leader shall report to, consult and liaise with the Client's Project Manager on all matters. Water Utilities Corporation will form a Project Team comprising of relevant expertise to oversee the project up to its completion. The consultant will report to this team on progress towards all deliverables.

18 PROJECT MEETINGS

The Project Manager appointed by Water Utilities Corporation will assist the Consultant in obtaining information required for the successful completion of the assignment. The Consultant shall do likewise. Meetings which require WUC senior management where major decisions will be made, such as Steering Committee, will be held in Gaborone. Other meetings which are of course important but mainly technical by nature will be held in Francistown. The timing and frequency will be decided during the Consultancy. The Consultant will meet costs of preparing minutes and reports, printing of reports and minutes and other associated expenses.

19 PROCEDURE FOR SUBMISSION AND EVALUATION

19.1 General

The Corporation adopts a two-stage process of tender evaluation (Technical Evaluation & Financial Evaluation) which maintains quality as the paramount requirement. To aid the evaluation of the proposals, it is essential that the proposals follow the following format and include the information specified below: -

(Only in exceptional circumstances can deviation be accepted, and, in such cases, this must be fully explained and justified)

- i) Table of Contents
- ii) List of Tables and Drawings
- iii) Introduction and Summary
- iv) Technical Discussion and Approach to Work
- v) Consultant's Past Experience
- vi) Project Management and Staffing
- vii) Facilities and Equipment
- viii) Key Personnel Experience

19.2 Details of the Report Format

The following elaboration expands on the contents of some selected components in the report format.

a) Introduction and Summary

- i. The proposal shall start with a clear description of the Consultants' understanding of the project indicating what aspects he conceives to be most important.
- ii. The Consultant shall thereafter present an outline of how the project will be approached linking all the individual tasks and project components.
- iii. The Consultant shall identify possible problems and constraints to the design study and explain what he will do to remove or overcome such foreseen hindrances.
- iv. The Consultant shall seek clarification from the client in cases where he finds the Terms of Reference unclear. In the event an omission of a very important item is brought up, all the Tenderers will be duly informed to avoid any prejudice against any of the Consultants.
- v. The Consultant may conclude this part with comments on the Terms of Reference. The Consultant is in this particular context free to suggest amelioration's and/or additions to the given Terms of Reference which he feels will result in a better or more cost-effective

project. However, there must be no ambiguities or confusion in what is being covered by the proposal and what would be considered as desirable but will not be covered by the presented cost proposal.

- vi. Any alternative offer shall be accompanied by full explanations and justification for the proposed additions, modifications or any deviations. Alternative offers must also be submitted with a binding cost proposal.

b) Technical Discussion, Approaches to Work

This section shall contain the main technical proposal. It shall be presented in as much detail as necessary to give a clear indication of what is included as work items and degree of detail. Lengthy discussions of methods should be avoided.

- i) A logic flow network which clearly shows the interdependence of various tasks.
- ii) A bar chart showing time estimates for the various activities
- iii) Principles and techniques that will be applied in the performance of the project, difficulties anticipated and expected degrees of success.
- iv) Clear statements as to what degree of detail each individual project component will be studied and in what form it will be presented.
- v) Complete and detailed description of inputs including the functions and responsibilities of all key personnel the consultant will employ for the project.

c) Consultant's Past Experience

General experience and background of the Consultant on similar work must be documented. Previous or current assignments of projects of similar background in Botswana and/or other countries with similar characteristics should be separately documented.

d) Project Management and Staffing

This section shall include the following: -

- i) Time schedule showing each specific task.

- ii) Personnel scheduling chart identifying each individual by name and his discipline and showing on a Gantt chart the estimated number of man-months each individual will be used on the project.
- iii) A short description of the 'key personnel' with their experience and anticipated tasks in the performance of the project. Only in exceptional cases and after full justification can change in the key-personnel be allowed after the offer is submitted. Under any circumstances, the qualifications and experience of the replacement must be at least equal to or higher than that of the originally proposed candidate.
- iv) There should be an office organisation in Botswana to support the Project Team.
- v) Specific additional personnel and sub-contractor which are to be used, with full details of source, qualifications, etc. including curriculum vitae of all additional personnel listed.
- vi) Estimate of travel required, including origin, destination and number of trips with substantiation of the purpose and need for the proposed travel

e) Facilities and Equipment

This section should include a statement of office facilities, available plant, laboratory, equipment, facilities, etc., proposed for the project.

The Consultant shall include an explanation of the applicability of the equipment to the programme with substantiation of the need. The Consultant shall also give an estimate of the extent of subcontracting anticipated, together with a list of items to be subcontracted with the names of the planned sub-contractors.

APPENDICES

Appendix I. Greater Francistown Location Map

Greater Francistown Location Map

