WATER SERVICES DEPARTMENT
Ministry of Public Infrastructure, Energy, Utilities & Domestic Transport

"Water is Life, Every Drop Counts"

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TERMS OF REFERENCE FOR GROUNDWATER DRILLING SERVICES AND CONSUTRCTION OF PUMP HOUSES FOR THE GOVERNMENT OF ST. KITTS

1. INTRODUCTION AND BACKGROUND

The Government of St. Kitts & Nevis (GOSKN) - Water Services Department, through the Public Works Department is seeking qualified contractors to submit proposals for the drilling of groundwater wells to support the country's ongoing water supply and sustainability efforts. This Terms of Reference outlines the scope of work, project requirements, and terms of engagement for the successful contractor to execute the drilling works. Geophysical surveys to assess the best drilling sites have been initiated and results will be provided to the successful bidder.

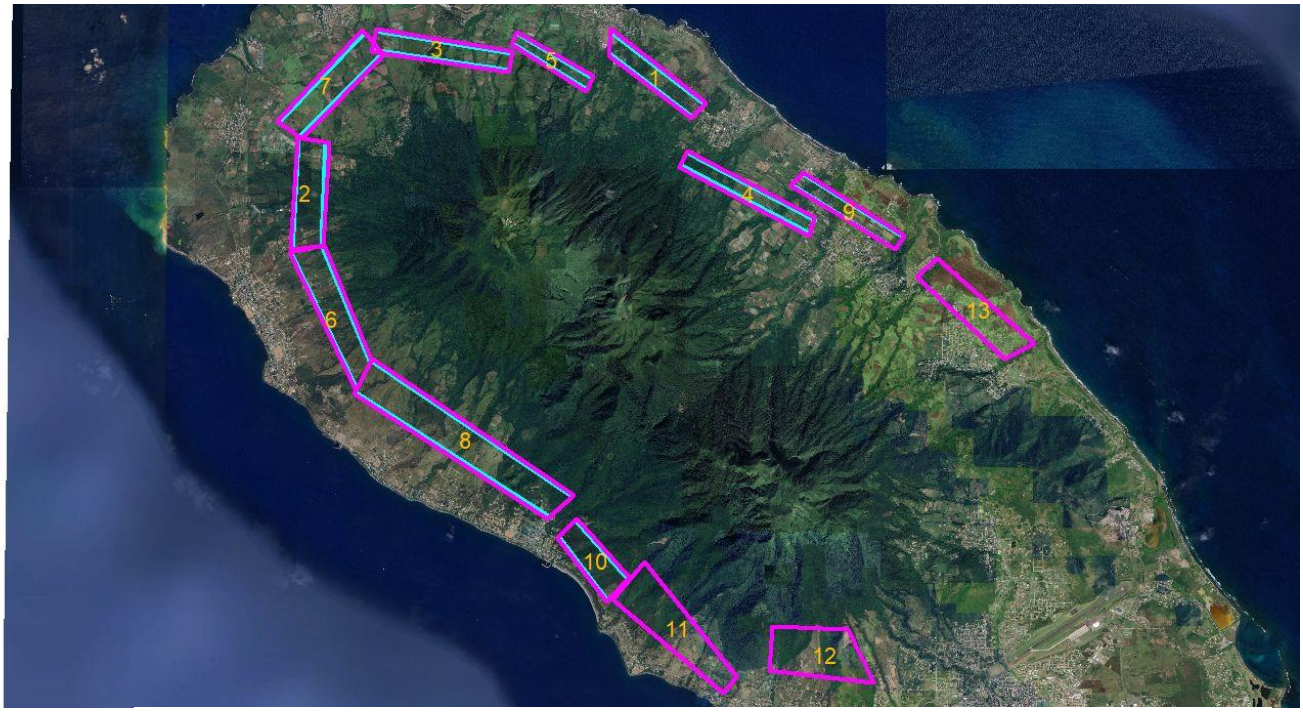

Figure 1: Map showing prioritized target groundwater drilling zones in St. Kitts

Extensive preliminary work was undertaken to determine the most favorable locations for groundwater drilling. This effort involved a comprehensive analysis of various datasets, including hydrogeologic, topographic, cultural, and pipeline data, which were utilized to select zones with high potential for successful drilling operations.

The selected zones were carefully prioritized based on their accessibility, the minimum presence of cultural interference, and their elevation, which ranges from 200 to 500 feet above sea level. The focus was also placed on areas where the development of groundwater resources could significantly alleviate water shortages.

These zones are clearly marked on the attached map. Within each zone, ground-based survey lines have been established, represented in blue on the map, which run just inside the boundaries of the favorable zones.

This survey data will guide the subsequent drilling operations, ensuring that the selected sites are optimal for the construction of new groundwater wells that meet the needs of the local population.

1.1 Project Goals

The objective of this project is to drill new groundwater wells in strategic locations identified through the geophysical survey results. The wells should provide a sustainable and reliable source of potable water to meet the demands of St. Kitts' growing population and development needs.

1.2 PROJECT SCOPE

The scope of the groundwater drilling project includes the following tasks:

Drilling Works

Perform drilling operations at each selected site, ensuring that the well depths, diameters, and construction meet the specifications outlined by GOSKN. One borehole will be drilled for each identified site.

Supply and Installation of Casing and Screen

Supply and install casing and screen materials at each drilled site to ensure well integrity, prevent collapsing, and facilitate water extraction.

Supply and Installation of Gravel Pack

Provide and install a gravel pack of selected material around the well screen to enhance filtration, prevent clogging, and improve water flow into the well, unless otherwise specified by the Owner.

Well Development

Implement necessary well development techniques, such as airlifting, surging, or other accepted well-cleaning methods, to enhance well yield and improve water quality.

Construction of Sealed Wellhead with Cement Grouting

Construct a sealed wellhead for each well, including cement grouting around the borehole annulus to prevent contamination and ensure structural integrity.

Test Pumping of Drilled Well

Conduct test pumping of the drilled well to determine its discharge capacity and evaluate

hydraulic properties. This will include step-drawdown tests to assess the well's performance.

Flushing/Redevelopment and Pump Testing of Existing Borehole

For existing boreholes, perform flushing and redevelopment to restore yield and enhance water quality. Conduct pump testing to evaluate the operational capacity of the newly constructed wells.

Water Quality Testing

Conduct water quality analysis for each well to ensure the water is safe for potable use, meeting World Health Organization (WHO) standards. This includes chemical, physical, and biological testing of the groundwater.

Construction of Pump House

Construct a pump house to house the pumping equipment and associated systems. The pump house will be an 8' x 14' x 9' structure designed for durability and ease of access. Additionally, a 13' x 14' platform will be constructed for an external generator. The construction will include:

- Foundation works, walls, and roofing.
- Installation of doors, windows, and ventilation.
- Electrical and plumbing works as required.

Completion and Handover

Provide GOSKN with fully functional, tested, and commissioned wells, along with the constructed pump house and generator platform. Ensure all required documentation is included, such as as-built drawings, well construction details, pump house specifications, test results, and a comprehensive completion report.

2. SCOPE OF WORK

2.1 Preliminary Activities

Geophysical Survey Interpretation

The contractor shall work closely with GOSKN to review and understand the results of the geophysical surveys conducted to identify promising drilling sites. The location and depth of the boreholes will be determined based on the results of the geophysical surveys.

Site Access and Preparation

The contractor is responsible for organizing site access and preparing the site for drilling, including clearing vegetation, constructing access roads, and ensuring the safety of the site.

2.2 Drilling and Well Construction

Drilling

Drilling diameter shall be in accordance with the geophysical data and the specifications provided by GOSKN.

Drilling shall use rotary or percussion drilling methods, depending on the geological conditions encountered.

Ensure borehole stability and prevent caving by utilizing appropriate casing and borehole stabilization techniques.

Soil Sampling and Analysis/Classification

The contractor will collect soil samples at various depths during the drilling process. These samples will be analyzed for geological classification and other relevant parameters that will help in the proper design and construction of the well.

Borehole Casings and Screens

Casing Installation
If the casing is cracked or damaged, it will not be installed. The contractor must ensure that all casings are intact before installation. The bottom of the screen casing must be closed properly to prevent sediment from entering the well.

Casing and Screen Placement:
When installing casing and screens, they should pass easily into the borehole under their own weight, without requiring force. If casings do not fit properly, they must be removed, and the borehole must be reamed to remove any blockages or misalignment, at the contractor's expense.

Temporary Casing
The contractor will bear the full cost of supplying, installing, and removing any temporary casing. The contractor may not claim for temporary casings that are left in the borehole if they cannot be retrieved.

Borehole Development

The contractor is responsible for providing all necessary equipment, including pumps, compressors, bailers, or other tools required for borehole development. The contractor must employ approved methods to maximize specific yield and to extract as much sediment as possible from the screened formations to enhance well capacity.

Depth and Yield Test

The final depth of the well shall be determined by the Owner based on the geology and yield potential.

Test Pumping

- **Test Pumping Setup**
  The contractor will conduct test pumping to establish the performance and yield of the borehole. The necessary equipment, such as submersible pumps, generators, dip meters, and flowmeters, will be provided by the contractor.

- **Pump Installation**
  The contractor shall install a pump with a non-return valve at the intake, allowing measurement of recovery. A throttling device should be fitted to control the discharge rate.

- **Continuous Discharge Drawdown Test**
  The contractor shall conduct a 72-hour continuous discharge drawdown test at a specified rate, followed by a recovery test.

- **Flow and Water Level Measurement**
  The contractor will install and maintain equipment for measuring water flow (e.g., flowmeters) and a dipper for measuring water levels.

Well Development

Perform well development procedures to remove any drilling-induced turbidity and enhance water flow, including airlifting and surging techniques.

2.3 Equipment Installation

Pump Installation

Install submersible pumps, pipework, and related components, ensuring that the pumps are capable of producing the expected yield at the required pressure levels.

Ensure proper installation of electrical connections, including control panels, submersible cables, and any associated monitoring equipment.

Such pumps and electrical panels are to be specified & sourced by the Contractor after approval by the Owner.

Power Supply

The GOSKN will provide power to the well sites, but the contractor is responsible for ensuring that all electrical connections and equipment are compatible with the existing power systems.

2.4 Water Quality Testing and Reporting

Water Sampling

Collect water samples from the newly drilled wells for laboratory analysis to ensure compliance with WHO standards (e.g., potable water guidelines, chemical, biological, and physical tests).

The contractor is responsible for water sample testing for the following parameters:

Ca, Mg, Na, K, Fe, Mn, Cl, SO_4, NO_2, NO_3, NH_4, Total Nitrogen, Pb, Orthophosphate, Total Hardness, Total Alkalinity, Temperature, Fluoride, Arsenic, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), pH, Colour, Turbidity, Electrical Conductivity, and Fecal Coliforms.

The testing will be carried out by a certified laboratory that complies with World Health Organization (WHO) standards.

Reporting

Provide detailed water quality reports to SKWSD for each well tested.

2.5 Wellhead and Pump Line Connection Details

The contractor shall construct the wellhead and install the necessary fittings to connect the pump line to the water delivery system. The typical configuration is shown in the provided drawing in **Figure 2.**

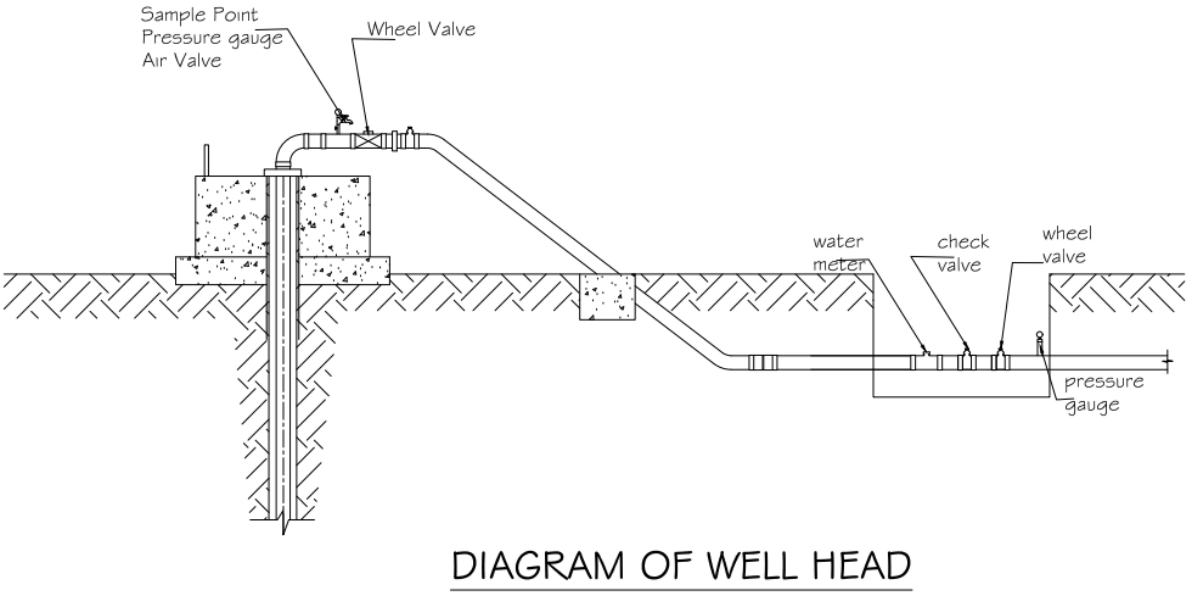

Figure 2: Drawing of Well Head

The contractor's responsibilities shall include:

- Construction of the wellhead, including casing and cement grouting.
- Installation of the pump line from the submersible pump to the wellhead.
- Installation of fittings, valves, and other required components up to the water meter.

Protection Box

After the completion of drilling, development, and pump testing, the contractor shall construct a protection masonry box over the well with a proper foundation to safeguard the wellhead.

2.6 Documentation and Handover

Reports, borehole log and test pumping log

During the drilling, well development and pump testing, the contractor will keep accurate activity records, using agreed data collection formats.

On completion of all works, the Contractor shall submit to the Owner a set of reports comprising Borehole Completion Report including borehole log, pump test Report in both hard and electronic copies and Water Quality Analysis Report.

Daily Record

- Site name
- Co-ordinates of borehole (Easting & Northing)
- Date of reporting
- Names of foreman and drillers
- Method of drilling
- Diameter of hole
- Depth of hole at start and end of shift or working day
- Description of strata drilled with depth of transitions encountered.
- Depth of intervals at which formation samples are taken.
- Water level at the start and end of each working day
- Electrical conductivity measurements during test pumping
- Problems encountered during drilling.
- Details of installations in the borehole (if any)
- Depth and description of well casing
- Depth and description of well screens

Daily Record

A copy of the Daily Record shall be made available on daily basis to the Employer, and should include any other pertinent data as may be requested by the engineer.

As-Built Drawings

Upon completion of the works, the contractor shall provide as-built drawings of the wells, including all relevant details such as well depth, casing configuration, pump specifications, and electrical connections.

Testing and Performance Records

Submit records of all performance tests, including step-drawdown tests, yield data, and water quality test results.

2.7 Health, Safety, and Environmental Considerations

Health and Safety

The contractor must adhere to all applicable safety regulations and standards during the execution of the works. All staff must be trained in safety procedures and equipped with necessary personal protective equipment (PPE).

The contractor must provide a portable toilet on-site to ensure adequate sanitary facilities for all workers**.**

Environmental Protection

The contractor must implement all necessary measures to minimize environmental impact, including the safe disposal of waste materials, protection of surrounding vegetation, and careful management of water resources during drilling operations.

Site Restoration

Upon completion of the drilling, development, and pump testing, the contractor shall clear the site, removing all debris, hydrocarbons, and waste. All pits must be backfilled to the approval of the engineer.

2.8 Acceptance of the borehole

The well shall only be accepted by the Employer upon satisfactory completion of all drilling operations, installation of casings and screens, development works and test pumping as per Terms of Reference.

Other Conditions

Loss of equipment

Any equipment lost down a borehole must be removed, or the borehole will be considered a failed borehole. In such an event a replacement borehole will have to be constructed and tested at the contractor's expense.

Lost /abandoned Borehole

Should any incident to the plant, jamming of the tools or casing, or any other cause prevent the satisfactory completion of the works, a borehole shall be deemed lost and no payment shall be made for that borehole or for any materials (used or not recovered) or time spent.

In the event of a lost borehole, the contractor shall permanently seal the bore and construct a borehole immediately on other suitable location indicated by the geophysical survey. The option

of declaring any borehole lost shall rest with the contractor and is subject to the approval of the Employer.

An abandoned borehole shall be treated as follows:

- The contractor may salvage as much casing from the borehole as possible and use it in the alternative borehole upon approval of Employer.
- The lost borehole shall be sealed by concrete, cement grout or neat cement.
- The upper 2 meters of the borehole shall be backfilled with native soil. Sealing of the borehole shall be done in such a manner as to avoid accidents and to prevent it from acting as a vertical conduit for transmitting contaminated surface or subsurface waters into the water bearing formations.

2.9 Construction of Pump House

The contractor shall undertake the design and construction of a pump house at each well site to ensure the safe housing and operation of pumping equipment. The construction of the pump house includes the following tasks:

Design Specifications

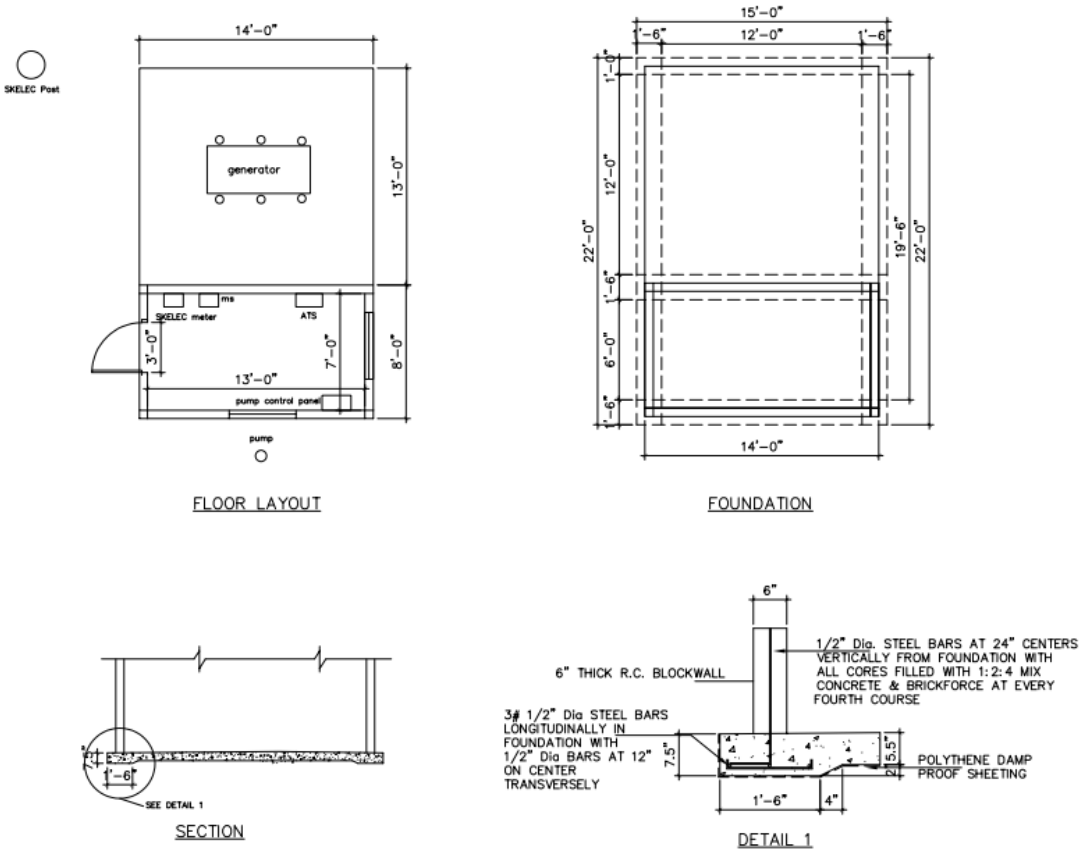

Figure 3: Drawing of Pump House

- The pump house must be designed to house the pumping system, electrical panels, monitoring equipment, and any associated accessories.
- The structure must provide adequate space for maintenance and operation activities.
- The pump house should be designed to withstand local environmental conditions, including high winds, heavy rainfall, and exposure to sunlight.

Construction Details

Foundation

Construct a reinforced concrete foundation designed to bear the load of the pump house and its equipment. The foundation design should adhere to the specified dimensions provided by GOSKN or as determined during the site assessment.

Superstructure

Build walls using durable, weather-resistant materials such as reinforced concrete blocks or equivalent.

Construct the roof as a reinforced concrete slab with appropriate thickness and reinforcement, designed to withstand local weather conditions and loads.

Ensure the roof slab has a slight slope or drainage system to prevent water pooling.

Provide adequate ventilation to maintain safe operating conditions for electrical and mechanical equipment.

Include lockable doors and secure windows for protection against unauthorized access.

Electrical and Mechanical Integration

Install conduits and fittings for electrical connections between the pump house and the well equipment.

Ensure sufficient space and provisions for the safe and secure installation of control panels, instrumentation, and monitoring devices.

Drainage System

Design and construct a drainage system to prevent water pooling within or around the pump house.

Lighting and Safety

Install internal and external lighting to ensure safe operation and maintenance activities.

Provide safety signage and equipment such as fire extinguishers as required.

Finishing and Painting

Plaster and paint interior and exterior walls with weather-resistant and protective coatings.

Apply anti-corrosion treatments to all metallic components.

Documentation and Handover

Submit as-built drawings of the pump house, including dimensions, materials used, and installed equipment.

Provide maintenance and operation manuals for the pump house and its systems.

3. END OF CONTRACT REPORT

The Contractor is required to prepare an end of Contract report, which should address at the minimum the following issues.

1. The site location
(Suitability, accessibility)

2. The drilling /test pumping methodologies
(Type of drilling, designs used, test-pumping methods)

3. Contract schedules and duration
(Summarised diary of events and actual durations)

4. Summary of results and analysis.
(*Table showing location, depths, casing type and depths, driller's and test pumping yields, well log and any other information necessary)*

5. Casing /screens received and used during this Contract
(Table showing casings received, used, damaged and balances)

6. Problems encountered
(With accessibility, formations, equipment and community, etc)

7. Suggestion for improvement
(On supervision, documentation, durations, etc.)
8. Borehole Completion Records,
(Original Drilling and test pumping logs bound separately from the report)

9. Any other information that the Contractor may deem important or necessary.

Two hard copies of this report and one electronic copy of the Borehole Completion Records should be submitted to the Employer.

4. PROPOSAL SUBMISSION REQUIREMENTS

Interested contractors should submit a comprehensive proposal containing the following elements:

4.1 Company Profile

Provide a brief description of the company, including its history, expertise in groundwater drilling, and relevant project experience.

4.2 Technical Approach and Methodology

A detailed description of the contractor's approach to the drilling and installation process, including the methods and techniques that will be used for drilling, well construction, and pump installation.

4.3 Project Plan and Timeline

A detailed work plan that outlines the project timeline, including key milestones, deliverables, and estimated completion dates.

4.4 Pricing and Cost Breakdown

A detailed breakdown of the costs associated with each aspect of the work, including drilling, equipment installation, labor, testing, and site restoration.

4.5 Health, Safety, and Environmental Compliance

Details of how the contractor will ensure compliance with health, safety, and environmental standards during the execution of the work.

4.6 References and Past Performance

Provide at least one reference from previous clients for similar projects, including contact information and project details.

5. EVALUATION CRITERIA

Proposals shall be evaluated based on the following criteria:

1. Resources: 10%

i. Provide an organizational chart for your company.
ii. Structure of Key Personnel to be on Site.
iii. Name, post, and CV of ALL key personnel for this project:

- Must indicate how long the individual has been actively working with the firm.
- Indicate what projects the individual has been involved in with the company.
  iv. Resources: List key resources for this project in a table form showing capacity, age of equipment, owned, leased, or rented.

2. Experience: 15%

i. Excellent command of the English Language both written and spoken.
ii. Proof that the company has undertaken similar projects in the last 10 years.
iii. Familiarity with FIDIC Condition of Contracts.
iv. Health and Safety Plans for this project.
v. Quality Control & Assurance and Quality Management.
vi. Company must show that it is in good standing with Inland Revenue (requirement for local bidders). Overseas companies can provide evidence of good standing through equivalent documentation from their home country, such as tax clearance certificates or letters from their national tax authority indicating compliance.
vii. Company must show that it is up to date with Social Security Payments (requirement for local bidders). If the bidder operates in a jurisdiction with social security or similar employee contribution systems, they should provide documentation proving they are up to date with those payments.

3. Construction Time/Work Program: 10%

i. Reasonableness of time to execute the project.
ii. Provide a preliminary work program for this project, highlighting resources, activities, duration, etc.

4. Methodology: 15%

i. A description of the type of drilling method.
ii. Outline the methodology for the construction of the pump house, including steps for excavation, construction, installation of structural components, and finishing.

5. Financial Standing: 15%

i. Provide evidence of being able to carry the project financially for at least one (1) month.
ii. Provide a letter from a financial institution for financial support.
iii. Provide proof of being able to obtain a Performance Bond if considered for the project.

6. Price: 35%

i. Submit a detailed budget for the project, including:

- Drilling of the well: labor, equipment, materials, and associated costs.
- Construction of the pump house: site preparation, excavation, superstructure, roofing, and finishing costs.
- Preliminaries, including repairs to the access road during the construction stage.
- Any additional items required to complete the project.

The Government of St. Kitts and Nevis Invites Consultants to Bid on the following Project:

GROUNDWATER DRILLING SERVICES AND CONSUTRCTION OF PUMP HOUSES FOR THE GOVERNMENT OF ST. KITTS

Terms of Reference (TOR) can be obtained via email or hardcopy at the St. Kitts Water Services Department, Needsmust, Basseterre, St. Kitts,

as of

Tuesday 7th January 2025.

Completed Request for Proposal (RFP) shall be delivered via email to water.services@gov.kn and in a sealed envelope to the office of:

Manager/ Water Engineer

Water Services Department

Needsmust, St. Kitts

on or before Monday 17th February 2025 at 3:00pm

Eligibility

Up-to-Date Business License

Bids Open to Companies Not registered in St. Kitts and Nevis.

MANAGER/ WATER ENGINEER