

**RFP/ZIMHA/2025/001**

**ANNEX A**

## **DESIGNING, SUPPLYING AND INSTALLING OF AN AUTOMATED SYSTEM FOR WATER RETICULATION IN TONGOGARA REFUGEE SETTLEMENT, CHIPANGAYI, CHIPINGE**

### **TERMS OF REFERENCE (TOR)**

#### **Introduction to UNHCR**

The Office of the United Nations High Commissioner for Refugees (UNHCR) was established on December 14th, 1950 by the United Nations General Assembly. The agency is mandated to lead international action to protect and safeguard the rights and well-being refugees and asylum seekers. It also has a mandate to help stateless people and to help resolve refugee problems worldwide.

In more than 5 decades the agency has helped tens of millions of people restart their lives. Today a staff of over 16,800 people in more than 134 countries continues to help about 70.8 million persons. To help and protect some of the world's most vulnerable people in so many places and types of environments, UNHCR must purchase goods and services worldwide. For further information on UNHCR, its mandate and operations, please see <http://www.unhcr.org>.

#### **Context**

Zimbabwe is party to the 1951 Refugee Convention relating to the Status of Refugees along with its 1967 Protocol; 1969 OAU Convention relating to Specific Aspects of Refugees in Africa and the 1954 Convention relating to the Status of Stateless Persons which was signed in 1998. This has ensured that refugees and asylum seekers have access to protection and assistance services. Due to the encampment policy, refugees and asylum seekers generally reside at Tongogara Refugee Settlement.

TRS is situated in the southeast of Zimbabwe, located some 420 km from the capital city Harare, in Chipinge District in Manicaland Province, not far from the country's border with Mozambique [longitude: -20.347495°, latitude: 32.328163°]. The settlement has a population of over 16,000 persons and is surrounded by a few host community villages as well as several large-scale commercial irrigated agriculture schemes and is bound by the Save River along its western boundary.

## Problem, Objective & Intended Results

The 3 main water distribution systems ('Old network', 'New network', 'BH28 network') for TRC and nearby host communities are overcomplex and the complete reliance on manual handling of gate valves as well as checking for turbidity and coliforms is not only laborious for Partner and refugee Water Operators but also creating inequitable water distribution as well as risks of waterborne disease outbreaks in seasons where water supply is compromised. Currently, the 3 systems are interconnected in improvised ways and not efficient. To tackle these challenges of water distribution in the Tongogara Refugee Settlement, it is proposed to use automation devices, which build on UNHCR's ongoing WASH Real Time Monitoring (RTM) pilot project using Long-Range Wide-Area Network (LoRaWAN) devices.

Although the use of RTM/LoRaWAN provides opportunities for effective monitoring, simply generating and observing RTM water data via LoRaWAN is passive: the ongoing RTM pilot project is intended to only monitor water systems such as water levels in storage tanks, water qualities, flow rates, and pressures in pipelines as well as groundwater levels in boreholes in real-time, while actions required to be taken based on the RTM data are not included in the system design, such as adjusting pump rate or turning pumps on and off, opening and closing pipeline and tank inlet/outlet valves, or chlorinating the distribution lines based on the RTM data captured in the project. In other words, UNHCR and Partner staff are still required to act only with manual interventions in real-time to address complex water distribution problems. The proposed automation systems are intended to fill the gap between the RTM data collection/analysis and the required real-time action to maintain the equitable distribution of clean drinkable water for all sections and host communities.

Below is a list of the RTM (Real Time Monitoring) LoRaWan devices already installed at Tongogara Refugee Settlement:

Description of Devices Installed	Quantity Installed
LoRaWAN Outdoor Gateway - as per full specification in Annex 'B'EU 868 MHz	1
Borehole Level and Temperature Probe + LoRaWAN Transmitter HumBox Level Pressure + Keller Probe 36XS (16mm)	5
Threaded Pipe Pressure Sensor + LoRaWAN Transmitter	5
Threaded Conductivity Sensor + LoRaWAN Transmitter	3
Water Gas, Electricity Meter Pulse Counter [Electric Pulse or Reed Switch] + LoRaWAN Transmitter	3
Multi-Parameter Weather Station + LoRaWAN Transmitter	1
Electricity Consumption Sensor + LoRaWAN Transmitter	3

Particulate Matter PM1, PM2.5, PM10 Sensor + LoRaWAN Transmitter	1
Solar GPS Asset Tracker + LoRaWAN Transmitter	1
LoRaWAN Gateway and Sensors Installation Tools Kit	1

More information on the LoRaWAN equipment is provided in Annex G.

### Key Results Expected

- **Increased efficiency:** To optimize the water supply system and reduce energy consumption, resulting in cost savings.
- **Improved accuracy:** To ensure that the system operates with high accuracy and reliability, reducing errors and minimizing downtime.
- **Remote monitoring and control:** Remote and live monitoring of the water supply system, allowing for real-time data visualization and control from a central location.
- **Automatic operation & Human remote control:** (1) Onsite automatic control based on sensors within the reticulation with pre-set parameters, meeting which should trigger controlling automation devices without human intervention; and (2) off-site human remote-control system based on real-time data collected and alerts (i.e., Human Machine Interface). Online dashboards should be connected to the gateway in a way to enable users to control automation devices remotely.
- **Access control:** Implement password protection for both the Automation devices and Dashboard (Human Machine Interface systems) to prevent unauthorized access and control of the system.
- **Automatic alerts:** Alarms to be configured to alert system operators or maintenance personnel in the event of a problem or failure, allowing for quick resolution and minimizing the impact on the system.
- **Enhanced Data Management:** Automation devices and Dashboard (HMI) system to store data regarding the water supply system operation, which can be used for analysis and improvements in the system's design.
- **Enhanced safety:** To improve safety by reducing the need for manual intervention and minimizing the risk of accidents or errors.

### Location

The Google Earth image below indicates the approximate locations of the 3 main water supply systems within the settlement. The following maps are provided in Annex G.

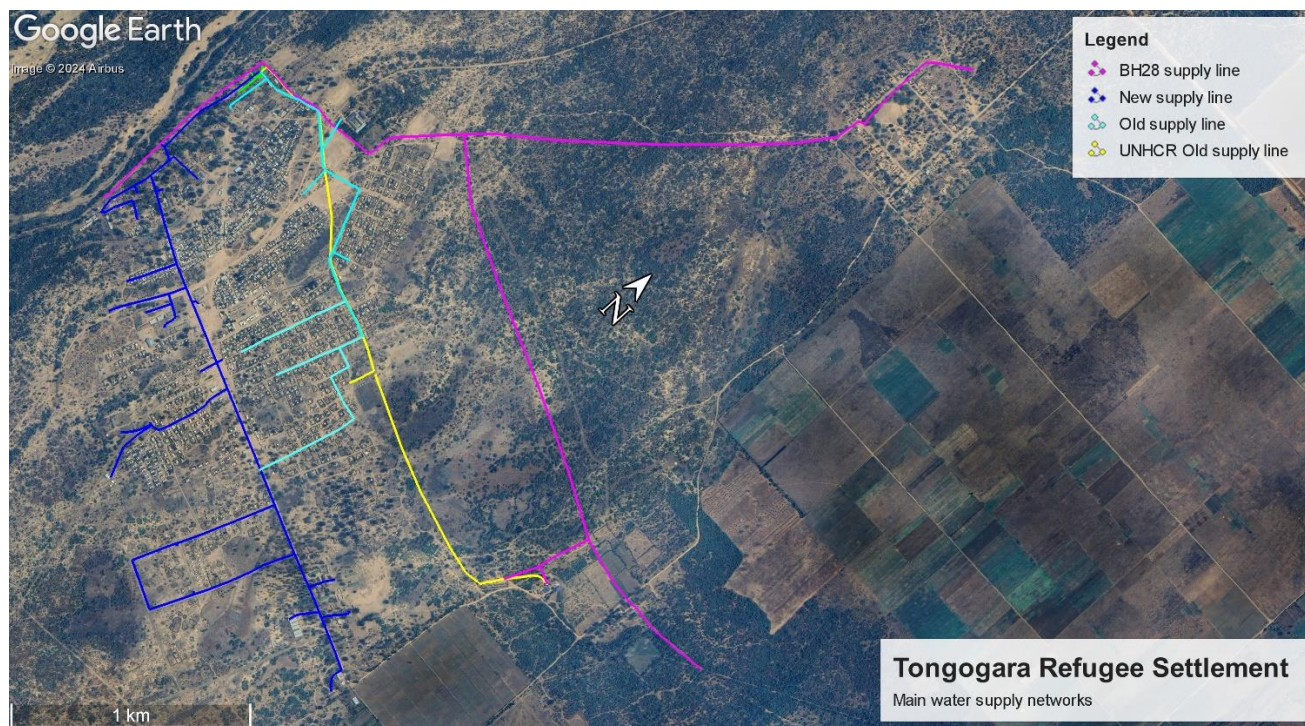


Figure 1: Main Water Networks that supply at TRS

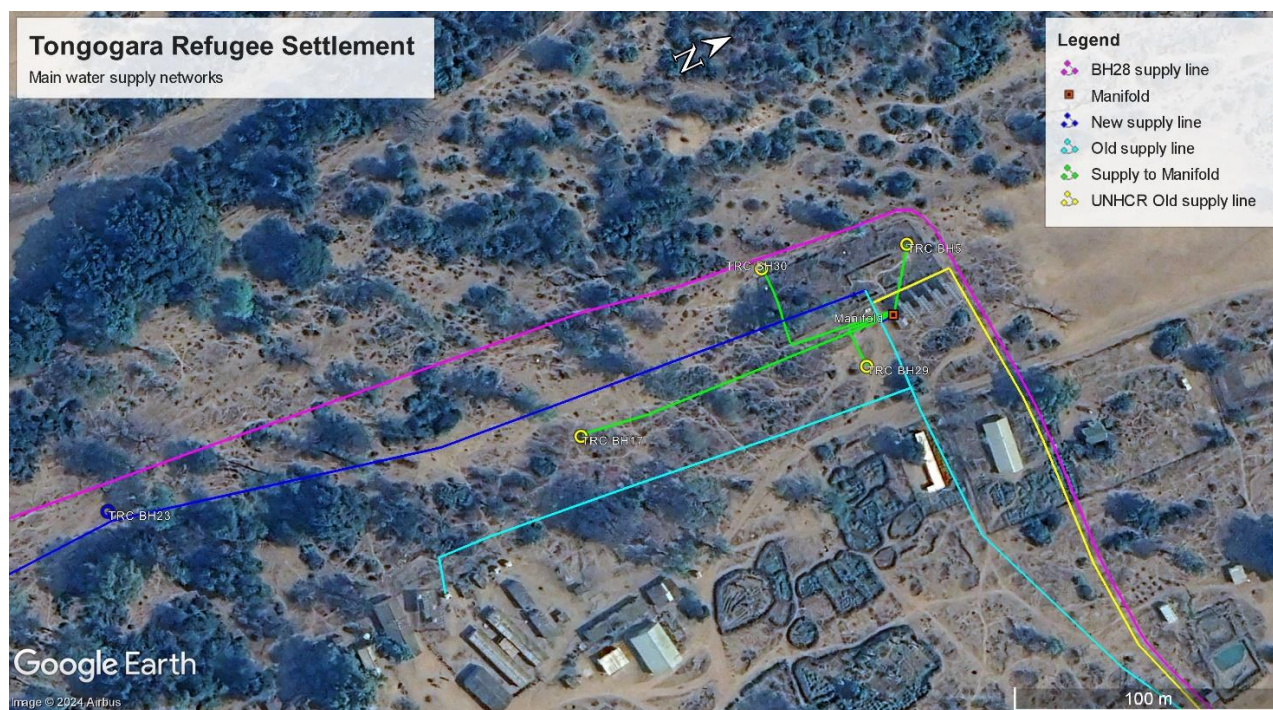


Figure 2: Main boreholes for supply at TRS



Figure 3: Main boreholes for supply at TRS

## Program of Works

The Program of Works will include the following items:

- **Analyse** the water reticulation system of TRS by utilizing the Google Earth maps, the as built drawings in AutoCAD and hydraulic models in EPANET provided in Annex H, to come up with the best suited design for the automation system to solve the existing inefficiency problems in TRS water networks.

Borehole name	Borehole Depth (m)	Safe Yield (m)	SWL (m)	DWL (m)	Lorentz Model	Pump Characteristics
BH5	34	19.8	6.7	18.8	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m
BH17	26.7	14.4	13.2	23.3	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m
BH23	34.8	11.88	8.8	26.7	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m
BH24	28.9	23.76	5.7	7.4	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m
BH28	34.1	23.76	10.9	23.3	PSk3-15-SJ17-18	Qmax-22m <sup>3</sup> /h Hmax-180m
BH29	35.2	23.76	8.4	28.1	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m
BH30	34	16.2	9	31.4	PSk3-7-C-SJ12-15	Qmax-23m <sup>3</sup> /h Hmax-100m

- **Design** of the complete automation system selecting the most suitable devices which include their size, material, manufacture and where it will work. The design should include the development of a tailor-made dashboard to be used for managing the system. The dashboard should be simplified for laymen users and should address the critical issues of the water supply and distribution. The design may also factor in the role of the RTM devices that are already installed within the system. The system **may** include, but **not limited to**, automated-valves (gate valves for opening, digital flow meters and closing pipelines and inlets or outlets to storage tanks based on pre-set values), working together with existing or any proposed additional RTM LoRaWAN-applicable such as water flow meters, and pressure sensors, water tank level, borehole level, pump control systems, or water quality (any of turbidity, pH, TDS, EC, Free Residual Chlorine, Total Coliforms, E. Coli) etc.
- **Design Flow Schematics** must be provided to illustrate the various components of the system and how they interact with each other to produce the required outcome. This must be in a form of an annotated diagram to further explain the diagram elements.
- **Automation devices** in order to facilitate the comparing of bids, there is an automation scenario provided below, and it is subject to change after the selection of the bidder. The negotiations will be done by UNHCR and the chosen supplier on the actual quantities feasible for the project. It is important to note that the 7 boreholes that need pumping automation, there are equipped with Lorentz pumps which have hybrid power input capabilities. The tanks that need automation have 40mm inlet and outlet diameters with exception of two 46 000L tanks that have 50mm inlet and outlet diameters. The tank brands we have installed are StoraTank, Jojo Tank and Lamasat Tanks of 5 000L and 10 000L capacities.

Description of Components to be Supplied	Quantity
Borehole automation – Turbidity Sensors (turbidity detection to protect borehole from siltation)	7
Tank automation (inflow and outflow) To close the valve and prioritise where there is need	8
Supply line gate valve automation (110 mm)	5
Supply line gate valve automation (75 mm)	12
Flowmeter automation (50 mm)	5
Pressure Sensor	3
Additional LoRaWAN Gateway (where sensor-gateway LoRaWAN interactions needs strengthening)	2

- **Installation** of the automation devices is to be done as per the Design mentioned above. The installation must be synchronized with the associated dashboard.
- **Automation devices** of the proposed system to be accompanied by datasheets of each of the

components which mentions but not limited to name of manufacture, purpose, features etc.

- **Quality** of devices to be supplied should meet the minimum standards for the materials that get into contact with drinking water [according to the WHO guidelines for drinking water quality<sup>1</sup>](https://www.who.int/publications/i/item/9789241549950). The device materials should not contaminate the water passing through it. The devices should be ISO, SANS, SABS or ZAS approved to be fit to work in drinking water systems.
- **Detailed Workplan** developed by the Contractor for the recommended works showing the scheduling of the key activities for the project to the end of implementation. Preference will be given to proposals showing a shorter but realistic completion time.
- **Testing and Commissioning** of equipment and materials jointly onsite with the Contractor and UNHCR project focal point and submission of a report including data output from testing equipment and software. The Contractor shall conduct a short-term test run and equipment test lasting for a duration of 48 hours to monitor both devices and dashboard and submit the test certificate that shall confirm the functionality of the equipment installed and dashboard developed as per the proposed design. The contractor shall submit a satisfactory delivery, installation, and commissioning report of all the works done which demonstrates the successful achievement of the objectives of this TOR described above.
- **Training** of staff in operation and troubleshooting/fault detection during a 1 to 2-day training session. The training should also involve how the design was arrived at, the observation and analysis of data in the dashboard developed and possible improvement of the system based on the analysis. This is relatively new technology in the rural WASH sector in Zimbabwe and training cannot be over emphasized so that the client UNHCR, Partner, stakeholders and government can acquaint themselves with the technology and operate it themselves. The supplier shall develop a training course manual in soft copy to be used for the training. Follow-up online training sessions should also be made available within the contract within 1 month after the onsite training.
- **As-Built** drawings and updated EPANET models of the installed automation systems.
- **O&M:** Provision of a 3-page O&M Manual detailing in an easy-to-follow manner, the operation and maintenance schedule to be employed in managing the newly automated system. The recommended service intervals for each component should be stated in the O&M manual along with parts costs, time and skill level required to carry out the service.
- **Optional Offer** for additional devices and capabilities that is priced and includes the specifications and datasheets of the devices for potential purchase in future. These devices can be the same or different from the ones provided on the main offer but should be able to work harmoniously with the entire system

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<sup>1</sup> <https://www.who.int/publications/i/item/9789241549950>

## Other details

Some of the details to be adhered to are as follows:

- **Delivery**: The delivery, installation and commissioning of a complete system should take a maximum of 9 weeks upon award of the contract at a date determined by UNHCR and the successful bidder. If the bidder will be unable to deliver, UNHCR will unilaterally cancel the order. Upon successful bidding the contractor will enter into a contractual agreement with UNHCR.
- **Warranty**: The bidder should detail as part of the technical proposal confirm the warranty period of at least 1 year for the various components of the systems and the Defects Liability Period (DLP), repairs/ replacement covered by the warranty and the technical support that will be provided after installation in case the systems develop a problem. It is expected that during this period, the bidder will be responsible for making good at their cost, repair and replacement of faulty parts and installation and shall promptly attend to faults on demand.
- **Service Agreement**: In addition, the bidder shall submit with their offer, a priced proposal for a 2-year service agreement after expiry of the warranty and DLP. The service agreement shall include but not be limited to periodic routine maintenance of the equipment as well as on demand maintenance. The cost of the priced service proposal will be considered separately from the main offer. The bidder should also detail as part of the technical proposal their availability and capacity to provide backup support from within the country. Parts should be replaceable at a low level of modularity to reduce replacement costs. The bidder must have access to spare parts supply with backing from the equipment manufacturer. Spare parts should typically be available within 5 days of payment.
- **Eligibility**: The bidder should represent a registered company of good international standing and with experience to meet the requirements of this project. The bidder must have a minimum of 4 years' experience of projects of a similar size, scope, and application. As evidence of experience and success is able to demonstrate they have similar project experiences for 4 years. The bidder must make available a minimum of 3 reference projects in which they have led. The reference projects must be of a similar scope, size and implemented within Zimbabwe or any country in Africa. References will be followed up. The bidder should be able to provide positive references from international organizations within the country as well as other countries. There should be an overall positive reputation for good business practice, professionalism, and financial stability. The bidder must have qualified and trained staff that are certifiable with the equipment manufacturer. Training must be of a level to successfully implement the project.

UNHCR holds proper ethical conduct in the highest regard. If it is discovered that corrupt or unethical practices have been undertaken by the bidder or been attempted, the vendor will be disqualified from this work and any further engagement with UNHCR.