BAGUIO WATER DISTRICT

"Serving mankind is serving God"

BIDDING DOCUMENTS

SUPPLY, INSTALLATION AND COMMISSIONING OF WIRELESS SCADA SYSTEM AT DIFFERENT BAGUIO WATER DISTRICT PUMPING STATIONS

VOLUME 2 OF 2

TECHNICAL SPECIFICATIONS

March 2023

TERMS OF REFERENCE

TECHNICAL SPECIFICATIONS OF THE SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) PROJECT FOR BAGUIO WATER DISTRICT OPERATIONS

I. BACKGROUND

Baguio Water District (BWD) is a Government Instrumentality exercising Corporate Powers (GICP) under the umbrella of the Local Water Utilities Administration (LWUA). As a service utility, BWD is mandated to deliver adequate and potable water at affordable rates to its consumers

The BWD continues to find ways to streamline its operations with the latest and state-of-the-art equipment for both electro-mechanical and information communications technology (ICT) available to effectively and efficiently manage its internal operations specifically designed to address the consumers' needs for adequate and potable water supply.

In view of this initiative to integrate the latest trend in technology in its daily operations, the procurement of a Supervisory Control And Data Acquisition (SCADA) system is necessary which shall be developed, customized and incorporated in the operation by industry standard experts in SCADA systems, for the exclusive ownership and use of the Baguio Water District.

The SCADA systems shall be used as a tool/framework that will be aligned to the strategic objectives of the organization to standardize its processes to reduce reaction time and implement site security for the BWD water sources in its effort to continually eliminate Non-Revenue Water (NRW).

Thus, continuous supervision of the water supply operations must be undertaken so that should any problem or concern arise, the same may be resolved immediately and at the same time, maintain normal functioning parameters. Achieving immediate and precise solutions imply automation and monitoring architectures which contain: a supervision and control system for the real-time installation, programmable logic controllers with the needed basic functions (such as communication, adjusting, measuring, forecasting) libraries, communication systems, standard interfaces or dedicated ones with sensors, electrical drive elements, measuring devices and real-time video signals.

II. OBJECTIVE

The main objective of this project is to obtain a Supervisory Control and Data Acquisition (SCADA) System for BWD operations in order to:

(a) maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime:
(b) prevent problems on sudden increase/decrease of pump capacity or water supply loss or vice-versa by analyzing and processing data leading to an optimum functioning and important financial decisions:
(c) provide data for the monitoring and control of the technological parameters in its existing water distribution stations, which will allow the optimum functioning of the pumping system:
(d) provide safety and accuracy in the equipment operations and downtime management: and
(e) obtain efficient energy usage and optimum administration of its water supply network.

III. SCOPE OF WORK

The successful bidder shall provide for the supplies/equipment necessary for the SCADA system and shall be responsible for its installation and commissioning. Thereafter, an after-sales training for the necessary controls and needed communication structures shall be conducted for the following locations:

1. BWD Main Office
2. Strategic Areas of the Amparo Pumping Station
3. Balsigan Pumping Station
4. BGH Tank Facility
5. Wireless Infrastructure Communications System

The system must be fitted to measure and improve the efficiency of water supply engagement of Baguio Water District through accurate data collection and effective control.

The standard design of the system must be capable to store and retrieve data for historical reference, through SCADA server locally/LAN or any available technology as back-up. The entirety of data collection must be in real-time. Supervision of all facilities shall be centralized and can be examined or viewed in the Baguio Water

District Main Office (HQ) where the SCADA server is located, as well as in remote devices.

General important items:

- SCADA system must be consolidated with the above facility locations of BAGUIO WATER DISTRICT and can be accessed securely via designated workstations or server. Other accessibility methods such as mobile & web-thin client and Cloud backup is recommended but not required.

- The system should be designed to work with digital radio signal through radio modem to synchronize the communication between the SCADA server and corresponding remote stations. Other equivalent communication access such as via GPRS/3G/HSDPA/LTE that uses open-VPN technology should serve as a backup access set-up but not necessarily required.

- Modular controller (PLC) must have capability to calculate/monitor a mix of telemetry signals including systems condition, monitoring and power measurements without excessive third (3'd)parfy hardware. Controller l/O modules must be sizable for future SCADA site expansion of Baguio Water District.

- Twenty (20)-year guaranty for availability of hardware spare parts covering core SCADA component (needs submission of manufacturer's Certification or Letter of Warranty).

IV. GENERAL MINIMUM REQUIREMENT

The following shall serve as minimum requirements or guides in the design and implementation of fhe SCADA project. Incorporation of additional technology equipment and/or software platform whenever deemed necessary is granted to the winning bidder provided that it will not diminish part or even the whole element of the suggested SCADA project implementation

IV - A. Baguio Water District Main Office (BWD HQ)

Supply and commissioning of SCADA software and pertinent controls and equipment including attached software and programs which include, but not limited to, the following:
SCADA Software
The SCADA Software shall be configurable by the contractor and/or by the trained BWD SCADA Software manager to meet the requirements of Baguio Water District.

1. Database

The SCADA software database shall be of true relafional database/historian designed and optimized for real-time SCADA operation. The Database Builder and Editor (DBE) shall be delivered as part of the SCADA software package.

2. Human Machine Interface (HMI)

The operator interface software, herein described as the HMI (Human Machine Interface), shall be an integrated package for developing and running automation applications.

- HMI screen will be developed and will be presented to BWD representative/s for comments and suggestions. Screen layout may change, and color maybe improve based on BWD requirements.
- The HMI shall have real-time and historical trending capabilities. It shall also have the ability to display both real-time and historical data at the same time on the same trend.
- The HMI shall store all historical data, support scripting for integration with other products, and allow data exchange with a wide range of process devices.
- The HMI shall provide the capability for display/plotting of real-time and historical data as curves.
- The HMI shall support multiple development environment clients that can have simultaneous access to the HMI.
- The HMI shall support multiple HMI servers in an application.
- The HMI shall support multiple run time clients that can have simultaneous access to the HM1 application.
- The HMI shall support remote editing. Any computer with sufficient security and the configuration software installed can add, change or delete any configuration information on any computer in the distributed application.
- The HMI shall support a scalable design environment.
- The HMI shall provide a tool to configure security settings.
- The HMI shall have the ability to switch automatically to a pre-defined secondary network if the primary network fails at run time.
- The HMI shall allow users to set up a complete Alarm and Events system. The alarms shall be logged to the SCADA database without any limit on

the number of alarm occurrences and shall allow viewing of alarms without disrupting data collection or alarm processing.
- The HMI shall have the capability of providing audible alarm notification configurable for each alarm by category.
- The HMI shall have the ability to record information about various types of system activity and shall be able to switch to an alternate path if a problem is encountered logging to the primary path.
- The HMI shall provide a number of ready-made graphic displays as libraries and shall provide a graphic display editor for creating displays using graphic objects.
- The HMI shall support a centralized and secure username and password repository.
- The HMI shall support multiple concurrent thick and thin-client connections.
- The HMI shall provide a mobile-only framework that shall allow graphics to be dynamically scaled to fit the device form factor.
- All parameter data logs are exportable to Microsoft Excel files, CSV files, etc.
- Designed with built-in printable parameter.
- The HMI shall provide an 'HMI Server Backup and Restore' utility that has the ability to backup running HMI servers without shutting down and restore servers into applications.
- The HMI shall support GIS/Google Mapping integration and monitoring.

3. Programmable Logic Controller (PLC)

- The PLC shall be programmed based on the agreed sequence of operation.
- The PLC shall be compatible within all devices.
- Supply and installation of PLC that are not specifically stated herein but necessary for the completion shall be provided by the winning bidder/ contractor.

The system could be further configured to enable SMS messaging software and web server if decided by BWD to allow data display in remote sites in the frame work of the project.

4. SCADA Hardware

1. One (1) SCADA Server with Development License Software The SCADA Server shall have the following minimum specifications:

Form Factor	Tower
Processors	Intel() Xeon® Silver 421 OR or higher compatible configuration
Memory	16GB RDIMM, 3200MT/s, Dual Rank
Graphics	GPU high resolution specification compatible with high demand SCADA and GIS graphic requirement
Network Controller	Dual-Port 1 GbE On-Board LOM
Storage Controller	PERC H330 RAID Controller, Adapter, Full Height
Hard Drive	1TB 7.2K RPM SATA 6Gbps 512n 2.5in Hot-plug Hard Drive, 3.5in HYB CARR
Chassis	Chassis with up to 8, 3.5" Hot-Plug Hard Drives, Tower Configuration
Optical Drive	DVD +/-RW, SATA, Internal, 495W
Management	iDrac9, Enterprise
Power Supply	Single,Hot-plug Power Supply
Devices	Soft touch keyboard Standard US, Optical mouse Standard US, Speakers Two (2) 42" UHD or XUHD LED Monitors
UPS	1500 VA capacity with built-in AVR

Software	SCADA compatible as per specifications and Licensed Server Operating Systems
Warranty	3yrs ProSupport and Next Business Day Onsite Service

2. Three (3) Workstations and Licenses Each SCADA workstation shall have the following minimum specifications:

Processor	6 core-6 thread; base clock of 2.9GHz ; 8MB L3 cache
Motherboard	Built in LAN, HDMI, VGA, USB 3.0
RAM	16gb (dual, 2x 8GB) ddr4 3200
Graphics	HD graphics card
SSD	500GB SSD NVMe Gen3 or higher
UPS	1000VA with built-in AVR
Casing	ATX mid tower casing
Devices	Soft touch keyboard Standard US, Optical mouse 24" LED Monitors
Operating System	Licensed Windows 10
Productivity	Licensed Microsoft Office 2016 or higher

3. Other component which may not be stated herein but necessary in SCADA operation.

4. Training

PLC Training Level 1 for Eight (8) Participants

a. Training Objectives:
- Understanding the principles of operation and importance of PLC.
- Able to create, edit and analyze the PLC program.
- Able to establish communication to upload and download PLC program.
- Able to troubleshoot and maintenance of PLC.
- Training software and handouts / manual, training equipment to be provided.

IV - B. STRATEGIC AREAS OF THE AMPARO PUMPING STATION

Supply, installation and commissioning of SCADA equipment such as PLC hardware, Valve w/ Motorized Valve, level monitor & Flowmeter with the following components:

1. A. PLC Component

- PLC Controller, 2Mb Memory, w/Supercap Backup, up to 16 I/O expansion modules, 32 EtherNet/IP and 120 TCP connections, 1- 2GB SD card support.
- 120/240V AC Power Supply (5V @ 4Amp)
- 32 Point 24 VDC Input Module • 32 Point 24 VDC Output Module
- 8 Channel Analog Current/Voltage Input module and 8 Channel Analog Current Output Module
- Right End Cap Terminator
- Unmanaged switch, 16 copper 10/100 ports
- HMI Graphic Terminal,Standard Model,6.5 in. Display, TFT Color,Touch Screen,Single Ethernet,18-30 V DC

B. Amparo Main Panel Assembly for PLC:

- 5 pcs - Control CB6A CB2A ampere,
- 5 pcs - Pin type relay 4P, 230V
- 1-lot - Terminal block, Weidmuller
- 1 set - Power supply 220VAC, 24VDC
- 1 set - Panel light with switch
- 1 pc-UPS, 220 VAC, 1000 V

2. Amparo Main Automation Engineering:

Supply of automation works required to monitor control the field devices of Baguio Water District Amparo Pumping Station as per given load schedule including electrical works.

Electrical Works:

- General requirements and mobilization.
- Power and cable harnessing and termination inside the panel
- Provision of manual level control using probe type level sensor (alternative control in case the PLC failed) - Loop checking and testing.

Automation Works:

- Program PLC and HMI program testing and development.
- FAT and panel inspection.
- Field device testing and signal validation.
- Sequence testing and commissioning.
- As-built diagram.

3. Amparo Ultrasonic level monitor w/ display:

- Configurable for Level & Distance Measurement, Pump Control and Open-Channel Flow
- Sensor: up to 15m range, +/-0.25% accuracy with Built-In Temperature Compensation, IP68, Glass-Reinforced
- Epoxy Face, Glass-Filled Polyester Housing, 7deg. beam angle, 41kHz Operating Frequency, -40 to 90 deg. C
- Operating Temperature, 3" ANSI Class 150 PVC Flange Connection, c/w 10m Cable Length
- Transmitter: Wall-Mounted, Glass-Loaded Polycarbonate Enclosure, IP65, Backlighted LCD with Integrated
- Echo Display and Keypad, ½" NPT Conduit Connection, 4-20mA loop-powered output, HART communication
- protocol, 5 configurable SPDT Relays, 8A Rating, 110/220VAC or 20 to 30VDC power supply, 21-Point
- Linearization for Converting Tank Level into Volume, Automatic Variable Gain.

4. Amparo discharge water Flowmeter:

a) 1-unit 4" Electro-Magnetic Flowmeter, Remote Type
   - Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
   - Embedded Sensor Application Memory enables Transmitter Replacement without the need for
   - Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
   - Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
   - ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
   - Test Report Sensor: (4 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
   - PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
   - Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
   - Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
   - 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
   - Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

b) 1- unit 6" Electro-Magnetic Flowmeter, Remote Type
   - Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
   - Embedded Sensor Application Memory enables Transmitter Replacement without the need for
   - Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
   - Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
   - ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
   - Test Report Sensor: (6 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
   - PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.

- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

c) 1,3- units 8" Electro-Magnetic Flowmeter, Remote Type
- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (8 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

d) 1- unit 12" Electro-Magnetic Flowmeter, Remote Type
- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (12 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

e) 1- unit 16" Electro-Magnetic Flowmeter, Remote Type
- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (16 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

5. Amparo Gauge Pressure Transmitter:

a) 7 units Gauge Pressure Transmitter
- Range: 0 to 580 psi, up to 1,160 psi over-pressure
- Adjustment, +/- 0.25% accuracy, 20:1 turndown ratio, SS316L Diaphragm,Wetted Parts
- Material, Silicon Oil-Filled, 1/2" NPT(M)/1/4" NPT(F) process connection, 4-20mA output with HART
- Communication protocol, backlighted glass touch LCD Display with keypad, Rotatable

6. Valve with Electraulic actuator

a) 1 unit 4” Butterfly Valve: Wafer Type,
- Body: Ductile Cas Iron
- Disc: Stainless Steel (CF8); Stem: SS410;
- Seat: EPDM; ASME Class 125/150, hand lever operator
- complete with:
- Electraulic™ Technology
- Coupled with Electraulic Actuator (2 years warranty)
- Self-contained, positive-pressure, hydraulic system
- 100% modulating duty cycle rated
- Fail-safe capable (spring fail or accumulator)
- Deadband adjustable from 5% to 0.1% (optional to 0.05%)
- Input signal: 4-20 mA analog
- Repeatability: < 0.1%
- Resolution: adjustable to < 0.1%
- Linearity: correctable to < 0.05%
- User-friendly, push-button calibration

b) 1 unit 6” Butterfly Valve: Wafer Type,
- Body: Ductile Cas Iron
- Disc: Stainless Steel (CF8); Stem: SS410;
- Seat: EPDM; ASME Class 125/150, hand lever operator
- complete with:
- Electraulic™ Technology
- Coupled with Electraulic Actuator (2 years warranty)
- Self-contained, positive-pressure, hydraulic system
- 100% modulating duty cycle rated
- Fail-safe capable (spring fail or accumulator)
- Deadband adjustable from 5% to 0.1% (optional to 0.05%)
- Input signal: 4-20 mA analog
- Repeatability: < 0.1%
- Resolution: adjustable to < 0.1%
- Linearity: correctable to < 0.05%
- User-friendly, push-button calibration

c) 1 unit 8” Butterfly Valve: Wafer Type,
- Body: Ductile Cas Iron
- Disc: Stainless Steel (CF8); Stem: SS410;
- Seat: EPDM; ASME Class 125/150, hand lever operator
- complete with:
- Electraulic™ Technology
- Coupled with Electraulic Actuator (2 years warranty)
- Self-contained, positive-pressure, hydraulic system
- 100% modulating duty cycle rated
- Fail-safe capable (spring fail or accumulator)
- Deadband adjustable from 5% to 0.1% (optional to 0.05%)
- Input signal: 4-20 mA analog
- Repeatability: < 0.1%
- Resolution: adjustable to < 0.1%
- Linearity: correctable to < 0.05%
- User-friendly, push-button calibration

IV - C. Balsigan pumping station

Supply, installation and commissioning of SCADA equipment such as PLC hardware, level monitor & flowmeter with the following components:

1. A. PLC Component.
- PLC Controller, 2Mb Memory, w/Supercap Backup, up to 16 I/O expansion modules, 32 EtherNet/IP and 120 TCP connections, 1- 2GB SD card support.
- 120/240V AC Power Supply (5V @ 4Amp)
- 32 Point 24 VDC Input Module
- 32 Point 24 VDC Output Module
- 8 Channel Analog Current/Voltage Input module
- Right End Cap Terminator
- Unmanaged switch, 16 copper 10/100 ports
- HMI Graphic Terminal,Standard Model,6.5 in. Display, TFT Color,Touch Screen,Single Ethernet,18-30 V DC

B. Main Panel Assembly for PLC:

- 5 pcs - Control CB6A CB2A ampere,
- 5 pcs - Pin type relay 4P, 230V
- 1-lot - Terminal block, Weidmuller
- 1 set - Power supply 220VAC, 24VDC
- 1 set - Panel light with switch
- 1 pc- UPS, 220 VAC, 1000 V

2. Balsigan Main Automation Engineering:

Supply of automation works required to monitor control the field devices of Baguio Water District Balsigan Pumping Station as per given load schedule including electrical works.

Electrical Works:

- General requirements and mobilization.
- Power and cable harnessing and termination inside the panel
- Provision of manual level control using probe type level sensor (alternative control in case the PLC failed) - Loop checking and testing.

Automation Works:

- Program PLC and HMI program testing and development.
- FAT and panel inspection.
- Field device testing and signal validation.
- Sequence testing and commissioning.
- As-built diagram.

3. Ultrasonic Level monitor w/ display:

- Configurable for Level & Distance Measurement, Pump Control and Open-Channel Flow
- Sensor: up to 15m range, +/-0.25% accuracy with Built-In Temperature Compensation, IP68, Glass-Reinforced
- Epoxy Face, Glass-Filled Polyester Housing, 7deg. beam angle, 41kHz Operating Frequency, -40 to 90 deg. C
- Operating Temperature, 3” ANSI Class 150 PVC Flange Connection, c/w 10m Cable Length
- Transmitter: Wall-Mounted, Glass-Loaded Polycarbonate Enclosure, IP65, Backlighted LCD with Integrated
- Echo Display and Keypad, ½” NPT Conduit Connection, 4-20mA loop-powered output, HART communication
- protocol, 5 configurable SPDT Relays, 8A Rating, 110/220VAC or 20 to 30VDC power supply, 21-Point
- Linearization for Converting Tank Level into Volume, Automatic Variable Gain.

4. Balsigan discharge water flowmeter

a) 2 units 16” Electro-Magnetic Flowmeter, Remote Type

- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (16 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

5. Balsigan Gauge Pressure Transmitter:

a) 2 units Gauge Pressure Transmitter

- Range: 0 to 580 psi, up to 1,160 psi over-pressure
- Adjustment, +/- 0.25% accuracy, 20:1 turndown ratio, SS316L Diaphragm, Wetted Parts
- Material, Silicon Oil-Filled, 1/2" NPT(M)/1/4" NPT(F) process connection, 4-20mA output with HART

- Communication protocol, backlighted glass touch LCD Display with keypad, Rotatable

IV - D. BGH Tank Facility

Supply, installation and commissioning of SCADA equipment such as PLC hardware, level monitor & flowmeter with the following components:

1. A. PLC Component

- PLC Controller, 2Mb Memory, w/Supercap Backup, up to 16 I/O expansion modules, 32 EtherNet/IP and 120 TCP connections, 1- 2GB SD card support.
- 120/240V AC Power Supply (5V @ 4Amp)
- 32 Point 24 VDC Input Module
- 32 Point 24 VDC Output Module
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B. Main Panel Assembly for PLC:

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- 1 set - Power supply 220VAC, 24VDC
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2. BGH Tank Facility Main Automation Engineering:

Supply of automation works required to monitor control the field devices of Baguio Water District Balsigan Pumping Station as per given load schedule including electrical works.

Electrical Works:

- General requirements and mobilization.
- Power and cable harnessing and termination inside the panel
- Provision of manual level control using probe type level sensor (alternative control in case the PLC failed) - Loop checking and testing.

Automation Works:

- Program PLC and HMI program testing and development.
- FAT and panel inspection.
- Field device testing and signal validation.
- Sequence testing and commissioning.

3. BGH Tank Facility ultrasonic level monitor with display

a) Configurable for Level & Distance Measurement, Pump Control and Open-Channel Flow
   - Sensor: up to 15m range, +/-0.25% accuracy with Built-In Temperature Compensation, IP68, Glass-Reinforced
   - Epoxy Face, Glass-Filled Polyester Housing, 7deg. beam angle, 41kHz Operating Frequency, -40 to 90 deg. C
   - Operating Temperature, 3” ANSI Class 150 PVC Flange Connection, c/w 10m Cable Length
   - Transmitter: Wall-Mounted, Glass-Loaded Polycarbonate Enclosure, IP65, Backlighted LCD with Integrated
   - Echo Display and Keypad, ½” NPT Conduit Connection, 4-20mA loop-powered output, HART communication
   - protocol, 5 configurable SPDT Relays, 8A Rating, 110/220VAC or 20 to 30VDC power supply, 21-Point
   - Linearization for Converting Tank Level into Volume, Automatic Variable Gain.

4) BGH Tank Facility discharge water Flowmeter:

a) 1 unit 6” Electro-Magnetic Flowmeter, Remote Type
   - Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
   - Embedded Sensor Application Memory enables Transmitter Replacement without the need for
   - Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
   - Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
   - ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and

- Test Report Sensor: (6 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
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- Test Report Sensor: (8 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

c) 2 units 16" Electro-Magnetic Flowmeter, Remote Type
- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (16 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared
- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

d) 1 unit 24" Electro-Magnetic Flowmeter, Remote Type
- Reduced-Bore Version for Installation with No Available Upstream/Downstream Straight Pipe.
- Embedded Sensor Application Memory enables Transmitter Replacement without the need for
- Re-Configuration. Easy Set-Up Function, Modular Design that accommodates up to 5 I/O Modules.
- Enhanced Diagnostics Function that continuously monitor its own operation as well as the process including
- ground fault and gas bubble detection. WRAS approval. Includes Inspection Certificate for Calibration and
- Test Report Sensor: (24 inches), Elastomer Liner, SS316 Electrode and Grounding Ring, ISO 7005
- PN16 EN 1092-1 Carbon Steel Flange Process Connection, IP68, Cable Fitted & Potted, 20m Cable Length.
- Transmitter: Wall-Mounted, Universal Transmitter, LCD Display with Keypad, Adjustable Contrast, Rotatable
- Display, Powder-Coated Aluminum Housing with Glass Window, IP67, M20 x 1.5 Conduit Connection ,
- 85 to 265 VAC power supply, 4-20mA + pulse + contact output, HART communication protocol, Infrared

- Service Port with USB Adaptor, Tamper-Proof/Write Protect via Internal SwitchNumber of test point, 3 points.

IV - E. Wireless Infrastructure Communications System

A free wireless network infrastructure (within 5 GHZ) shall be constructed and designed to provide seamless communication between telemetry signals involving the initial locations stated from IV - A to IV D to pave way to receive more SCADA enabled facilities of the Baguio Water District should they find it necessary.
The standard composition of a wireless network architecture would be a layer of protocols, services and routes. BWD understands that designing such architecture would entail a meticulous process to guarantee that all components shall fit together and compatibility issues are resolved to maneuver a resilient, open standard and scalable wireless network.

1. Design Objectives

a. Design and implement a Wireless Local Area Network (LAN);
b. Interconnect five (5) strategic sites/areas Amparo pumping station, Balsigan pumping station, Baguio General Hospital tank facility, Mount Kabuyao repeater facility, and the BWD Main Office (HQ) using free frequency mode
c. Wall-mount wireless receiver antenna at BWD HQ; and
d. Construct tower with lightning arrester (to be grounded).

2. Recommended Wireless network hardware (may vary depending on the design and the technology used)

- 5/7/10 pcs Wireless Radio - Dual chain 5GHz integrated 802.11acAP/Backbone/CPE, 2xRPSMA connectors, high TX power, Gigabit Ethernet, waterproof metal enclosure.
- 5/7/10 pcs Parabolic dish/ omni directional antenna for 5GHz, 30dBi gain with precision alignment mount.
- 4 pcs Router 5 port , 1 GBps, 128MB RAM
- 1 set 80ft, Monopole Tower (Balsigan Sites)
  - 2x2Oft 3" sch 40, 1x2Oft 2.5" sch 40, 1x2Oft 2" sch 40
  - galvanized, with lightning arrester
- 1 set 40ft, Monopole Tower (Amparo Sites)
  - 1x2Oft 2.5" sch 40, 1x2Oft 2" sch 40
  - galvanized, with lightning arrester
- 1 set 40ft, Monopole Tower (Baguio General Hospital Tank)
  - 1x2Oft 2.5"sch 40, 1x2Oft 2" sch 40
  - galvanized, with lightning arrester
- 1 roll FTP Cat 6 Outdoor Cable and connectors
- 2 rolls Guy wires and consumables
- 1 lot Civil work, turnbuckles, clips, bolts and nuts etc.

3. Kabuyao Repeater Site works

The Kabuyao repeater site is an ideal line-of-sight location for BWD due to its elevation. Interconnecting wireless communication of this kind of technology is subservient to direct line-of-sight communication, whereas BWD existing facility on the said mountain is preferred.
- Rehabilitation works on the existing BWD radio tower
- Consumables - Guy wires, paint, and other materials deemed necessary

4. General Activities/Works required

- Tower construction and installation
- Radio site to site alignment, calibration and testing
- Network and security configuration; and
- To use free frequency (with-out NTC permit).

V. PROJECT DURATION:

The project duration shall be for a period of Two Hundred Seventy-Five (275) days which shall be divided into two phases:

a. First phase: for all works/services and expected deliverables - Two Hundred Seventy (270) calendar days from the actual start of the contract.

b. Second phase: free training/seminar workshop of the users, technician, administrators and programmers - three (3) consecutive working days for eight (8) hours per day following successful testing of the SCADA system and another two (2) consecutive working days for eight (8) hours per day for advanced training.

Programming and administration training may take longer than the above but should not exceed thirty (30) working days for eight (8) hours per day.

VI. TERMS AND CONDITION:

1. The winning bidder shall provide the following in the conduct of works.
   - ✓ Tools and Equipment
   - ✓ Logistics and transport vehicle
   - ✓ Consumable Materials
   - ✓ Certified Test Result Report
   - ✓ Personnel and overseer

2. The winning bidder shall be able to prove that they have performed similar project for reference.

3. Delivery of equipment and services shall commence at the Baguio Water District office and/or corresponding facilities listed above.

VII. BACK UP AND SECURITY

Supplied SCADA product must have the capacity/facility to contain battery-backed memory for the duration of at least one (1) day dedicated for the PLC's programming and configuration.

System must be able to send alerts for power outages. An Industrial Type Uninterruptible Power Supply (UPS) must be present for PLC back-up for at least fifteen (15) minutes. It must also support local and remote firmware upgrade.

Under any given circumstance that no password/s shall be encoded in the Control System (in PLC or in the Control Network) without written approval from BAGUIO WATER DISTRICT signed by the General Manager (GM).

VIII. QUALITY ASSURANCE

The winning bidder shall test and inspect the different types of equipment that comprise the whole SCADA system. The winning bidder shall furnish BWD copies of test records or applicable certificates (e.g. Factory and Site Acceptance Test (FAT/SAT) issued by the vendor indicating compliance to all applicable test requirements and quality regulations.

During commissioning, the winning bidder shall conduct the actual and complete testing of the equipment and corresponding software in the presence of the Production/Distribution, NRWM and ICT Division personnel. Testing procedures shall be as recommended by the manufacturer and as agreed upon by the end-users.

IX. PROGRAM PARADIGM, SOFTWARE AND SOURCE CODE

For each derived system programs/codes that form part of the delivered SCADA technology this must be properly documented and turned-over to the BAGUIO WATER DISTRICT as its property; registered to and licensed in its name. Remote programming must also be developed & available for complete documentation.

X. DELIVERABLES

The following are the prescribed documents for submission before the implementation of the project:

A. Literatures, brochures describing each item such as PLC/ Embedded PC controller in sufficient detail including materials of construction of each part of the proposed model.
B. Project Documentation which includes but not limited to the following:

   - ✓ Wiring Diagram (I/O) including relays and fuses based on NEMA Standard;
   - ✓ System Architecture showing the network connection of the different facility locations;
   - ✓ I/O List and designation;
   - ✓ Logic Diagram using the ladder/ function block/ STL/ or other means of language with complete source code;
   - ✓ Flow Diagram showing the sequence, operation concept and completion timeline;
   - ✓ Loop Diagram following ISA 5.4 Standard;
   - ✓ Process and Instrumentation Diagram following ISA 5.1 Standard;
   - ✓ Electrical Wiring Diagram;
   - ✓ Power Circuit following an American Standard;
   - ✓ Control Circuit following an American Standard: and
   - ✓ Single Line Diagram based on NEMA.

Required documents for submission after Completion:

a. Manufacturer's Authorization and Warranty certificate.
b. Manufacturer's operation and maintenance manuals. The maintenance instruction shall also include troubleshooting data, preventive maintenance information and complete spare parts list with ordering information.
c. Complete set of training manuals for users, administrator and programmer.

XI. OPERATION AND MAINTENANCE

- Operation and maintenance of the programmable logic controller shall be recommended by the manufacturer and as agreed upon by the end-users.
- The delivered equipment shall be ready for operation/ field installation.
- Service unit shall be provided in case of equipment breakdown during the one (1) year warranty period.
- The supplier shall have the local capability to do repair and maintenance of the equipment to be supplied.
- In the event the equipment or any of its accessories become defective during the
- warranty period, the supplier shall provide their duly registered technician or maintenance crew within twenty-four (24) hours upon receipt of the BAGUIO WATER DISTRICT's notice.