

Procurement of Consulting Services for the

**Supervisory Control and Data Acquisition
(SCADA) System for Three (3) Pumping
Stations and Two (2) Reservoir**

TERMS OF REFERENCE



Terms of Reference
Supervisory Control and Data Acquisition (SCADA) System for Three (3)
Pumping Stations and Two (2) Reservoir

I. Introduction

The purpose of this Terms of Reference (ToR) document is to outline the scope, objectives, and requirements for the implementation of a SCADA system for three pumping stations and two reservoir of General Santos City Water District. The SCADA system will provide remote monitoring and control capabilities for the pumping stations to ensure efficient and reliable operation.

II. Project Objectives

The primary objectives of a SCADA (Supervisory Control and Data Acquisition) system are to enable efficient monitoring and control of industrial or infrastructure processes. These objectives can be broken down into several key goals:

1. **Real-time Monitoring:** SCADA systems provide real-time data from sensors and devices throughout a process or facility. SCADA Operators can monitor variables but not limited to pressure, flow rates, voltages, currents, frequency, tank water levels, and deep well water levels to gain immediate insights into the system's performance.
2. **Remote Control:** SCADA systems allow for remote control of devices and equipment. Operators can issue commands, make adjustments, and control processes from a central location.
3. **Data Acquisition:** The system collects and stores data from various sensors and devices. This data can be used for analysis, historical tracking, and reporting.
4. **Alarm Management:** SCADA systems can trigger alarms and alerts when certain conditions or thresholds are met. This helps operators respond to abnormal situations promptly.
5. **Data Visualization:** Data collected by a SCADA system is typically presented in user-friendly graphical interfaces (HMI - Human-Machine Interface). This visualization helps operators understand complex processes quickly.
6. **Efficiency and Optimization:** SCADA systems aim to improve the efficiency and optimization of processes. By monitoring and controlling variables in real time, operators can make informed decisions to enhance performance, reduce waste, and save energy.
7. **Reliability and Safety:** The system helps ensure the reliability and safety of processes. It can detect faults or issues and take corrective actions automatically or with operator intervention, reducing downtime and minimizing risks.

8. **Data Logging and Reporting:** SCADA systems log historical data, which can be used for trend analysis, compliance reporting, and process optimization. This data can be valuable for regulatory requirements and decision-making.

In summary, the primary objectives of a SCADA system are to provide real-time monitoring, control, data acquisition, and analysis capabilities to improve the efficiency, reliability, and safety of industrial and infrastructure processes.

III. PROJECT INFORMATION

A.) Project Details

Item	Description
Project Title:	This Project is Supervisory Control and Data Acquisition (SCADA) System for Three (3) Pumping Stations and Two (2) Reservoir
Project Scope:	<p>Design, Supply, Delivery, Installation, Fit-Out, Testing, and Commissioning of supervisory control and data acquisition (SCADA) system to General Santos City Water District.</p> <ul style="list-style-type: none"> • The successful bidder is responsible for providing, installing, conducting testing, and commissioning the Super Supervisory Control and Data Acquisition (SCADA) System for Pumping Station No. 6 (Roca), Pumping Station No. 7 (Philbanking), Pumping Station No. 8 (Lansang), the elevated steel tank at Pumping Station No. 6 (PS6), and the Reservoir at SM Village, Brgy Sinawal. This entails transmitting and presenting all essential parameters in the central command center. • The successful bidder is tasked with seamlessly incorporating the new SCADA project into the already operational SCADA system. This integration involves ensuring that the new SCADA system is able to communicate, interact, and work harmoniously with the existing one. It includes making certain that data, processes, and control functions between the two systems are effectively coordinated. • The integration should be carried out without disrupting the continuous operation of the existing SCADA system, ensuring a smooth

	<p>transition and minimal downtime during the implementation of the project.</p> <ul style="list-style-type: none"> • The successful bidder shall furnish all labor, materials, tools, equipment, transport, supplies, and other necessary services required for the complete and proper conclusion of a working SCADA system. • The successful bidder shall provide Command Center and onsite HMI controlling capability for; • Remote start and remote stop of diesel generator • Remote start and remote stop of Motor Control Panel • Remote start and remote stop of Sampling • Provisions for ATS Trip Command • Provision for remote opening and remote closing of butterfly valves • The system and instruments shall be brand new Programmable Automation Controllers, Sensors and transmitters and SCADA Software, those that were not stated herein but are necessary in the complete SCADA system shall be included in the tendered price. • Training of operators and maintenance personnel. • Documentation of the SCADA system, including user manuals and as-built drawings. • Ongoing support and maintenance after the system is operational within warranty period.
Project Description:	<p>The implementation of a SCADA (Supervisory Control and Data Acquisition) system for three pumping stations and two reservoirs is a vital project aimed at enhancing the efficiency, reliability, and remote monitoring and control capabilities of the water supply infrastructure. This project description outlines the objectives, scope, and key components of this project.</p>
Estimated Project Duration:	<p>Total of one hundred twenty (120) calendar days, from Execution of Contract to Issuance of Certificate of Final Acceptance of the project</p>
Mode of Procurement	<p>Public Bidding using a 2-envelope system under RA 9184 and its 2016 Revised IRR, particularly, Annexes G, A, E, and F thereof.</p>

Total Approved Budget for the Contract (ABC)	Three Million Pesos (Php 3,000,000.00)
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B.) Detailed Engineering Design

A detailed engineering design for a SCADA system for three pumping stations and two reservoirs is a critical phase of the project. It involves creating comprehensive plans and specifications to ensure the successful implementation of the system. Below is a list of elements to be included in the detailed engineering design:

1. **System Architecture:**
 - Provide a detailed overview of the SCADA system's architecture, including hardware and software components.
 - Describe the network topology, redundancy schemes, and data flow diagrams.
2. **Equipment Specifications:**
 - Specify the hardware components, such as but not limited to PLCs (Programmable Logic Controllers), RTUs (Remote Terminal Units), HMIs, servers, communication devices, and sensors.
 - Include specifications for software components, such as SCADA software, HMI software, and database management systems.
3. **Communication Protocols:**
 - Define the communication protocols and standards to be used for data exchange between the SCADA system and pumping station equipment, reservoir sensors, and other devices.
4. **HMI Design:**
 - Develop detailed HMI design plans for each pumping station and reservoir, specifying the layout, graphical elements, and user interface features.
5. **Data Logging and Storage:**
 - Specify the data logging intervals, storage requirements, and databases used for storing historical data.
6. **Alarm and Event Management:**
 - Define alarm thresholds, escalation procedures, and notification mechanisms for critical events and alarms.
7. **Integration with Existing Infrastructure:**
 - Explain how the SCADA system will be integrated with existing pumping station and reservoir equipment and systems.
8. **Network Infrastructure:**
 - Specify the network infrastructure requirements, including routers, switches, and cabling, to support the SCADA system's data communication.
9. **Power Requirements:**
 - Define power supply needs and backup power solutions to ensure continuous system operation in case of power failures.

10. Instrumentation and Sensors:

- List the types and specifications of sensors and instrumentation used for monitoring and control at the pumping stations and reservoirs.

11. Environmental Considerations:

- Address environmental factors that may affect the SCADA system, including temperature, humidity, and physical protection measures.

12. Regulatory Compliance:

- Ensure that the design complies with relevant industry standards, regulations, and safety requirements.

13. Documentation and Manuals:

- Create comprehensive documentation, including system manuals, operation manuals, maintenance manuals, and as-built drawings.

14. Testing and Commissioning:

- Develop a testing and commissioning plan to verify the system's functionality, including factory acceptance testing (FAT) and site acceptance testing (SAT).

15. Training Plan:

- Outline a training plan for operators and maintenance personnel to ensure they can effectively use and maintain the SCADA system.

16. Support and Maintenance Plan:

- Include a plan for ongoing support, maintenance, and system updates post-implementation.

17. Budget and Cost Estimates:

- Provide detailed cost estimates for the entire design and implementation process.

18. Project Schedule:

- Develop a project schedule with timelines and milestones for design, procurement, installation, testing, and commissioning.

C.) Selection Criteria

The General Santos City Water District (GSCWD) will utilize a **Quality-Based Cost Evaluation** method to choose the contractor responsible for designing, supplying, delivering, installing, outfitting, testing, and commissioning a Supervisory Control and Data Acquisition (SCADA) system for the operation. The criteria for selecting the external service provider are outlined as follows.

Quality Requirement:

Firm Experience and Capability	: 40%
Personnel Competence for Deployment	: 40%
<u>Project Cost</u>	<u>: 20%</u>
Total	100%

Selection Criteria	Qualification (Points)	Score	Percentage
A. Firm Experience and Capability (40%)			
Company's number of years in existence	15 – 10 years or more		
	10 – 5 to 9 years		
	5 – 1 to 4 years		
Number of years in consultancy and SCADA Instrumentation	15 – 10 years or more		
	10 – 5 to 9 years		
	5 – 1 to 4 years		
Number of SCADA system completed project in the government agencies and private sectors. (for the last 5years)	10 – 5 projects or more		
	8 – 3 to 4 projects		
	5 – 2 projects		
Total Score & Percentage	40		
B. Personnel Competence for Deployment (40%)			
1.) Team Manager (PEE)			
Number of years practice in industry application and project management.	15 – 15 years or more		
	10 – 10 to 14 years		
	5 – 9 years and below		
2.) Team Members (REE)			
Number of years practice in industry application and in configuring and programming SCADA systems.	15 – 10 years or more		
	10 – 5 to 9 years		
	5 – 4 years and below		
Number of Registered Electrical engineers assigned in the project	10 – 3 members or more		
	8 – 2 members		
	5 – 1 member		
Total Score & Percentage	40		
C. COST (20%)			
Cost Rating [(Lowest Financial Bid/Quoted Amounts)x100%]			
OVERALL SCORE			

To satisfy the **Quality Requirement** interested bidder are to submit proof of qualifications in accordance to the requirement shown in the table:

Criteria	Proof of Evidence (Documents)
Firm Experience and Capability	<ol style="list-style-type: none"> 1.) Company DTI Registration 2.) Notice of Award and Certificate of Acceptance/ Completion per project. 3.) Authorized Distributor Certificate, Reseller, Partner or Dealer of the Equipment Manufacturer
Personnel Competence for Deployment	<ol style="list-style-type: none"> 1.) Unexpired Professional Regulation Commission (PRC) Registered License 2.) List of Description of the team members 3.) Certificate of Experiences

IV. TIMELINES, DELIVERABLES AND SCHEDULE OF PAYMENT

The contractor's engagement period will span one hundred twenty (120C.D.) Calendar Days starting from the date of receiving the Notice to Proceed. All reports and related documents must be submitted to the GSCWD project engineer and should be officially acknowledged. The following outlines the schedule for deliverable submissions:

Milestones	Deliverables	% of Contract Amount
Mobilization	<ul style="list-style-type: none"> • Rental and Other Admin Costs • Safety PPE Requirements <p>Submission date: With in thirty (30) days from the receipt of Notice to Proceed</p>	15%
Approved and accepted Progress Report	<p>Original signed progress report properly dated and duly accepted and approved by the GSCWD Resident Engineer.</p> <p>Submission date: With in sixty (60) calendar days with 45% of work completed.</p>	30%
Approved and accepted Testing	<p>Original signed Testing and debugging report properly dated and duly accepted and approved by the GSCWD Resident Engineer.</p>	30%

and Debugging Report	<ul style="list-style-type: none"> • Comprehensive testing of the entire SCADA system • Identification and resolution of software and hardware issues • Performance testing and optimization <p>Submission date: With in ninety (90) calendar days with 90% of work completed.</p>	
System Commissioning and Final Inspection	<p>Original signed System Commissioning and Final Inspection report properly dated and duly accepted and approved by the GSCWD Resident Engineer.</p> <p>Submission date: With in one hundred twenty (120) calendar days with 100% of work completed.</p>	25%
Total		100%

V. Technical Requirements

1.0 LIST OF MAJOR COMPONENTS

Item no.	Item	Quantity	Total Quantity	Statement of Compliance
1	Programmable Logic Controller (PLC)	4	4	
2	Power Meter	3	3	
3	Fabricated Powder Coated Panels	4	4	
4	Human Machine Interface (HMI)	3	3	
5	Un-interruptible Power Supply	4	4	
6	Surge Protection Device	4	4	
7	Chlorine Gas Leak Sensor	3	3	
8	Residual Chlorine Analyzer	3	3	
9	Pressure Transducer	3	4	
10	Water Level Monitoring Transmitter (well)	3	4	
11	Water Level Monitoring Transmitter (Reservoir)	2	2	
12	Chlorine Weighing Scale	3	3	

2.0 COMPONENT SPECIFICATIONS

Description	Requirement	Statement of Compliance
<p>PLC Programmable Logic Controller</p> <p>Rated supply voltage:</p> <p>Discrete input number:</p> <p>Discrete output number:</p> <p>Memory capacity:</p> <p>Data backed up:</p> <p>Data storage equipment:</p> <p>Battery type:</p> <p>Backup time:</p> <p>Regulation loop:</p> <p>Positioning functions:</p> <p>Function Available:</p> <p>Counting input number:</p> <p>Integrated connection type:</p> <p>Communication port protocol:</p>	<p>24Vdc</p> <p>24 discrete input (4 fast input conforming to IEC 61131-2 Type 1)</p> <p>16 transistor (2 fast output)</p> <p>256kB user application and data RAM 10000 instructions 256kB internal variables RAM</p> <p>256 kB built-in flash memory backup of application and data</p> <p>2 GB SD card</p> <p>BR2032 or CR2032X lithium non-rechargeable</p> <p>1 year 77 °F (25 °C) by interruption of power supply</p> <p>Adjustable PID regulator up to 14 simultaneous loops</p> <p>PTO 2 pulse/direction 100 kHz) PTO 1 CW/CCW 100 kHz)</p> <p>PWM PLS Frequency generator</p> <p>4 fast input (HSC mode) 100 kHz 32 bits</p> <p>USB port mini B USB 2.0 Non isolated serial link serial 1 RJ45 RS232/RS485 Ethernet RJ45</p> <p>USB port USB - SoMachine-Network Non isolated serial link Modbus</p>	

	<p>master/slave - RTU/ASCII or SoMachine-Network Ethernet</p>	
Port Ethernet:	<p>10BASE-T/100BASE-TX 1 328.08ft (100 m) copper cable</p>	
Communication Service:	<p>Modbus TCP slave device Ethernet/IP adapter Modbus TCP server Modbus TCP client DHCP client</p>	
AI MODULE		
Rated supply voltage:	<p>24Vdc</p>	
Analogue input number:	<p>8 Analogue Inputs</p>	
Analogue input type:	<p>Current 4...20 mA Current 0...20 mA Voltage 0...10 V Voltage - 10...10 V</p>	
Permissible continuous overload:	<p>0 13 V, analogue input type: voltage 40 mA, analogue input type: current</p>	
Surge withstand:	<p>1 kV power supply common mode conforming to EN/IEC 61000-4-5 0.5 kV power supply differential mode conforming to EN/IEC 61000-4-5 1 kV Input common mode conforming to EN/IEC 61000-4-5</p>	
Mounting support:	<p>Top hat type TH35-15 rail conforming to IEC 60715 Top hat type TH35-7.5 rail conforming to IEC 60715 Plate or panel with fixing kit</p>	
Turbidity controller		
Measure range:	<p>0...10NTU</p>	
Power supply:	<p>AC220V</p>	
Output signal:	<p>Relay, 4-20mA, RS485</p>	

Turbidity sensor:	RMD-Z5-1	
Temperature range:	0-60°C	
Pressure range:	0...2bar	
(5m cable length Without temperature compensation Flow through type)		
Chlorine Residual		
Measure range:	0...20mg/L	
Power supply:	AC220V	
Output signal:	Relay, 4-20mA, RS485	
Chlorine sensor:		
Temperature range:	0-60°C	
Pressure range:	0...1bar	
(Constant voltage type 5m cable length, pin type wiring Without temperature compensation Flow through type)		
Pressure transmitter		
(Discharge pressure monitoring)		
Range:	0-80psi	
Signal Output:	24VDC, 4-20mA, 2-wire	
Process connection:	1/4"NPT(M), SS304	
Electrical connection:	DIN 43650, IP65	
Pressure transmitter		
(Well and Tank level monitoring)		

Range: Cable length: Signal Output: Atmospheric Humidity Sensor Range: Resolution: Accuracy: Supply : Output Signal : (With Solar Radiation Shield 3m Cable Length)	0-5bar (0-50mH2O) 50meters PUR cable 24VDC, 4-20mA, 2-wire Humidity:0-100%RH Humidity: ±3%RH Humidity: 0.5%RH 24VDC 4-20mA	
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3.0 LIST OF HMI ALARM

No.	Alarms	Statement of Compliance
1	Low Voltage	
2	High Voltage	
3	Over Current	
4	Water Reservoir Low Level	
5	Water Reservoir High Level	
6	Chlorine leak	
7	Chlorine low in terms of weight	
8	Discharge Valve Close / Open	
9	Discharge line High pressure	
10	Discharge line Low Pressure	
11	Motor Control Panel Tripped	
12	Submersible motor tripped off	
13	Motor Control Panel High Temperature	
14	Well water Level Low	
15	Power Utility / Generator Power	

4.0 ALARM MESSAGES VIA SMS

No.	Alarms	Statement of Compliance
1	Submersible Motor Stop	
2	Submersible Motor Running	

3	Submersible motor Tripped	
4	Submersible motor Tripped Reset	
5	Voltage Monitor Tripped	
6	Voltage Monitor Tripped Reset	
7	Main Contactor Closed	
8	Main Contactor Open	
9	Chlorine Leak	
10	Discharge line High pressure	
11	Power Utility Power	
12	Genset Power	

VI. INTEGRATION OF EXISTING ELECTRICAL COMPONENTS

Particulars	Requirements	Statement of Compliance
Existing Electromagnetic Flow Meter	The winning bidder shall integrate the Flow Meter to be connected to the PLC by means of any communication protocol and the data collected shall be displayed and monitored at the command and monitoring center such as but not limited to flow rate, total volume, total volume of reverse flow and water velocity.	
Existing SS/SS and VFD Motor Controller	The winning bidder shall integrate all existing motor controllers to the Programmable Logic Controller. It can be controlled and monitored in the command and monitoring center such as but not limited to voltage, current, fault and fault history.	
Existing Fault Monitoring Devices	The winning bidder shall integrate existing fault monitoring devices, such as voltage monitor, floatless relay and EOCs to the Programmable Logic Controller. The fault status shall be logged to the alarm reports with exact time of fault.	
Existing Standby Generator Set	The winning bidder shall integrate all existing standby Generator Set to the Programmable Logic Controller. It can be controlled and monitored in the command and monitoring center.	
API	The winning bidder shall provide API (Application Programmers Interface) for the data acquisition and future customization.	

VII. OTHER REQUIREMENTS

Requirements	Statement of Compliance
<p>Reports During fault alarms of VFD, soft starter, pressure, flow and other protective devices to command center.</p>	
<p>Trends and Data Logging GSCWD will provide the list of variables to be included in the trend and shall be logged continuously in the hard drive for historical trending with reference to the monitoring requirements.</p>	
<p>After Sales Service After the final acceptance, the contractor shall conduct a monthly site visit within the warranty period. The contractor shall have 24/7 availability of technicians within Mindanao Island.</p>	
<p>WARRANTY All components shall be guaranteed against defects in workmanship and materials for a period of two (2) years from the date of acceptance. Defective components or parts discovered within the warranty period shall be replaced without charge or additional cost to GSCWD.</p>	
<p>Trainings / Transfer of Technology The winning bidder shall provide training of the set-up and configuration of all equipment and shall conduct especial training on PLC without additional cost to General Santos City Water District.</p>	
<p>Bidders Qualification</p> <ul style="list-style-type: none"> ➤ Bidder must have a Regional Presence or a Regional Service/Support Partner/Center within Mindanao. ➤ Bidders must be an Authorized Distributor, Reseller, Partner or Dealer of the Equipment Manufacturer. ➤ Bidder must be the exclusive or authorized distributor of the principal company of the equipment and the necessary consumables in the Philippines. 	

VIII. TERMS AND CONDITION


No.	TERMS AND CONDITIONS	Statement of compliance
1	The winning bidder shall observed good housekeeping during the entire duration of the project. They shall be responsible of their own materials, equipment and tools to avoid accident to happen in the work place.	
2	<p>The winning bidder shall be liable for any damages to materials, electro-mechanical equipment such as but not limited to submersible motor, flow meters, pumps, motor controllers and other electro-mechanical devices during testing and commissioning of the SCADA project. And shall be required to replace immediately to any incur defects without cost to GSCWD.</p> <p>➤ The GSCWD shall issue MOA stating that <i>all</i> electro-mechanical equipment thereof as <i>well as all</i> facilities found therein <i>are one hundred percent (100%)</i> maintained and <i>good working condition before commencement of the project. Any damages incur during the implementation of SCADA project, the winning bidder is held liable for any abnormalities and defects found.</i></p>	
3	In accordance with the Electricity Safety Regulations, successful bidders are obligated to ensure that unsafe wiring or equipment is neither connected to an electrical installation nor left connected under hazardous conditions. Furthermore, with regard to the management of potentially dangerous energy sources, the standard mandates the isolation of machinery and equipment from these sources and the application of locking or tagging procedures before any servicing activities take place.	
4	All bidders is required to submit and include documents but not limited to manuals, data sheets, Test Certificate and Manufacturers Certificate to all electrical and mechanical components in there bidding documents.	
5	That during the installation and commissioning of the SCADA System, the winning bidder shall be required to send a technician responsible of commissioning. All relevant and incidental cost (transportation, accommodation, allowances and etc.) in the commissioning of the SCADA System shall be shouldered by the winning bidder.	
6	The certificate of acceptance shall be release only if the project is 100% working condition.	

7	The winning bidder shall be subjected to Liquidated Damages (LD) for each day of delay as provided by the IRR of RA 9184.	
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