water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

1. DETAILED SPECIFICATION

8.1 The details of the Specification details shall be captured on the SBD 3.1 as contained below

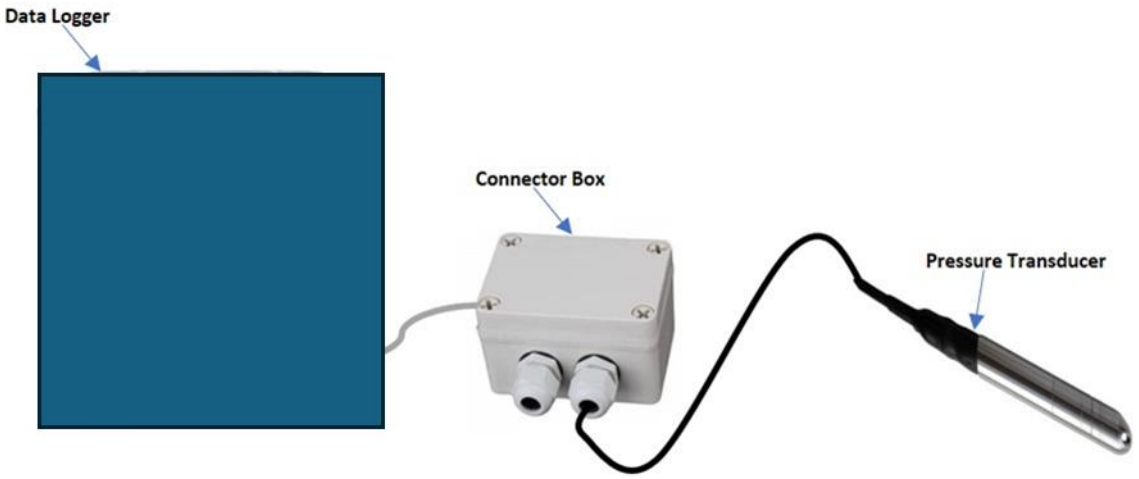
The following list of requirements **must** be complied to and confirmed.

4.1 Next to each specification a block is provided for the bidder to complete the following by indicating as below

a. Offered equipment / item to specification - [Y] or [✔]

b. Offered equipment / item not to specification - [N] or [X]

A typical DWS set up of a data logger and sensor combination looks similar to the image below.



NOTE: The details below must be fully completed. Items that do not fully comply will not be accepted. (Only under Item B is the N/A symbol accepted). Brochures are needed for each item quoted.

A	Data Logger Requirements	Y/N
1	The user can connect to the data logger wirelessly or by comms cable using a laptop	
2	The user is able to configure the logger for various logging and data transmission periods	
3	The user can configure the sensor to three decimals	
4	The user can download data from the logger on site	
5	The logger is IP68 Rated, compact with internal modem and battery	
6	The logger can transmit data via GSM and GPRS	
7	High and low alarms can be set by the user on site and remotely	
8	The data logger can be configured to transmit Alarms to a server **AND** a sms to another cellphone number	
9	The data logger must be a single unit with an internal user replaceable battery/ batteries	
10	The internal battery must work for at least 2 years, recording data every 12 minutes and transmitting every 4 hours	
11	The logger can be configured to transmit data to the Pretoria Head Office server Zednet WaterCore	
12	Hard copies/ electronic copies of all manuals related to wiring, data retrieval and configuration of the data logger will be supplied	
13	1 day online presentation on the installation and maintenance of the instrumentation and sensors	

B	Connector/Junction Box Requirements	Y or N or N/A
1	The pre-wired connector box must be IP68 Rated	
2	If no connector box is needed, the connection between the sensor and data logger must be IP68 Rated	

C	Pressure Sensor Requirements	Y/N
1	The pressure sensor measures within 0.1% of the Full Measuring Scale (FMS)	
2	The pressure sensor is a 4-20mA sensor	

D	Radar Sensor Requirements	Y/N
1	The radars sensor measures within 0.1% of the Full Measuring Scale (FMS) within 2mm	
2	The radar sensor is a 4-20mA sensor	

E	Contact Gauge Requirements	Y/N
1	The probe of the contact gauge is sealed from direct exposure to elements but open to water exposure	

4.2 Compact Data Logger IP68 capable of measuring a 4-20 mA pressure sensor with internal battery, internal GSM/GPRS modem ☐

a. Application: ☐

The GSM data logging system would be installed at remote gauging stations and used for secondary real-time or backup data collection applications where water levels and rainfall is measured.

b. Design and technical details: ☐

The equipment shall be designed to function satisfactorily under the following conditions:

- Operating temperature range: -20°C to 50°C;
- Relative humidity: 100%;

Real time clock:

- The data loggers shall be equipped with battery backed hardware real time clock system.
- The real time clock system shall provide time (24-hour system) and date information.

c. Memory: ☐

The data loggers shall be provided with the following types of memory systems:

- The memory size: 512K.
- Recording Interval programmable between 1 minute and 1 hour.
- Data storage: Rotating store

d. Power supply: ☐

- Each data logger shall be provided with an internal source that would prevent equipment shutdown or loss of data when the main battery is either disconnected for a short period or exchanged. (±12 minutes)
- Power for all the sensors will be derived from the internal main battery via the data logger for at least 2 years at an interval of 12 minutes and transmitting 4 hourly.
- The logger must have low power consumption on standby mode.
- The battery MUST be standard and easily purchased from any dealer selling batteries in South Africa. The batteries should be easily changed without the need to soldier it.
- The data logger must be reverse polarity protected.

e. Input functions and interfacing: ☐

- Programmable Input range: 0 - 40m
- Resolution: ± 0.1%.
- In order to conserve power, the data logger shall control the power supply to each sensor. Sensors shall be switched on in sequence and readings taken under processor control. Sufficient warm-up and stabilization time for sensors must be controlled by the logger.
- Full calibration procedures shall be provided for each sensor
- Input connectors for sensors shall be clearly labelled, shall be polarized to prevent mismatching of connectors and shall be configured so that no damage can occur if a unit is accidentally or intentionally connected to the wrong input channel. Each connector shall make provision for all the necessary signal lines, earth, 0V and 12V (switched) supplied lines.

f. Enclosure and Housing: ☐

- **Only compact data loggers** will be accepted, therefore all electronic components, wiring, etc., will be inside the logger housing.
- The data logger shall be designed to operate without degradation under dusty or condensing conditions experienced at sites.
- The housing shall be manufactured of corrosion resistant material.
- The data logger / communication unit housing shall not exceed the following dimensions:
  - Height: less than 200 mm;
  - Width: less than 200 mm;
  - Depth: less than 150 mm.

g. SIM Card Compatibility and Replacement: ☐

- The data logger will permit the fitting and replacement of the SIM card by the user if needed. It should support all current forms of SIM cards in common use by GSM operators if needed.

h. Transmission of Data: ☐

- The data logger will be programmed to initiate data transmission hourly, daily, weekly or monthly at a user selected time.
- Data to be transmitted will be all data, which has not been previously sent, or, at the particular date and time.
- Advanced channel profile and threshold alarms.
- The Data Logger must also be able to be set up so that SMS alarms can be sent directly to pre-programmed cell phone numbers.

4.3 SENSOR FOR WATER LEVEL MEASUREMENT: PRESSURE TRANSDUCER: CERAMIC OR PIEZO RESISTIVE WITH 4-20MA OUTPUT;

a. Application:

- The submersible pressure transducer will be used for hydrostatic water level measurement and will be measuring pressure using a vented cable.
- Pressure transducers must be capable of measuring water levels from 0 - 100 m, the range of each transducer being determined by the Department and pre-set in the factory. Typical ranges could be: 0 - 1 m; 0 – 2.5 m; 0 - 5 m; 0 – 10 m; 0 – 20 m, 0 – 30 m and >40 m on request.
- The pressure transducers must have a high reliability and ensure a large range of application for pressure measurement in all fields of water level measurement.

b. Design and technical details:

Pressure Transducer housing:

- The housing must be in an all-sealed enclosure and the pressure port must be vented to the atmosphere using a vented cable.
- The transducer housing must be robust, corrosion-resistant, insensitive to impact and vibration and watertight up to at least 70 m of water column. (>70 m on request).
- The opening to the sensor must be protected by a removable cap to allow for maintenance.
- The transducer housing shall preferably not exceed the following dimensions and weight:
  - Length: 500 mm
  - Diameter: 50 mm
  - Weight: 1 kg
  -
- The transducer housing can be fitted with a watertight plug for connection to the transducer cable.

c. Pressure Transducer sensor:

- The submersible pressure transducer sensor must be based on a piezo-resistive ceramic pressure sensor element.
- The measuring cell must be chemically and thermally resistant.
- The pressure sensor must have a compensated operating temperature range of -5°C to +70°C.

- The sensor should be calibrated, temperature compensated and provide amplified analogue output signals for 4-20mA output.
- The sensor should have a supply voltage of between 9 to 32V and must have reverse polarity protection.
- The sensor must have a response time of maximum 35 ms with a power consumption not exceeding 250mW. Typical sensor warm-up time must not exceed 10 seconds.
- The sensor proof pressure must be two times the rated pressure range. Proof pressure is the maximum pressure which may be applied without causing damage to the sensing element.
- The pressure sensor must have surge immunity according to EN 61000-4-5 for current output devices with cable lengths longer than 10m.

d. Measuring Accuracy of the Pressure Transducer Sensor: ☐

- The sensor's Non-linearity (Best Straight Line fit), hysteresis (maximum output difference at any point within the operating pressure range for increasing and decreasing pressure) and repeatability must be 0.1 % FSO (Full Scale).

e. Vented transducer cable: ☐

- The vented cable is factory fitted to the submersible pressure transducer housing and the length of cable for each submersible pressure transducer are being determined by the Department during procurement.
- The pressure transducer and transducer cable shall be designed to function satisfactorily with a cable length of up to 200 m.
- Flexible with Polyurethane jacketing material for corrosive media and maximum outer diameter 12 mm.
- Double sheathing with interposed tinned copper- braiding shielding with polyester with polyester film to cover the vented tube and all connectors.
- There must be filler between the conductors and vent tube and all conductors must be of tin copper.
- A polyamide pressure-compensation capillary tube for measuring the reference pressure, with an inside diameter of preferably 3 mm, but not less than 1,0 mm.

4.4 SENSOR FOR WATER LEVEL MEASUREMENT USING A RADAR FOR WITH 15m AND 30m RANGE AND 4-20 mA OUTPUT SIGNAL

a. Application ☐

- The radar level sensor will be used for water level measurement and will be mounted above the water surface to measure the distance to the water surface and provide the invert for water depth.

- The radar level sensors will be used in locations where a measuring range from 0-15m or 0-30 m would be required.

DESIGN AND TECHNICAL DETAILS

Measuring Accuracy of Radar Level Sensor:

Measuring Range:	Up to 15m	Up to 30m
Deviation:	≤ 2mm	≤ 2mm
Beam Angle:	8°	4°
Output Signal:	4-20mA	4-20mA

b. Radar Sensor Housing

- The housing must be in an all-sealed enclosure, and the sensor must have an integrated cable with encapsulated cable gland.
- The housing must be robust, corrosion-resistant and insensitive to minor impact and vibration.
- The housing shall not exceed the following dimensions and weight to allow for installation in existing enclosures:

Length: 150 mm
Diameter: 100 mm
Weight: 1.5 kg (without integral cable)
IP 66

c. Radar Sensor

- The sensor should allow for maintenance free operation and make use of 80 GHz technology.
- The sensor should be unaffected by ambient conditions and provide very good signal focussing to allow for versatile installation positions.
- The sensor must have a two-wire configuration with output signals for 4-20mA output.
- The sensor should have an operating voltage of between 12 to 35V DC.
- The sensor must be able to achieve a stable output reading with a typical sensor warm-up time of 15 seconds.
- Bluetooth interface, version 5.0 with 25 range
- Operating voltage 12 – 35 V DC

4.5 Sensor for Water Level Measurement in boreholes: Contact Gauge.

d. Application:

The contact gauge must be portable, and it will be used for the measurement of water levels, in boreholes and stilling wells.

e. Design and technical details:

- The contact gauge should have an electrode inside the measuring probe, when the probe makes contact with the water surface, an acoustic beep should be sounded.
- The frame of the contact gauge should also consist of a signal lamp that lights up when the probe makes contact with the water surface.
- The measuring tape should preferably be white or yellow and must not be able to stretch.
- The graduations on the tape should be clearly marked in metres, decimetres and centimetres.
- The probe body should be manufactured from corrosive resistant material and should not exceed an outer diameter of 25 mm.
- The contact gauge should make use of commercially available dry alkaline batteries.
- Operating temperature range to be at least between –5°C to +40°C.
- The contact gauge must be available in the following measuring range: 150m.
- The contact gauge must be supplied in a robust carry case made from polypropylene and is waterproof.
- The PROBE of the contact gauge MUST be sealed so that the sensor is exposed to water but not any debris in the borehole, see the images below.

Probe with sensor enclosed

Probe with sensor NOT enclosed

BI-DIRECTIONAL COMMUNICATION CABLES WITH USB SERIAL PORT

The cables provided for communication to the data logger must be able to connector to a laptop via a USB port. This communication cable must be able to communicate with the Data logger stated in 8.2

Detailed technical specifications and brochures of the offered items must be submitted.

The quantities of the items required are listed in Table 1 below:

NO.	DESCRIPTION	QUANTITY	PRICE
1.	**Compact Data Logger IP68** with **connector box (wired to each channel)** with three channels of which two channels are dedicated **4-20 mA** and one channel for pulse measurement (rainfall), have an internal battery and internal modem	15	
2.1	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-1m range) With 5 m length vented cable	2	
2.2	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-5m range) With 5 m length vented cable	6	
2.3	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-5m range) With 10 m length vented cable	1	
2.4	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-5m range) With 30 m length vented cable	1	
2.5	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-10m range) With 10 m length vented cable	3	
2.6	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-20m range) With 25 m length vented cable	1	
2.7	Sensor for Water Level Measurement: Pressure Transducer: ceramic or piezo resistive with 4-20mA Output (0-30m range) With 30 m length vented cable	1	
3.1	Sensor for Water Level Measurement: Radar range maximum of 15m with 4-20mA Output	1	
3.2	Sensor for Water Level Measurement: Radar range maximum of 30m with 4-20mA Output	1	
4.	Bidirectional communication cables with USB serial port for ITEM NR 1	4	
5.	Contact Gauge 150m (for measuring water depth in boreholes)	1	
	TOTAL COST		