المواصفات الخاصة بالعطاء رقم
٢٠٢٥/٣

1. Requested Works

This bid document is prepared to specify the required works from bidders to install new telemetric weather stations and to reconfigure the data loggers of existing weather stations installed at NARC research stations and Centers, and to centralize the data measurements from new and existing weather stations at a consistent bases to a data base with a web application for data view and analysis at NARC premises. Furthermore, the system provided must be able to send alarm messages via SMS and emails for a provided list for specific measured parameters such as but not limited to: wind speed/gust speed, air temperature, soil temperature, rainfall intensity and relative humidity, at a certain threshold value which are predefined and will be provided to the winning bidder.

2. Bill of Quantities

S.N	Telematics Weather Stations - Monitoring and Alarm System	Unit	Quantity	Unit Price (JOD)	Total (JOD)
1	**Weather Stations**				
1.1	Supply, install, connect & commission of telemetric weather station with measuring devices for: precipitation (amount & intensity), temperature, wind speed, wind direction, relative humidity, solar radiation, and atmospheric pressure; according to specifications	No.	11		
2	**Connection and upgrade**				
2.1	Site visit and evaluation of existing weather stations and reconfiguration of data loggers (existing weather stations) for centralized data transfer according to specifications	No.	8		
3	**Software works**				
3.1	Installation of compatible software with all necessary infrastructure required for operation at NARC premises for data view, data storage and analysis of all measured parameters from new weather stations and the reconfigured existing weather stations. Data compilation of received measurements from existing telemetric weather stations with the newly installed centralized data base system at NARC premises according to specifications	L.S	1		
4	**Training**				
4.1	Conduct O&M training for NARC staff according to specifications	L.S.	1		
	Total (in JOD):				

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3. General Specifications

3.1 Data Logger

The data loggers used shall meet or exceed the following basic technical specifications:

- The system shall automatically collect the observations from attached sensors, process it according to a predetermined procedure, and store it in memory every full hour UTC. This data is then transmitted to the database software control room at NARC premises via a local telecommunication service provider, with the possibility of using multiple providers depending on network coverage. The contractor shall assess network coverage and signal strength at each site. Transmission frequency and mode are determined by software settings. The selection of telecommunication service providers requires approval from NARC. Additionally, the system must be capable of transferring, storing and processing of measured parameters based on the proposed solution and related infrastructure required to operate the system from NARC headquarter/premises. An alternative solution is accepted, i.e.: data transfer from the supplier cloud to the centralized data base at NARC premises once it fulfils all other requirements and ensure stable and efficient data transfer and storage.
- The system shall have spare channels available for potential future upgrade with additional sensors, in total not less than 12 channels with a power supply from battery and solar panel.
- The system is required to provide a complete health status. It must possess self-diagnostic capabilities, displaying Station ID/Sensor ID codes and messages on a panel for fault identification, with the option to monitor these statuses externally via a laptop or PC.
- **The system should have the ability to set alert messages** through SMS and email (3 recipients at least) for a pre-defined threshold values for the different types of measured meteorological parameters such as but not limited to: rainfall intensity, temperature, relative humidity and wind speed which will be provided to the contractor once the system is set up and ready for configuration.
- The system shall have a weather-proof housing.
- Non-volatile flash memory with min. 8 MB, suitable for the storage of all data for at least 1 year, with possibility of including SD card for additional memory requirements.
- Power supply: chargeable, maintenance-free battery, guaranteed run time without battery change for 1 year (minimum), solar panel with charging regulator: with sufficient power for recharging the battery
- Resistance against thermal, mechanical, and humidity influence, protection class: IP65.
- Taking into consideration the arid/semi-arid environment of Jordan, equipment installation at various locations must meet specific standards to withstand adverse climatic conditions. This involves resistance to solid particles and fluids, with IP marking levels varying based on station types. Devices in different stations must also operate within specified temperature ranges, such as weather stations requiring IP65 or higher and operational temperatures between -20 to +60 °C or better. Additionally, consideration should be given to the possibility of barometric pressure equals to or exceeding 110 kPa in certain areas within the Jordan Valley where stations altitude is below sea level.

3.2 Site Layout and Station Design

Installation shall be according to the following specifications:

- The site's dimensions must be 10 by 10 meters;
- All cabling work at weather station sites must be concealed / underground using suitable cable routing/steel piping/conduits;
- Stations installations and erection shall be as per international best practices and guideline of the World Meteorological Organization. For instance: "Guide to Instruments and Methods of Observation (WMO-No. 8)", and "Guideline for Weather station siting and installation", Ministry of Water and Irrigation in collaboration with BGR, November 2014.

3.3 Location of weather stations

The winning bidder will be granted site access to the locations where the new weather stations are to be installed. Similarly, site access to existing stations to be checked and reconfigured by the contractor will be provided as well. The coordinates of locations for new weather stations and those to be reconfigured and pushing data for view, storage and analysis at NARC premises are provided in Table 1 and Table 2 respectively.

The weather stations specified in Table 2 shall be reconfigured by the contractor in terms of all measured parameters shall transmit measurements to a centralized database and a web based software located at NARC premises which shall, (similar to the new weather stations configuration), be able **to set alert messages** through SMS and email for a pre-defined threshold values for the different types of measured meteorological parameters such as but not limited to: rainfall intensity, temperature, relative humidity and wind speed which will be provided to the contractor once the system is set up and ready for configuration. Location map of proposed new stations and the existing stations is provided under Figure 1.

In case of difficulties of data logger reconfiguration, the contractor shall provide sufficient justification for not complying with the required specifications.

Table 1: The XY coordinates of the new telemetric weather stations sites.

Weather station ID	Longitude	Latitude
1. Tafeleh	35.6171484	30.8320362
2. Wadi Araba	35.2184558	30.2317797
3. Shobak	35.5321834	30.5096740
4 Jarash*	35.872419	32.260487
5 Ajloun*	35.752703	32.324399
6. Ghor Safi	35.4931106	31.0580999
7. Al Rabba	35.7411560	31.2751307
8. Sharhabeel	35.5836957	32.3935202
9. Al Mafraq	36.1752916	32.3202509
10. Al Ghoueir	35.7424428	31.1524147
11. Ramtha Station	35.9648081	32.4871996

*The Jarash and Ajloun stations (ID 4 and 5) will be located within agricultural directorates in specified regions and another coordinates might be provided later.

Table 2: The XY coordinates of the existing telemetric weather stations sites to be inspected by the contractor.

Weather station ID	Longitude	Latitude	Manufacturer
1. Khaldiyyah	36.2955478	32.1664858	Meter/Zentra
2. Khanasri	36.0575560	32.4046500	Aeron
3. Ramtha WWTP	35.98503	32.594659	Aeron
4. Maro	35.9013400	32.6072190	Aeron
5. Deir Alla	35.6217889	32.1935663	Meter/Zentra
6. Karameh	35.5702484	31.9288016	Meter/Zentra
7. Mushakar	35.8027502	31.7735844	Aeron
8. Hussein Station (NARC HQ)	35.8427000	32.0800798	Aeron

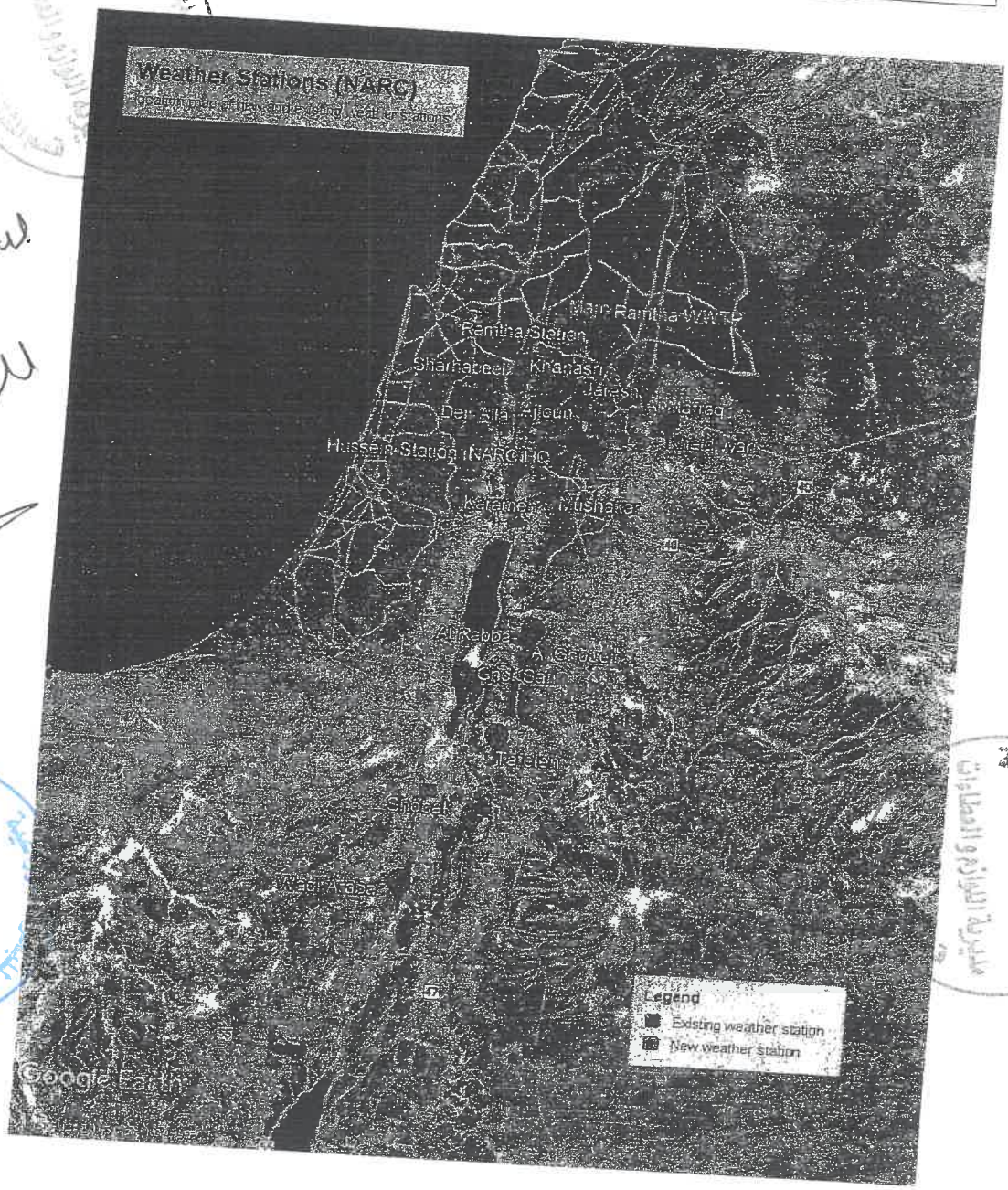

Figure 1: Location map of new and existing weather stations.

3.4 Physical Measuring Methods/Measured Parameters

The provided instruments shall comply with the specifications provided in Table 3 and 4 for measurement accuracy and instruments performance and physical measuring methods and devices, respectively.

Table 3: Operational measurement accuracy requirements and instrument performance.[1,2]

Parameter	Unit	Range	Resolution	Accuracy
Precipitation amount	mm	0-200 mm h-1	0.25 mm	±2%
Precipitation intensity	mm/h	0-1000 mm h^{-1}	0.1 mm h^{-1}	±2%
Temperature	°C	-40 to +60 °C	0.1 °C	±0.3°C% to ±0.5°C%
Wind speed	m/s	0.5 - 40 m s^{-1}	0.5 m s^{-1}	±0.3 m s^{-1} to 0.5 m s^{-1} or ±2% to ±5%
Wind direction	In degrees clockwise from north	0 - 360°	1° to 5°	±3° to ±5°
Relative humidity	%	0 to 100%	1% RH	±3% to ±5% RH
Solar radiation	W/m^2	0 to 1500 W/m^2	1W/m^2-5W/m^2	±3%- to ±5%
Atmospheric pressure	hPa	500-1080	0.1 hPa	±0.5 hPa

Table 4: Overview of Parameters, physical measuring methods and devices for weather stations.[1]

Parameter	Measuring Method	Device
Precipitation amount	mechanical (tipping bucket)	tipping bucket rain gauge
Precipitation intensity	mechanical (tipping bucket)	tipping bucket rain gauge
Air temperature	resistive	Thermos-transmitter
Wind speed	mechanical or ultrasonic	aerovane or ultrasonic anemometer
Wind direction	mechanical or ultrasonic	wind vane/aerovane ultrasonic
Relative humidity	capacitive	Hygro-transmitter
Solar radiation	resistive	pyranometer
Atmospheric pressure	barometric	barometer

Please note that value and number based specifications given in the above table can be marginally modified by the individual contractor/supplier in order to meet the specific system design offered by him. Wherever such modifications are suggested, in his technical proposal the future contractor/supplier shall clearly bring out the benefits that may accrue by way of these modifications of the specific parameters.

3.5 Software Works

- The supplier shall provide a web-based, user-friendly and secured interface software/system solution at NARC premises for data view, storage, processing and conduct calculations and produce reports to be installed based on the bidder proposed solution considering the required infrastructure at NARC premises/headquarter with sustainable software access.
- The system shall be able to receive measurements from new and existing weather stations and sending alarm messages and emails for pre-defined

[1] Modified according to WMO-No. 8, 2008, "Guide to Meteorological Instruments and Methods of Observation"

[2] Modified according to ASAE EP5052004, "Measurement and Reporting Practices for Automatic Agricultural Weather Stations"

threshold values for the different types of measured meteorological parameters such as but not limited to: rainfall intensity, temperature, relative humidity and wind speed which will be provided to the contractor once the system is set up and ready for configuration

- The system must be able to conduct calculations based on predefined equations for instance to calculate potential evapotranspiration from available meteorological measurements for any interval on hourly, daily, monthly and yearly basis. Yearly Thermal heat and chilling hours will be calculated for each location. Also, the software should be able to give the requested information regarding any weather element (T max, T min, RH, wind speed, Solar radiation for any selected period on hourly, daily, monthly and yearly basis.

3.6 Specifications for Training

The Contractor shall conduct O&M training with NARC staff, including training seminar and On-the-Job Trainings. The training shall take place at NARC premises and on site. The trainer shall provide necessary training materials and printed documentation. The training activities and related material to be developed by the Contractor shall be provided in both English and Arabic language in order to enable easy dissemination of the knowledge.

The Bidder shall offer a training plan of 1-3 days for 3-7 trainee at NARC premises which will provide the trainee with basic knowledge on the installed system with respect to the physical parts and software of the new telemetric weather stations. Table 5 summarizes the Modules of Training (MoT) according to required skills and fields of technical knowledge to be developed for the trainee.

Table 5: Area and Modules of Training (MoT)

	MoT	Skill Development / Field of Knowledge
1	**Software**	1. Field Software Modem and Configurators 2. Web-based software access and use 3. Trouble-shooting (basic knowledge)
2	**Monitoring Hardware**	1. Data logger and data transmission 2. Meteorological Sensors
3	**Installation, O&M, Trouble-shooting** **"On the job training"**	1. Site visit to a meteorological station 2. Replacement of station physical parts such as solar panels, sensors, telemetric system et al. (basic knowledge)

3.7 Bid Conditions

The Contractor/supplier shall fulfil the following terms and conditions:

- Proven evidence of experience with projects of similar nature and size, preferably in Jordan.
- System operation and maintenance for one calendar years starting from the date of handing over of all services including the hard ware and software of the system.
- Written guarantee on the provided material and services for at least one year and an official commitment from the main manufacturer of spare parts availability and customer support for at least ten years.

- Provision of data sheets from weather stations manufacturer for sensors, data logger, data transmission module, and power supply system.
- Construction and implementation works shall be done under the supervision and approval of the employer representative/s.