RAINFALL MONITORING SYSTEM

ISSUED BY MIAMI-DADE COUNTY:
Internal Services Department, Procurement Management Services Division

for the
Miami-Dade Water and Sewer Department (WASD)

COUNTY CONTACT FOR THIS SOLICITATION:
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Background
WASD recognizes the importance of accurate spatial and temporal rainfall data in managing its wastewater collection and transmission system. As a result, WASD desires to develop a program to acquire and analyze GARR data to support decision-making in Planning, Engineering, and Operations.

Miami-Dade County has a service area of approximately 480 square miles, which is shown in Exhibit A. The "GARR Study Area" boundary, shown in Exhibit A, MDWASD Rain Gauges, defines the study area for the radar-rainfall program and includes the urban coastal communities of the Greater Miami area.

WASD owns and operates a wastewater collection and transmission system, consisting of approximately 1,000 pumping stations and over 2,500 miles of collection mains. The collection system serves 13 major municipalities or Volume Sewer Customers (VSC), in addition to the Miami-Dade County residents. The collected wastewater is transmitted through over 640 miles of transmission mains to the three (3) regional wastewater treatment facilities, located in the North, Central, and South Districts. The total permitted capacity of these wastewater treatment facilities is approximately 350 million gallons per day (MGD).

Current Process
WASD currently operates a network of 66 rain gauges. Their locations are shown in Exhibit A. In addition, there are other rain gauges in WASD's service area operated by other agencies (e.g., National Oceanographic and Atmospheric Administration, National Weather Service, etc.). At each County location, WASD measures rainfall continuously and stores data at a 3-minute interval.

WASD has an ongoing program to manage system-wide collection and transmission system capacity and reduce sanitary sewer overflows. As part of this program, WASD tracks wet weather flow response in the system. This involves comparing concurrent rainfall hyetographs against wastewater hydrographs. This information is used to evaluate system performance and track infiltration and inflow (I/I) levels.

In order to support these efforts, WASD would like to have GARR data to determine total rainfall over specific geographic areas (e.g., pump station basins). This information will be utilized by WASD for historical storms in order to determine baseline conditions. WASD would also like to have GARR data on an ongoing basis, in order to support the wastewater collection and transmission program. In addition to supporting MDWASD's capacity management program, obtaining the GARR data in real-time will assist in supporting operational decisions.

Services to be Provided
The selected Proposer shall perform the following tasks and deliverables:

Tasks and Deliverables

Task 1: Review Rain Gauge Program

The selected Proposer shall perform an evaluation of WASD’s existing rain gauge network and provide recommendations to improve the capture of high quality data. As part of the review, rain gauge sitting, data quality, equipment, spacing, the number of gauges, operation and maintenance practices, data collection, and other relevant factors should be analyzed and addressed.
The selected Proposer will be required to meet with County staff as needed to perform the review and present recommendations to improve final data quality and accuracy. The selected Proposer will be required to submit the recommendations in a technical memorandum as a deliverable under the resultant contract.

Task 2: Historical Rainfall Data

WASD desires to determine baseline wet weather conditions in the collection and transmission system. To assist in this effort, WASD desires AQ-GARR data for five (5) selected historical storms for any time period gap between the expiry of the current contract and start of the new contract. WASD will provide the selected Proposer with historical rainfall data. The selected Proposer will be required to assist WASD in the selection of the historical storms to use in the analysis by meeting with County staff as needed, reviewing/analyzing historical rain gauge and radar data, and making recommendations to WASD.

The selected Proposer will be required to develop AQ-GARR data across the study area for the 5 historical storms (if applicable) at a 5-minute time step. The selected Proposer will perform detailed QA/QC on the rainfall and radar data used to develop the AQ-GARR data. The County rain-gauge data will be provided at a 3-minute time step. The selected Proposer will be required to obtain additional rain-gauge data from other sources as it deems necessary to fulfill this requirement.

It is anticipated that the selected Proposer will provide the County with the following:

1. A technical memorandum which summarizes the historical storms including the date of occurrence, duration, total volume and recurrence frequency for the entire service area.
2. A Microsoft Excel spreadsheet which summarizes the historical storms including the date of occurrence, duration, total volume and recurrence frequency for each of the pumping station basins.
3. The AQ-GARR data formatted as ARC/INFO ASCII Grid files or other file format as approved by WASD. The Selected Proposer shall provide a separate file for each rainfall time step and the files shall use a naming convention as approved by WASD which clearly identifies the date and time corresponding to when the rainfall occurred.
4. ASCII files with tab-delimited columns which provide the time series of rainfall data for each pumping station. The Selected Proposer shall provide a separate file for each storm. The first column shall contain the timestamp and the proceeding columns shall provide the rainfall for the pump stations for the corresponding time step. The first row shall contain header information such as the pump station names and the units of measurement.

The selected Proposer shall provide to the County the files through web access as approved by WASD. The selected Proposer will also be required to make the data for the five (5) historical storms (if applicable) accessible to County staff through the website as described in Task 5, Web-Based Access to Rainfall Data.

Task 3: Monthly Archive Data

The selected Proposer will be required to develop and submit on a monthly basis AQ-GARR data for the study area as a deliverable under the resultant contract. The time step of the AQ-GARR data can be no more than five (5) minutes.
In support of the development of the AQ-GARR data, the WASD will provide rainfall data from the County’s network of ground-based rain gauges to the selected Proposer. The selected Proposer will be required to perform a detailed QA/QC on the rainfall and radar data used to develop the AQ-GARR data.

It is anticipated that the selected Proposer will provide the County with the following deliverables on a monthly basis:

1. A brief technical memorandum which summarizes the storm events including date of occurrence, duration, total volume, and recurrence frequency over the total service area. The narrative will also be required to include observed gauge errors that may indicate mechanical failure, digital file corruption, or improper synchronization of the gauge clocks.

2. A Microsoft Excel spreadsheet which compares the AQ-GARR data against the raw rain gauge data. The spreadsheet will be required to compare the gauged storm total against the AQ-GARR storm total for that radar “bin.” Scatter-plots of rain gauge storm totals versus the AQ-GARR storm totals shall be prepared for each gauge. A cumulative distribution plot will be required to be prepared and submitted for each storm for each gauge site that shows rain gauge data, non-adjusted radar-rainfall data and AQ-GARR data.

3. AQ-GARR data in ARC/INFO ASCII Grid file format or other format as approved by WASD. The selected Proposer will be required to provide a separate file for each rainfall time step and the files will use a naming convention as approved by WASD which clearly identifies the date and time corresponding to when the rainfall occurred.

4. ASCII file with tab-delimited columns which provides the time series of rainfall data for each pumping station. The first column shall contain the timestamp and the proceeding columns will be required to provide the rainfall for the pump stations for the corresponding time step. The first row will be required to contain header information such as the pump station names and the units of measurement.

The selected Proposer shall provide to the County the deliverables through web access as approved by WASD. The deliverables are to be postmarked on or before the 15th of the following month. The selected Proposer will also be required to make the monthly data accessible to County staff through the website as described in Task 5, Web-Based Access to Rainfall Data, on or before the 15th of the following month.

Proposal submissions should detail the approaches and tools that will be used to develop AQ-GARR data. The approaches used to identify problems or anomalies in the rainfall and radar data should also be detailed along with processes for correcting or compensating for them. The process of calibrating the radar data to the rainfall data should be detailed and include, but not be limited to a discussion of the frequency of calibration (e.g., calibration to storm totals, total during each time step, etc.) and the spatial-weighting of the rain gauges in the calibration process.

**Task 4: Real-Time Rainfall Data.**

The selected Proposer shall provide real-time, GARR data to WASD. The selected Proposer will be required to make the data accessible to County staff through the website as described in Task 5, Web-Based Access to Rainfall Data. Barring delays in NEXRAD and rain gauge data deliveries to the selected Proposer which are beyond the selected Proposer’s control, the “real time” data available on the website will be required to reflect the earliest possible, recent conditions.

It is understood that the accuracy and reliability of “real-time” GARR data is less than that for AQ-GARR data. Proposals should detail the range of accuracy and reliability that can be provided by the real-time data.
Proposals should detail the process used to develop the “real-time” GARR data and make clear the differences between this process and the process used to develop the AQ-GARR data.

In support of the development of the real-time data, the WASD will provide rainfall data from the County’s network of ground-based rain gauges to the selected Proposer in “real time.” Proposals should describe data exchange protocols by which WASD can provide the selected Proposer with “real-time” rain gauge data.

Task 5: Web-Based Access to Rainfall Data

The selected Proposer will be required to provide, maintain, and host a password-protected website which provides County staff with access to the AQ-GARR data, pumping station rainfall time-series data, real-time GARR data, and predictive rainfall data.

The website will be required to provide the following functionality at a minimum:

- Display a service area map showing rain gauge locations, pump stations, pump station basins and other GIS layers that will be provided by WASD;
- Animate rainfall intensities for user-selected storms over the service area map (utilizes data from Tasks 2, Historical Rainfall Data, and 3, Monthly Archive Data);
- Animate rainfall intensities for user-selected preceding time period (e.g., last 3 hours, last 8 hours, last 24 hours, last 48 hours, etc.) over the service area map (utilizes data from Task 4, Real-Time Rainfall Data);
- Display real-time rainfall intensity on service area map (utilizes data from Task 4, Real-Time Rainfall Data);
- Provide graphs/tables of 5-minute rainfall intensity over the service area or a user-selected pumping station basin for a user-selected storm or preceding time period (utilizes data from Tasks 2, Historical Rainfall Data; 3, Monthly Archive Data; and 4, Real-Time Rainfall Data);
- Provide graphs/tables displaying total rainfall depth for the service area or a user-selected pumping station basin for a user-specified time period or preceding time period (utilizes data from Tasks 2, Historical Rainfall Data; 3, Monthly Archive Data; and 4, Real-Time Rainfall Data);
- Provide table of predicted rainfall for the service area and user-selected pumping station basins (utilizes data from Task 6);
- Provide animated map of forecasted rainfall intensities (utilizes data from Task 6, Predictive Rainfall Data); and
- Provide ability to export tables to Microsoft Excel.

Additionally, it is highly desired that the website provide a map which illustrates the spatial distribution of a storm’s recurrence frequency given a user-specified duration (e.g., 12 hours, 24 hours, etc.).

Task 6: Predictive Rainfall Data

The selected Proposer will be required to provide or make available spatially distributed rainfall forecasts to WASD through web access. The forecasts will be required at a minimum of one (1) hour into the future. The forecasted rainfall data will be required to be available through the website.

Proposals should discuss the method used to spatially predict rainfall and provide references to academic journals or other sources of information which provide additional detail. Proposals should also discuss the reliability and accuracy of the predictive spatially-distributed rainfall data.
WASD understands that a number of wastewater utilities use one (1) hour predictions to assist in system operation. WASD would like to develop a better understanding of whether or not a longer predictive period can be reasonably obtained, and if so, how reliable and accurate the data would be. Accordingly, proposals should quantify how the reliability and accuracy of the predictions change as the predictive period increases.

**Deliverables**

The key project deliverables will be required to include, but not be limited to, the following (that are further detailed in the above tasks):

- Rain Gauge Program Review Technical Memorandum
- Historical Rainfall Data
- Technical memorandum
- Microsoft Excel spreadsheet summarizing the historical storms
- AQ-GARR grid data file for each time step
- Pumping station time-series rainfall file for each storm
- Monthly Deliverables
- Technical memorandum
- Microsoft Excel spreadsheet comparing AQ-GARR data against raw data
- AQ-GARR grid data file for each time step
- Pumping station time-series rainfall file
- Password-protected website provided and hosted through selected Proposer which provides access to:
  - Historical storm AQ-GARR data (animated maps of service area, tables/graphs for service area and pumping stations)
  - Monthly AQ-GARR data (animated maps of service area, tables/graphs for service area and pumping stations)
  - Real-time GARR data (animated maps of service area, tables/graphs for service area and pumping stations)
  - Predictive rainfall data

**Technical Support Services**

The proposed Solution must be of the most recent release and the selected Proposer shall provide all hosting, software maintenance, and technical support services for the proposed Solution throughout the term of the contract.

Any restrictions to, shutdowns of, or lack of due deliverables at the selected Proposer’s web site must be restored fully within three (3) days.

**Implementation Requirements**

The selected Proposer must provide a detailed explanation and implementation timeline with their proposal response that addresses the firm’s ability for contract startup. The explanation must demonstrate that adequate services will be available within thirty (30) days of the awarded contract start date to accommodate the service level expectation of WASD. Proposers shall include the following information at a minimum in their proposal response:
• Provide implementation schedule and delivery dates list all services requested in Section 2.0, Scope of Services, including rainfall activity data dating back to the contract start date (processed after the fact).

Training
The selected Proposer shall provide WASD with at least five (5) “Train the Trainer” sessions of up to twenty (20) WASD Users each to cover using, administrating, and reporting on the Solution. Training shall be conducted on-site at a designated location provided by WASD and be coordinated with approved dates/time by the authorized WASD Project Manager. The selected Proposer shall supply an electronic copy of all training materials to WASD. Additional training shall be made available via on-line videos or other resources on an ongoing basis throughout the term of the contract awarded as a result of this solicitation.

Tests
The selected Proposer shall configure and program the Solution to conform to Section 2.0, Scope of Services. The software will be subject to several tests. Implementation Plan, and Acceptance Criteria to be developed and agreed by both parties.