

COVER PAGE

AWARD NUMBER: G22AC00120

SPONSORING ORGANIZATION: Utah Geological
Survey

PROJECT TITLE: Persistent Portal Connection and Water Level Equipment Purchase
and Installation to the NGWMN by the Utah Geological Survey

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TERM COVERED: July 1, 2022, to October 1, 2023

MAJOR GOALS: Continue the flow of data to the National Groundwater Monitoring Network (Objective 2- support persistent data services) and purchase and installation of transducers (Objective 6-Equipment purchase)

PROJECT SUMMARY: The Utah Geological Survey (UGS) continues the flow of data from the UGS Water-Quality Network to the National Ground-Water Monitoring Network (NGWMN). In addition, we purchased and installed 8 transducers and 3 barologgers. This project establishes a long-term goal to continue integrating our state-level data with a national-level database. The total federal funding available for this project was \$41,136, federal funds

spent to date is \$22,819.

OVERVIEW OF WORK

The Utah Geological Survey (UGS) cooperated with the USGS to provide a continued connection between the UGS Water-Quality Network and the NGWMN, providing the NGWMN with selected sites and related quality-controlled data. The UGS linked a database from our network for entry and integration of data to the NGWMN portal. The UGS provided ongoing maintenance by updating the list of UGS network sites, populating data elements for new sites acquired, substituting for a previous site that was not accessible at a later sampling date, and ensuring the NGWMN Portal connection to the databases stayed operational. For year one of this two year grant, the UGS installed transducers in 8 new water-level monitor sites and measured water levels. Geologists and GIS Specialists in the Groundwater and Wetlands Program of the UGS performed all tasks in cooperation with the USGS and provided web services for database integration, despite having a change of staff in for our GIS staff members.

Data flow maintenance by the UGS consisted of the following four tasks:

1. **Ongoing network maintenance (persistent data services)**
 - Janae Wallace, Paul Inkenbrandt, Nathan Payne (1/2 year), and Kiersten Winwood (1/2 year)
 - a. administered and maintained the UGS database;
 - b. performed regular manual and automated quality assurance and quality control (Paul Inkenbrandt and Kiersten Winwood);

- c. maintained a user interface (UI) application that allows for upload of site and field chemistry information (Nathan Payne, Kiersten Winwood);
- d. Created and maintained data services for water level and well construction information.

2. Updating network site list (Objective 2)

Janae Wallace coordinated with other groundwater geologists at the UGS to check station data and add data where necessary. The groundwater geologists inspected records related to their respective sample sites and verified the accuracy of the information of each location to ensure that it is correct and current. Under the direction of Janae, the geologists entered new data related to the NGWMN sites into the UGS database, which allowed for the flow of that data to the NGWMN.

3. Ensured an operational connection between the UGS and the NGWMN Portal

(Objective 2)

Working closely with the USGS, the UGS continued to provide data to the NGWMN. The UGS:

1. ensured that the data is flowing from UGS to WQX to NGWMN;
2. maintained data integrity and proper flow of results data;
3. established best practices for data transfer and upkeep;
4. maintained a schema/field mapping and conversion in cooperation with USGS;
5. maintained REST service to serve data via web service in cooperation with USGS;
6. Communicated with Candice Hopkins (USGS) to ensure data were mapping correctly.

4. Purchase and installation of transducers in existing water quality sites in order to collect water-level data. (objective 6)

Objective 2: Persistent data services

WEB SERVICES

The UGS uses an ESRI-based ArcGIS SDE (spatial database engine) to store data collected for the UGS networks. The ArcGIS platform allows us to serve data via REST-based public web services. The schema of the database was modeled after the EPA's WQX database under the guidance of the USGS, where the primary tables are a Results table that holds measured data and a Stations table that holds monitoring location/site information. Many of the field names are different from those of the WQX to meet field name limitations of the SDE and some fields have been added to comply with the minimum data requirements (Subcommittee on Ground Water, 2013) of the NGWMN. We also have well owner information, well construction information, and lithology information tables. Well owner information is not made publicly available by the UGS. All the data we transmit and services we provide follow existing federal schemas, specifically the WQX schema. The UGS provides services that contain the following tables:

1. Stations

- a. unique identification is the station identification number
- b. contains minimum data requirements for sites

2. Results

- a. many to one relationship with stations
- b. joined to stations using station identification number
- c. parameter per row format
- d. contains results returned by the U.S. EPA laboratory and the Utah Department of Epidemiology and Lab Services
- e. contains measured field parameters

3. Lithology

- a. lithology describes the geology from the well driller's record
- b. this information is connected to the station table via the station identification number

4. Well Information

- a. this table includes completion and well construction

b. it is derived from the Utah Division of Water Rights database

The current UGS services can be found at the following web addresses:

- REST URL:
https://webmaps.geology.utah.gov/arcgis/rest/services/Groundwater/NGWMN_USGS_V2/MapServer
- SOAP URL:
https://webmaps.geology.utah.gov/arcgis/services/Groundwater/NGWMN_USGS_V2/MapServer

The state of Utah provides technical assistance to various state agencies through its Department of Technology Services (DTS). In addition, former UGS employee Martha Jensen was the designated data manager who maintains and builds our databases that feed our website. She was replaced by Nathan Payne. The UGS also has many technically experienced staff that maintain databases and web pages. We are currently working with the EPA on an Exchange Network grant to enhance the flow of water chemistry and wetland data from Utah to the EPA. With the Exchange Network support the UGS is actively developing an ESRI Collector based application to interface with the database, allowing UGS staff to enter station and field data anywhere that the internet is available. The interface is still being beta-tested but will be the main platform for entering data into the UGS database. Data entry on the application limits users to specific domains for each field, to ensure that the entered data follows the schema required by the EPA WQX and NGWMN.

Objective 6: Purchase water-level measuring equipment

The UGS has requested funding to purchase and install 8 transducers and 3 barologgers. The State of Utah currently has a purchasing contract with an In-Situ distributor for pressure transducers. For this project, we are using In-Situ RUGGED TROLL 100 pressure transducers. These transducers are non-vented and have a built-in data logger. For the barologgers, we are using the BAROTROLL pressure transducer, which also has a built in datalogger. Specifically, we used NGWMN funding to purchase and replace 3 transducers in Snake Valley NGWMN wells that have been serving water quality data and now will provide persistent water level data services (in addition to water quality data) from agency databases to

the NGWMN Portal (figure 2; table 1). The Snake Valley transducers have been in service for 5 years and three months. In addition, UGS purchased and equipped 5 additional water quality network wells with transducers and barologgers. Two of these sites are in Castle Valley (2 transducers and 1 barologger), two are in the Uinta Basin water quality network (2 transducers, 1 barologger), and one in northern Utah in Cache Valley (one transducer and one barologger) (figure 2; table 1). Janae Wallace deployed new transducers in the Castle Valley and Uinta Basin sites. Hugh Hurlow deployed 3 transducers in the Snake Valley sites, and Paul Inkenbrandt deployed the remaining transducer and barologger in Cache Valley, Utah.

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