

**New Hampshire Geological Survey  
National Ground-Water Monitoring Network Project  
(Cooperative Grant Agreement No. G23AC00309)  
07/01/2023 – 06/30/2025  
Final Report**

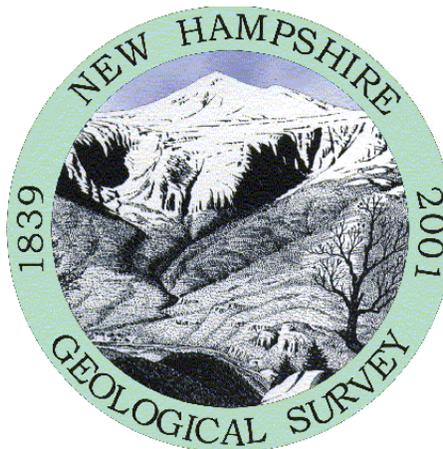
Submitted to:

U.S. Geological Survey  
Office of Acquisition and Grants  
Attn: Rod Caldwell

By

Michael W. Howley, P.G., Senior Geoscientist  
Principal Investigator  
New Hampshire Geological Survey  
29 Hazen Drive, PO Box 95  
Concord, New Hampshire 03302-0095  
(603) 271-2876  
michael.w.howley@des.nh.gov

November 20, 2025





## Introduction

The New Hampshire Geological Survey (NHGS), a unit within the New Hampshire Department of Environmental Services (NHDES), has been involved with the National Ground-Water Monitoring Network (NGWMN) since becoming a new data provider in 2016. NHGS's involvement with NGWMN has been as an initial data provider, standing up web services, performing evaluation and maintenance of the network wells to ensure compliance with the network criteria for inclusion, implementing procedures for data handling and quality control, replacing existing network wells, installing network expansion wells, and identifying data gaps. This document is meant to fulfill our obligation of a final report for our 2023 grant, Cooperative Grant Agreement No. G23AC00309, effective dates 07/01/2023 to 06/30/2025.

All groundwater level monitoring wells monitored by NHGS provide groundwater level data to the NGWMN and are part of New Hampshire's Groundwater Level Monitoring Network ("the network"). In addition to contributing daily and monthly groundwater level measurements to the NGWMN, the network is also utilized to evaluate the effects of meteorological drought on groundwater conditions within the State of New Hampshire. The network serves as a critical resource to both NHDES' internal and statewide Drought Management Teams. During the ongoing drought of 2025 in New Hampshire, groundwater level data from New Hampshire's network has been critical in informing National Weather Service hydrologists and weekly U.S. Drought Monitor map authors of the on the severity and distribution of severe and extreme drought conditions in the State of New Hampshire. In addition, these data are crucial to instream flow evaluations and to evaluate the effects of longer-term climate change trends.

On a monthly basis, NHGS staff and volunteers collect data from the current 48 network wells, the locations of which are shown in Figure 1. 41 of the 48 network wells are equipped with transducers and data loggers which record hourly water level and temperature measurements. Quarterly site maintenance is conducted at 38 of the 41 wells equipped with dataloggers that have cellular telemetry enabled and transmit data daily to State of New Hampshire managed servers. Quarterly maintenance includes calibration of the datalogger by hand measurement of groundwater level and replacement of consumable desiccants. Monthly site visits are conducted at the remaining 3 wells equipped with dataloggers but where no cellular service is available, and at the 7 wells that do not have dataloggers installed. Monthly site visits include manual download and calibration of the datalogger, if equipped, and hand measurement of groundwater level. Following data collection and quality control procedures, the data are loaded into a database management system. Once finalized, these data are then shared to the



internet via web services and, in cooperation with USGS, are made publicly accessible through the NGWMN portal. NHGS prepares a monthly report of groundwater conditions across the network and provides the data along with hydrographs and statistical tables of monthly frequency analysis to stakeholders involved with drought management. NHGS also maintains the [New Hampshire Groundwater Level Monitoring Dashboard](#) which displays the most recent groundwater level data, statistical analysis, and the past six months of weekly groundwater summary statistics.

In our 2023 proposal, NHGS proposed the following tasks:

Objective 2, Part A:

- NHGS proposed to continue to make groundwater level measurements available through our web services to support the continued flow of groundwater data to the NGWMN from the wells monitored by NHGS.

Objective 3:

- NHGS proposed to fill gaps in information at two NGWMN expansion wells in Keene, NH and Alton, NH (NGWMN Monitoring Location Registry ID: NHGS:KEWB-01 and NHGS:ANWB-01, installed under G22AC00123 and G23AC00309, respectively) by conducting borehole video logging to determine lithologic details and upload the modified network metadata to the NGWMN portal.

Objective 4:

- NHGS proposed: to replace the surface casing at one existing NGWMN site in Campton, NH (NGWMN Monitoring Location Registry ID: NHGS:CBW-34); and to replace the well cover at one existing NGWMN site in New London, NH (NGWMN Monitoring Location Registry ID: NHGS:NLW-01).
- NHGS proposed to conduct periodic maintenance pumping of 10 NGWMN wells to assess and maintain their connection to the aquifers monitored by these wells.

Objective 5:

- NHGS proposed to drill one overburden well in Canaan, NH and one bedrock well in Gilford, NH to fill spatial gaps in the NGWMN.



- Collection of site metadata and purchase of continuous monitoring equipment for the NGWMN expansion sites was also proposed.

#### Objective 6:

- NHGS proposed to purchase and install groundwater pressure transducer and data loggers (“loggers”) to support continuous water-level data collection in two existing NGWMN wells (NGWMN Monitoring Location Registry ID: NHGS:NLW-01 and NHGS:RGWB-02).

#### **Objective 2, Part A: Data and Web Service Management – Ongoing**

NHGS continues to collect, curate and store groundwater level data from our network of monitoring wells. The current (November 2025) NHGS well network that provides data to the NGWMN Portal can be seen in Figure 1. These data are then exposed to the public through our web services and through a GIS dashboard which displays the statistical analysis of the most recent groundwater level data. Over the last year, we have been engaged with USGS to ensure our web services are operating and providing data to the NGWMN network. Specifically, over the last year NHGS has worked with NGWMN data managers to redesign and reconfigure web services to maintain data flows that have been interrupted by changing security requirements for web services that serve water levels, and sunseting of ArcGIS Enterprise support for web services that serve well location, lithology, and construction details. These data flow issues have been resolved, and 100% of data retrieval requests from USGS NGWMN are succeeding. NHGS also continues to work with the USGS New England Water Science Center to display up-to-date data from NHGS-monitored NGWMN groundwater wells on the Groundwater Levels in New England website. Inclusion of the NHGS NGWMN data alongside other USGS monitored sites in New Hampshire and elsewhere in New England has benefitted both the internal NH stakeholders and federal partners at the National Weather Service and US Drought Monitor map authors.

#### **Objective 3: Network Data Gap Filling – Completed**

Under Objective 3, NHGS proposed to conduct borehole video logging in NHGS:KEWB-01 and NHGS:ANWB-01, installed under G22AC00123 and G23AC00309, respectively, to determine lithologic details in these bedrock wells. Borehole video logging was conducted in spring of 2025. Lithologic details have been determined and NHGS has updated NGWMN metadata in the Monitoring Location Registry and in the Construction Details that are exposed to NGWMN through NHGS’ Web Services.



#### **Objective 4: Network Well Maintenance Activities – Completed**

NHGS proposed to replace the protective well casing at the NGWMN site in Campton, NH (NGWMN Monitoring Location Registry ID: NHGS:CBW-34); and to replace the well cover at the existing NGWMN site in New London, NH (NGWMN Monitoring Location Registry ID: NHGS:NLW-01). The replacement well casing for CBW-34 was purchased in April 2024 and installed in May 2024. The protective casing was cemented in place without altering the height of the monitoring point above ground surface and will provide weather-tight protection for this overburden well for many years to come. Materials for the replacement well cover for NLW-01 were purchased and installed in October 2023. Masonry repairs were performed to the existing dug well riser, along with construction of a new access hatch to the well cover to allow installation of a data logger at this site. The exiting hand-pump down-pipe was removed from NLW-01 and the hand-pump was repainted and reinstalled as requested by the property owner. Photos 1 and 2 below show the protective casing and well cover at CBW-34 and NLW-01, respectively, before and after maintenance was performed.



Photos 1 - NHGS:NLW-01 before (left) and after (right) NGWMN-funded site maintenance was conducted in October 2023.



Photos 2 - NHGS:CBW-34 before (left) and after (right) NGWMN-funded site maintenance was conducted in May 2024.



NHGS proposed to conduct maintenance pumping in 10 existing NGWMN wells, specifically: CVWB-01, CVWB-02, DDWB-01, EAWB-01, EAWB-02, HKW-05, NLW-01, NWWB-01, RGWB-01, RGWB-02. Maintenance pumping was conducted in HKW-05, NWWB-01, RGWB-01, and RGWB-02 in July 2024, and in CVWB-01, CVWB-02, DDWB-01, EAWB-01, EAWB-02, and NLW-01 in April 2025. The pumping duration, approximate pumping rate, and approximate volume pumped from each well is reported in Table 1.

**Table 1.** Maintenance Pumping Rates and Observations.

| NGWMN Site ID | Well Depth | Date Pumped | Pumping Duration (minutes) | Pumping Rate (gal/min) | Volume Pumped (gallons) | Well Volumes Removed | Observations                            |
|---------------|------------|-------------|----------------------------|------------------------|-------------------------|----------------------|---|
| NHGS:NWWB-01  | 167        | 2024-07-01  | 45                         | 1.6                    | 72                      | 0.3                  | Recovery to static WL within 21 hours   |
| NHGS:RGWB-01  | 401        | 2024-07-02  | 50                         | 1.5                    | 75                      | 0.13                 | Recovery to static WL within 3.5 hours  |
| NHGS:RGWB-02  | 285        | 2024-07-02  | 50                         | 1.5                    | 75                      | 0.18                 | Recovery to static WL within 55 minutes |
| NHGS:CBW-34   | 102.7      | 2024-07-15  | 40                         | 1.7                    | 68                      | 0.45                 | Recovery to static WL within 2 hours    |
| NHGS:NLW-01   | 21         | 2025-04-22  | 45                         | 1.8                    | 81                      | 0.33                 | Recovery to static WL within 3.5 hours  |
| NHGS:CVWB-01  | 480        | 2024-04-22  | 40                         | 1.7                    | 68                      | 0.1                  | Recovery to static WL within 11 hours   |
| NHGS:CVWB-02  | 315        | 2024-04-22  | 45                         | 1.6                    | 72                      | 0.16                 | Recovery to static WL within 9 hours    |
| NHGS:EAWB-01  | 473        | 2024-04-25  | 40                         | 1.8                    | 72                      | 0.1                  | Recovery to static WL within 45 minutes |
| NHGS:EAWB-02  | 323        | 2024-04-25  | 45                         | 1.7                    | 76.5                    | 0.16                 | Recovery to static WL within 50 minutes |
| NHGS:DDWB-01  | 300        | 2024-04-25  | 50                         | 1.6                    | 80                      | 0.18                 | Recovery to static WL within 3 hours    |



### **Objective 5: Well Installation in Canaan, NH and Gilford, NH – Completed**

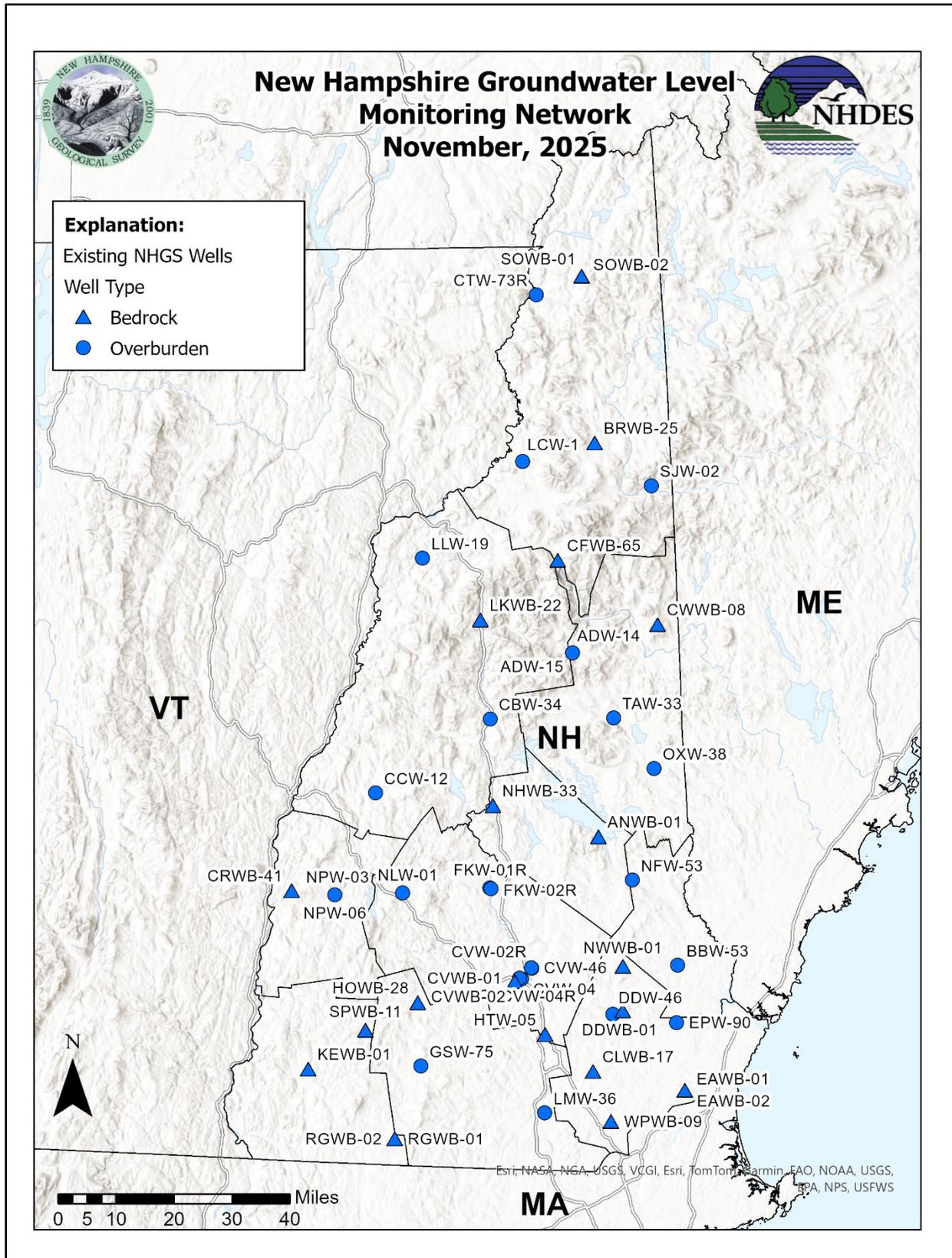
NHGS proposed to drill two network expansion wells in our proposal for G23AC00309. One well was specified to be an overburden well located in Canaan, NH, and the second well was specified to be a bedrock well located in Gilford, NH. The bedrock well planned for Gilford, NH was relocated to the adjacent town of Alton, NH due to land access issues. During the performance period of grant G23AC00309, NHGS has:

- Finalized the locations for the two wells to be installed under G23AC00309.
- Negotiated access agreements on two State of New Hampshire-owned properties.
- Solicited bids and selected drilling contractors to perform the well installation.
- Entered into contracts with the selected drilling contractors.
- Completed installation of expansion wells NHGS:CCW-01 and NHGS:ANWB-01.
- Collected initial site metadata including well construction details, GPS position, and other required site metadata of the new wells
- Uploaded site metadata to the NGWMN Monitoring Location Registry for the two network expansion sites
- Purchased and installed continuous monitoring data loggers in both wells
- Calculated the initial hydraulic conductivity for both wells
- Made available stratigraphic/lithologic information for both wells through NHGS' web services

Both wells are now serving daily median groundwater levels to the NGWMN through NHGS' water level web services.

### **Objective 6: Purchase and Install Continuous Groundwater Monitoring Equipment – Completed**

NHGS proposed to purchase and install groundwater pressure transducer and data loggers ("loggers") to support continuous water-level data collection in two existing NGWMN wells that were previously monitored at monthly measurement frequency. The NGWMN sites proposed under Objective 6 were a dug well located in New London, NH (NGWMN Monitoring Location Registry ID: NHGS:NLW-01) and bedrock well located in Rindge, NH (NGWMN Monitoring Location Registry ID: NHGS:RGWB-02). Data loggers were purchased and installed in these two wells in April 2024 and are currently serving daily median water level data to the NGWMN through NHGS' web services.



**Figure 2.** Map indicating the locations of existing NHGS wells contributing data to the NGWMN as of November 2024.