

**New Hampshire Geological Survey
National Ground-Water Monitoring Network Project
(Cooperative Grant Agreement No. G17AC00201)
Final Grant Report**

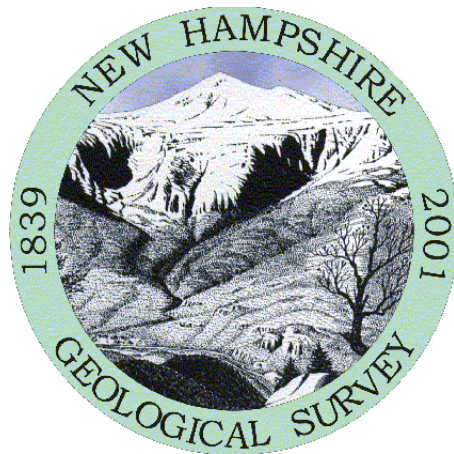
Submitted to:

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By

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Introduction

The New Hampshire Geological Survey (NHGS) began participation in the National Groundwater Monitoring Network (NGWMN) in June of 2016. This document is meant to fulfill our obligation of a final progress report for our 2017 grant, Cooperative Grant Agreement No. G17AC00201.

In our proposal, NHGS proposed the following tasks:

- Identify and negotiate inclusion of two new wells into the network,
- Maintenance of current web services,
- Enhance web services for lithologies encountered by each well and their construction elements, and
- Collection and evaluation of downhole camera video.

NHGS has completed or by end of the grant year (June 30, 2019) will have completed the tasks outlined in our agreement. We have experienced some small delays as the result of our agency having transitioned the database and web services to two new servers.

New Wells

NHGS sought to expand our groundwater monitoring network in two geographic regions, the high elevation White Mountains and in our southeastern coastal lowland (see Figure 1). Unfortunately, The National Forestry Service had already decommissioned the well prior to current Forestry staff and NHGS working out an agreement to monitor the C.L. Graham well, located at the top of the Swift River basin, a tributary to the Saco River. As a way to supplement this well, we tried locating at least one additional legacy well (from the USGS Stratified Drift Aquifer Mapping Project) within the Swift River basin. However, searches for this well (USGS well ADW-16) proved unsuccessful.

NHGS was successful in finding a well in the seacoast region. We chose well BBW-53 because its location avoids tidal and anthropogenic influences. BBW-53 is a well that was completed in stratified glacial drift and is 23 feet deep. This well was installed in the 1980's as part of the cooperative USGS Stratified Drift Aquifer Mapping Project. Review of the surficial geology mapped for the area indicates the well was completed in the sandy facies of the Presumpscot Formation. The Presumpscot Formation is well recognized in Maine, New Hampshire and northern Massachusetts and is interpreted as sandy or silt and clay sediment deposited in peri- and proglacial environments within the Pleistocene ocean. Review of LiDAR elevation data corroborates this depositional interpretation.



New Hampshire Ground Water Well Network

Legend

Network Expansion Wells

- BBW 53
- CVWB-02.1
- C.L. Graham

Ambient Network Wells

Well Type, Measurement Freq.

- BEDROCK, Monthly
- BEDROCK, Hourly
- DUG, Monthly
- GRAVEL, Monthly
- GRAVEL, Hourly
- Counties

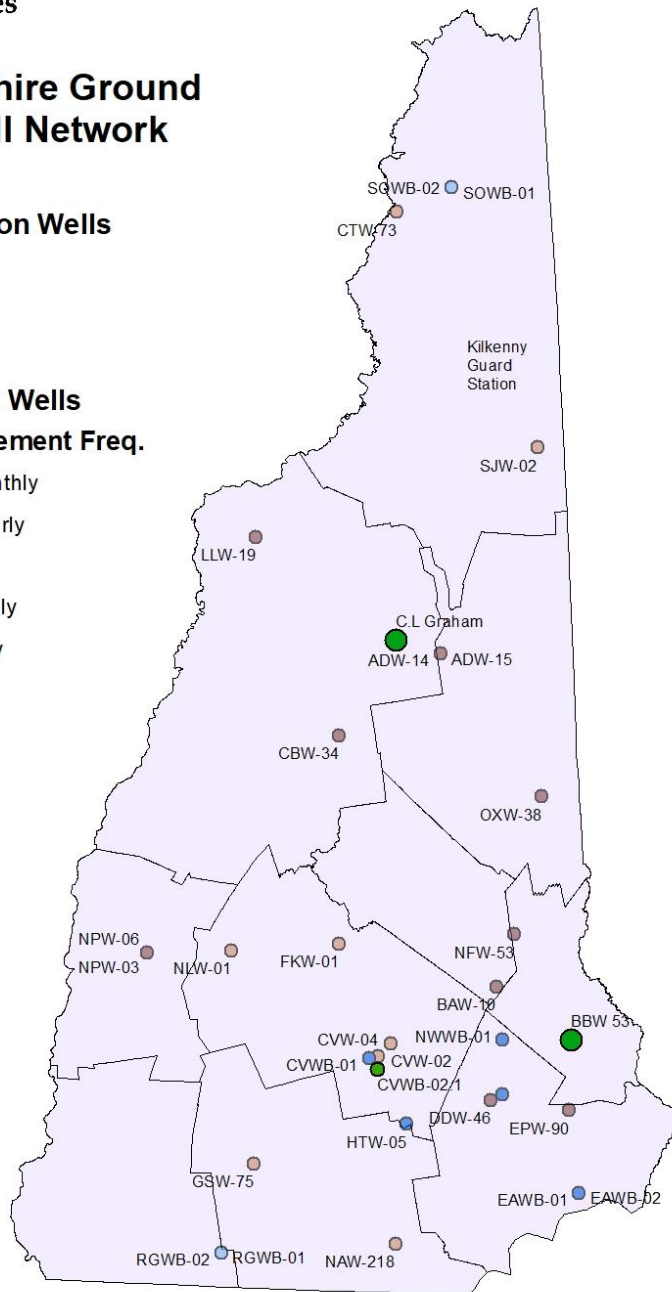


Figure 1 - Current NHGS Monitoring Network with proposed expansion wells C.L. Graham and BBW-53

Data and Web Service Management

NHGS continues to collect, curate and store groundwater level data from our network of monitoring wells. These data are then exposed to the public through our web services. Over the last year, we have made progress standing up a new web service that more easily serves well attribute data. NHGS developed a new GIS REST service that streamlines serving data for construction elements and lithologic/stratigraphic logging data for each location, where that data is available. The address of the new service is https://gis.des.nh.gov/server/rest/services/Hosted/NH_National_Groundwater_Monitoring_Network_Wells/FeatureServer. The network currently uses the older service and we will coordinate a transition to the new service. Also, we will be preparing summary statistics for each well which will also be available through the existing WaterML 1.1 service.

Collection and Evaluation of Downhole Camera Video

As a way of evaluating the condition of wells within the network, NHGS has in the past performed downhole videoing of most of our wells. Under this grant, we proposed to capture video from 3 additional wells (FKW-01, SJW-02 & CTW-73). The videoing was conducted in May and June of 2018 and revealed evidence of limited sediment build up and no structural integrity problems with any of the well casing or screens.

Updating Well Location and Elevation Attributes

NHGS staff visited each well location and collected new coordinate data for each well. The new location data was established using a Trimble Juno 3B with precisions generally less than 3 meters. The resulting coordinates collected were then compared against either 1-foot or 6-inch orthophotography, where available, to ensure higher precision spatial locations.

Elevation surveys were conducted using a Leica level and stadia rod. Prior to conducting the surveys, an evaluation was conducted of existing bench mark locations and their proximity to each well. When reasonably close (less than a ¼-mile away), a benchmark was used as an elevation source, otherwise LiDAR elevation data was used. In using LiDAR data, an elevation was extracted from the DEM for a readily recognizable feature (e.g., edge of pavement intersection) and using it as the elevation basis of the survey. The new elevations are provided in Table 1. The coordinates and elevations for each of the wells were also edited at the NGWMN portal.

Well Integrity Evaluation and Maintenance Activities

Throughout 2018 and 2019, NHGS conducted well maintenance and integrity evaluations for the overburden wells within the network. An initial hydraulic or “slug” test was conducted at

each well that monitors the overburden sediments. In this proposed project, NHGS was to use the results of the hydraulic testing as basis to conduct well redevelopment activities (i.e., sediment removal). However, under a subsequent proposal (G18AC00089), we committed to conducting well redevelopment of all the network overburden wells. See Table 1 for a list of wells with completed activities and Figure 1 for each location. The sediment removal was performed through use of a Waterra bailing system. In general, we used a target of 3 well screen volumes per well to determine adequate redevelopment. In several cases, this was either not necessary (purged water cleared quickly of sediment) or couldn't be achieved due to slow recharge volumes.

Table 1 – Summary of Well Maintenance, Testing and New Elevations					
NHGS Well ID	Town	Monitored Aquifer	Maintenance Performed	Hydraulic Testing	New Elevation (m)
ADW-14	Albany	Overburden	Purged	Slug Test Completed	380.89
ADW-15	Albany	Overburden	Purged	Slug Test Completed	380.90
BAW-10	Barnstead	Overburden	Purged	Slug Test Completed	161.74
BBW-53	Barrington	Overburden	Purged	-	58.27
CBW-34	Campton	Overburden	Purged	Slug Test Completed	166.67
CTW-73	Colebrook	Overburden	Purged	Slug Test Completed	103.12
CVW-02.1	Concord	Overburden	-	-	88.89
CVW-04	Concord	Overburden	Purged	Slug Test Completed	291.62
CVWB-1	Concord	Bedrock	-	-	-
CVWB-2	Concord	Bedrock	-	-	-
DDW-46	Deerfield	Overburden	Purged	Slug Test Completed	82.33
DDWB-1	Deerfield	Bedrock	-	-	146.84
EAWB-1	East Kingston	Bedrock	-	-	-
EAWB-2	East Kingston	Bedrock	-	-	-
EPW-90	Epping	Overburden	Purged	Slug Test Completed	37.51
FKW-01	Franklin	Overburden	Purged	Slug Test Completed	85.74
GSW-75	Greenfield	Overburden	Purged	Slug Test Completed	273.84
HTW-05	Hooksett	Bedrock	-	-	79.87
LLW-19	Lisbon	Overburden	Purged	Slug Test Completed	182.28
NAW-218	Nashua	Overburden	Purged	Slug Test Completed	62.29
NFW-53	New Durham	Overburden	Purged	Slug Test Completed	165.28
NLW-01	New London	Overburden	Purged	-	313.68
NPW-03	Newport	Overburden	Purged	Slug Test Completed	237.27
NPW-06	Newport	Overburden	Purged	Slug Test Completed	237.29
NWWB-1	Northwood	Bedrock	-	-	198.89
OXW-38	Ossipee	Overburden	Purged	Slug Test Completed	151.99
RGWB-1	Rindge	Bedrock	-	-	-
RGWB-2	Rindge	Bedrock	-	-	-
SJW-02	Shelburne	Overburden	Purged	-	-
SOWB-1	Stewartstown	Bedrock	-	-	679.64
SOWB-2	Stewartstown	Bedrock	-	-	679.67