

**Final Technical Report: Oregon Water Resources National Ground-Water Monitoring Network  
Cooperative Agreement G23AC00313 (7/15/2023 through 7/14/2025)**

**Award Number:** G23AC00313

**Agency Name:** Oregon Water Resources Department

**Title:** Oregon National Ground-Water Monitoring Network

**Contract Term:** 7/15/2023 through 7/14/2025

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## Background

The Oregon Water Resources Department (OWRD) manages water supplies in the state of Oregon. The Department monitors groundwater levels throughout the state to evaluate aquifer sustainability, the impacts of groundwater withdrawals on surface water sources, and the availability of groundwater for new proposed uses. Five principal USGS aquifers underlie extensive areas of Oregon (Miller, 1998; Whitehead, 1994): Willamette Lowland basin-fill aquifers, Pacific Northwest basin-fill aquifers, Pacific Northwest basaltic-rock aquifers, Columbia Plateau basin-fill aquifers, and Columbia Plateau basaltic-rock aquifers. Three additional principal aquifers underlie small areas of the state. Snake River Plain basin-fill aquifers and Snake River Plain basaltic-rock aquifers occur in a narrow strip in eastern Oregon, adjacent to Idaho, and Basin and Range basin-fill aquifers occur in southeastern Oregon adjacent to Nevada. A sizable fraction of Oregon is underlain by pre-Miocene rock that hosts low-yield fractured bedrock aquifers. Although these are not defined as a USGS principal aquifer, they represent an important water supply in many areas of the state, especially west of the Cascade Mountains.

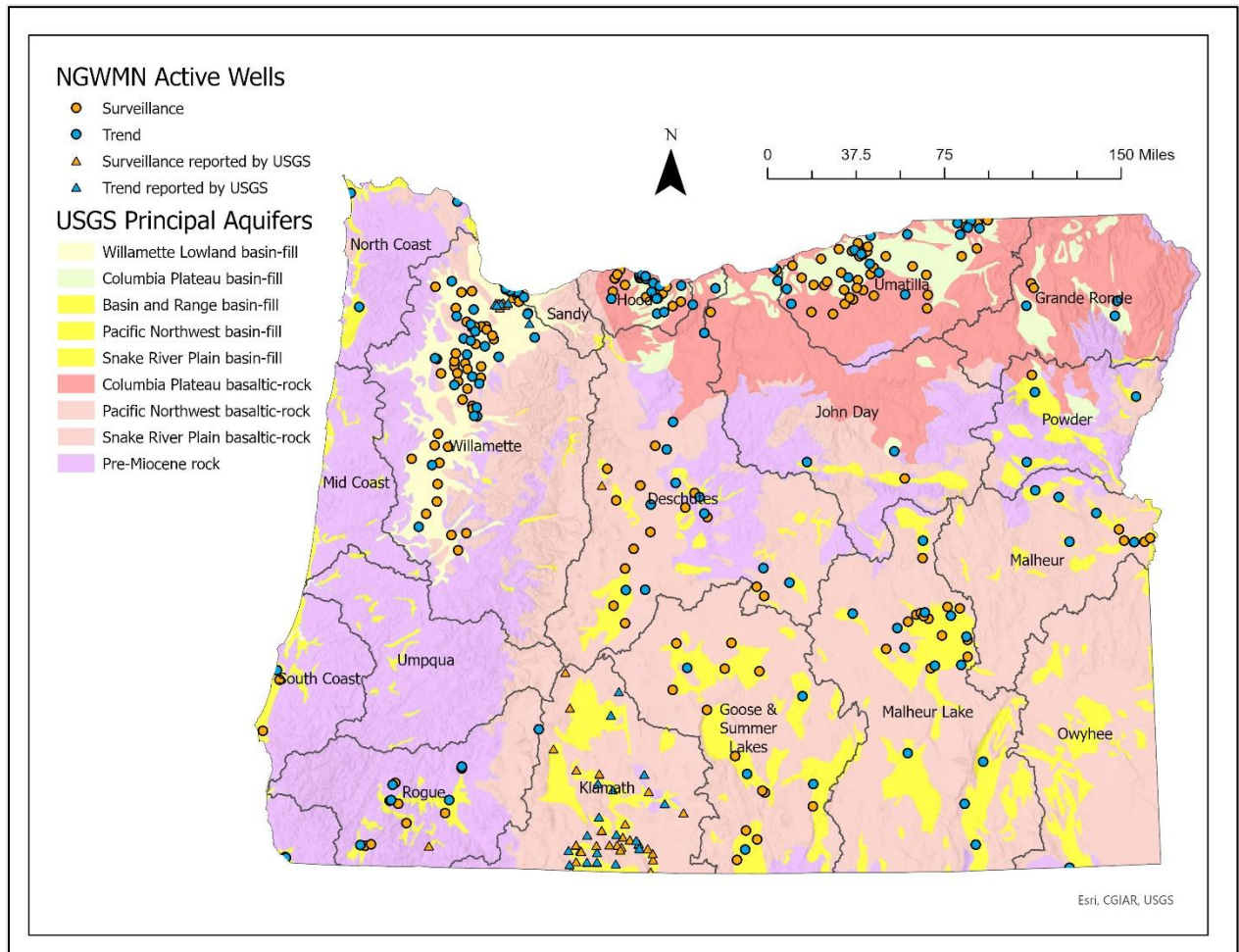


Figure 1: Current OWRD National Groundwater Monitoring Network wells.

OWRD became a new NGWMN provider in 2015 and currently maintains 287 active NGWMN sites that represent 5 USGS principal aquifers and several locally important pre-Miocene bedrock aquifers (Figure 1). Continuous recorders are installed in 61 wells (Table 1).

**Table 1: Summary of active OWRD NGWMN wells by aquifer, monitoring category, and recorder use. Trend monitoring provides high-frequency data over a long period of at a limited number of wells, while surveillance monitoring provides higher spatial resolution through measurement of more wells at lower temporal frequency.**

<b>USGS Principal Aquifer</b>	<b>Trend</b>	<b>Surveillance</b>	<b>Recorder</b>	<b>Total</b>
Columbia Plateau basaltic-rock aquifers	31	43	15	74
Columbia Plateau basin-fill aquifers	4	8	7	12
Other (Pre-Miocene rock)	7	4	4	11
Pacific Northwest basaltic-rock aquifers	23	44	13	67
Pacific Northwest basin-fill aquifers	29	37	16	66
Willamette Lowland basin-fill aquifers	21	36	6	57
<b>Total</b>	<b>115</b>	<b>172</b>	<b>61</b>	<b>287</b>

**Description of Work Done to Support the NGWMN under Award G23AC00313**

Award G23AC00313 provided funds to maintain the persistent data services (objective 2). The completion of all tasks is documented in the following section.

**Objective 2: Support Persistent Data Service**

During year 1 and 2 of the award period, OWRD’s Information Services Section performed routine backup, performance tuning, and stored procedure modifications to ensure continuity of web services.

Task 1: Update Registry

During the reporting period, OWRD staff made routine well registry updates as needed. Quality assurance of data was performed following the procedures outlined in the section titled “Data-Collection Methods and Quality Assurance Procedures” below.

Changes to the wells that OWRD actively serves to the NGWMN are listed in

Table 2. Overall, 12 wells were added, removed, or replaced. Of those changes, 6 were observation replacements, 3 additions, 1 removal, and 2 seeking replacement. The sum of those changes left the size of OWRD's active contributions to the network static at 287 wells (Table 1). Wells where a replacement observation well could be identified (Figure 3 through Figure 7) were added to the NGWMN registry if not already present. For those original wells, the Alternate Well ID in the NGWMN portal was set equal to the OWRD ID of the replacement, and the relationship set to "Replacement". For the replacement wells, the Alternate Well ID was set equal to the OWRD ID of the original well with a relationship of "Original". Alternate well links were not provided because attempting to set them gave an error of "The specified URL cannot be found." Two wells had their measurement responsibilities shifted from the USGS to OWRD in early 2025: CLAC0006388 (USGS site ID 452033122195901) and JACK0018427 (USGS site ID 420825123040401). One well (HARN000607) was added to the NGWMN in 2025 after having its measurements restarted in 2015 after a 25-year hiatus following the initial measurements starting in 1968 (Figure 2). Two wells were removed and are in need of replacement: WASC0003149 and WASC0003482. One well was removed from the network and will not be replaced: HARN0051611.

#### Task 2: Classify any new sites

All new sites were classified according to the Subnetwork and Monitoring Categories as described in the NGWMN Framework document and the tip sheets for Defining the Subnetwork and Defining Monitoring Categories. Two sites added to OWRD's NGWMN network had previously been part of the NGWMN with measurements and service from the USGS: CLAC0006388 (USGS site ID 452033122195901) and JACK0018427 (USGS site ID 420825123040401). These sites inherited their classifications from their predecessors. Only one site was added that had not been in the NGWMN before: HARN000607. This site was added as a Surveillance site with Documented Changes due to declines of about 40 feet over its interrupted period of record (Figure 2).

The other sites were added as replacement wells. To the extent possible, replacements were chosen that could match the same monitoring category (Trend or Surveillance) and subnetwork (Background, Suspected Changes, or Documented Changes) as their predecessor. However, this was not always possible due to differences in periods of record and access for measurements. Changes in these classifications between original and replacement wells are noted in the following paragraph.

HARN0001408 was added as a replacement for HAR0001393. The short period of record in HARN0001393 after 2015 led that site to be initially classified for Suspected Changes, but the consistent period of record confirming ongoing declines in HARN0001408 led that site to be classified as Documented Changes (Figure 3). UMAT0057007 was set as a replacement for UMAT0002396, and it inherited the classification of Documented Changes even though the record in UMAT0057007 alone does not display the long-term changes seen since the 1980s in UMAT0002396 (Figure 7).

Table 2: Classification of wells added to or removed from OWRD’s NGWMN network.

Original Well Name	New or Replacement Well Name	Original Year Last Observed	Replacement Year First Observed	Aquifer System	Subnetwork Type	Monitoring Category
45203312 2195901	CLAC 0006388	N/A	Same well, took custody from USGS in 2025	Willamette Lowland basin-fill	Background	Trend
N/A	HARN 0000607	N/A	1968	Pacific Northwest basin-fill	Documented Changes	Surveillance
HARN 0001393	HARN 0001408	2018	1958	Pacific Northwest basin-fill	Documented Changes	Trend
HARN 0000503	HARN 0051843	2025	2017	Pacific Northwest basin-fill	Documented Changes	Surveillance
HARN 0000755	HARN 0052102	2018	2014	Pacific Northwest basaltic-rock	Suspected Changes	Trend
HARN 0051611	Won't be replaced	2020	N/A	Pacific Northwest basin-fill	Background	Surveillance
420825123 040401	JACK 0018427	N/A	Same well, took custody from USGS in 2025	Other (Pre- Miocene rock)	Suspected Changes	Surveillance
MORR 0000508	MORR 0000509	2017	1980	Columbia Plateau basaltic-rock	Documented Changes	Surveillance
UMAT 0002396	UMAT 0057007	2017	2012	Columbia Plateau basin-fill	Documented Changes	Surveillance
WASC 0002760	WASC 0052294	2023	2015	Columbia Plateau basaltic-rock	Suspected Changes	Surveillance
WASC 0003149	Seeking	2025	Seeking	Columbia Plateau basaltic-rock	Suspected Changes	Trend
WASC 0003482	Seeking	2019	Seeking	Columbia Plateau basaltic-rock	Background	Trend

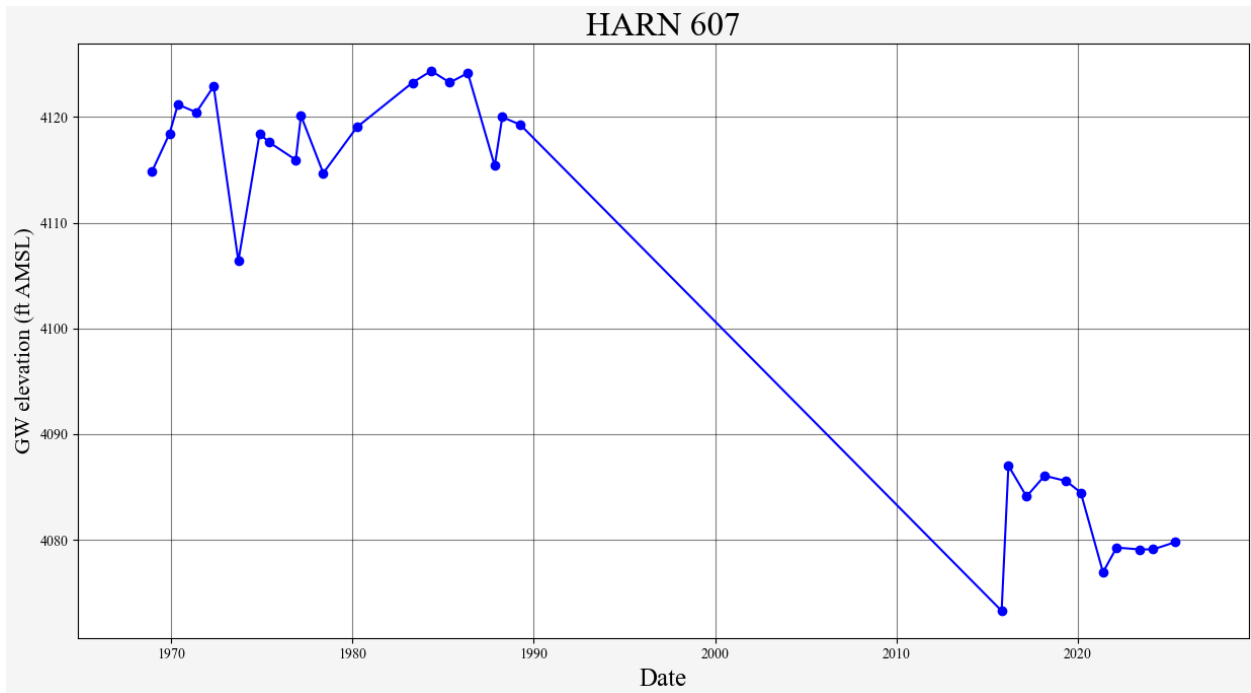


Figure 2: Hydrograph of annual high water levels in HARN0000607.

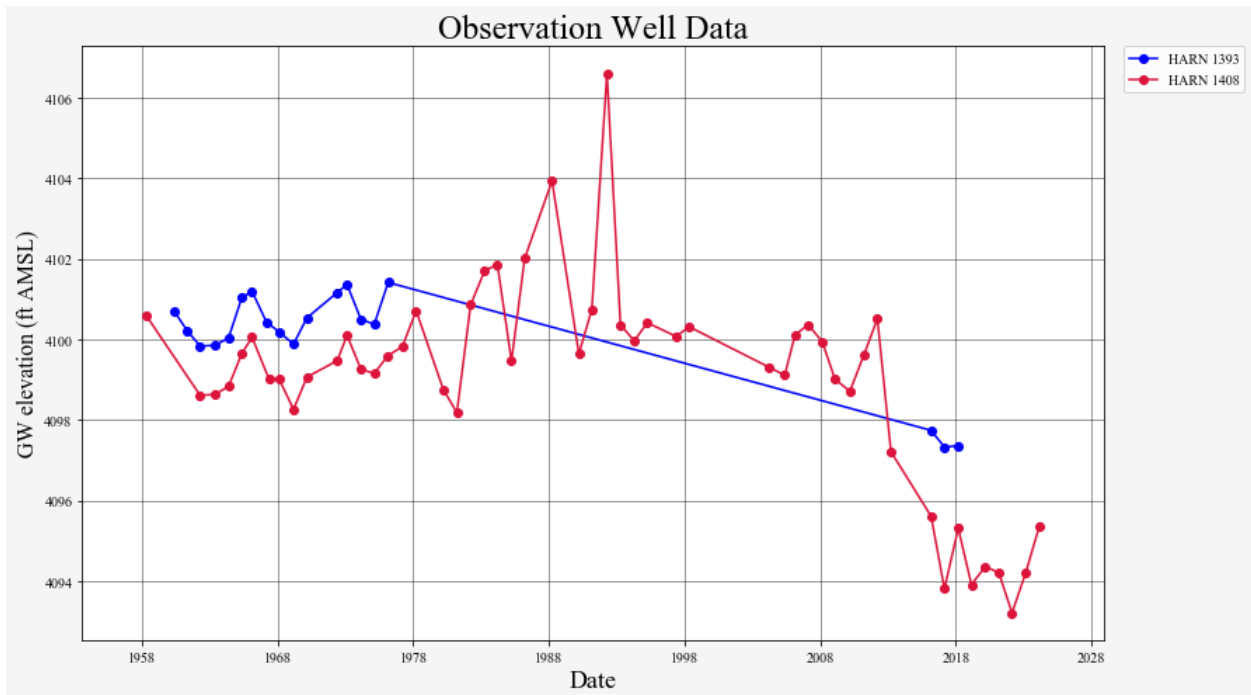


Figure 3: Composite hydrograph of annual high water levels for HARN0001393 and HARN0001408. HARN0001408 was already in the NGWMN registry and spans the record of HARN0001393.

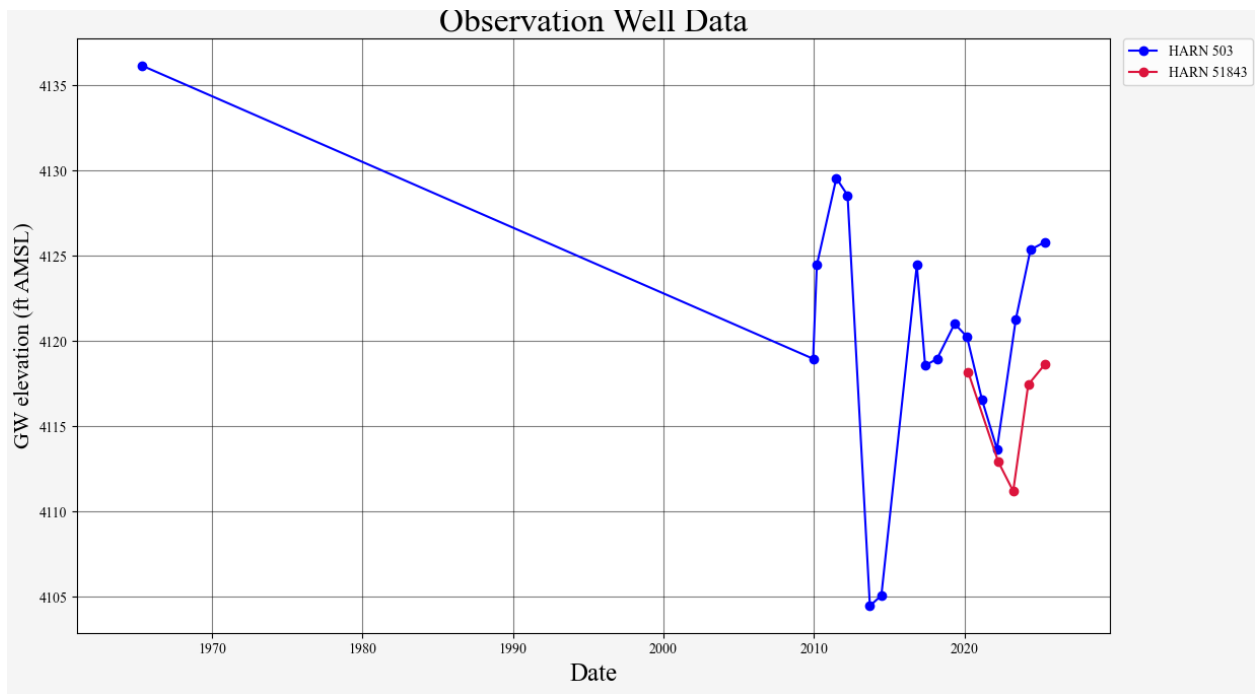


Figure 4: Composite hydrograph of HARN000503 and HARN0051843

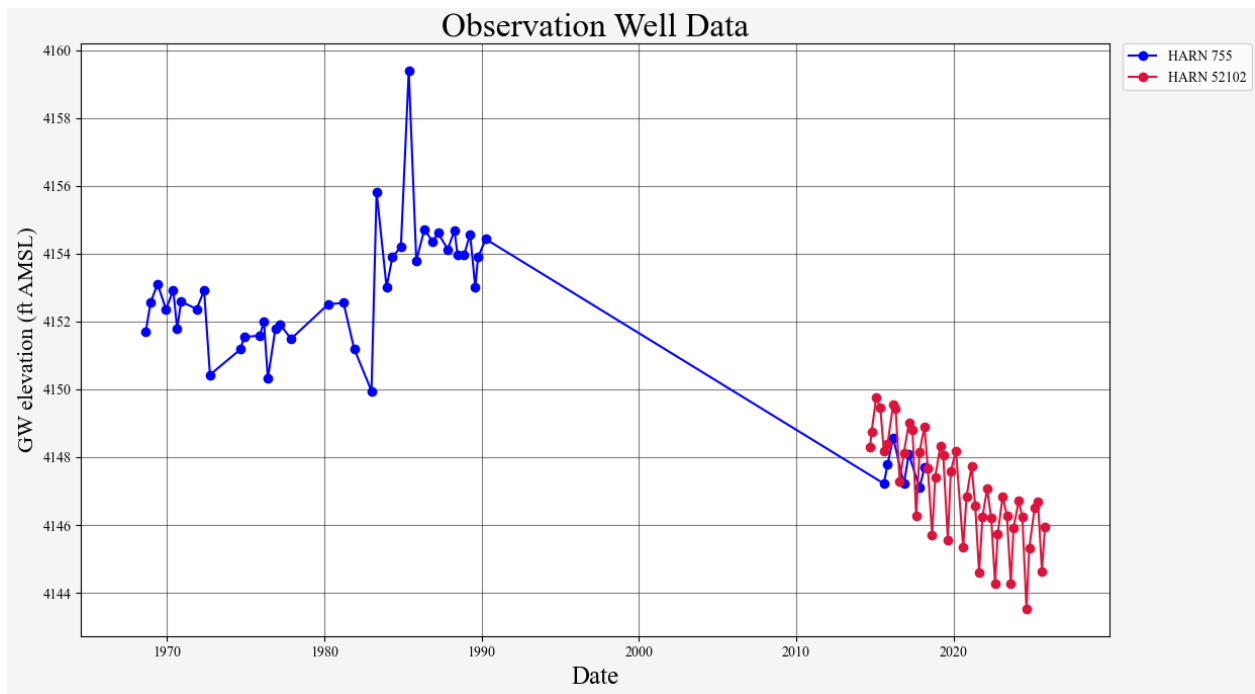


Figure 5: Composite hydrograph of annual levels for HARN000755 and its replacement, HARN0052102. Both wells are measured quarterly, supporting ongoing classification as a Trend well.

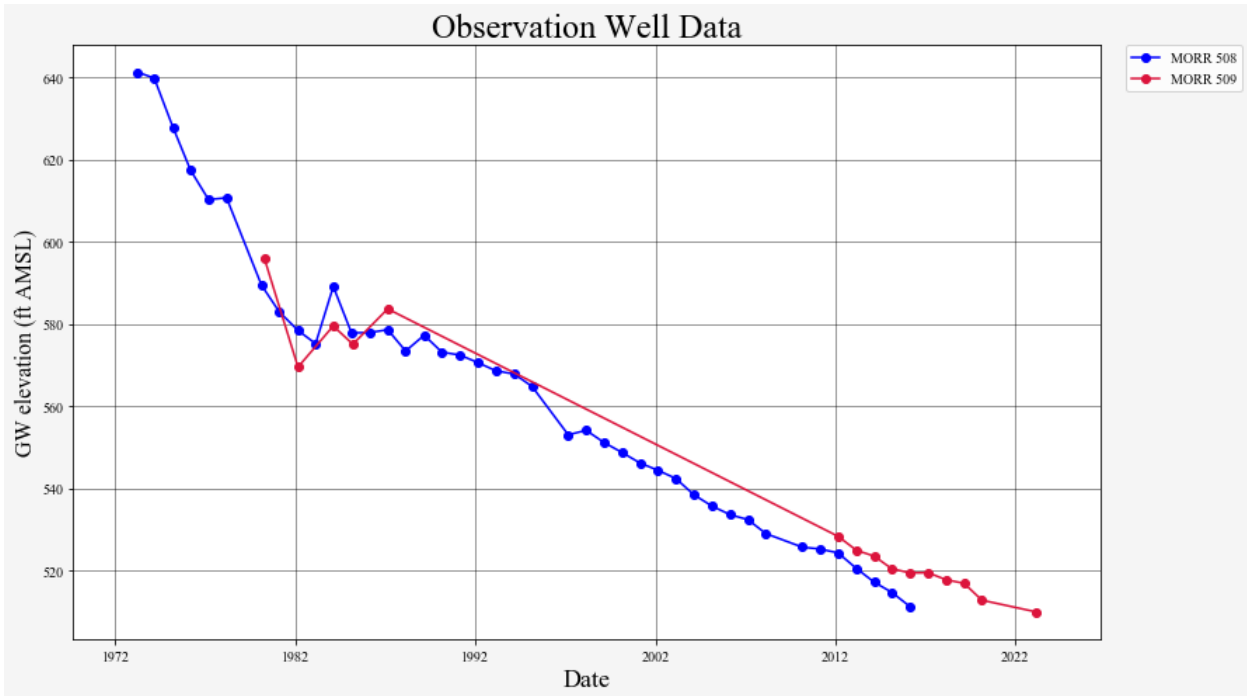


Figure 6: Composite hydrograph for MORR0000508 and MORR0000509.

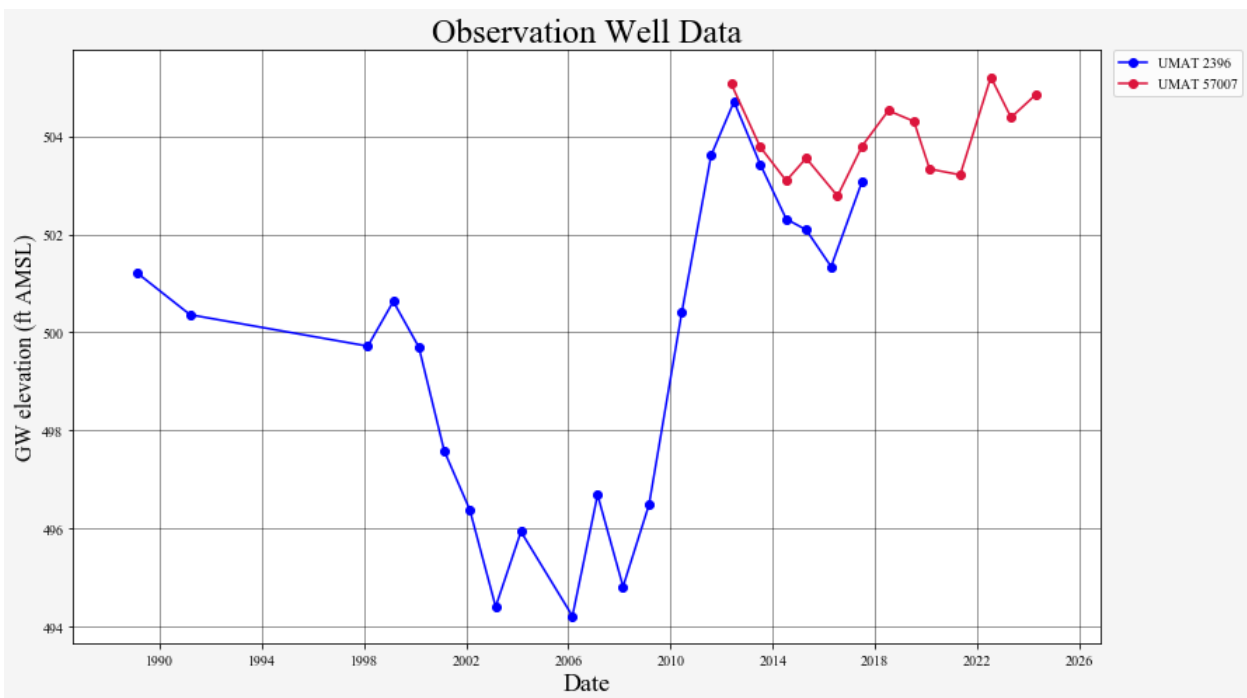


Figure 7: Composite hydrograph for UMAT00002396 and UMAT0057007.

Task 3: Populate data elements. (Groundwater Section)

During the reporting period, data elements were added on 5 active NGWMN sites, including a combination of well construction and construction history.

Task 4: Keep site information updated. (Groundwater Section)

During the reporting period, information was updated for 65 active NGWMN sites. These updates addressed a combination of updates about the site, its well construction, construction history, and location.

Task 5: Maintain web services (Information Technology and Groundwater Sections)

Web services were maintained. OWRD staff worked with Candice Hopkins to identify and remove an IP address filter that was blocking the NGWMN updates from new servers in January 2024.

Task 6: Update web services to serve any new required elements (Information Services Section)

WRD is not aware of any required updates during the reporting period, aside from access for the new NGWMN servers described above.

Task 7: Review Data Provider Pages. (Groundwater Section)

Data provider pages were reviewed regularly.

**In-Kind Data-Collection Activities**

*(Description of data-collection, well-maintenance, or well-drilling activities completed during the project)*

During the award period, routine water-level measurements were continued at all active NGWMN sites except for CLAC0006388, and automatic recorders were maintained at 61 sites. All data were routinely entered into OWRD database tables and are now available to the NGWMN via OWRD's web services.

**Data-Collection Methods and Quality Assurance Procedures**

OWRD collects water-levels and well metadata using procedures and data collection standards that parallel those outlined in the NGWMN Framework document and in Groundwater Technical Procedures of the U.S. Geological Survey (Cunningham and Schalk, 2011). The Department uses steel tapes in a few wells but generally uses commercially available electric tapes from several vendors. Tapes are calibrated annually, or more frequently as needed, using a 500-foot dedicated steel tape that has been calibrated by the USGS Oregon Water Science Center. Calibrated flat tapes (electric tapes with a steel core) are used in all dedicated observation wells without pumps. Coaxial electric tapes are used in all wells with pumps. In flowing artesian wells, calibrated gages are used to measure shut-in pressure. A few of our NGWMN wells are measured using an airline and a calibrated gage. Whenever possible, independent calibrated electric tape measurements are made to verify airline lengths.

Water-level measurement errors are initially assigned to each measurement based on the tool used to obtain the measurement as follows:

- Calibrated steel tapes 0.01 feet
- Calibrated flat electric tapes 0.01 feet
- Calibrated coaxial electric tapes 0.02 feet
- Uncalibrated coaxial electric tapes 0.10 feet
- Calibrated gage measurements used for shut-in pressures 0.25 feet
- Calibrated gage measurements used for airlines with verified airline lengths 2 feet
- Calibrated gage measurements used for airlines with unverified airline lengths 4 feet
- Water levels from a SCADA system 0.10 feet

However, these initial error estimates are adjusted upward as needed based on conditions encountered in the field.

Measuring points are documented relative to land surface at each well along with the horizontal and vertical errors associated with the well location and well-head elevation.

All current recorder data is processed and reviewed using WISKI, a time-series water-information management system developed by the KISTERS Company. A customized processing file is established in WISKI for each monitoring site based on unique site attributes. Standard protocols are used to subtract barometric pressure (most of our transducers are non-vented models), correct for drift using independent measurements made with calibrated electrical or steel tapes during each site visit, and correct for miscellaneous baseline shifts. Some of these processes are automated by the WISKI software but each file is also reviewed at various times by a hydrogeologist to ensure that the final product meets our quality control standards. The data is also processed to provide a table of mean daily levels. The final, corrected unit measurements and the daily mean values are uploaded into SQL tables, which are then available to the NGWMN Portal via OWRD's web services.

### **Status of OWRD Databases and Web Services**

OWRD initially established web services for discrete water levels, mean daily recorder water levels, lithology, and well construction when it became a new data provider in 2015. OWRD continues to maintain its groundwater database as needed to continue providing persistent data services and delivering data to the NGWMN.

OWRD web service requests currently available at:

[https://apps.wrd.state.or.us/apps/gw/gw\\_data\\_usgs/IndexUSGS.html](https://apps.wrd.state.or.us/apps/gw/gw_data_usgs/IndexUSGS.html)

Documentation of the web services is available at:

[https://apps.wrd.state.or.us/apps/gw/gw\\_data\\_usgs/IndexUSGS.html#hide1](https://apps.wrd.state.or.us/apps/gw/gw_data_usgs/IndexUSGS.html#hide1)

## References

- Cunningham, W.L. and C.W. Schalk, 2011. Groundwater Technical Procedures of the U.S. Geological Survey. USGS Numbered Series, U.S. Department of the Interior, Geological Survey ;
- Miller, J.A., 1998. Principal Aquifers [of the United States]. USGS Unnumbered Series, U.S. Geological Survey. doi:10.3133/32583.
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