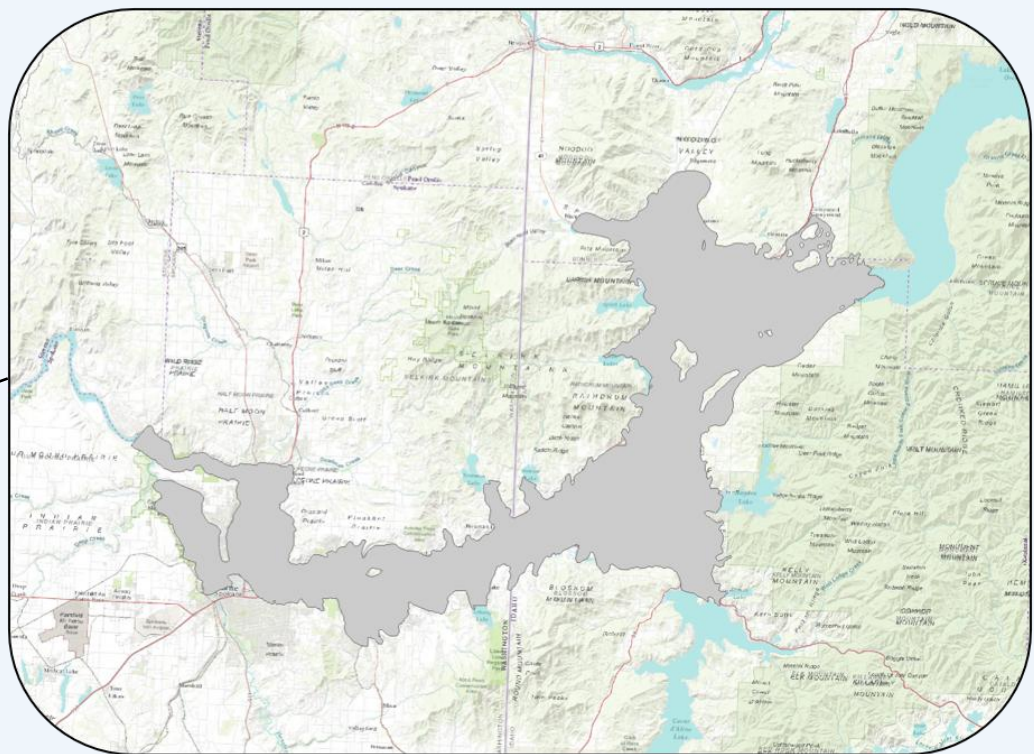


Update on Groundwater Level Monitoring and Trends for the Rathdrum Prairie Aquifer



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1. Introduction

The Rathdrum Prairie portion of the Spokane Valley-Rathdrum Prairie Aquifer provides drinking water to many municipalities and communities around Kootenai County and southern Bonner County. In 2015, over 100,000 people in the Kootenai and Bonner Counties relied on groundwater from the Rathdrum Prairie Aquifer (Solomon and Scott, 2015). Projected estimates suggest that in 2025 as many as 180,000 people in Idaho would rely on the Rathdrum Prairie Aquifer for drinking water (Solomon and Scott, 2015). SPF Water Engineering (2010) estimated that by 2060, the number of people in Idaho relying on the aquifer would increase to between 285,000 and 581,000.

Because of the importance of the Rathdrum Prairie Aquifer as a water source for the region, Idaho Department of Water Resources (IDWR) established the Rathdrum Prairie Ground Water Management Area (GWMA) in 2002. Though groundwater levels in the aquifer were not reported to be declining in 2002, IDWR established the groundwater management area to aid in administration of water rights and prevent the aquifer from becoming a Critical Ground Water Area (IDWR, 2002). The boundary for the 2002 Rathdrum Prairie Ground Water Management Area (Figure 1-1) is based on the 2000 Spokane Valley-Rathdrum Prairie Aquifer Atlas (MacInnis et al., 2000).

In 2004, the U.S. Geological Survey (USGS) began a multi-phase study of the Spokane Valley-Rathdrum Prairie Aquifer with a groundwater flow model published in 2007 (Kahle and others, 2005; Kahle and Bartolino, 2005; Hsieh and others, 2007). In addition to the groundwater model, the USGS developed a more extensive aquifer boundary to include areas in Bonner County and areas along the eastern margin of the Rathdrum Prairie (Kahle and others, 2005). In 2011, the Idaho Water Resource Board (IWRB) adopted the 2005 USGS aquifer boundary for the Rathdrum Prairie Aquifer Comprehensive Aquifer Management Plan (CAMP, Figure 1-1).

This report focuses on observed water level trends and general characteristics since IDWR began monitoring groundwater levels in the aquifer in 2006. Archived historical groundwater level measurements collected by the USGS provide an opportunity to assess groundwater level trends dating back to as early as the late 1920s.

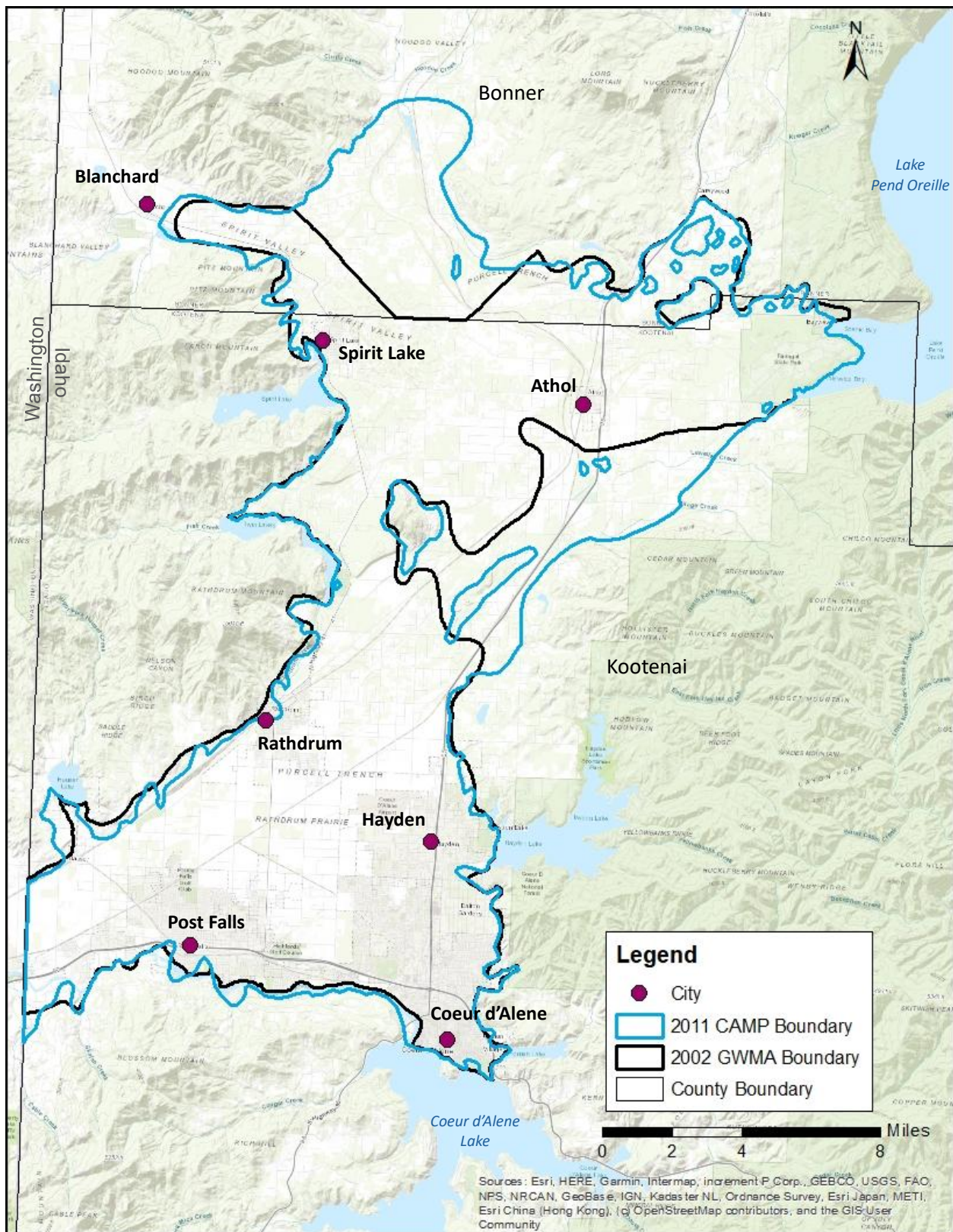


Figure 1-1. Map of the Ground Water Management Area and Comprehensive Aquifer Management Plan boundaries for the Rathdrum Prairie Aquifer.

2. Climate

2.1 Average Precipitation and Air Temperature

Climate data for the Coeur d'Alene Airport (Figure 2-1) shows the area experiences warm, dry conditions during the months of July, August, and September. Precipitation typically increases in October and continues through June, with January and December being the wettest months. On average, the Coeur d'Alene Airport receives approximately 25 inches of precipitation annually with an average annual temperature of 53 °F.

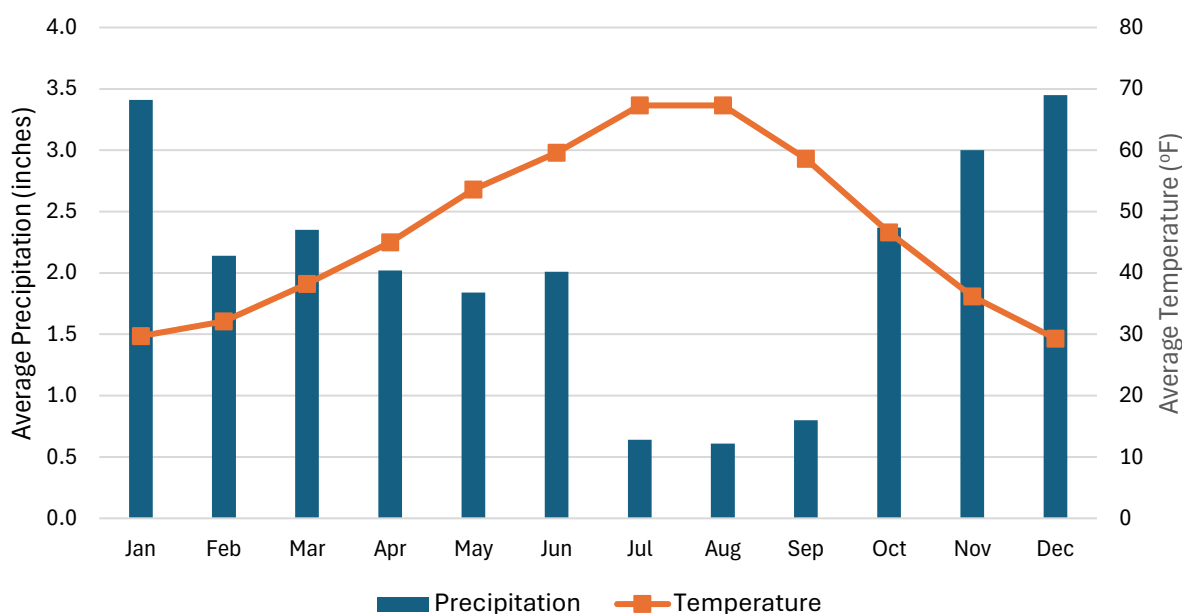


Figure 2-1. Average monthly climate conditions (1991-2020) for the Coeur d'Alene Airport (PRISM, 2024).

2.3 Climate Cycles

Multiple drought periods and wet periods have occurred in the Rathdrum Prairie over the past century. Climatic periods can be identified using both observed annual precipitation and the Palmer Drought Severity Index (PDSI) for the Rathdrum Prairie region. The PDSI method considers precipitation, evapotranspiration, soil moisture, and runoff for a specific region when calculating the PDSI value (Rhee and Carbone, 2007). Figure 2-2 shows monthly PDSI values for the Panhandle PDSI Region, which includes all of the Rathdrum Prairie Aquifer. Positive PDSI values indicate wet conditions with excess water availability and negative values indicate dry conditions with deficient water availability (Dai, 2023). The more positive or negative a value, the more extreme the conditions are. PDSI values between -2.0 and +2.0 are considered near

normal, whereas values less than or equal to -4.0 and greater than or equal to 4.0 are considered extreme (Dai, 2023).

As observed in Figure 2-2, multiple extreme droughts occurred during the 1920s to 1945. Extreme droughts occurred again in 1977 and 2021. Extreme wet years have occurred in the region in 1948, 1974, 1996-1997, and 2011-2012 with 1996 and 1997 being the wettest years over the past century (Figure 2-3). Though 2017 is not considered an extreme wet year, it was the wettest year over the past decade. Since 2017, the region has been experiencing generally drier conditions.

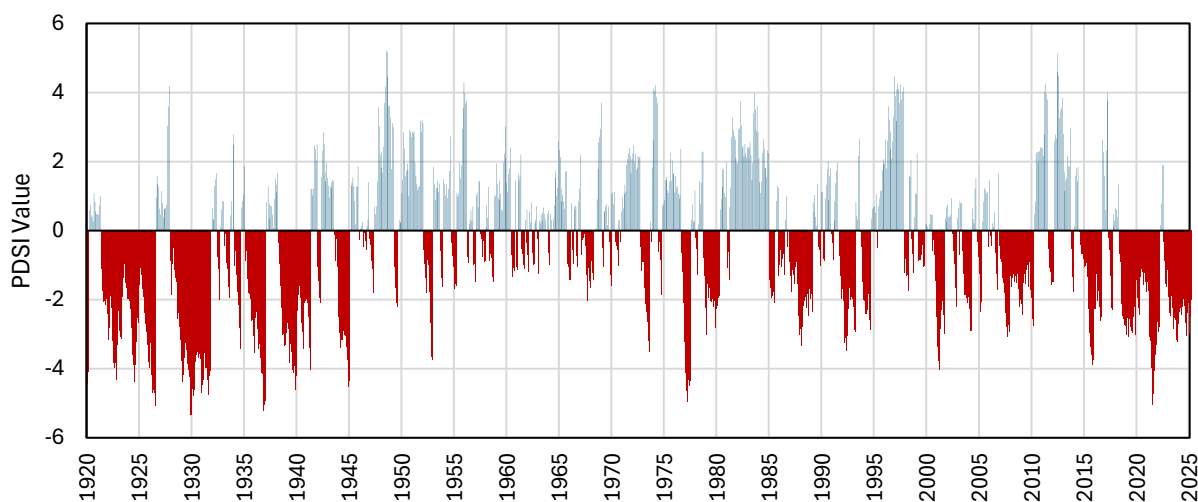


Figure 2-2. Palmer Drought Severity Index (PDSI) values for the Panhandle Region.

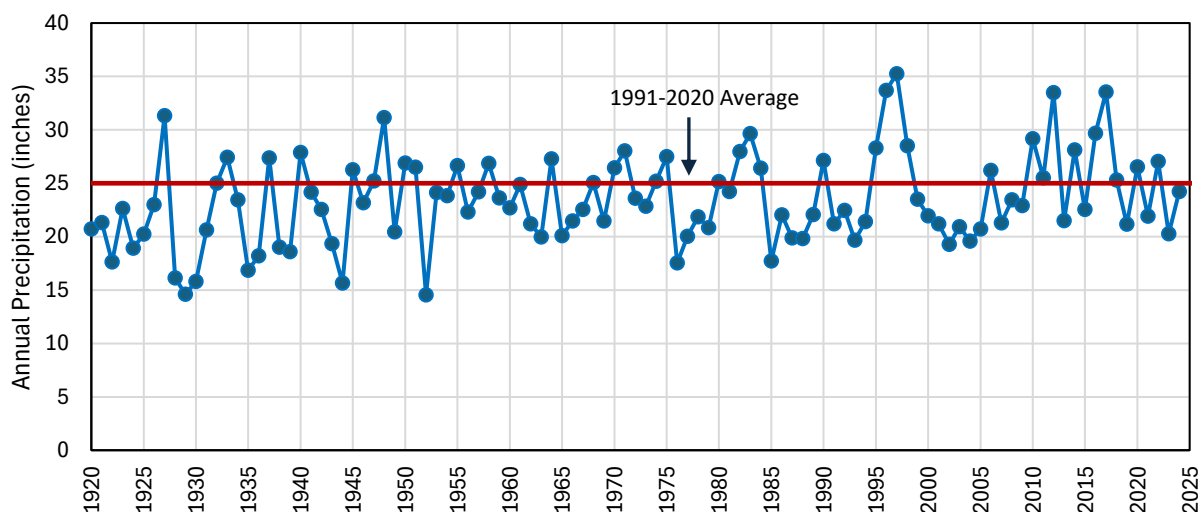


Figure 2-3. Annual precipitation for the Coeur d'Alene Airport (PRISM, 2024).

3. General Hydrogeological Setting

The Spokane Valley-Rathdrum Prairie Aquifer is generally described as being composed of unconsolidated sediments lying in a bedrock valley (Kahle and others, 2005). In Idaho, the aquifer is typically sands and gravels deposited from glacial outwash floods; however, sections along of the Spokane River can be alluvial (stream) deposits (Lewis and others, 2002). Fine-grained sediments can be found within the sands and gravels and along the margins of the Rathdrum Prairie (Kahle and Bartolino, 2007). Bedrock along the margins of the Rathdrum Prairie consist of older metamorphic formations, intrusive (granitic) formations, and the Columbia River Basalts (Lewis and other, 2002). Columbia River Basalts are present along the eastern margin of the Rathdrum Prairie near Lake Coeur d'Alene and Hayden Lake (Lewis and others, 2002).

Kahle and Bartolino (2007) present a general cross-section depicting the Spokane Valley-Rathdrum Prairie Aquifer (Figure 3-1). The aquifer around the margins is up to 200 feet thick but can be 800 to 1,000 feet thick north of Post Falls and near Spirit Lake (Kahle and Bartolino, 2007).

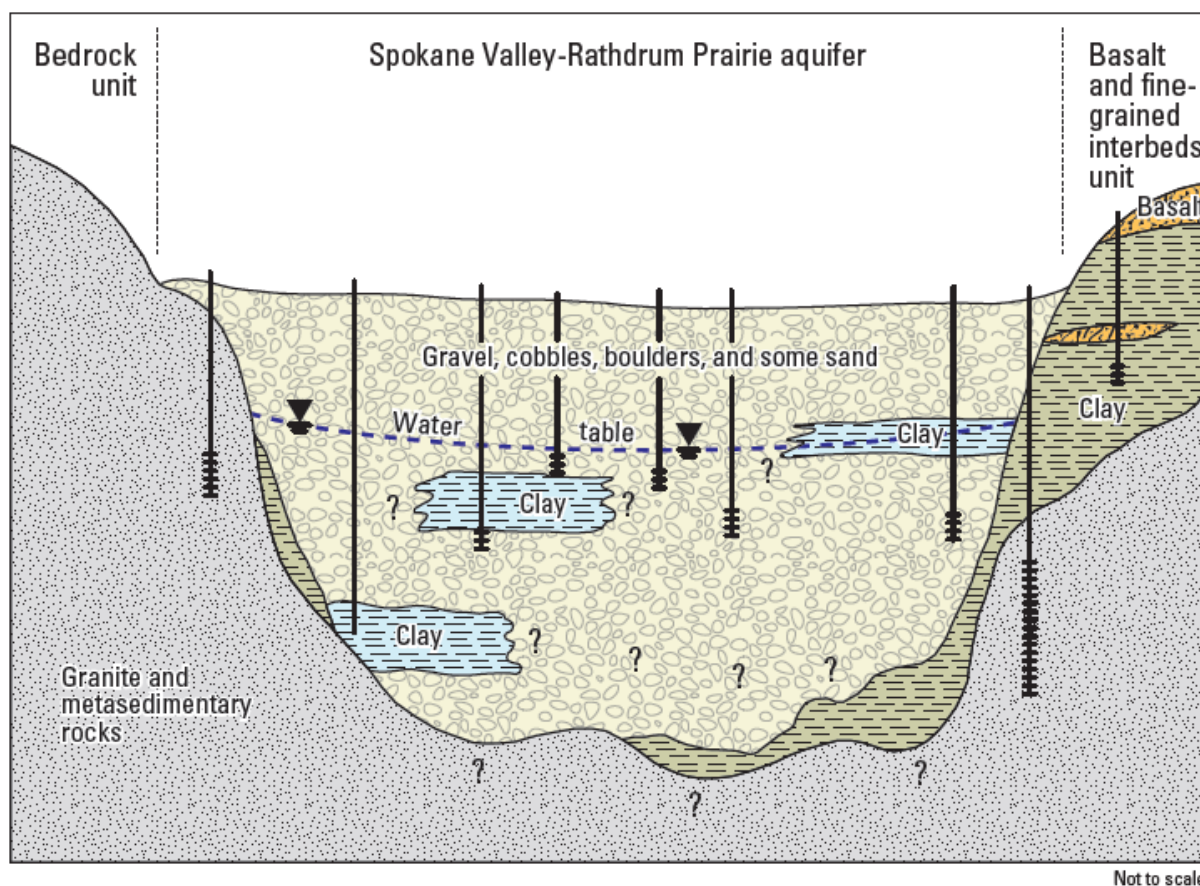


Figure 3-1. General conceptual cross-section of the Spokane Valley-Rathdrum Prairie Aquifer. From Kahle and Bartolino (2007).

Natural recharge to the Spokane Valley-Rathdrum Prairie Aquifer totals an estimated 1 million acre-feet on average each year (Kahle and Bartolino, 2007), with about 650,000 acre-feet per year flowing into the Rathdrum Prairie (CAMP, 2011). Kahle and Bartolino (2007) identified four major sources of recharge to the aquifer: the Spokane River, peripheral lakes, direct precipitation over the aquifer, and runoff from hillside drainages.

Groundwater generally flows through the aquifer from the north to the south-southwest and into Washington (Figure 3-2). Hsieh and others (2007) estimate, on average, that 820 cubic feet per second (590,000 acre-ft per year) flows through the aquifer from Idaho into Washington.

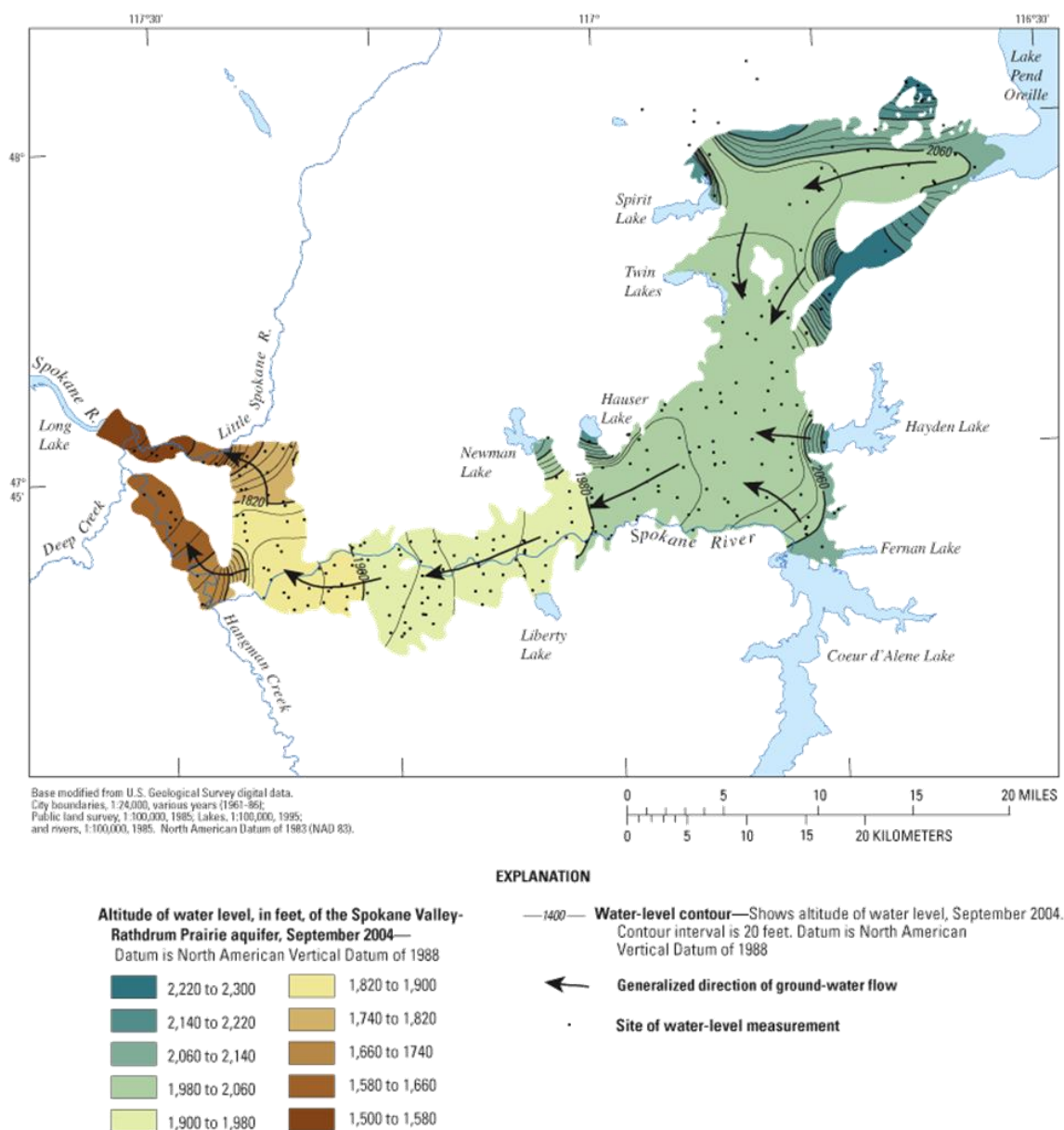


Figure 3-2. Modeled groundwater elevations and flow direction in the Spokane Valley-Rathdrum Prairie Aquifer, from Hsieh and others (2007).

4. Groundwater Use and Wells

SPF Water Engineering (2010) estimated that about 128,000 people in Idaho relied on water from the Rathdrum Prairie Aquifer in 2010. The study estimated the population reliant on the aquifer in 2025 would increase to between 162,000 to 206,000. Though the northern portion of the aquifer is in Bonner County, the majority is in Kootenai County. Kootenai County has grown from about 35,000 in 1970 to 188,000 in 2024 (Figure 4-1) with an average annual growth rate of 3.1% per year. Over the past decade, Kootenai County experienced above average growth in 2020 and 2021.

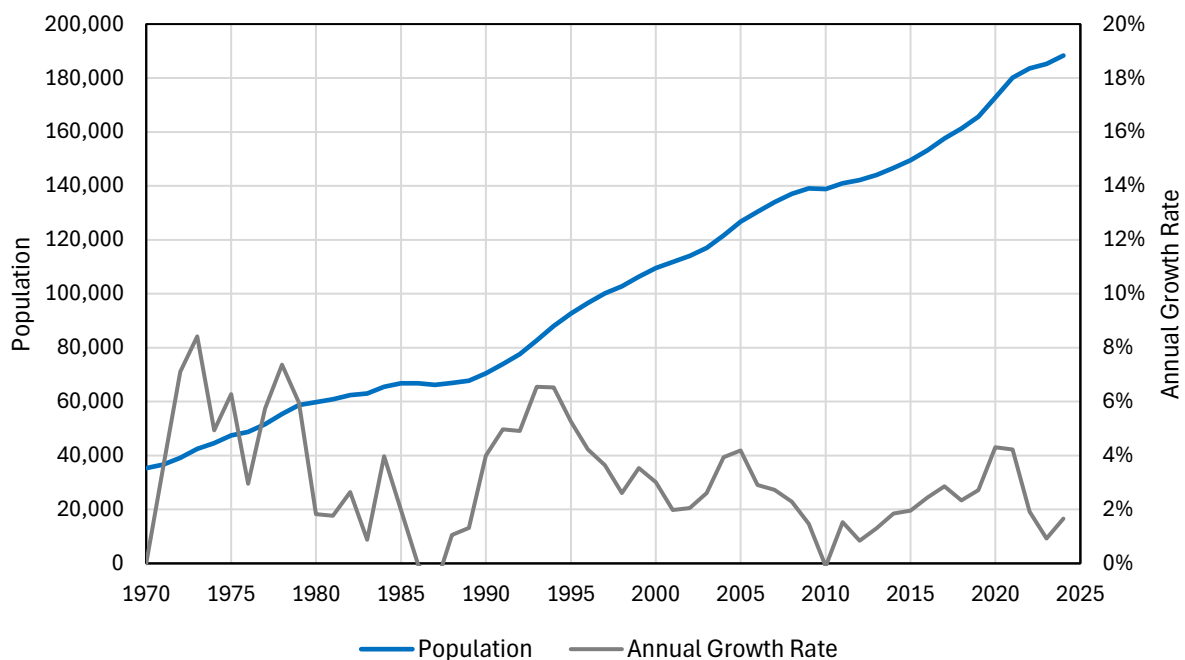


Figure 4-1. Population and growth of Kootenai County (U.S. Census Bureau,2025).

4.1 Well Construction

Based on IDWR's Well Construction Database, there are 3,970 known wells completed within the Rathdrum Prairie Aquifer boundary with a majority (~85%) categorized as domestic wells. Well construction activity increased in 1991 from an average of 40 to 100 wells each year and then slowed between 2008 and approximately 2016 (Figure 4-2). Since 2020, well construction in the aquifer has increased to roughly 130 wells per year. A map of all wells constructed within the Rathdrum Prairie Aquifer is provided in Figure 4-3. Areas with lower well density, particularly in the southern portion of the aquifer, are supplied by existing municipal systems rather than individual domestic wells.

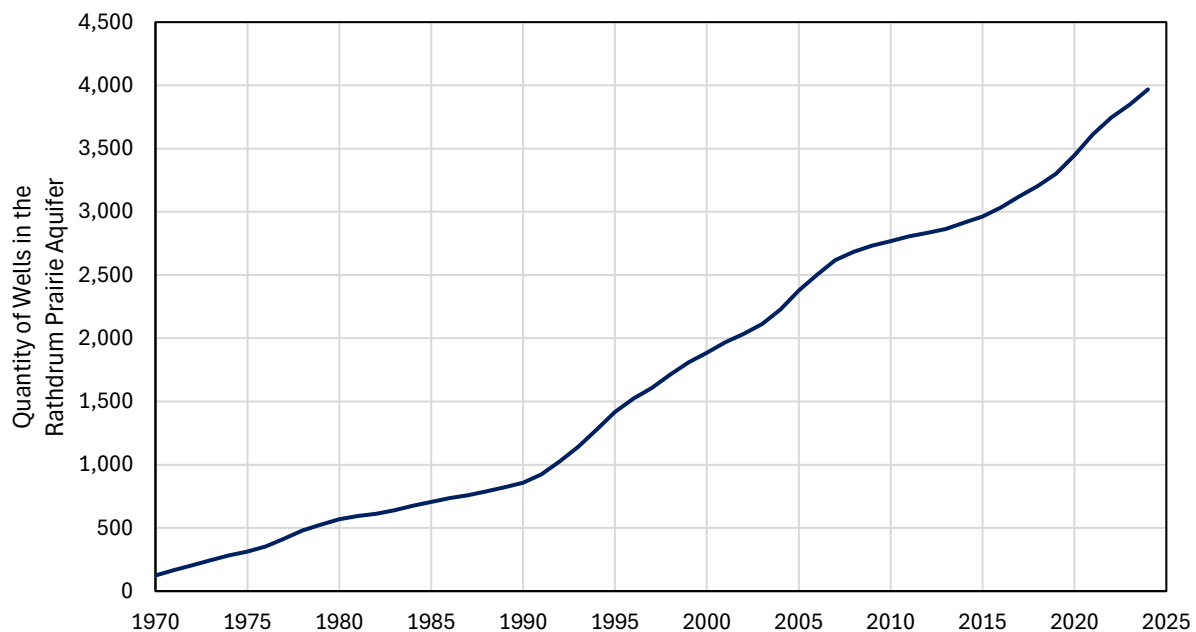


Figure 4-2. Wells completed within the Rathdrum Prairie Aquifer since 1970.

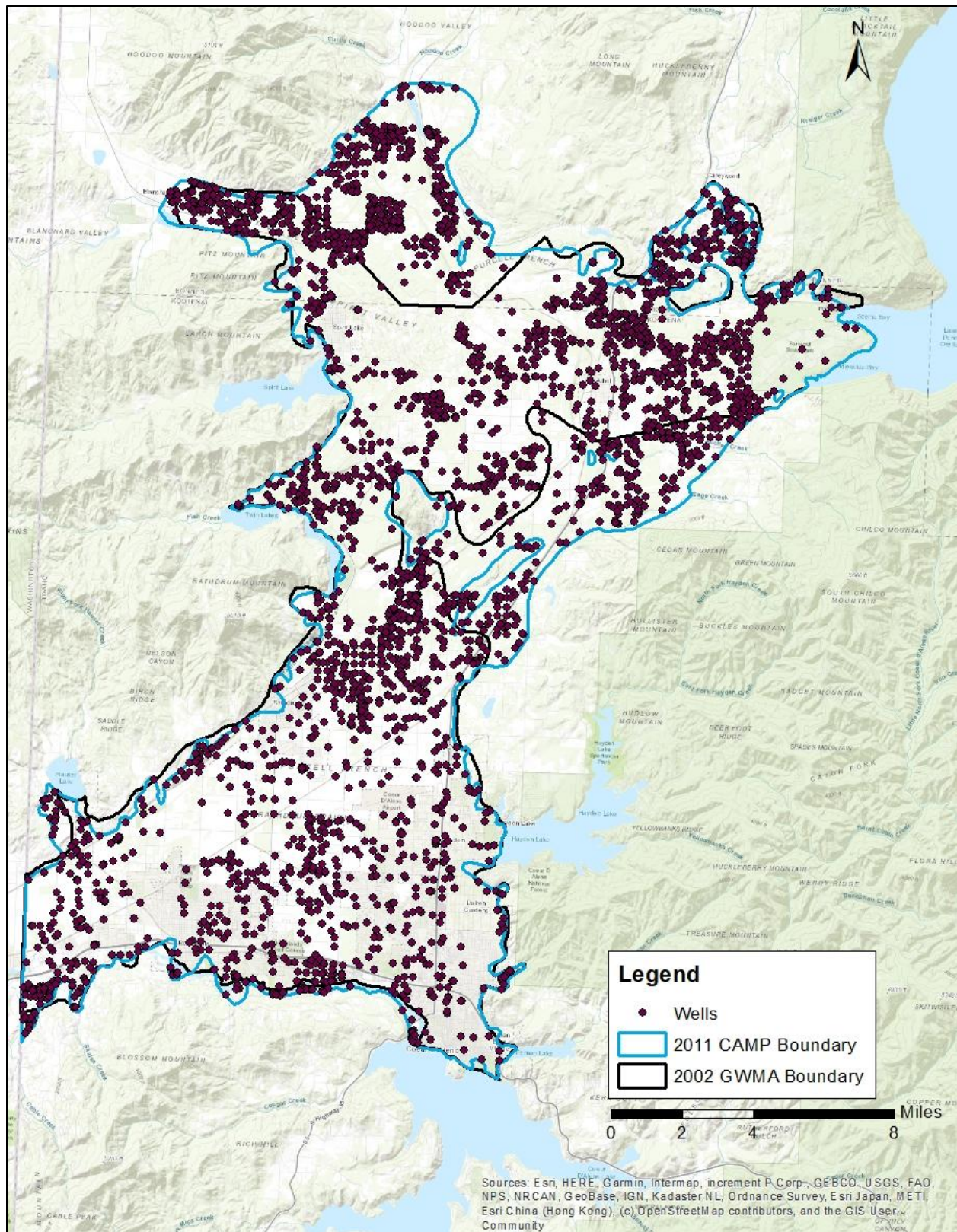


Figure 4-3. Location of known wells completed within the Idaho portion of the Rathdrum Prairie Aquifer.

4.2 Allocated Groundwater Resources

IDWR began requiring non-exempt (non-domestic and non-stockwater) groundwater uses to obtain a water right for use in 1963. As shown in Figure 4-4, this is when a steep increase in allocated groundwater began. As of 2024, an estimated 150,000 acre-feet per year has been allocated from the Rathdrum Prairie Aquifer, the majority of which is for municipal and irrigation use (Table 4-1). As illustrated in Figure 4-4, allocated groundwater from the aquifer has generally plateaued since 2009. This plateau could be due to more population connecting to municipal providers and changes in land use from agriculture to residential.

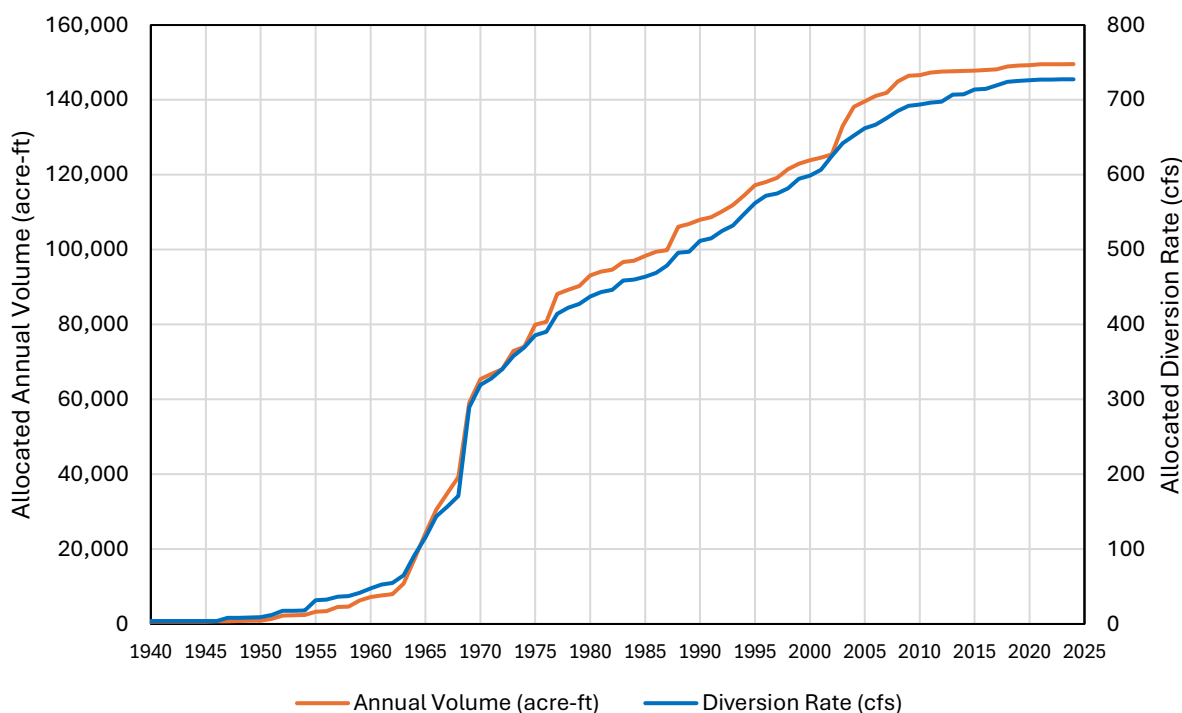


Figure 4-4. Allocated groundwater rights diverting from the Rathdrum Prairie Aquifer.

The greatest diversion rates are for municipal providers and large irrigators. The spatial distribution of groundwater diversion rates is shown in Figure 4-5. Larger municipal and irrigation systems are typically located in the southern region of the Rathdrum Prairie Aquifer, including East Greenacres Irrigation District. East Greenacres Irrigation District has the largest single water right diverting from the Rathdrum Prairie Aquifer, Water Right 95-7055. Water Right 95-7055 is for at a total rate of 90 cfs from multiple points of diversion.

Table 4-1. Summary of allocated groundwater and beneficial use of the Rathdrum Prairie Aquifer.

Beneficial Use	Total Diversion Rate (cfs)	Allocated Annual Volume (acre-feet)
Municipal without Volume Limit	122.7	N/A
Municipal with Volume Limit	140.5	46,192
Irrigation Only	209.9	49,414
Irrigation and Other Uses (Domestic, Stock, Commercial, etc.)	138.2	24,788
Domestic, Stock	74.0	21,522
Commercial/Industrial	20.0	3,086
Heating/Cooling	8.4	4,544
Fire Protection	13.8	N/A
Estimated Total	728	>149,546

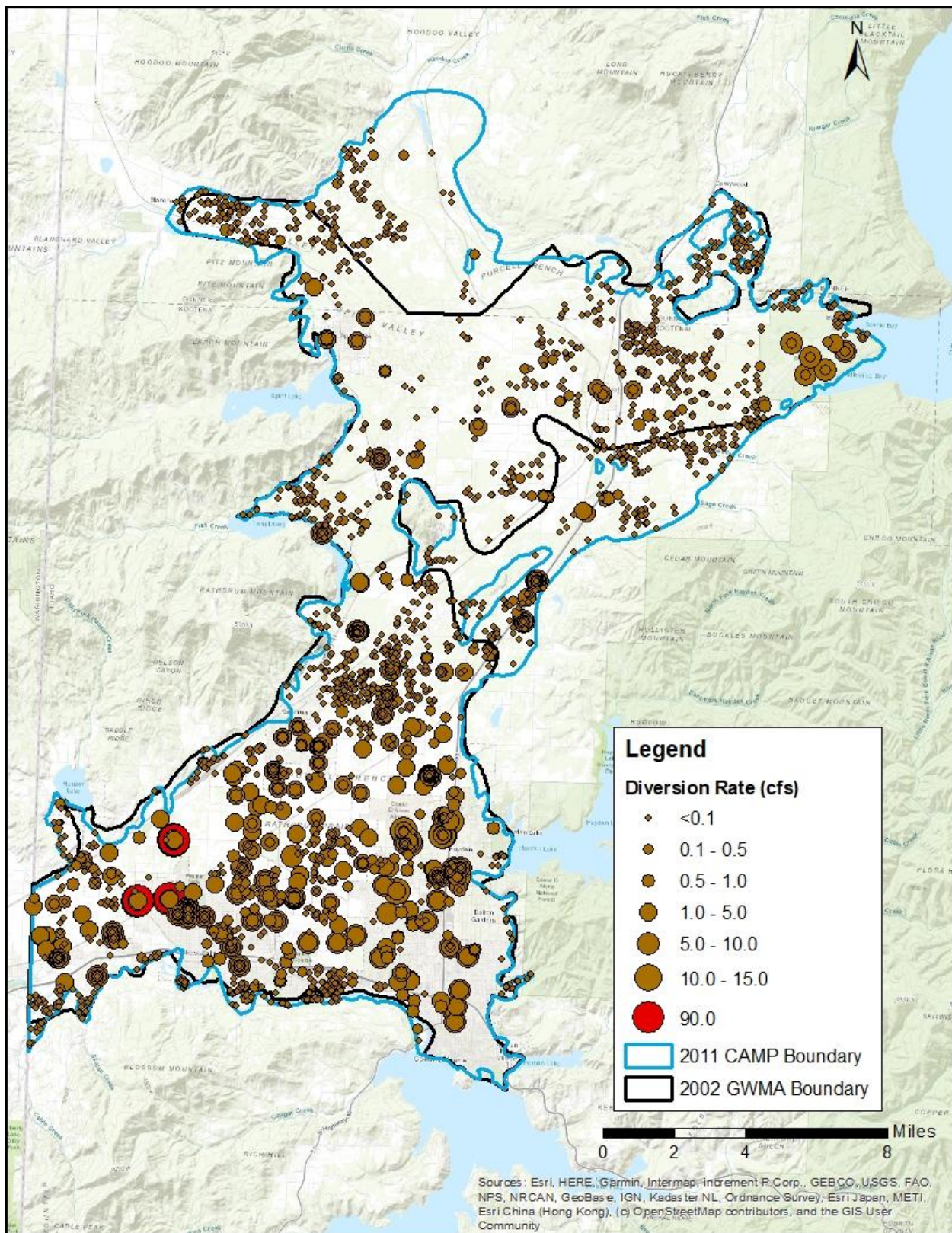


Figure 4-5. Location of groundwater points of diversion within the Rathdrum Prairie Aquifer.

5. Groundwater Monitoring Network

IDWR began monitoring groundwater levels in the Rathdrum Prairie Aquifer in 2006. Since then, IDWR's network has expanded to include 34 wells (Figure 5-1). Prior to IDWR's monitoring efforts, the USGS monitored water levels at select wells and obtained water level measurements from 26 wells for groundwater model development and calibration (Hsieh and others, 2007). The USGS currently monitors the water level at one well in the Rathdrum Prairie Aquifer (Well 16). All wells are equipped with dataloggers recording water levels at one to four hour intervals. IDWR measures water levels and downloads datalogger records once or twice each year. Nineteen wells are dedicated monitoring wells, ten wells are unused, and six wells are used for domestic or municipal purposes. Three wells have been decommissioned since 2019 to accommodate development. Wells in the Rathdrum Prairie Groundwater Monitoring Network are summarized in Table 5-1. Subareas are used in this report to compare observations within areas of the aquifer that could be affected by the same boundary conditions (Figure 5-1).

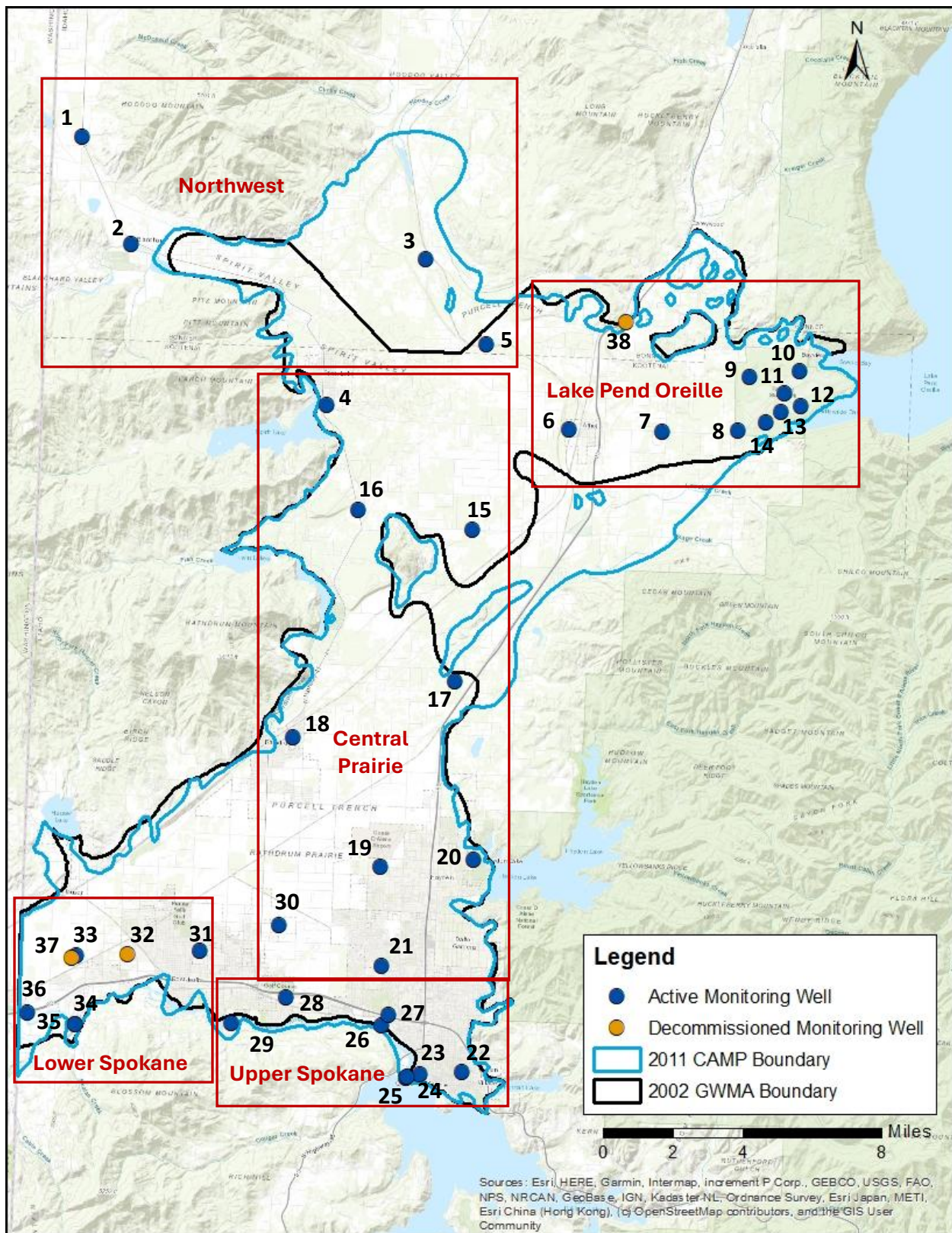


Figure 5-1. Monitoring locations for the Rathdrum Prairie Groundwater Monitoring Network and locations of subareas for trend analysis.

Table 5-1. Summary of wells in the Rathdrum Prairie Groundwater Monitoring Network.

Well Number	Well ID	Use	Ground Elevation (ft, NAVD88)	Latitude (WGS84)	Longitude (WGS84)	Total Depth (ft)	Open Interval (ft)	Period of Record
1	54N 05W 06BBC1	Monitoring	2,319	48.0611	-117.0233	178	173-178	2008-2025
2	54N 05W 20ABC1	Unused Domestic	2,271	48.0175	-116.9908	140	125-139	2008-2025
3	54N 04W 22ADD1	Monitoring	2,300	48.0156	-116.8078	260	240-255	2007-2025
4	53N 04W 08CAB1	Monitoring	2,572	47.9535	-116.8655	559	509-559	2016-2025
5	54N 04W 36DAC1	Monitoring	2,300	47.9811	-116.7686	265	265	2007-2025
6	53N 03W 16BBA1	Monitoring	2,382	47.9472	-116.7153	402	385-400	2007-2021
7	53N 03W 14AAA1	Monitoring	2,455	47.9475	-116.6575	441	421-441	2007-2025
8	53N 02W 08CCC1	Unused Municipal	2,459	47.9491	-116.6108	420	Unknown	1950-2025
9	53N 02W 05BDB1	Domestic	2,282	47.9713	-116.6047	280	260-280	2015-2025
10	53N 02W 04AAC1	Unused Municipal	2,280	47.9746	-116.5741	328	Unknown	1943-2025
11	53N 02W 04CDA1	Municipal	2,302	47.9650	-116.5827	357	210-350	1977-2025
12	53N 02W 09AAC1	Municipal	2,298	47.9602	-116.5727	351	Unknown	1943-2025
13	53N 02W 09BDB1	Unused Municipal	2,370	47.9576	-116.5846	420	370-415	1977-2025
14	53N 02W 08DAD1	Monitoring	2,410	47.9527	-116.5935	460	335-355	2011-2025
15	53N 04W 36ABB1	Monitoring	2,419	47.9039	-116.7731	460	380-420	2007-2025
16*	53N 04W 28CAB1	Monitoring	2,430	47.9107	-116.8439	449	438-448	1971-2025
17	52N 04W 24BDB1	Municipal	2,283	47.8408	-116.7803	317	281-301	2023-2025
18	52N 04W 31ABD1	Monitoring	2,223	47.8154	-116.8789	222	182-222	2017-2025
19	51N 04W 15CAC1	Unused Domestic	2,288	47.7631	-116.8219	343	323-333	2008-2025
20	51N 03W 18BCC1	Unused Irrigation	2,294	47.7672	-116.7650	310	272-297	2006-2025
21	51N 04W 34CAA1	Monitoring	2,260	47.7216	-116.8193	264	224-264	2013-2025
22	50N 04W 13DAA1	Unused Domestic	2,183	47.6788	-116.7673	458	245-255; 345-355	2004-2025
23	50N 04W 14DBA1	Monitoring	2,135	47.6774	-116.7932	88	60-70	2007-2025
24	50N 04W 14CDB1	Monitoring	2,132	47.6756	-116.8014	24	19-24	2009-2025
25	50N 04W 14CDB2	Monitoring	2,142	47.6761	-116.8011	34	26-31	2010-2025
26	50N 04W 10ACB1	Monitoring	2,148	47.6970	-116.8181	120	60-120	2010-2025
27	50N 04W 03DCD1	Monitoring	2,171	47.7017	-116.8142	176	100-140	2010-2025
28	50N 04W 04DAC1	Unused Domestic	2,173	47.7070	-116.8776	220	210-220	2017-2025
29	50N 05W 12BCDA1	Municipal	2,135	47.6956	-116.9104	250	180-245	2021-2025
30	51N 04W 30DBB1	Unused Municipal	2,253	47.7372	-116.8836	Unknown	Unknown	2024-2025
31	51N 05W 35BDC1	Unused Irrigation	2,210	47.7252	-116.9314	242	212-240	2007-2025
32	51N 05W 33CBA1	Decommissioned	2,143	47.7224	-116.9756	180	Unknown	1977-2017
33	51N 05W 31DBD1	Monitoring	2,087	47.7213	-117.0076	120	110-120	2013-2025
34	50N 05W 07DABC1	Monitoring	2,069	47.6929	-117.0062	79	69-79	2000-2025
35	50N 05W 07DABC2	Monitoring	2,069	47.6929	-117.0063	46	36-46	2000-2025
36	50N 06W 12BDAC1	Domestic	2,068	47.6968	-117.0365	137	137	2017-2025
37	51N 05W 31DBC1	Decommissioned	2,079	47.7202	-117.0106	110	97-110	2008-2018
38	54N 03W 27DDC1	Decommissioned	2,173	47.9926	-116.6824	90	79-89	2008-2019

*Monitored by the U.S. Geological Survey

6. Observed Water Levels and Trends

Hydrographs for all wells in the Rathdrum Prairie Groundwater Monitoring Network are presented in Appendix A. A subset of wells are presented in this section to estimate linear trends in the aquifer. Nineteen wells were selected for trend analysis based on period of record and spatial representation of groundwater conditions in each subarea. Only wells with at least 10 years of continuous water level data were analyzed. Annual maximum water level elevations were used for trend analysis to minimize the influence of seasonal fluctuations on the linear trend; the use of annual maximums also minimizes the impact of serial correlation on the statistical significance estimates. A positive trend indicates groundwater levels are rising, and a negative trend indicates groundwater levels are declining over the test period.

Linear groundwater trends in the selected wells were determined using the Mann-Kendall test (Helsel and Hirsch, 2002). Trends are considered statistically significant if the calculated p-value is less than 0.05 (Helsel and Hirsch, 2002), resulting in a confidence interval of 95% or greater. However, a calculated trend is not always representative of overall groundwater behavior if there are large water-level fluctuations or if the calculated trend is small.

For this report, the Rathdrum Prairie Aquifer is separated into five subareas. Subareas include the Northwest area, the Lake Pend Oreille area, Central Prairie area, Lower Spokane River area, and Upper Spokane River area (Figure 5-1).

6.1 Northwest Area

Groundwater levels in the Northwest area of the Rathdrum Prairie Aquifer can range from 20 to 400 feet below ground surface (ft-bgs). However, most wells in the area have depths to water of 70 to 160-ft bgs. Measured groundwater levels at four wells in the area show water level declines at rates of 0.2 feet per year (ft/yr) to 0.8 ft/yr from 2008 to 2025 (Figure 6-1, Table 6-1). With the exception of the trend at well 3, these trend estimates are not significant.

Groundwater levels in this area responded to wetting periods in 2011-2012 and in 2017-2018. The response was more attenuated at well 3 and well 5. Since 2018, water levels have been declining due to drier climatic conditions.

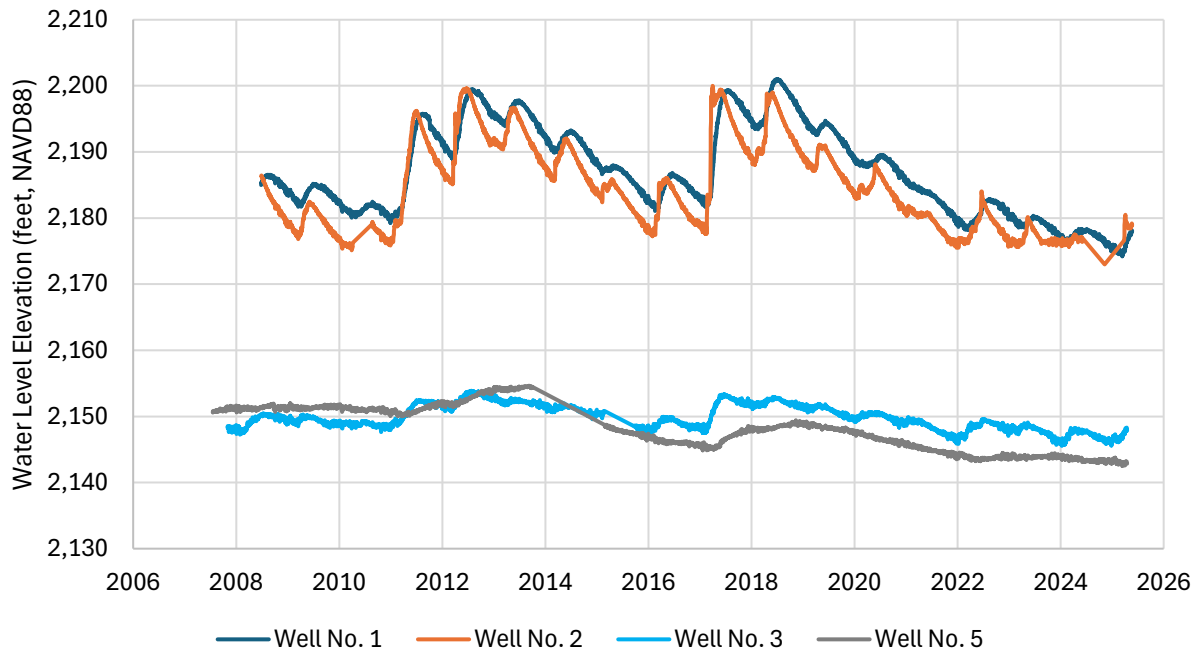


Figure 6-1. Observed groundwater levels in the Northwest area.

Table 6-1. Groundwater level trends in the Northwest area.

Well Number	Well ID	Period Tested	Trend (ft/yr)	p-value
1	54N 05W 06BBC1	2008-2025	-0.84	0.07
2	54N 05W 20ABC1	2008-2025	-0.82	0.06
3	54N 04W 22ADD1	2008-2025	-0.19	0.02
5	54N 04W 36DAC1	2008-2025	-0.18	0.06

6.2 Lake Pend Oreille Area

IDWR monitors nine wells in the vicinity of Lake Pend Oreille. Depths to water in the Lake Pend Oreille area typically range from 340 to 400 ft-bgs. The aquifer near Lake Pend Oreille is known to have good connection with the lake and groundwater levels at most wells near Lake Pend Oreille peak during the summer, coinciding with the lake level and operation of Albeni Falls Dam (Neely, 2015). The water level for Lake Pend Oreille is shown in Figure 6-2 for comparison to groundwater levels.

Measured groundwater levels at wells 7 and 8 declined at rates of 0.1 to 0.2 ft/yr from 2008 to 2025 (Figure 6-2, Table 6-2). Linear trends at wells 7 and 8 are statistically significant with p-values less than 0.01 (Table 6-2). The water level trend at well 6 was calculated through 2020, after which access issues at the well prevented water level measurements. Well 6 is located

approximately 7 miles west of Lake Pend Oreille and appears to be influenced by the lake. From 2008 to 2020, water levels appear to have a slight decline at 0.03 ft/yr; however, the trend at well 6 is not statistically significant.

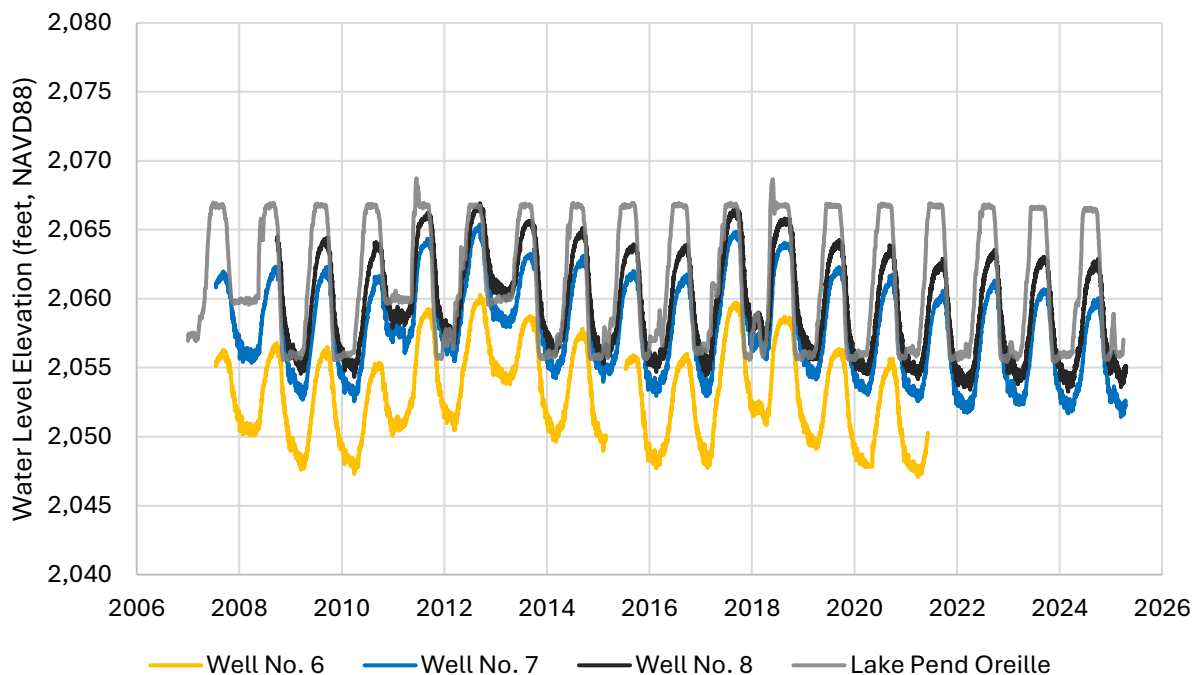


Figure 6-2. Observed groundwater levels in the Lake Pend Oreille area.

Table 6-2. Groundwater level trends in the Lake Pend Oreille area.

Well Number	Well ID	Period Tested	Trend (ft/yr)	p-value
6	53N 03W 16BBA1	2008-2020	-0.03	0.76
7	53N 03W 14AAA1	2008-2025	-0.17	<0.01
8	53N 02W 08CCC1	2008-2025	-0.13	<0.01

6.3 Central Prairie Area

The Central Prairie area of the Rathdrum Prairie Aquifer encompasses most of the aquifer extent. Groundwater levels in the Central Prairie area range from 200 ft-bgs north of Coeur d'Alene to 550 ft-bgs near Spirit Lake where there is a topographic high in the Rathdrum Prairie.

Measured groundwater levels at wells 15, 16, and 19 indicate groundwater levels declined at rates of 0.5 ft/yr to 0.6 ft/yr from 2008 to 2025 (Figure 6-3, Table 6-3). The groundwater level at Well 20 declined at a rate of 0.9 ft/yr for the same time period. Trends at wells tested in the Central Prairie area are statistically significant with p-values less than 0.05.

As with other areas in the aquifer, groundwater levels in the Central Prairie area responded to wetting periods in 2011 and 2012 and then in 2017 and 2018. Well 20 has the greatest response to wet periods. Well 20 is located adjacent to Hayden Lake which can flood an adjacent field during spring runoff.

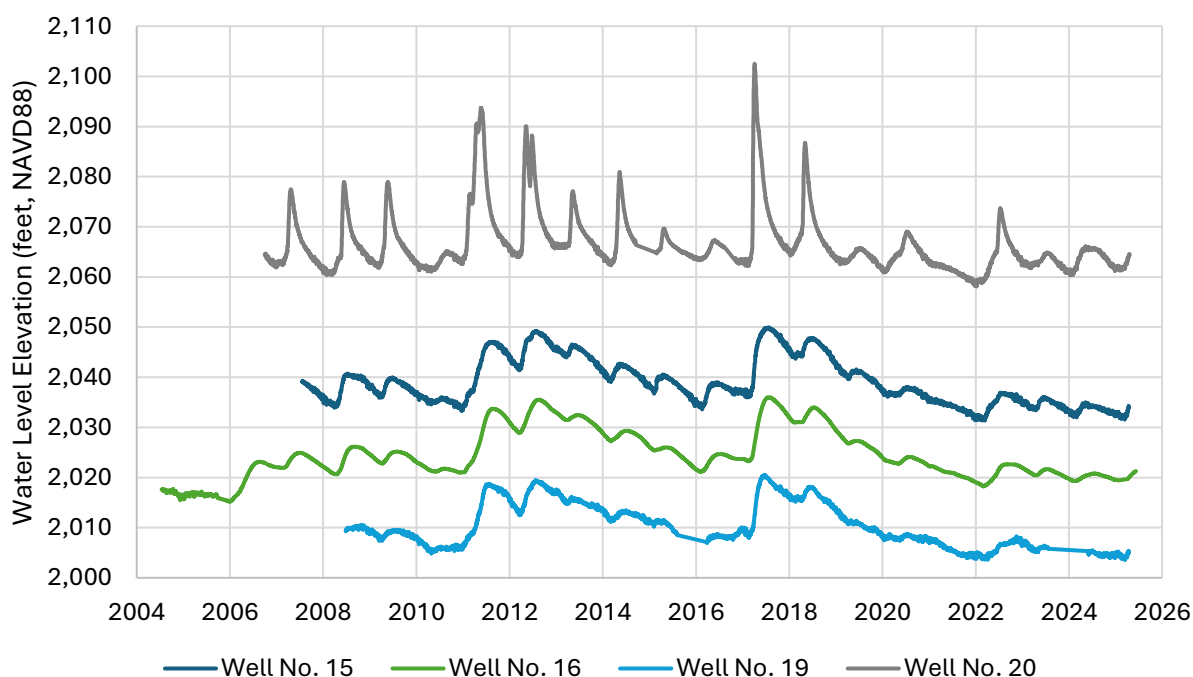


Figure 6-3. Observed groundwater levels in the Central Prairie area.

Table 6-3. Groundwater level trends in the Central Prairie area.

Well No.	Well ID	Period Tested	Trend (ft/yr)	p-value
15	53N 04W 36ABB1	2008-2025	-0.50	0.02
16	53N 04W 28CAB1	2008-2025	-0.52	0.02
19	51N 04W 15CAC1	2008-2025	-0.56	0.02
20	51N 03W 18BCC1	2008-2025	-0.94	0.03

6.4 Lower Spokane River Area

Groundwater levels in the Lower Spokane River area below the Post Falls Dam typically range from 30 to 200 ft-bgs depending on topography and distance from the river. Measured groundwater levels at well 31 and well 33 show groundwater level declines at rates of approximately 0.6 ft/yr from 2015 to 2025 and appear to have responded to the wet conditions in 2017 and 2018 (Figure 6-4, Table 6-4). These trends are statistically significant.

Well 34, located approximately 100 feet north of the Spokane River, shows a relatively stable groundwater level, and appears to be influenced by the Spokane River below Post Falls Dam. The hydrograph for the Spokane River below the dam is shown in Figure 6-4 for comparison.

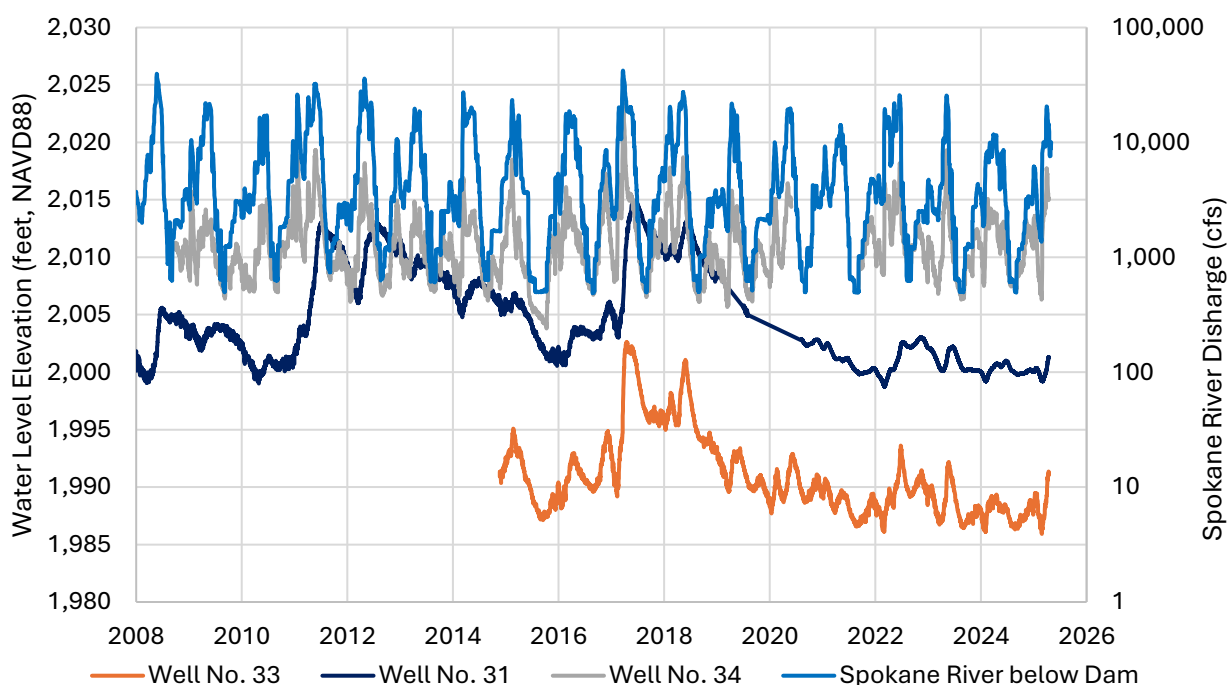


Figure 6-4. Observed groundwater levels in the Lower Spokane River area.

Table 6-4. Groundwater level trends in the Lower Spokane River area.

Well No.	Well ID	Period Tested	Trend (ft/yr)	p-value
31	51N 05W 35BDC1	2008-2025	-0.41	0.03
		2015-2025	-0.57	0.04
33	51N 05W 31DBD1	2015-2025	-0.64	0.02
34	50N 05W 07DABC1	2008-2025	-0.15	0.76
		2015-2025	+0.16	0.20

6.5 Upper Spokane River Area

Groundwater levels in the Upper Spokane River area above the Post Falls Dam typically range from 100 to 250 ft-bgs; however, they can be as shallow as 10 ft-bgs adjacent to the outflow of the Spokane River from Coeur d'Alene Lake.

Measured groundwater levels at well 22 and well 23 show groundwater level declines at rates of 0.3 to 0.4 ft/yr from 2011 to 2025 (Figure 6-5, Table 6-5). The groundwater level trend at well 27 from 2011 to 2025 is declining at a rate of 0.5 ft/yr. Calculated p-values for the linear trends at these wells are less than 0.05, indicating statistical significance in the linear trend (Table 6-5).

Well 24 is located approximately 250 ft east of Coeur d'Alene Lake and well 26 is located approximately 200 ft north of the Spokane River. Both wells exhibit similar water level fluctuations to the lake. Linear trends at well 24 and well 26 are not statistically significant.

Groundwater levels in the Upper Spokane River are influenced by the level of Lake Coeur d'Alene (Neely, 2015) and responded to the 2017 high water year.

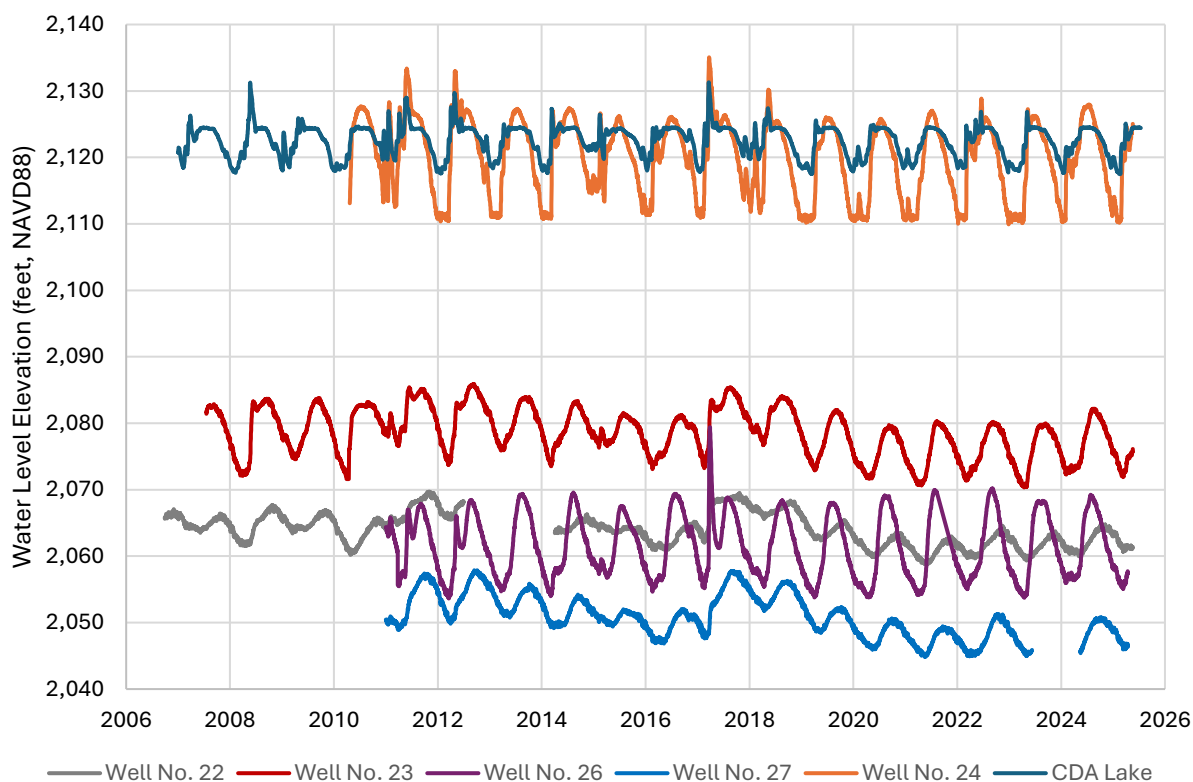


Figure 6-5. Observed groundwater levels in the Upper Spokane River area.

Table 6-5. Groundwater level trends in the Upper Spokane River area.

Well No.	Well ID	Period Tested	Trend (ft/yr)	p-value
22	50N 04W 13DAA1	2011-2025	-0.36	<0.01
23	50N 04W 14DBA1	2011-2025	-0.33	0.01
24	50N 04W 14CDB1	2011-2025	-0.16	0.17
26	50N 04W 10ACB1	2011-2025	+0.10	0.14
27	50N 04W 03DCD1	2011-2025	-0.53	<0.01

6.6 Long-Term Observations

Historical groundwater level data from six wells in the Rathdrum Prairie Aquifer provide for assessment of long-term changes and fluctuations in the Rathdrum Prairie Aquifer (Figure 6-6). Near Lake Pend Oreille, the USGS measured the water level at well 12 from 1943 to 2009 and IDWR has monitored well 12 since 2009. In the Central Prairie area, the USGS has historical water level data from two locations, well 40 (1929-1993) and well 12 (1971-2025). Well 40 is not currently in the monitoring network for the Rathdrum Prairie Aquifer. In the Lower Spokane River area water levels from three wells are available to assess long-term changes. The USGS has data for well 41 (1928 to 1993) and at well 32 (1977 to 2009). Well 41 is not currently in the monitoring network. IDWR continued to monitor well 32 from 2009 to 2017 when the well was decommissioned. Additionally, IDWR has been monitoring the water level at well 33 since 2014.

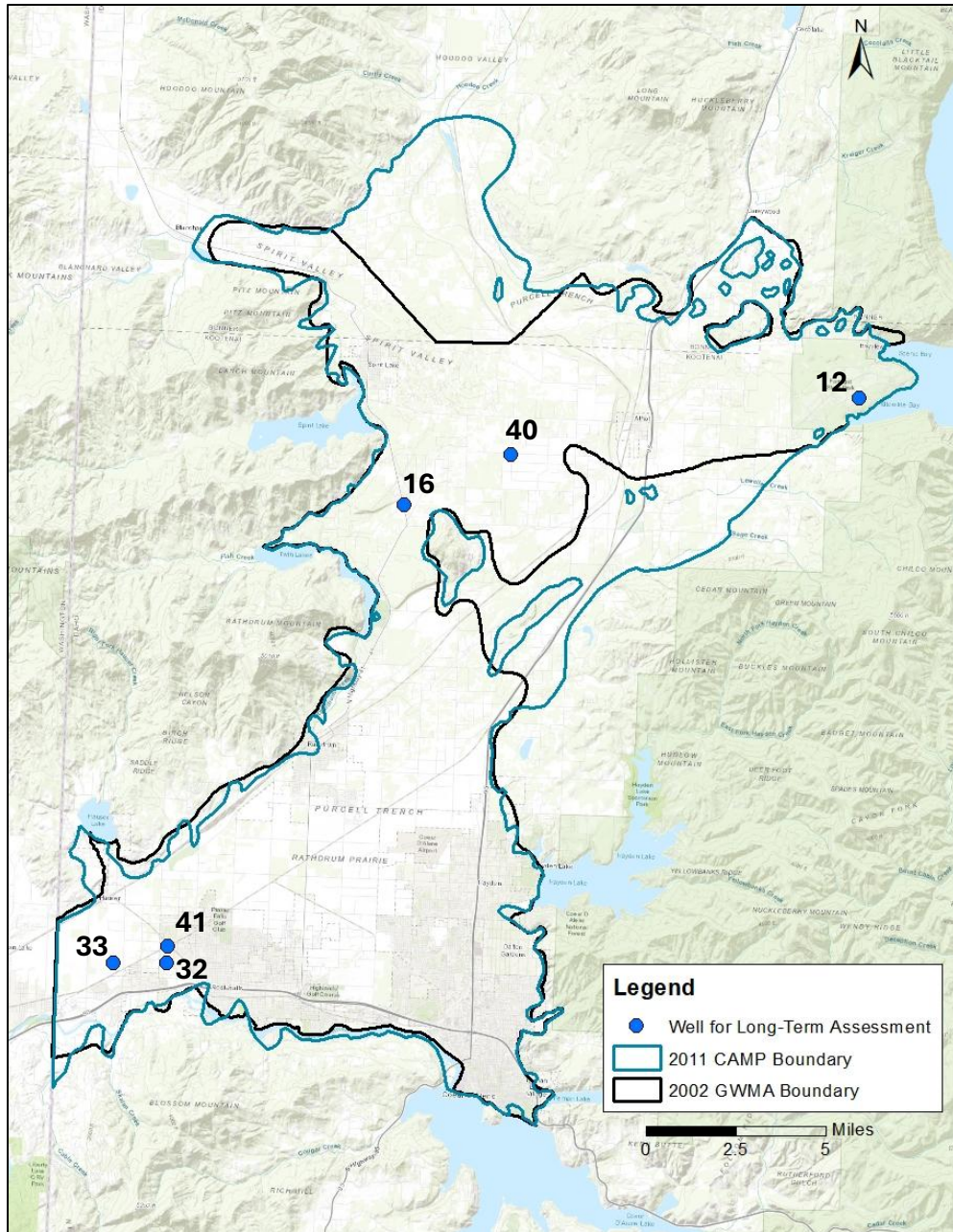


Figure 6-6. Location of wells used for long-term assessment.

The Army Corps of Engineers began construction of Albeni Falls Dam in 1951 with completion in 1955. The Albeni Falls Dam controls the level of Lake Pend Oreille. Groundwater levels at Well 12 appear to have responded to the construction of the dam (Figure 6-7). The long-term record at well 12 from 1943 to 2025 shows the average groundwater level over a five-year period from 2020 to 2025 is six feet higher than the average from 1945 to 1950 . The long-term record at Well 12 also shows some climate variability, with a peak in 1997 and a slight water level decline beginning in 2018. Groundwater levels in the Lake Pend Oreille area generally do not fluctuate more than twelve feet from lows during the winter to highs during the summer, similar to Lake Pend Oreille which typically fluctuates eleven feet from high summer to low winter pool levels.

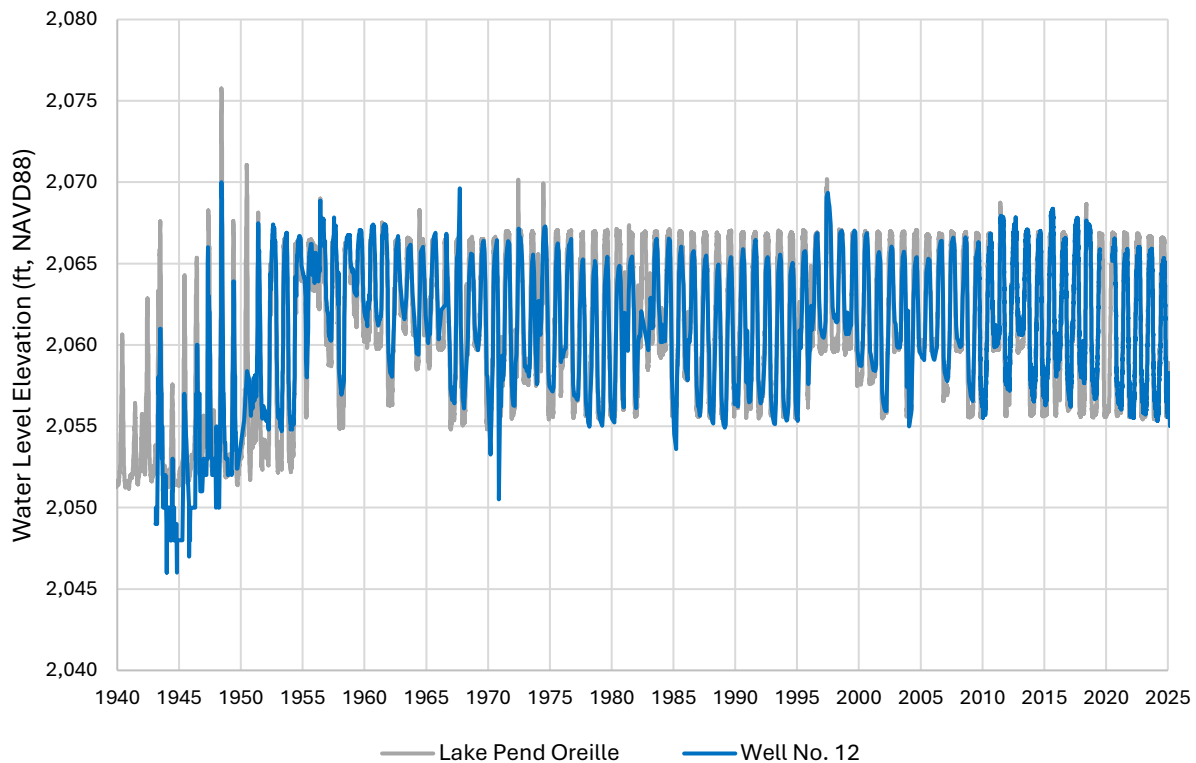


Figure 6-7. Long-term groundwater level data for the Lake Pend Oreille area.

Groundwater levels at well 40 and well 16 in the Central Prairie area (Figure 6-6) show a correlation during the period of overlap from 1972 to 1993. Well 40 is located approximately 3.3 miles northeast of well 16, where groundwater level elevations are approximately 10 feet higher. Water levels at well 40 have been offset for comparison to well 16 (Figure 6-8).

Overall, groundwater levels in this area of the Rathdrum Prairie Aquifer generally exhibit a positive trend since measurements began in 1929. The minimum observed groundwater level in the area was 2,003 feet which occurred in March 1932. The maximum observed groundwater level was 2,042 feet, which occurred in July 1997. Groundwater levels in 2025 were 15 feet higher than the low that occurred in 1932. The aquifer in this area of the Rathdrum Prairie responds to climate cycles mentioned in Section 2. The comparison of groundwater water levels to PDSI values indicates a strong relationship between groundwater conditions and climate patterns (Figure 6-9).

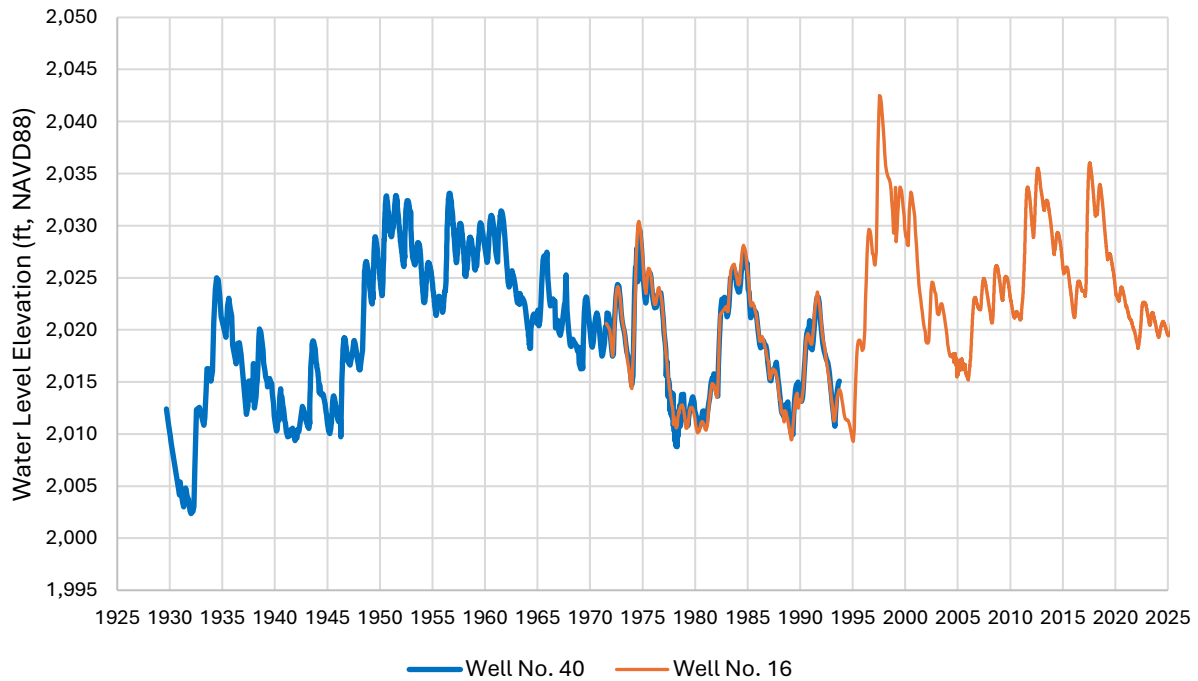


Figure 6-8. Long-term groundwater level data for the Central Prairie area. Note: The water level elevation at well 40 has been shifted 10 feet lower to account for the apparent gradient between the two wells.

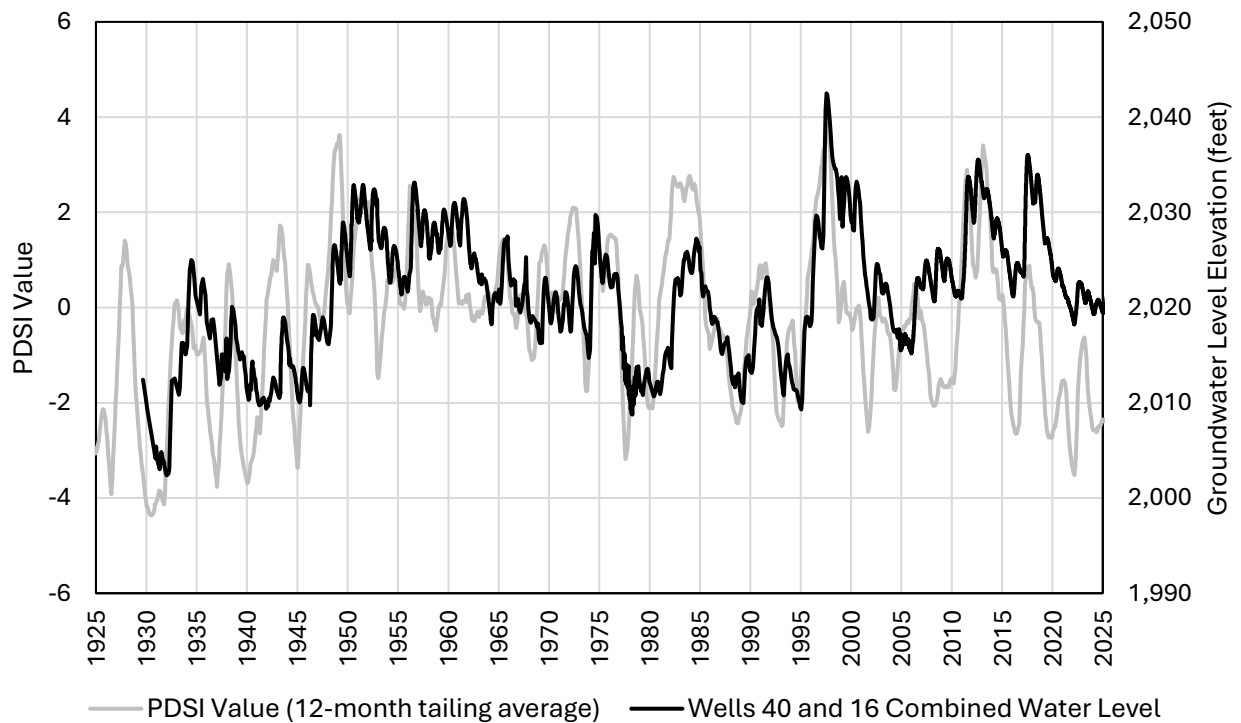


Figure 6-9. Comparison of groundwater levels to PDSI values for the Central Prairie area.

Groundwater level data from three wells in the Lower Spokane River area are used for long-term assessment and comparison to climate cycles. Well 32 is located approximately 0.3 miles south of well 41. Wells 32 and 41 have overlapping observations in 1977, 1978, and 1993. Well 33 is located 1.7 miles west of well 32. Well 32 and well 33 have overlapping observations from 2014 to 2018. Water levels at well 33 and well 32 have been offset three feet and seven feet, respectively, for comparison to well 41 (Figure 6-10).

Observed groundwater levels in the aquifer in the Lower Spokane River area indicate a generally positive trend since measurements began in 1928. The minimum observed groundwater level in the area was 1,976 feet which occurred in March 1932. The maximum observed groundwater level was 2,012 feet, which occurred in May 1997. Similar to the Central Prairie area, groundwater levels in 2025 were 20 feet higher compared to the low in 1932. The Lower Spokane River area of the Rathdrum Prairie Aquifer also responds to climate cycles as shown in Figure 6-11.

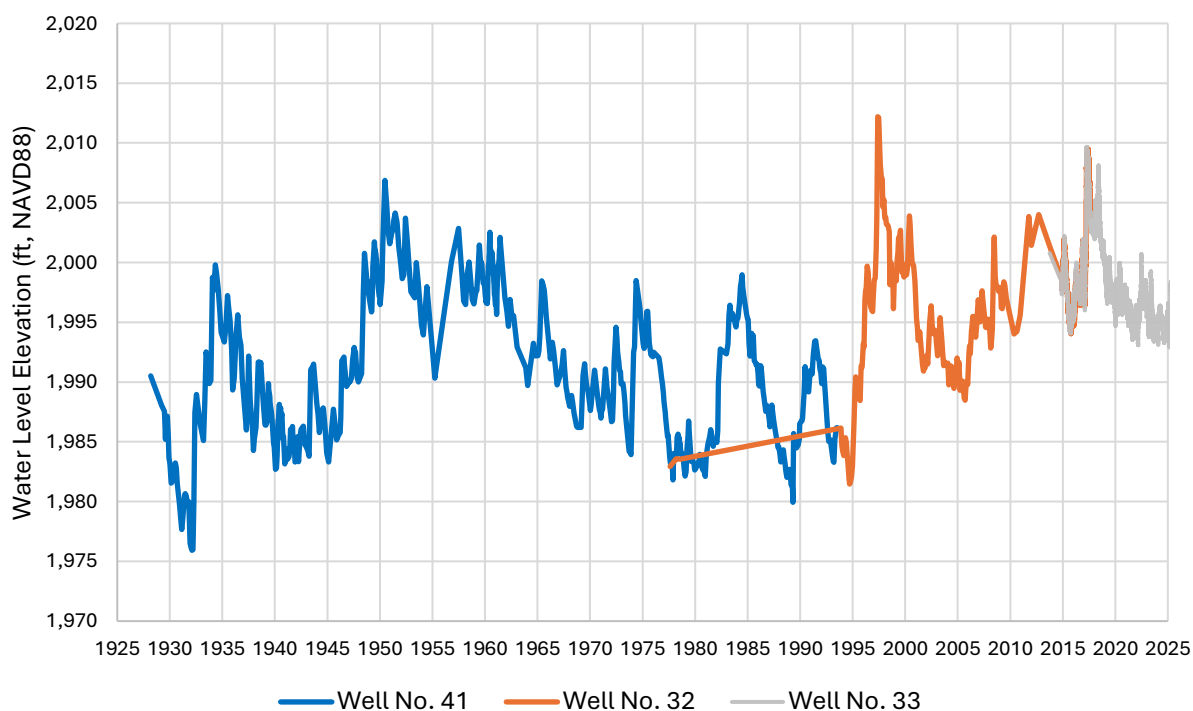


Figure 6-10. Long-term groundwater data for the Lower Spokane River area. Note: The water level elevation at well 32 and well 33 have been shifted up 3 feet and 7 feet, respectively, to account for the local apparent gradient.

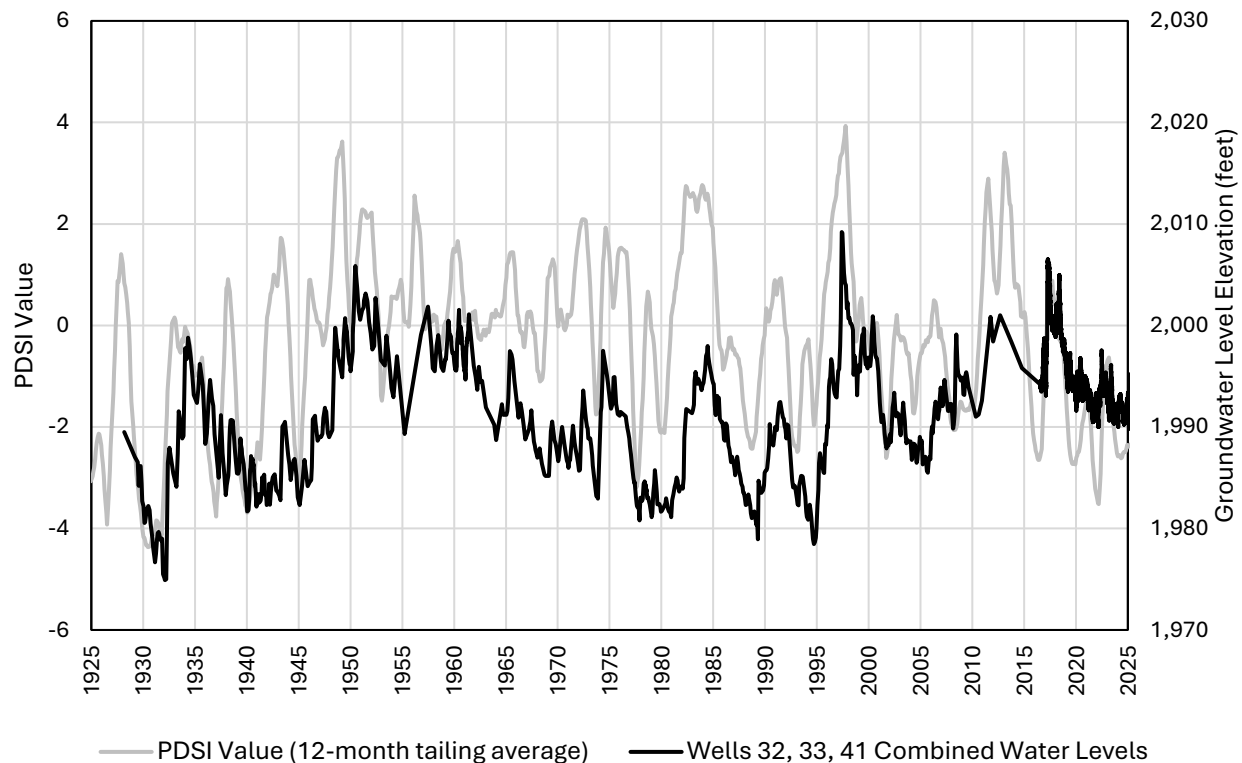


Figure 6-11. Comparison of groundwater levels to PDSI values for the Lower Spokane River area.

7. Summary and Continued Efforts

Groundwater levels in the Rathdrum Prairie Aquifer have generally declined since IDWR began monitoring water levels in 2006. Since 2019, declining groundwater levels are associated with drier climatic conditions. Groundwater levels are expected to stabilize or rise during future wet periods, as they did in response to similar wet periods that occurred in 2010 to 2012 and in 2016 to 2017. Although groundwater levels have generally declined since 2006, long-term data from some areas of the Rathdrum Prairie Aquifer indicate stable to rising trends since the late 1920s and early 1930s.

Groundwater levels reached their lowest observed levels in 1932 during the nationwide Dust Bowl drought and peaked in 1997 during the wettest period on record. Observations show that groundwater levels can be expected to fluctuate 35 to 40 feet from the driest periods to the wettest periods. Current groundwater levels remain above minimum levels observed in the late 1920s and early 1930s, despite increases in population and groundwater resource demand.

IDWR will continue monitoring the current network for the Rathdrum Prairie Aquifer and add new wells as opportunities arise in areas where additional data are needed. Areas of limited data or significant uncertainty identified by the USGS during groundwater flow model development included the Ramsey Channel, the Chilco Channel, the Blanchard-Spirit Lake area,

and those adjacent to the Spokane River, Hauser Lake, and Hayden Lake (Figure 7-1). Although monitoring along the Spokane River has increased, other areas remain unmonitored or have limited monitoring.

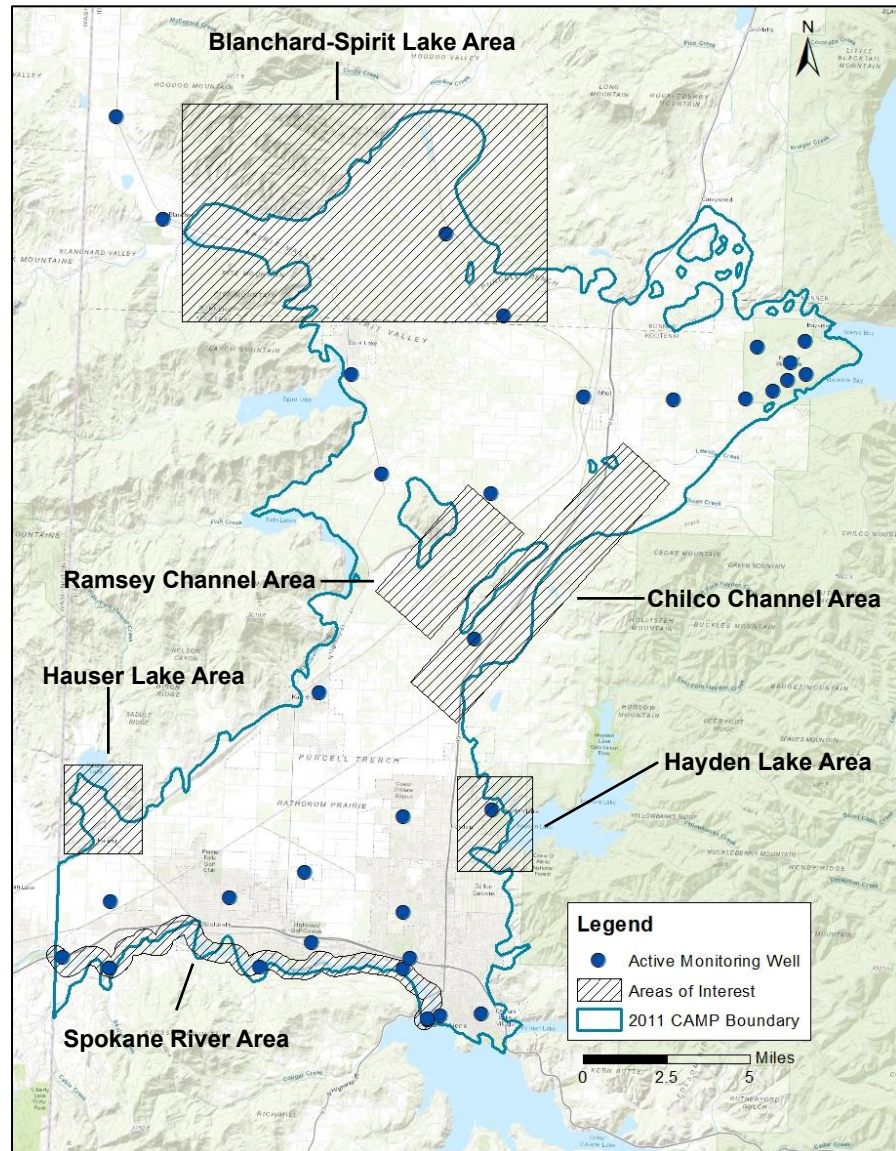


Figure 7-1. Areas for expanding water level monitoring in the Rathdrum Prairie.

Finally, IDWR is obtaining and compiling monthly groundwater production data from large and small municipal systems that divert from the Rathdrum Prairie Aquifer. Groundwater production data will be used to assess changes in demand and will be compared to projections established for the 2011 CAMP.

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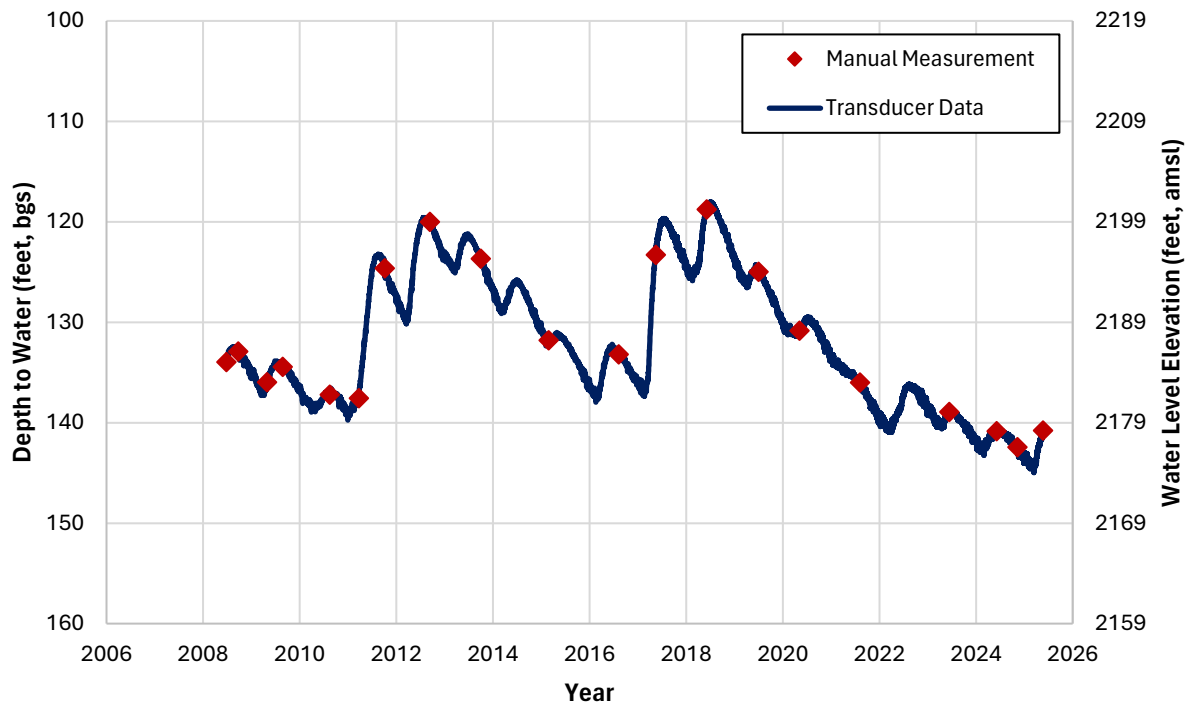
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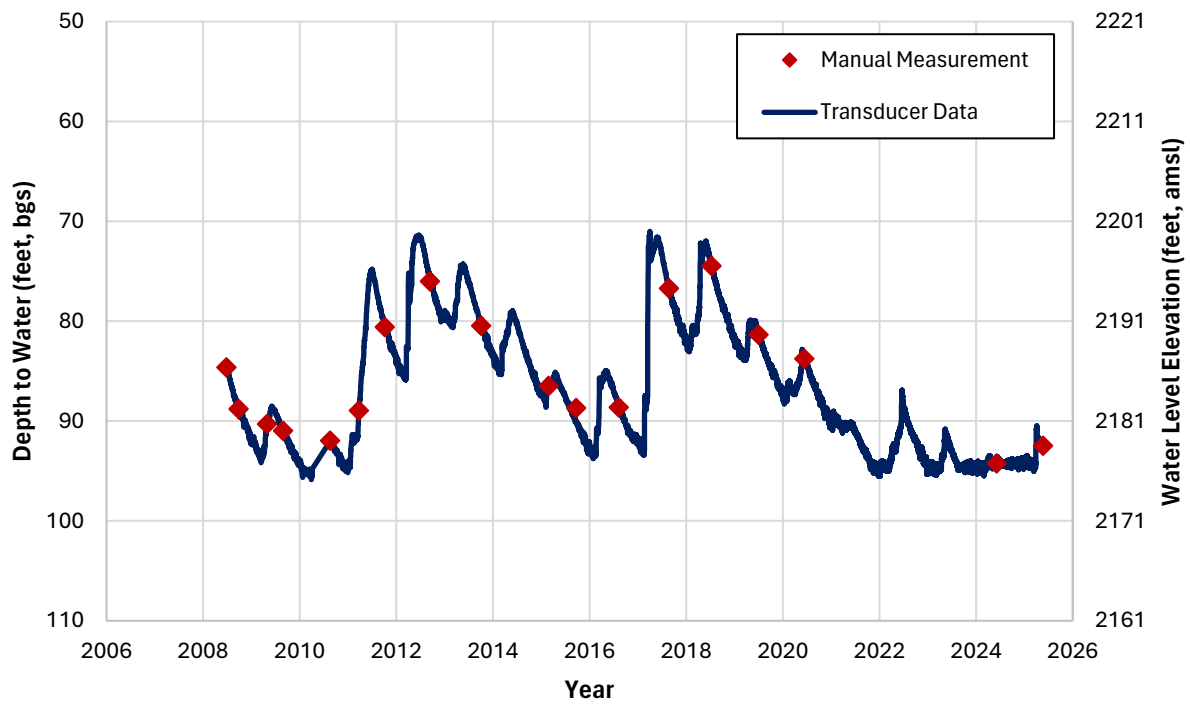
Appendix A

Hydrographs for the Rathdrum Prairie Aquifer Groundwater Monitoring Network

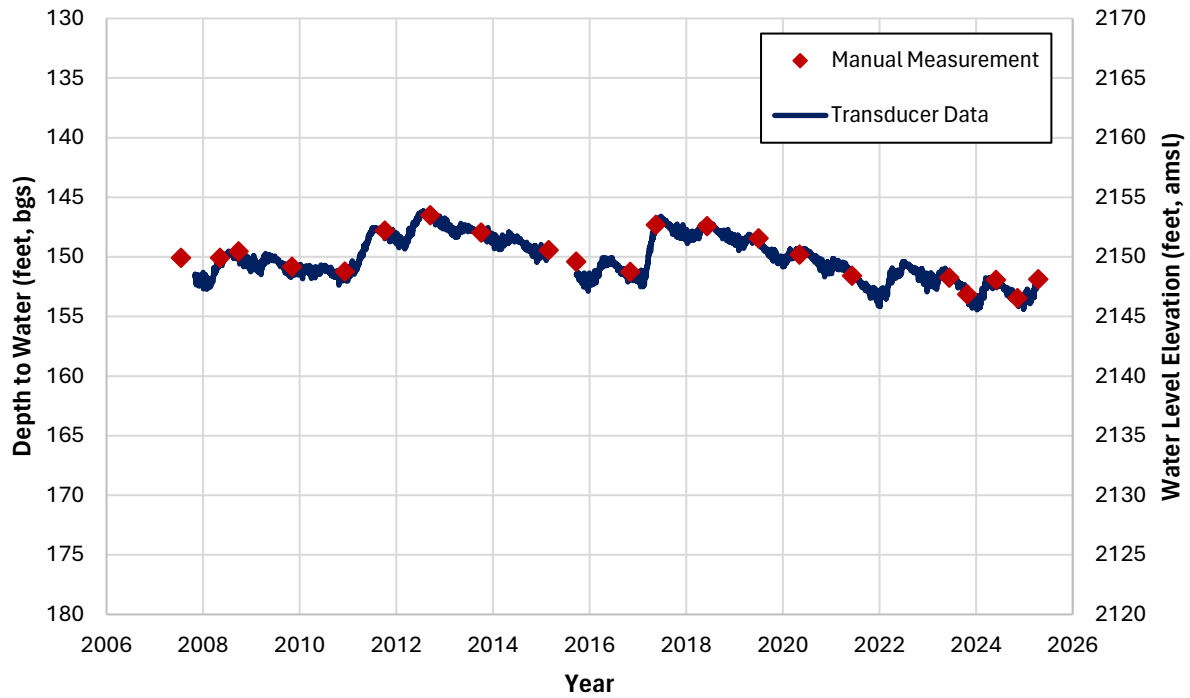
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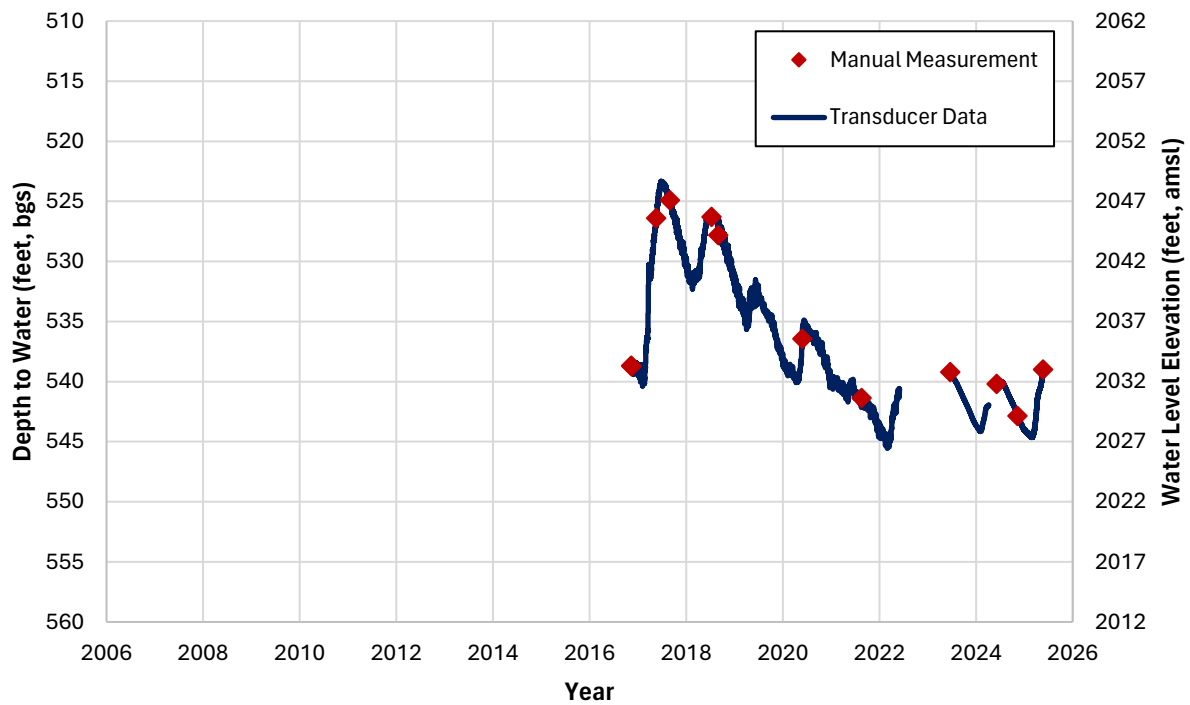
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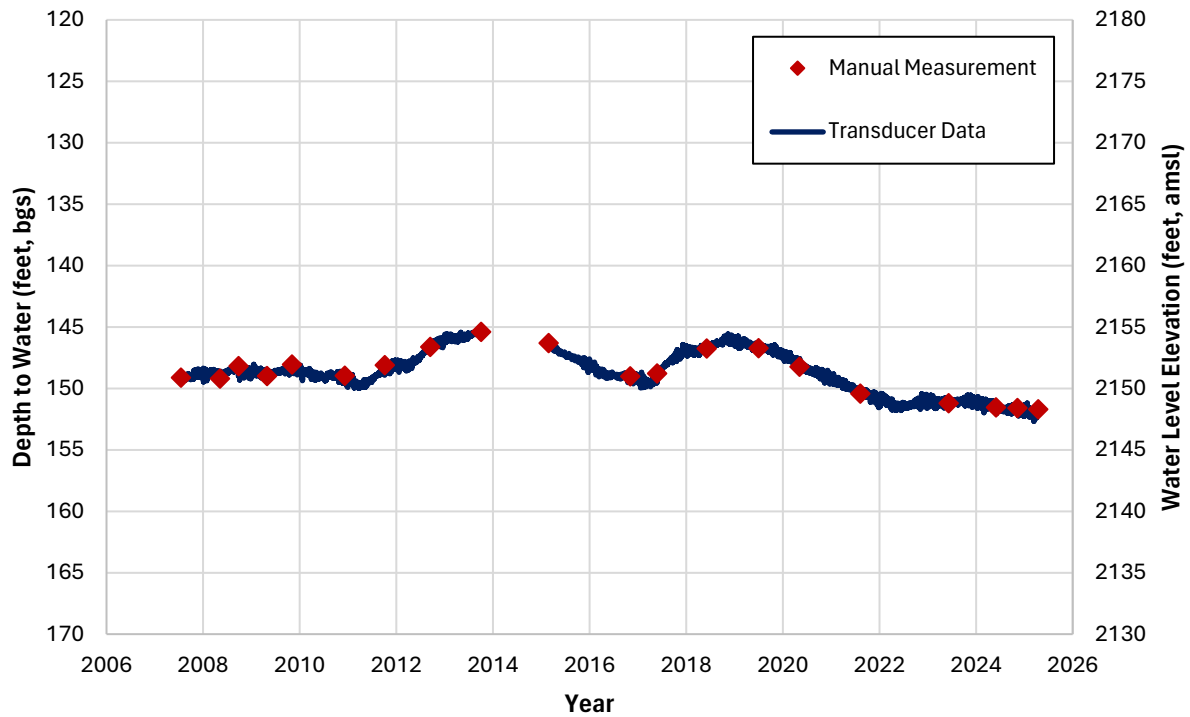
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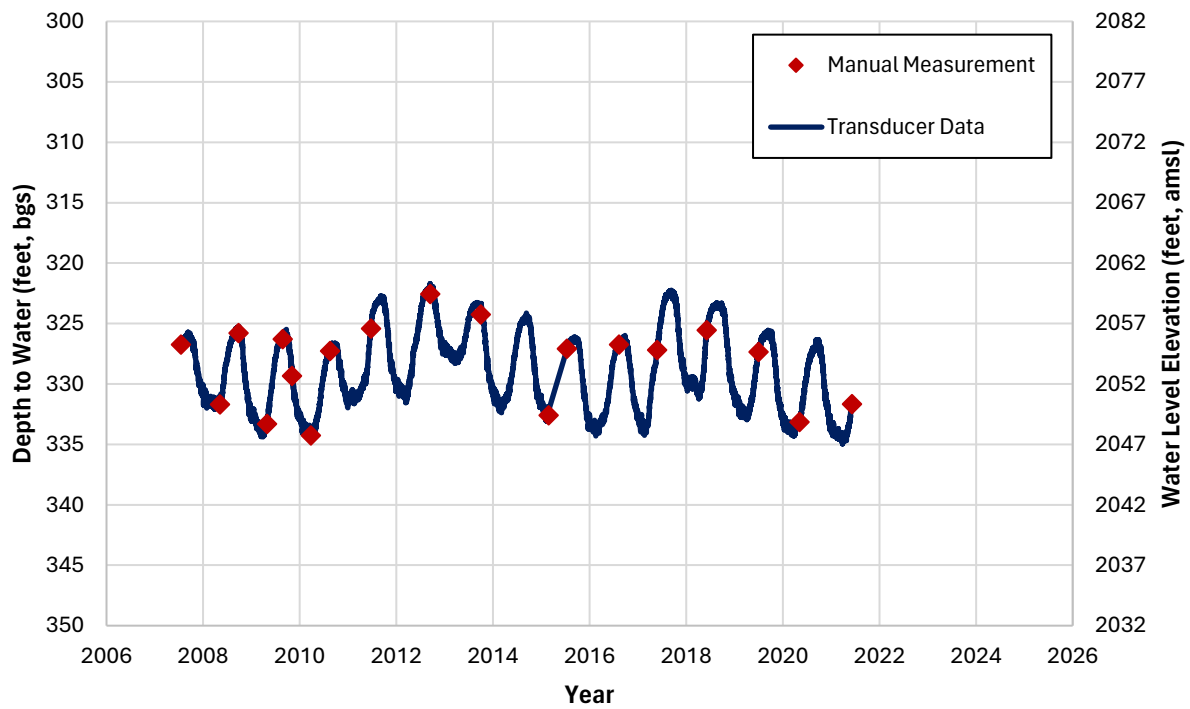
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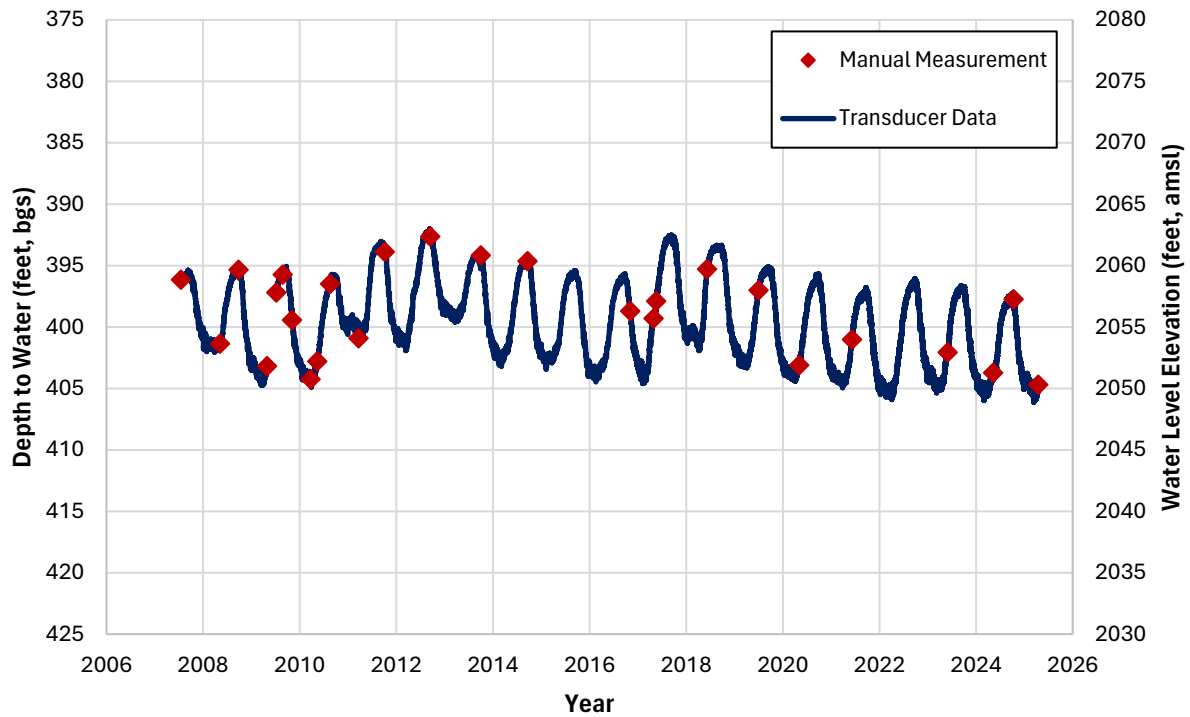
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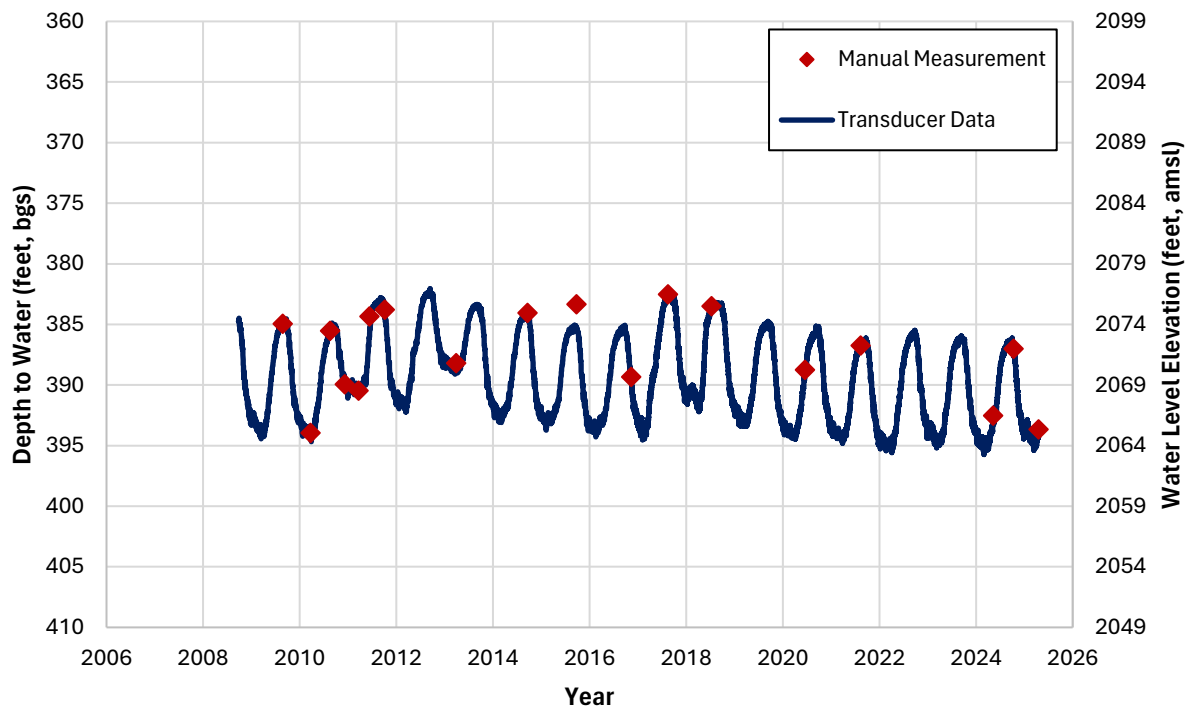
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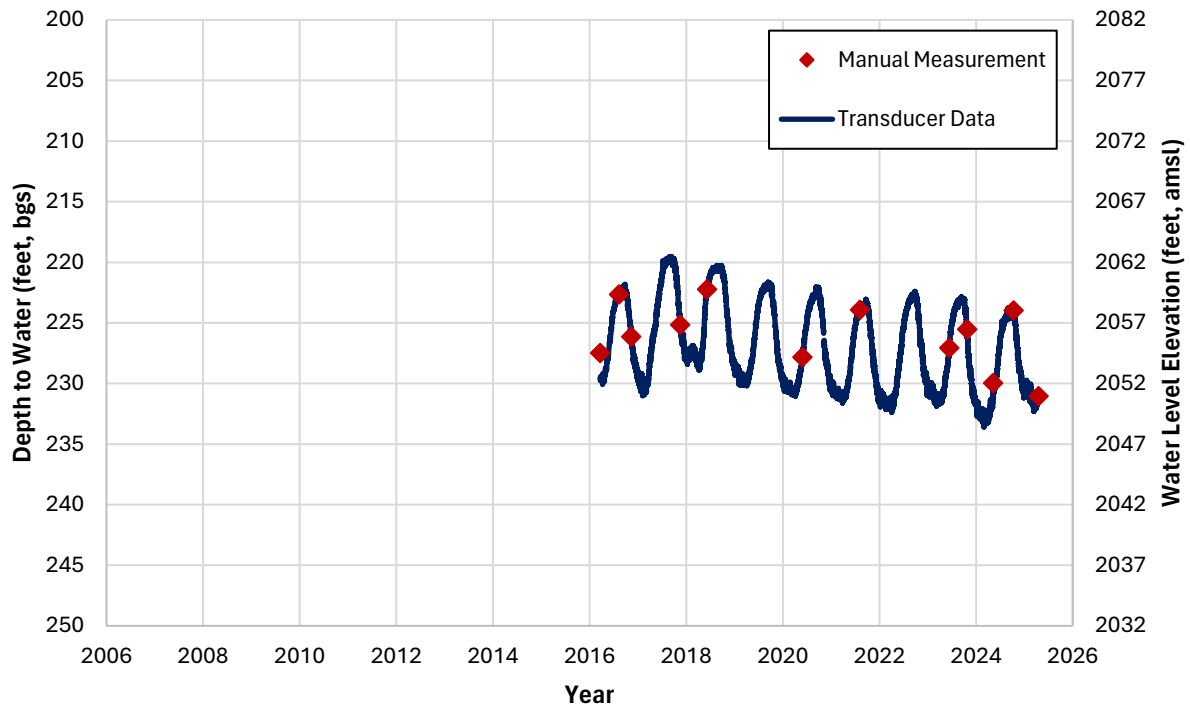
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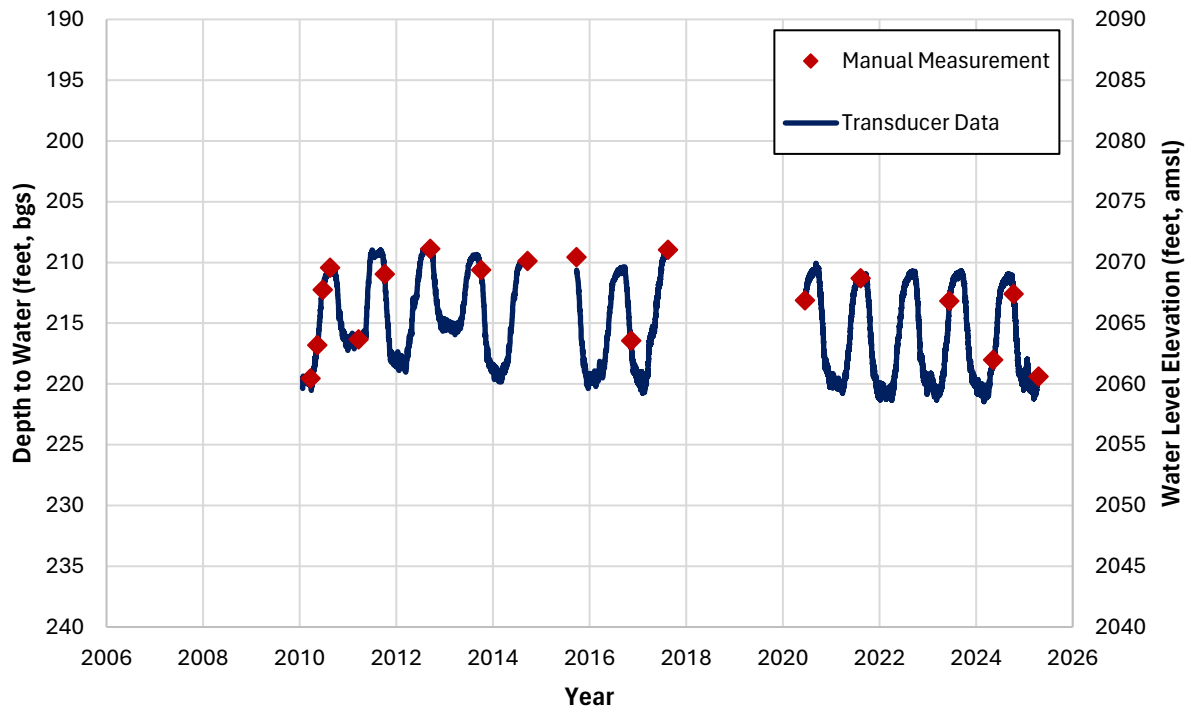
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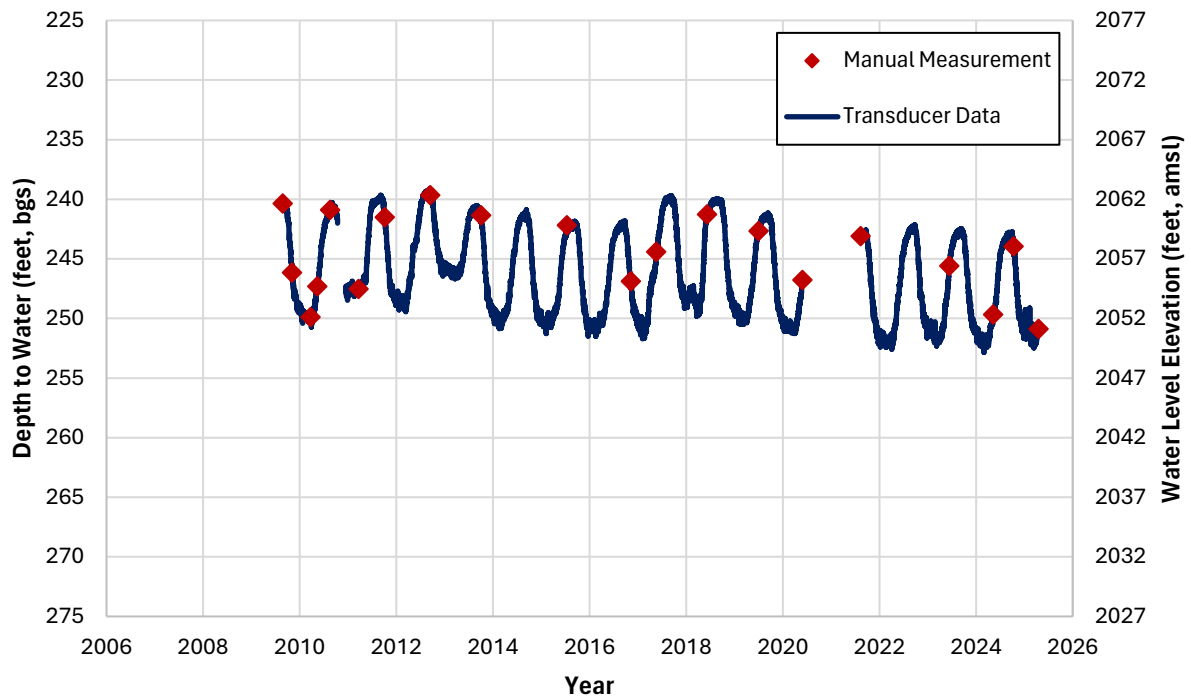
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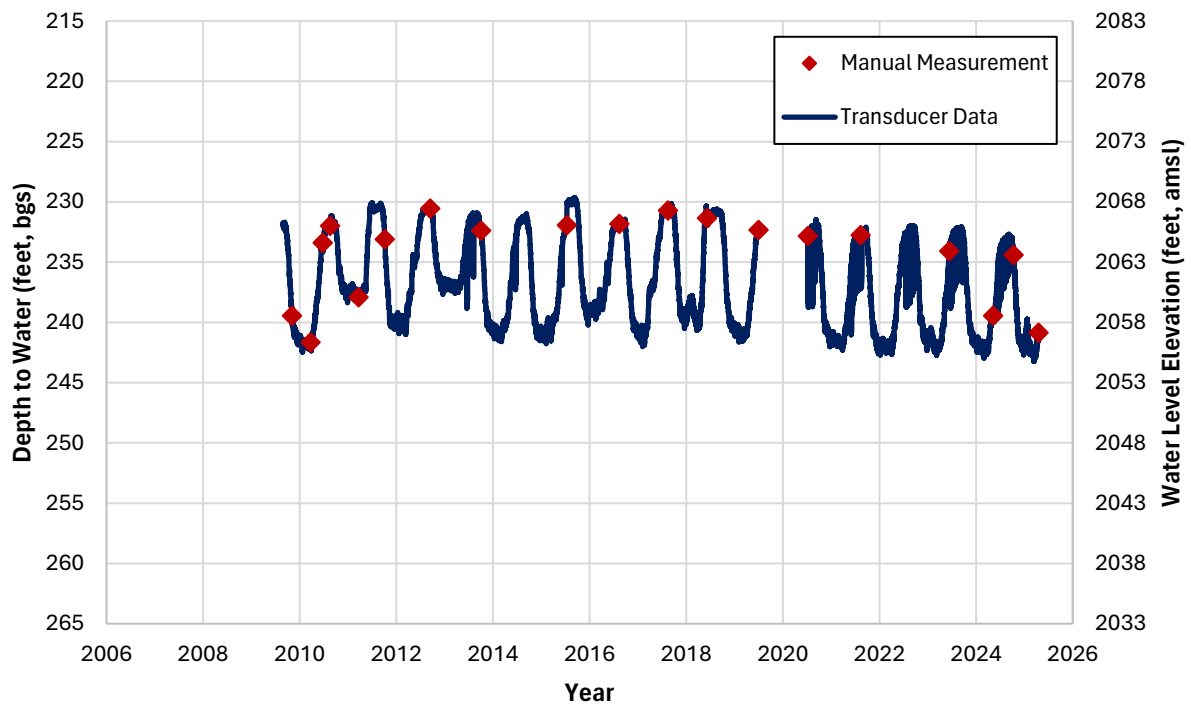
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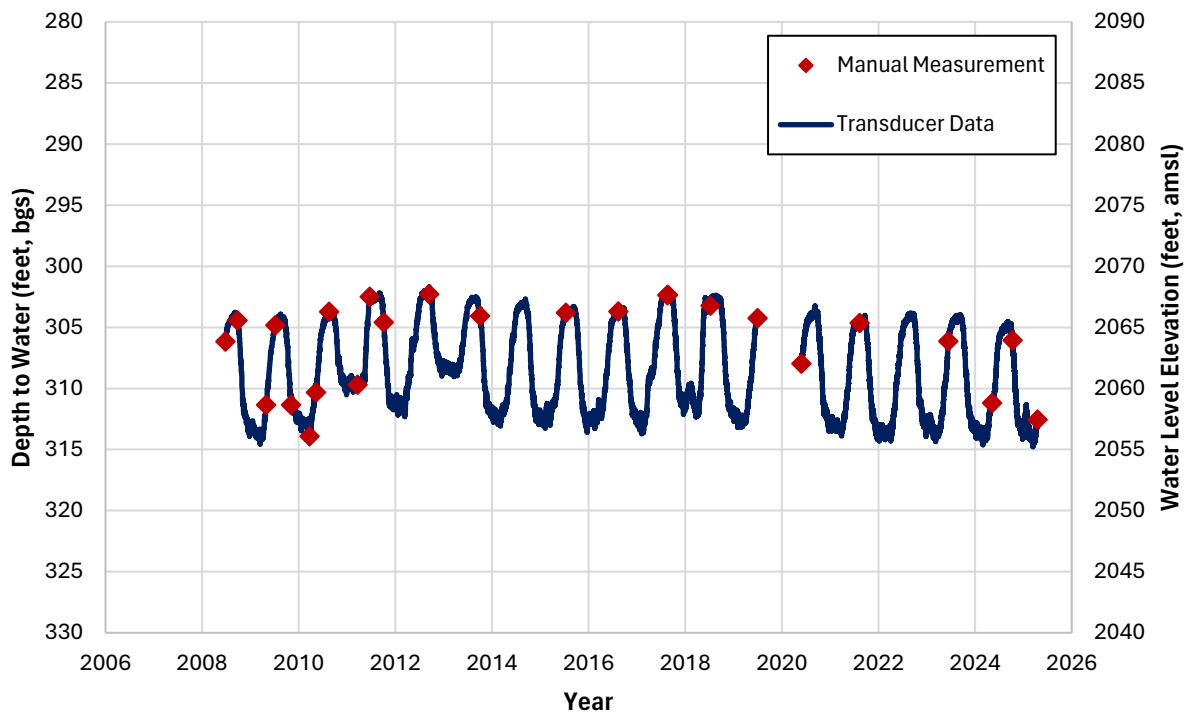
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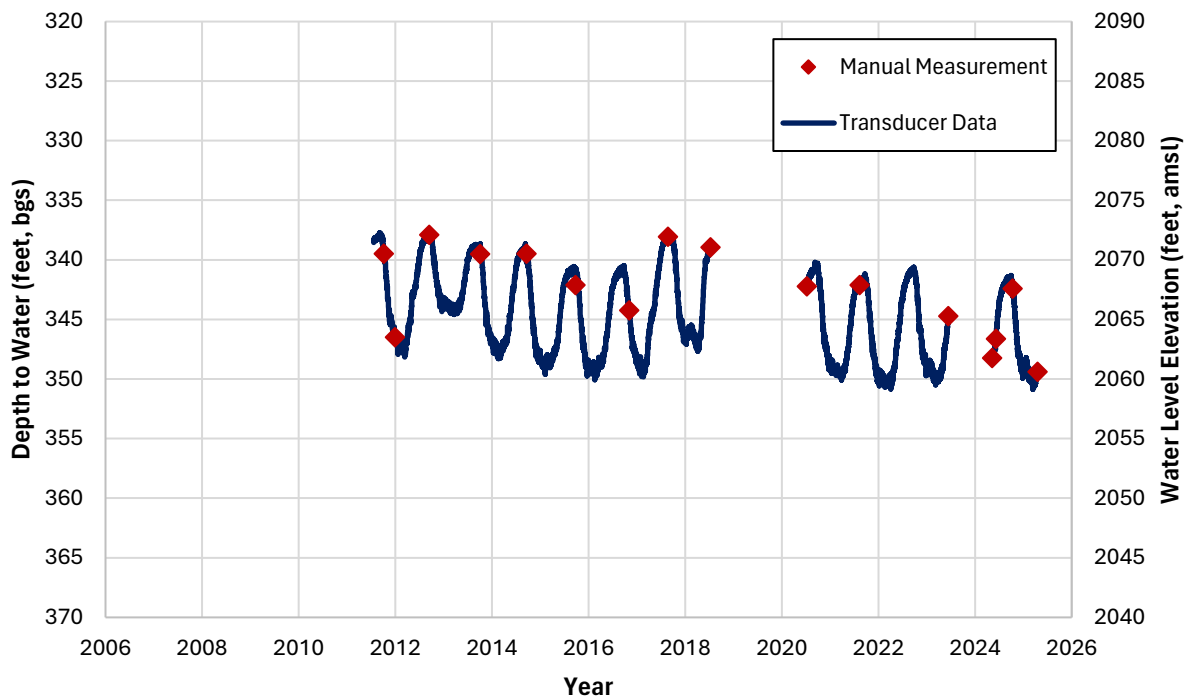
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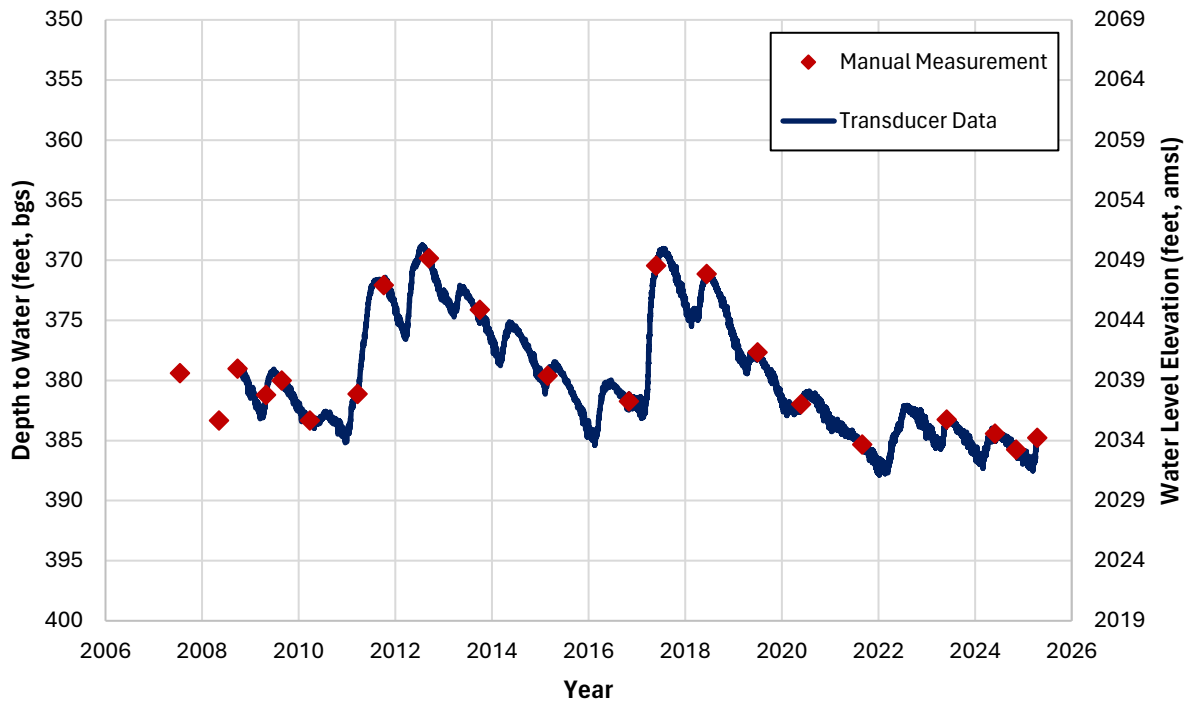
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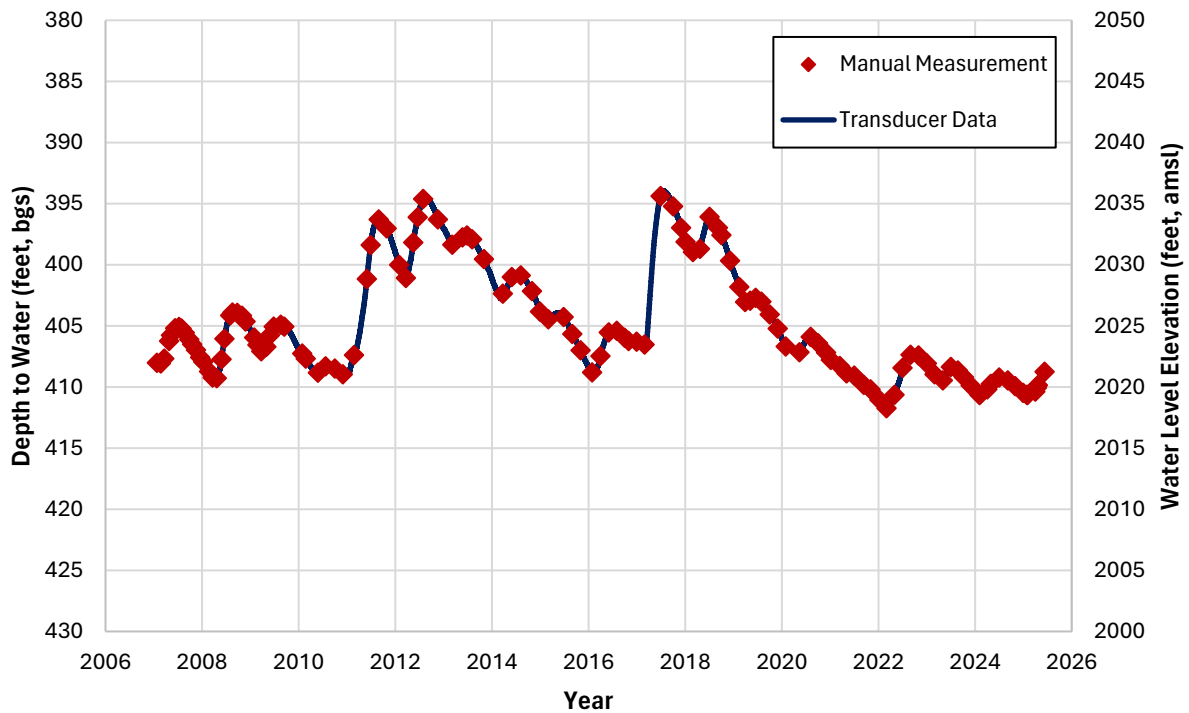
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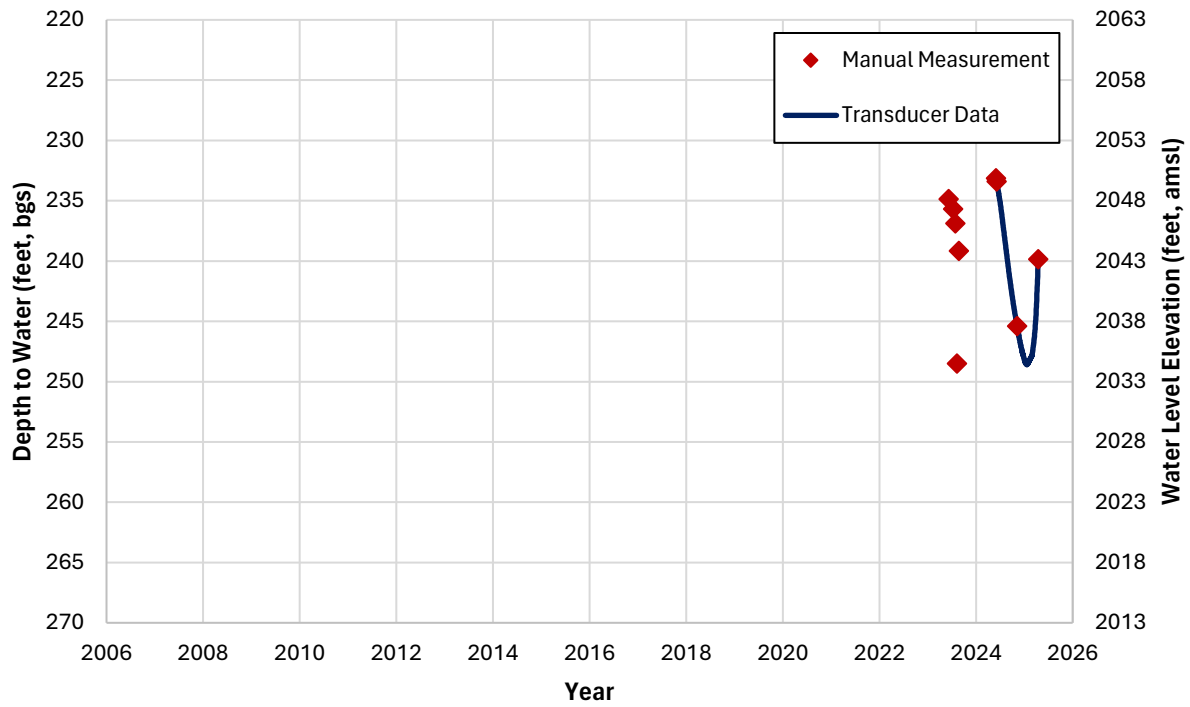
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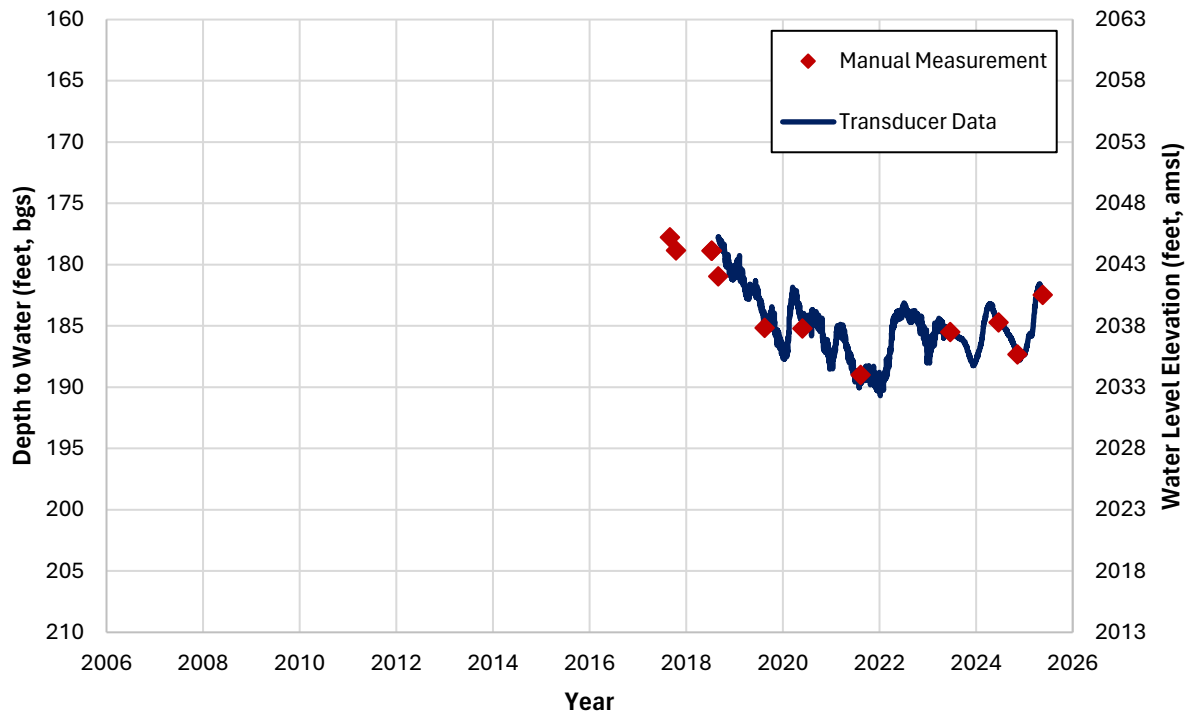
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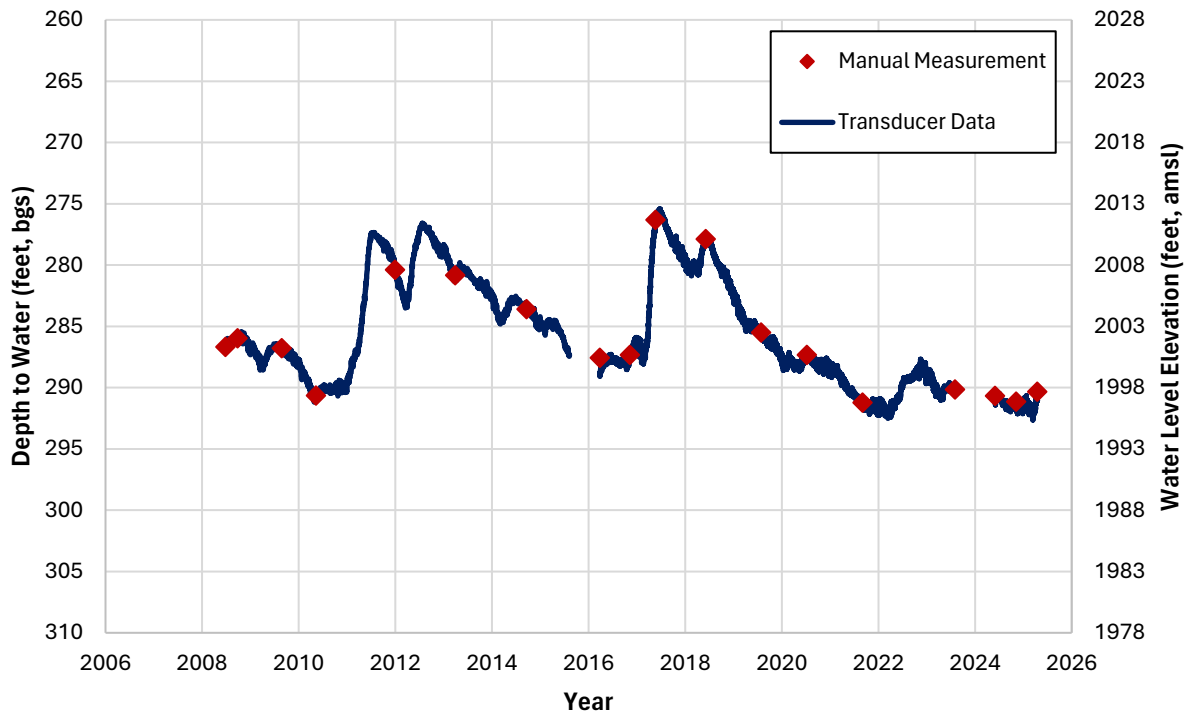
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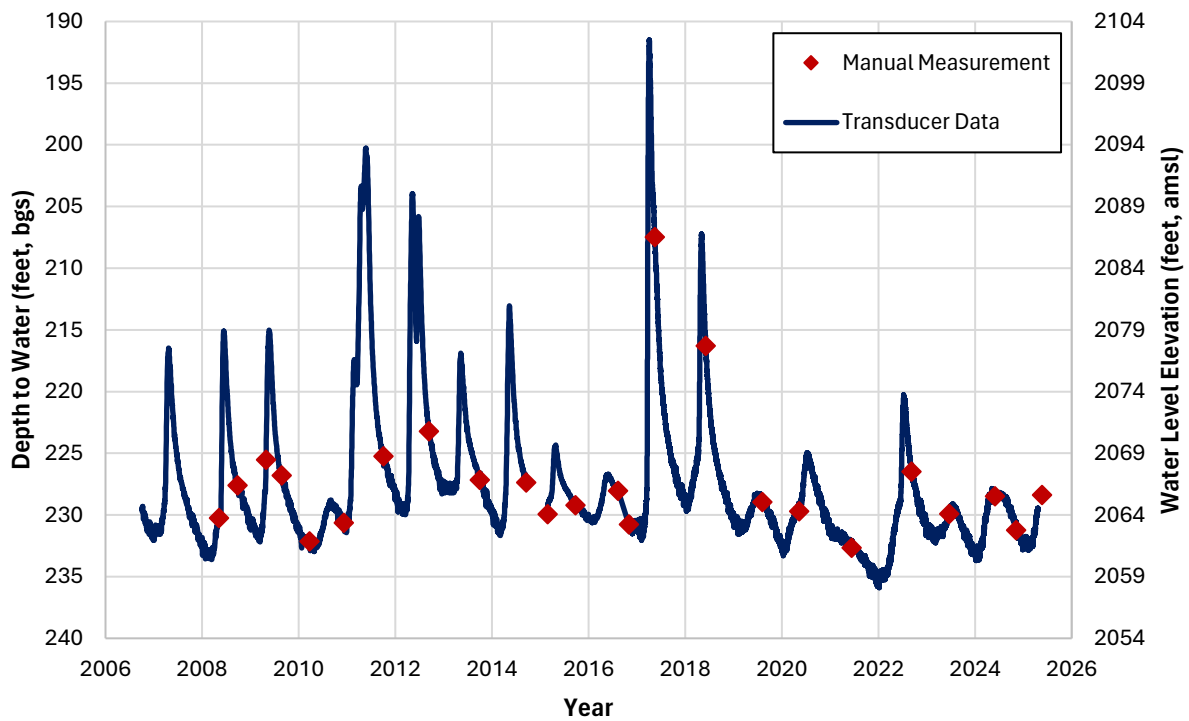
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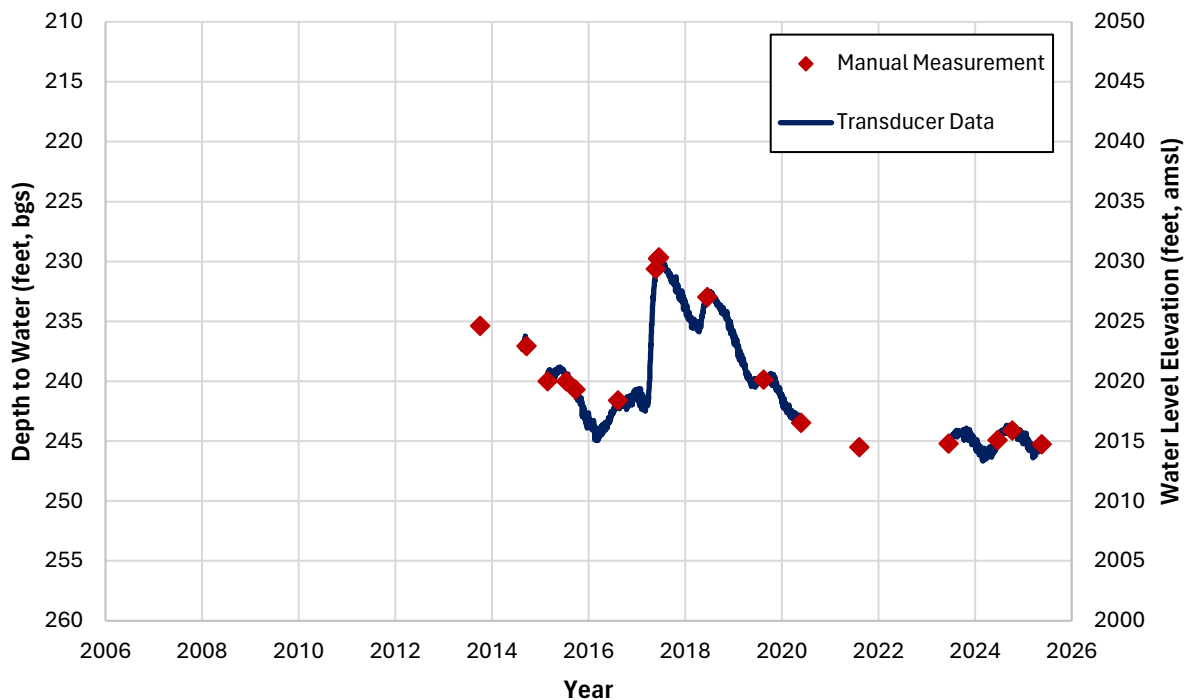
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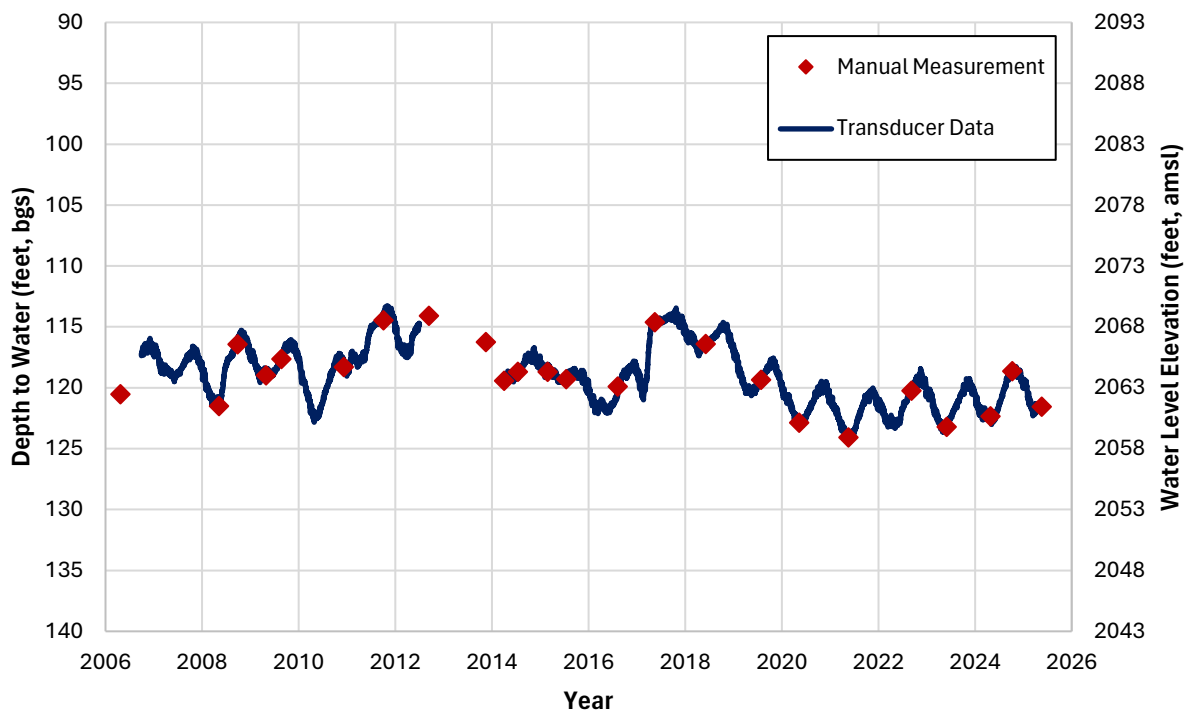
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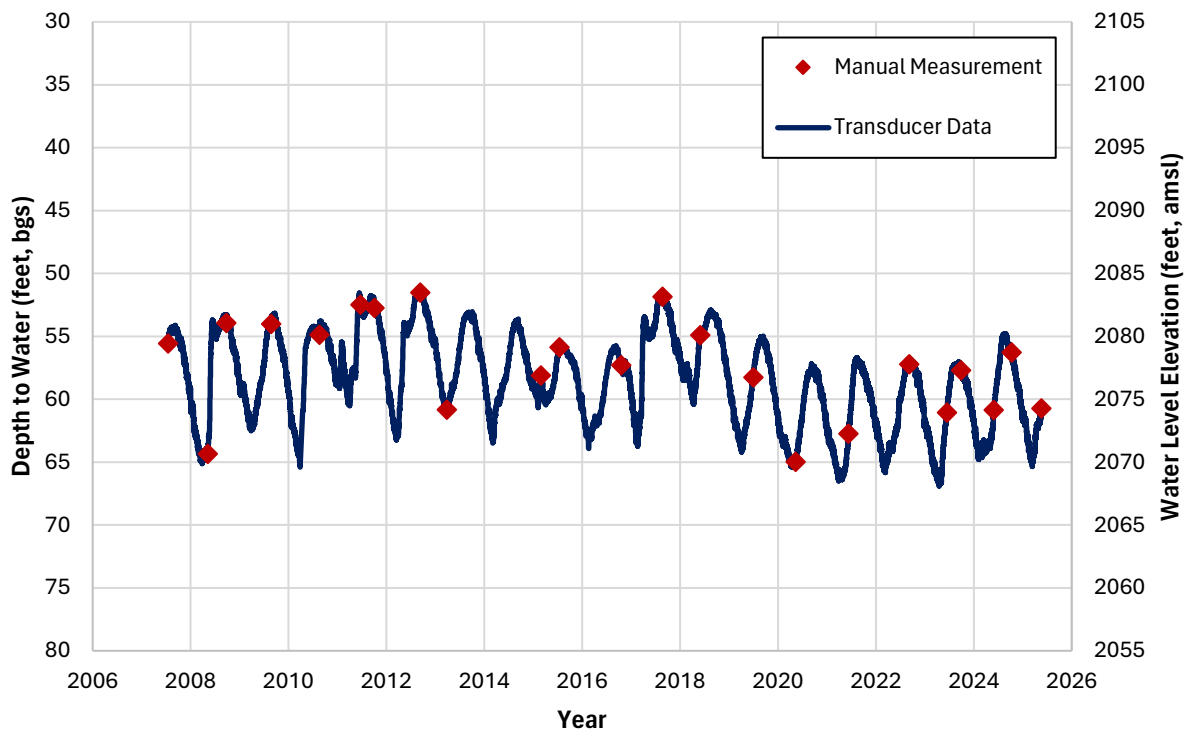
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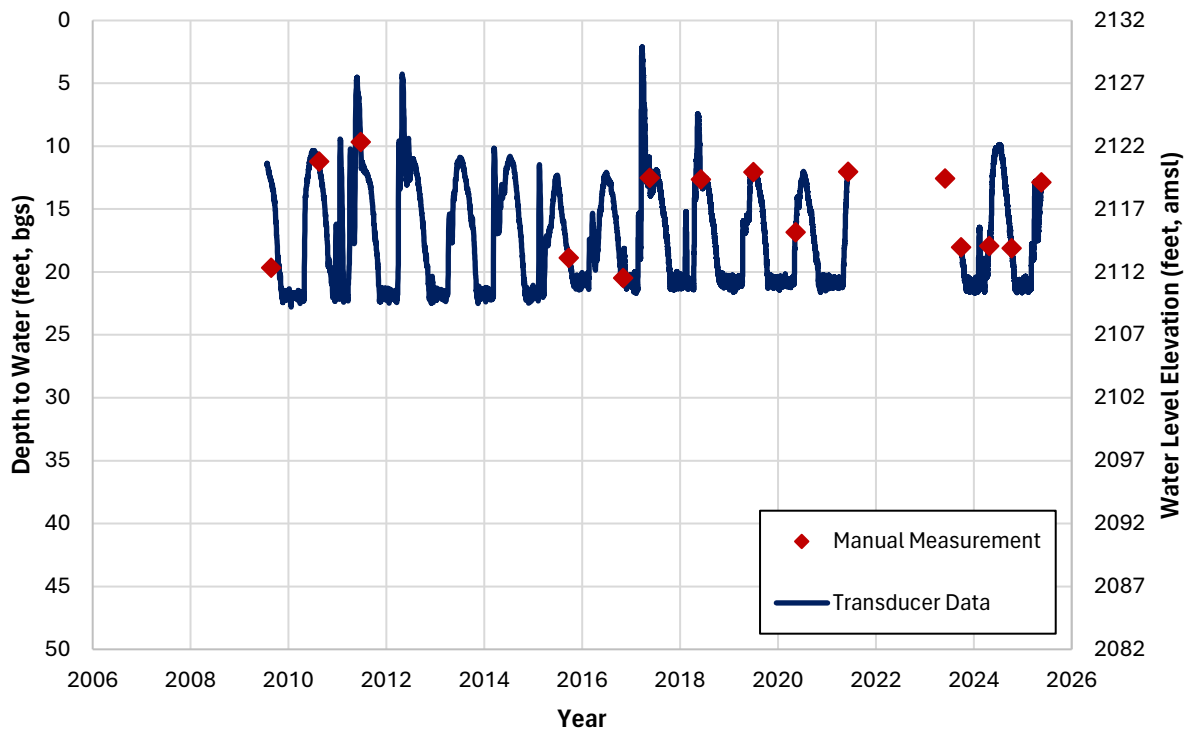
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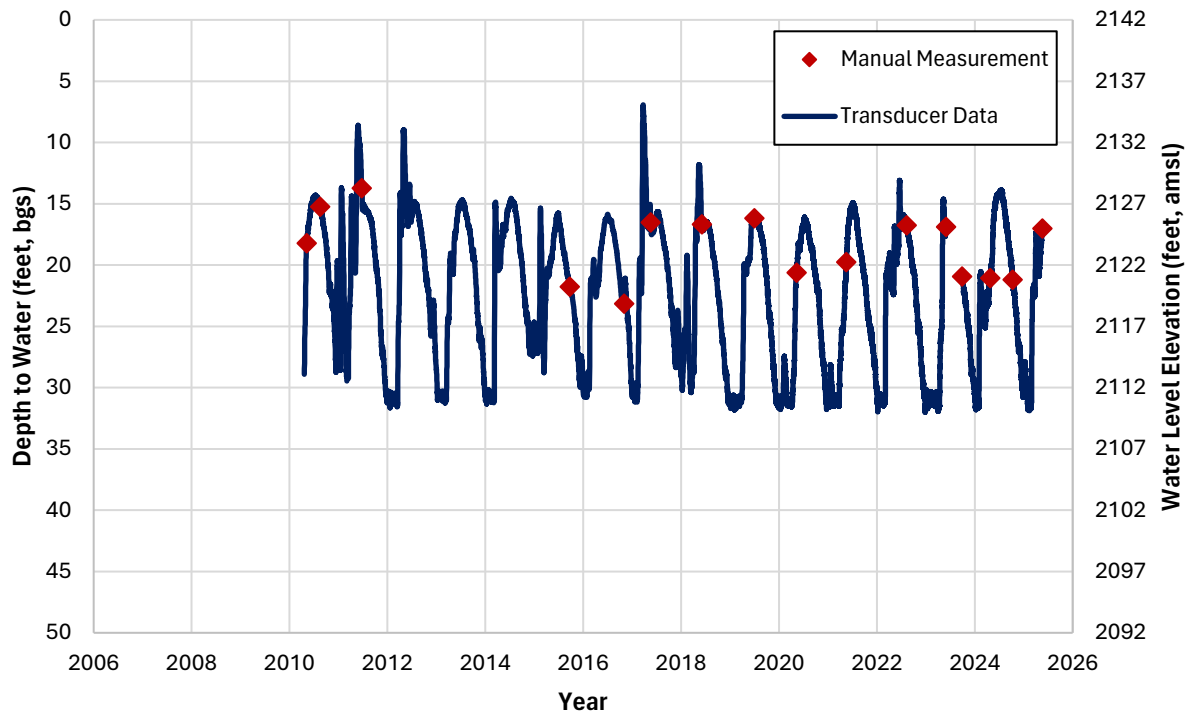
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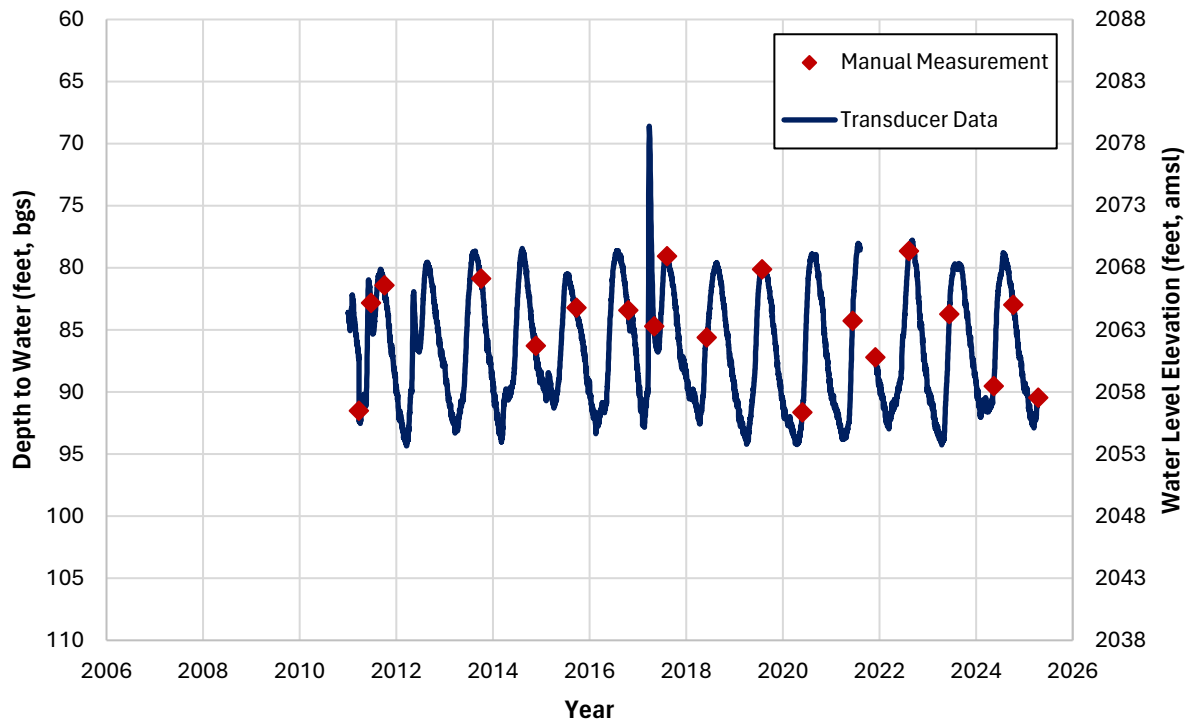
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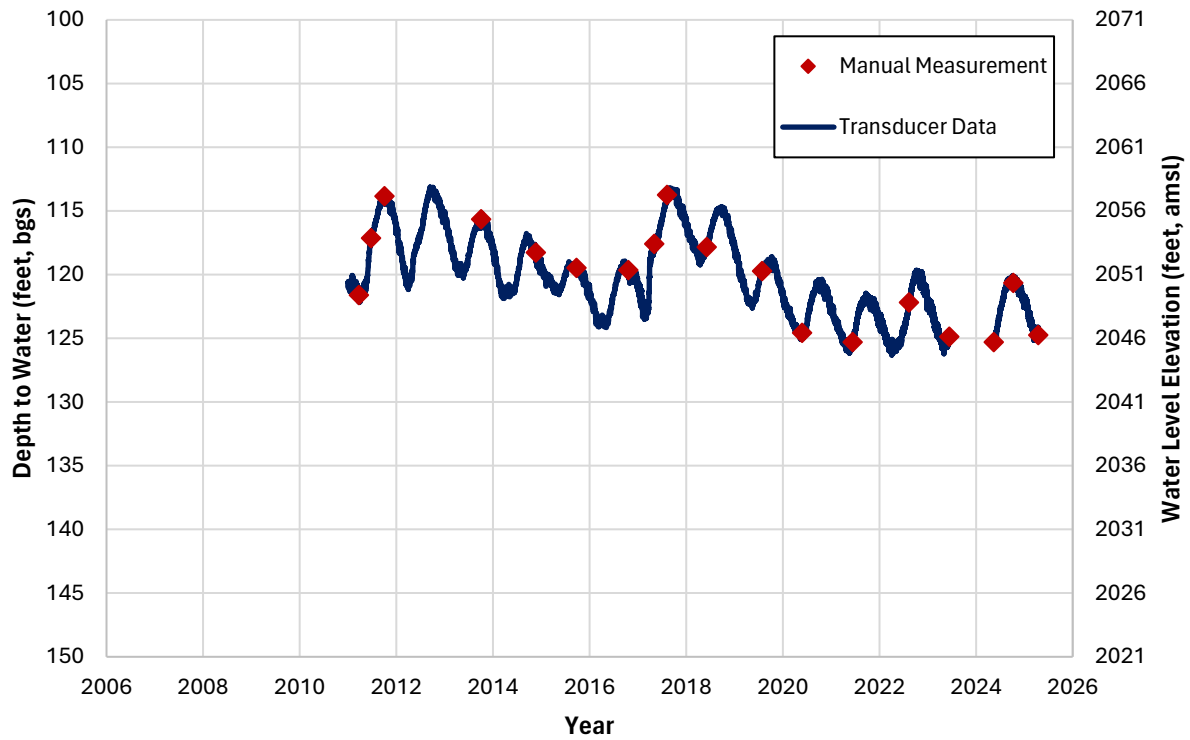
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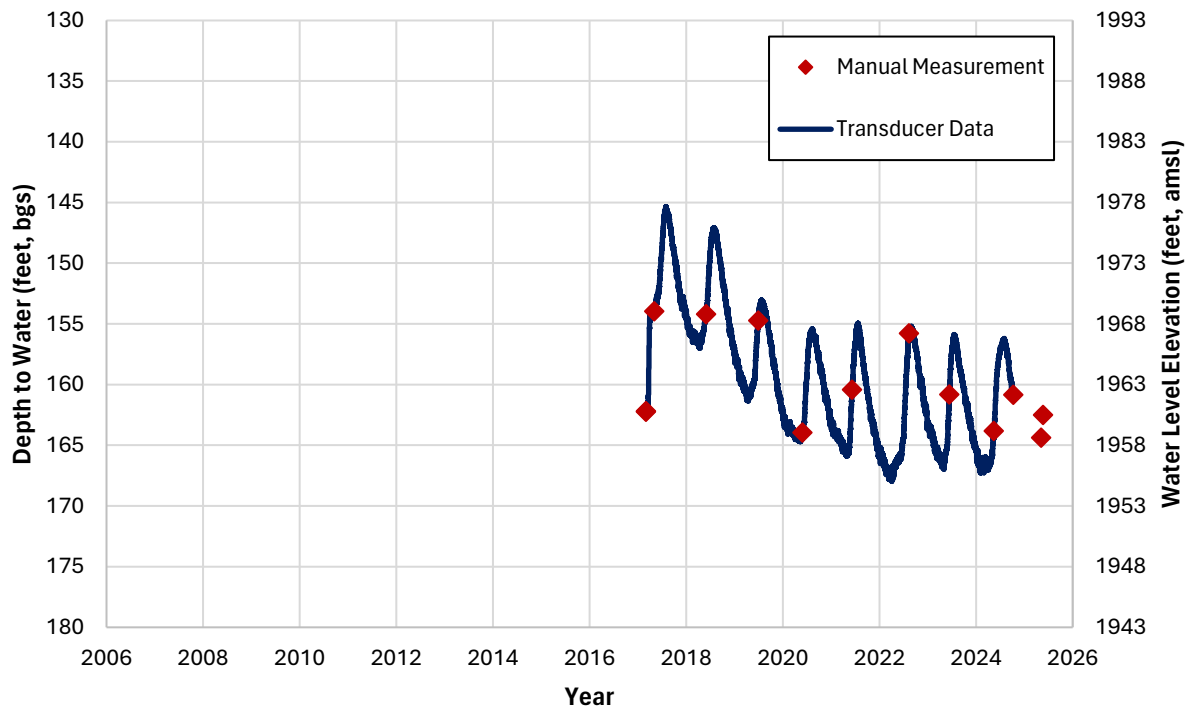
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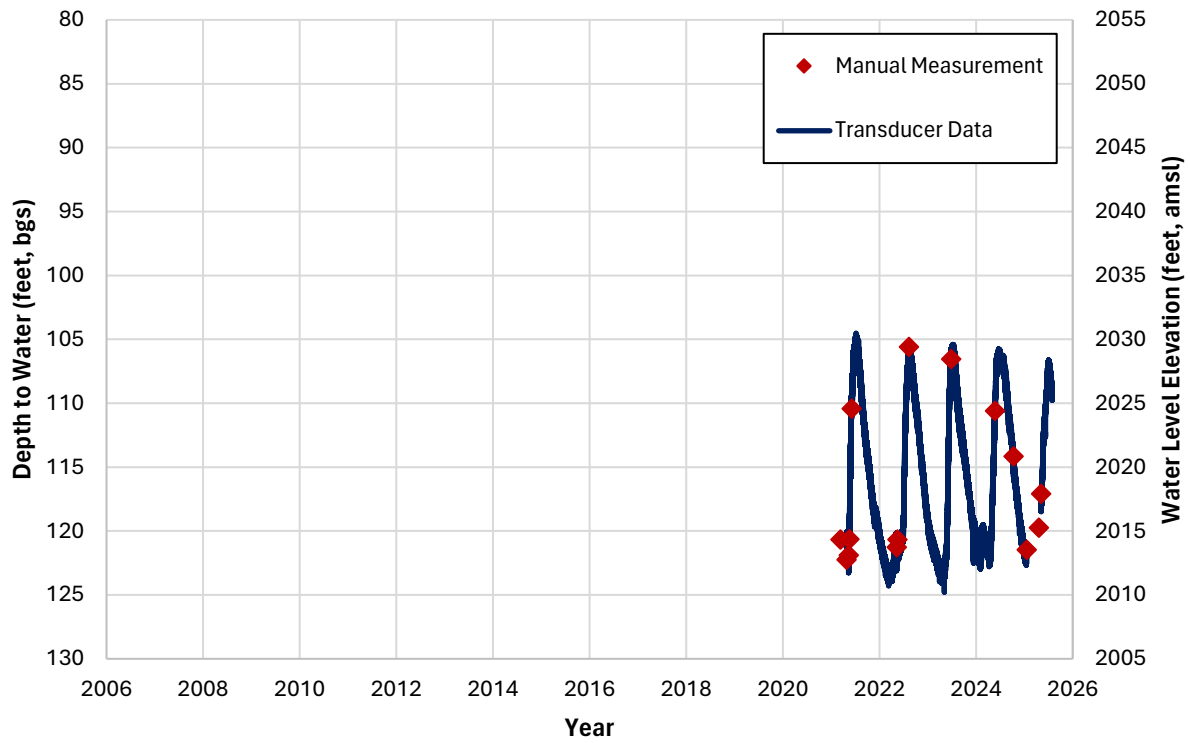
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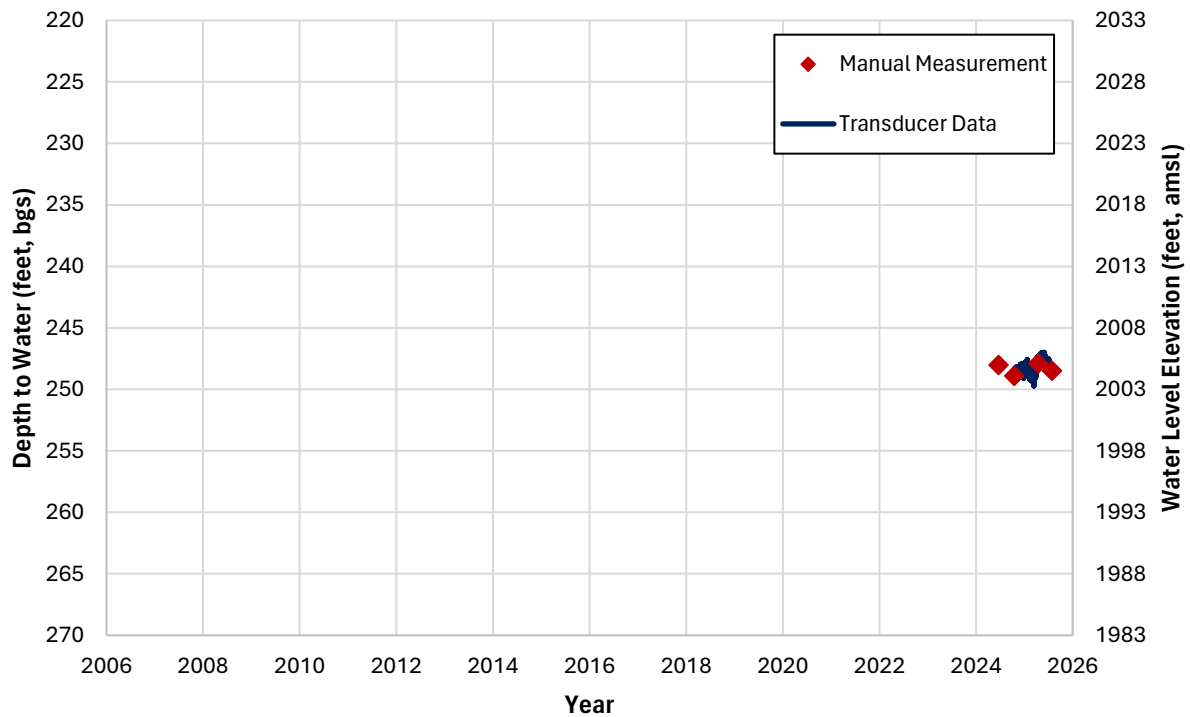
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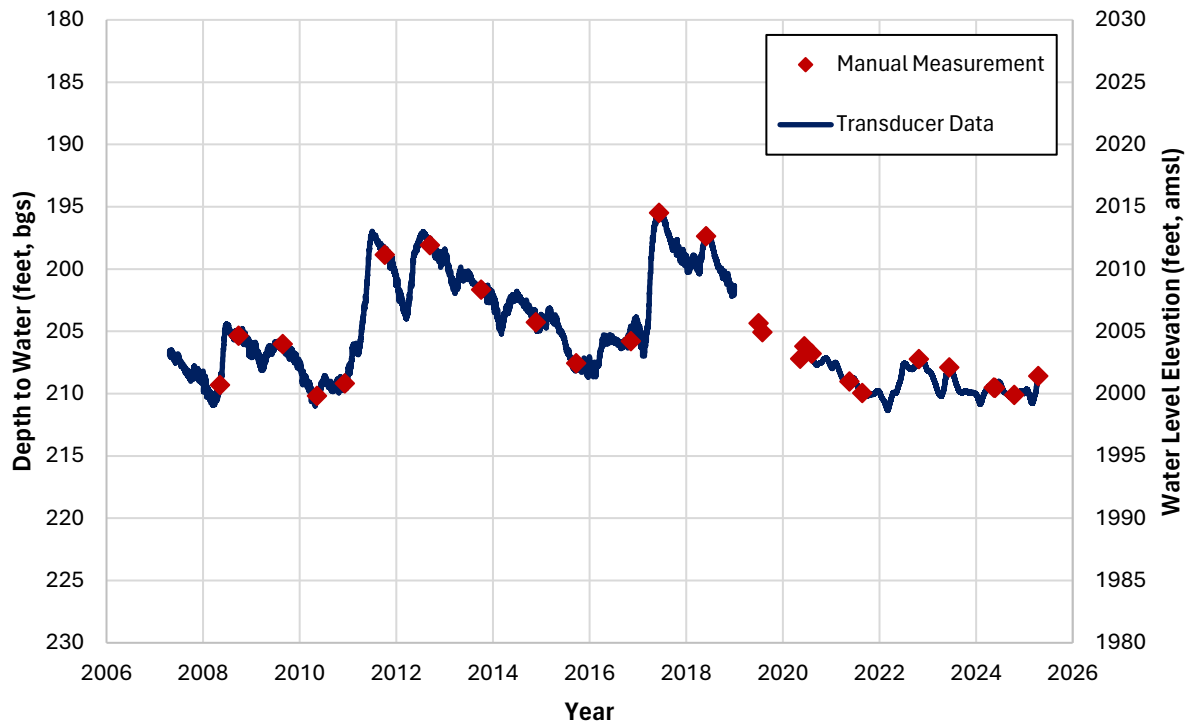
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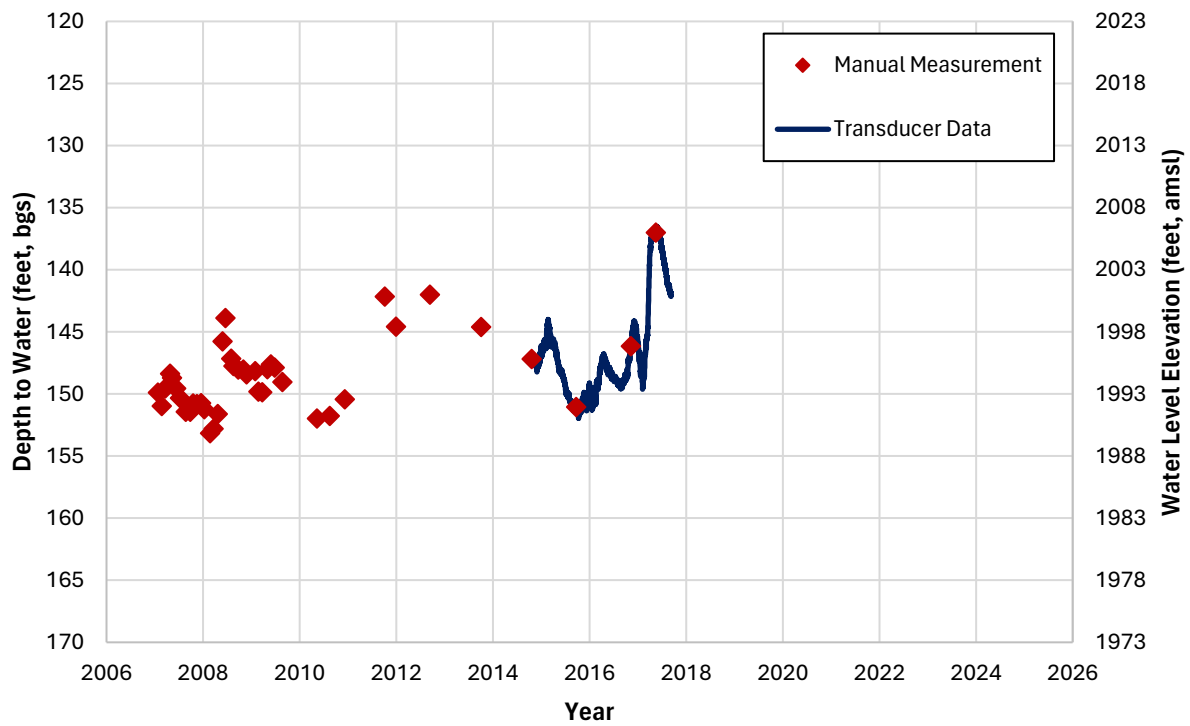
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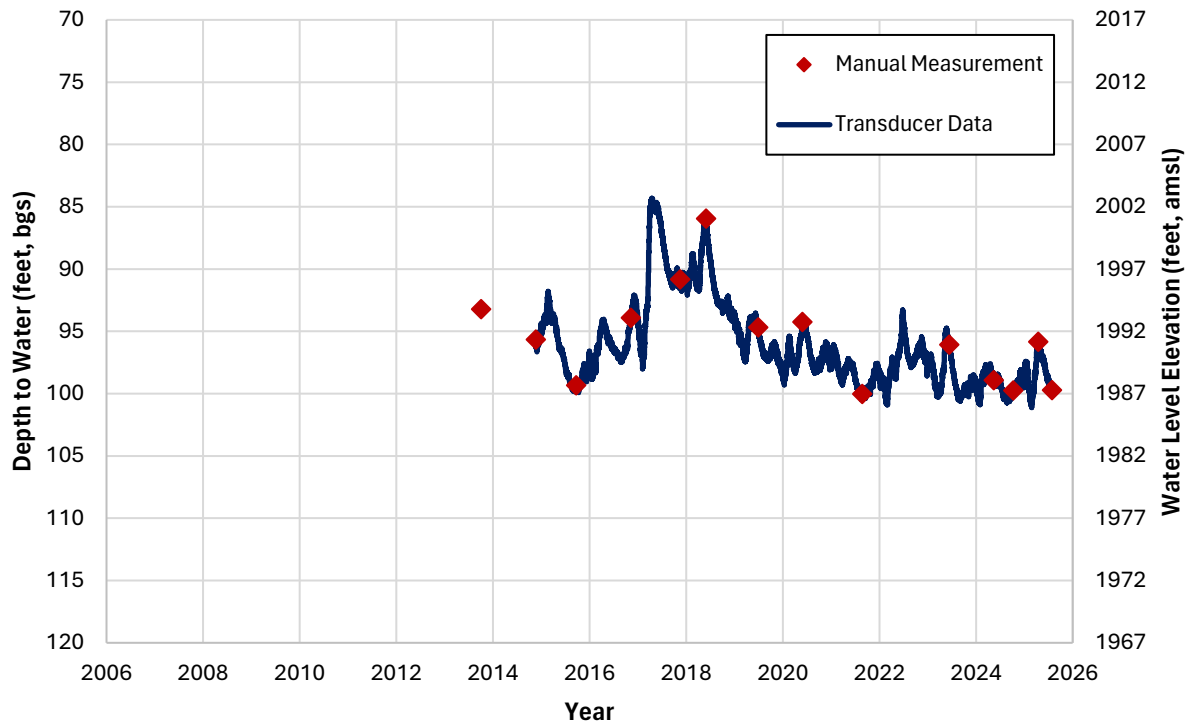
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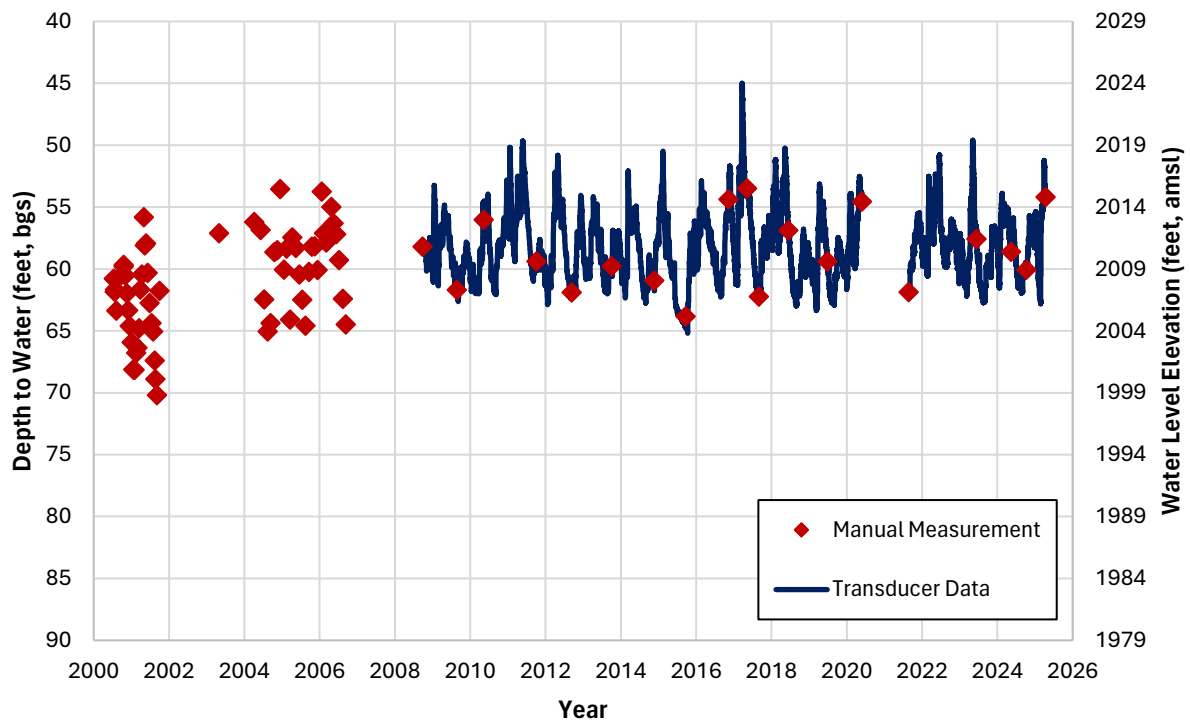
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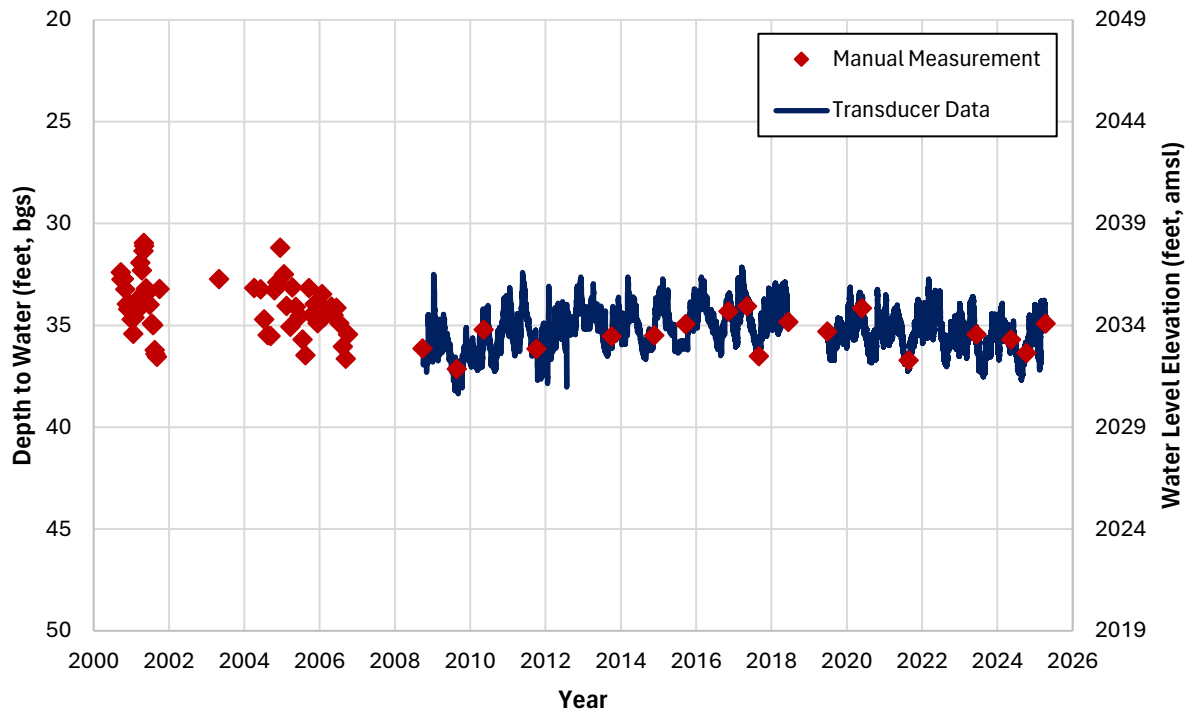
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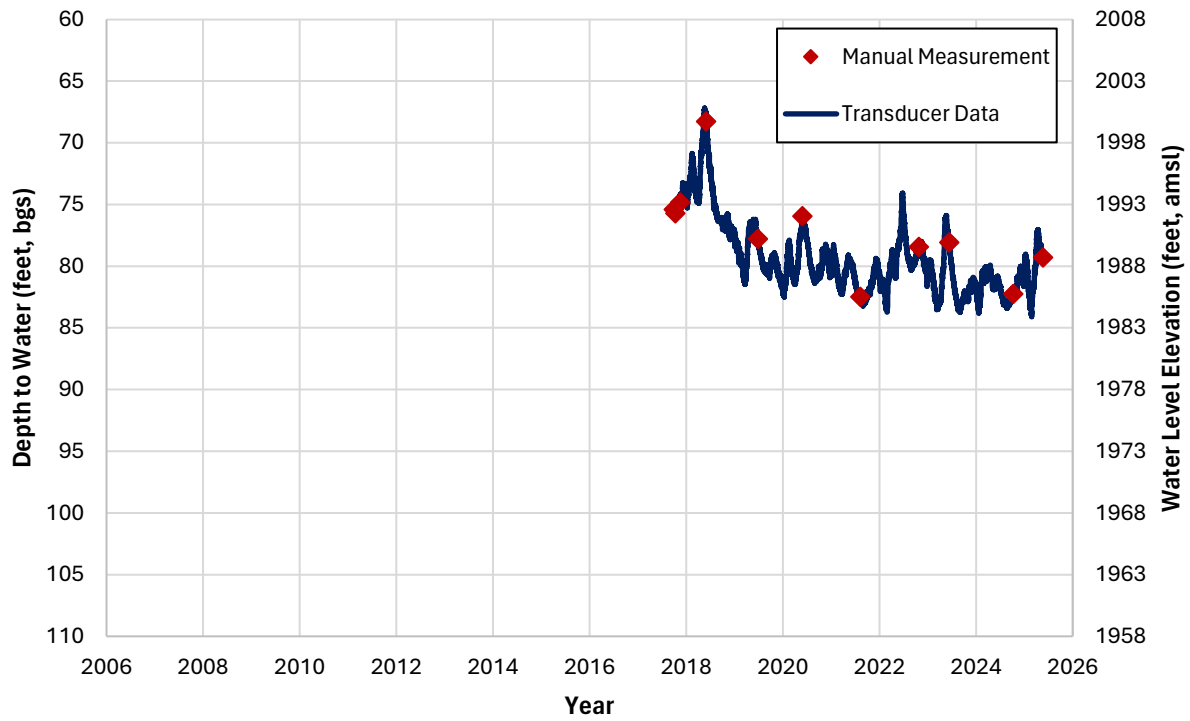
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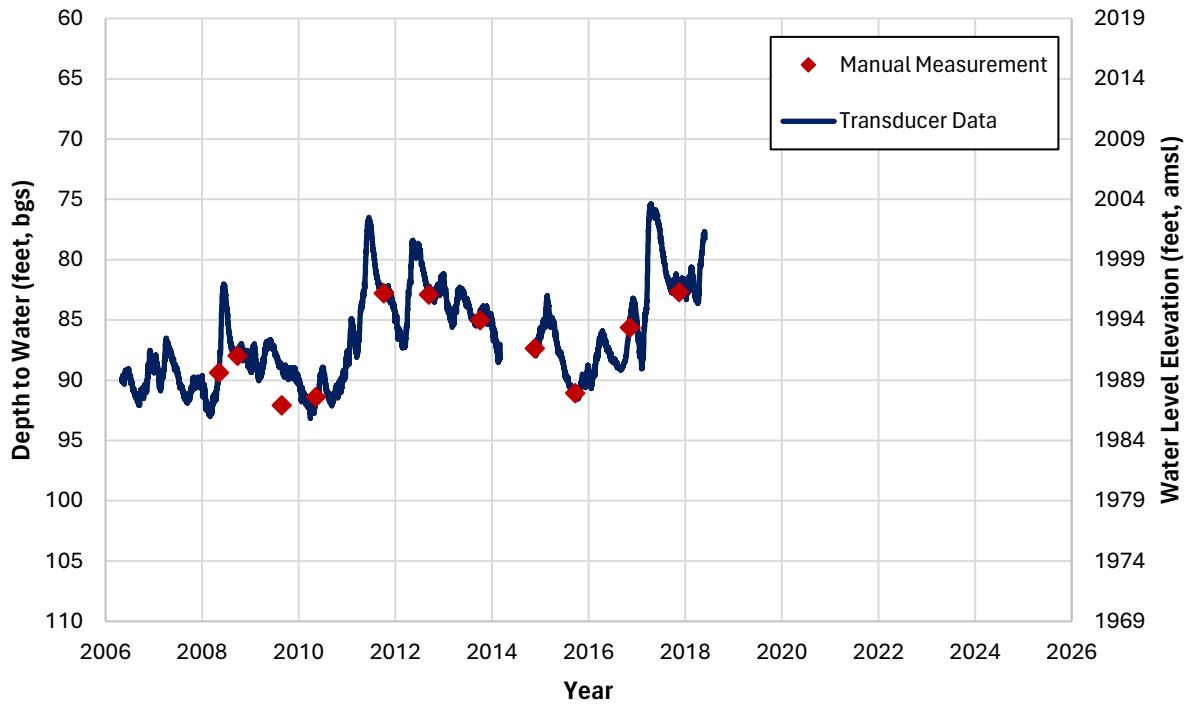
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