Idaho Department of Water Resources

MALAD VALLEY WATER LEVEL MONITORING UPDATE, 2023

ONEIDA COUNTY, IDAHO

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2023 Update of Groundwater Conditions in the Malad Valley Groundwater Management Area

The Idaho Department of Water Resources designates Critical Ground Water Areas (CGWAs) and Ground Water Management Areas (GWMAs) under Idaho Code §42-233a and §42-233b, respectively. A CGWA is all or part of a groundwater basin that does not have sufficient ground water to provide a reasonably-safe supply for irrigation or other uses at the current or projected rates of withdrawal. A GWMA is all or part of a groundwater basin that may be approaching the conditions of a CGMA. The Malad Valley GWMA was designated on November 4, 2015, based on local concerns regarding declining water levels. This report describes the status and trends of aquifer levels in the Malad Valley GWMA located primarily in Oneida County.

Introduction

The Idaho Department of Water Resources (IDWR) maintains a groundwater-level monitoring network in the Malad Valley GWMA which is located in Oneida County of southeastern Idaho. The monitoring network currently consists of 12 wells within the GWMA (Figure 1).

This report provides an update to the status of the Malad Valley GWMA groundwater-monitoring network, and presents water-level data collected over the network's history.

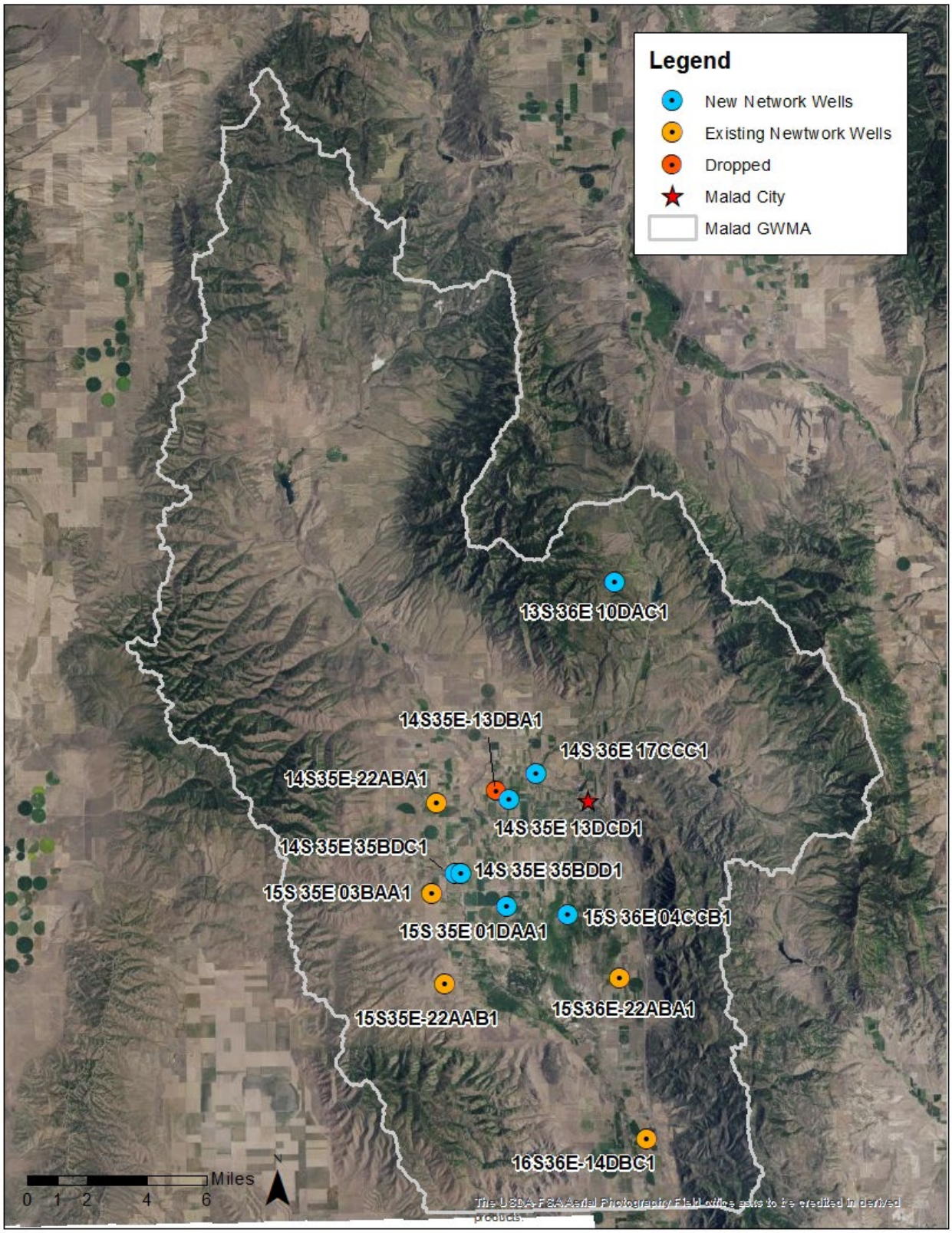

Figure 1. Location map for wells in the Malad Basin that are measured by IDWR.

Water Level Monitoring

IDWR monitored water levels in seven Malad Basin wells until 2017 when two wells were lost due to lack of water and access issues, reducing the number of wells monitoring network to five. However, several landowners gave IDWR permission to monitor their wells in the fall of 2022, and now water levels are measured in 12 wells within the basin (Figure *1*).

Prior to fall 2022, the IDWR network wells were located on the valley bottom, in the center and southern part of the GWMA; however, the wells added to the network in 2022 provide data from locations distributed across the basin (Figure1). The wells are generally completed in sediments and derive water from gravel layers. The land-surface elevation, depth-of-completion, and monitoring period for the wells are listed in Table 1. Wells added in 2022 are highlighted in bold.

Table 1. Well completion information.

Well Number	Elevation (ft)	Total Depth (ft)	Open Interval (ft)	Production Elevation (ft)[1]	Monitoring Start Date	Monitoring End Date
13S 36E 10DAC1[2]	**5,708**	**UNK**	**UNK**	**UNK**	**Sep 2022**	**May 2023**
14S 35E 13DBA1[3]	4,646	289	114-289	4,445	Oct 1943	Mar 2018
14S 35E 13DCD1	**4,603**	**250**	**218-238**	**4,375**	**Sep 2022**	**Mar 2023**
14S 35E 22ABA1	4,670	315	305-315	4,360	Aug 2006	Mar 2023
14S 35E 35BDC1[5]	**4,465**	**251**	**32-240**	**4,329**	**Sep 2022**	**Mar 2023**
14S 35E 35BDD1	**4,495**	**145**	**NA**	**4.350**	**Sep 2022**	**Mar 2023**
14S 36E 17CCC1[2]	4,648	**UNK**	**UNK**	**UNK**	**Mar 2023**	**Mar 2023**
15S 35E 01DAA1[4]	4,453	329	187-275	4,222	Aug 1943	Mar 2023
15S 35E 03BAA1	4,565	120	90-120	4,460	Jun 2007	Mar 2023
15S 35E 22AAB1	4,575	229	NA	4,346	Jun 1963	Mar 2023
15S 36E 04CCB1[2]	**4417**	**UNK**	**UNK**	**UNK**	**Sep 2022**	**Mar 2023**
15S 36E 22ABA1	4,419	100	NA	4,319	Aug 1943	Mar 2023
16S 36E 14DBC1	4,455	81	61-81	4,384	Jun 1991	Mar 2023

[1] Production elevation has been estimated as either the mean open interval or total depth.

[2] Well construction information is not available.

[3] Well was dropped in 2018 due to lack of water.

[4] Well was dropped in 2017 due to lack of access. Monitoring resumed in 2022.

[5] Well is screened over multiple intervals: 32-37 ft, 58-67 ft, 110-240 ft.

Water-Level Data

The groundwater-data records in the Malad Basin begin on various dates and continue until spring of 2023. The following hydrographs illustrate all the water-level data collected from the

wells that IDWR monitors. The colored data markers on the hydrographs illustrate the season in which the water-level measurements were taken, and the seasons have been defined in the following manner: spring-season measurements occur in January through April (green markers), irrigation season measurements occur in May through September (blue markers), and fall-season measurements occur in October through December (tan markers). It is important to note that very few measurements occur in November, December, January, or February.

LONG-TERM NETWORK WELLS

Water levels declined in four of the five wells measured in both spring 2021 and spring 2023 (Figures 3, 5, 6-8).

Well 14S 35E 13DBA1

Well 14S 35E 13DBA1 is not actively monitored by IDWR and is located approximately three miles west-northwest of Malad City on N 3400W, about 0.4 miles north of W 1000N. A driller's report is not available for this well. The period of record begins in the fall of 1943 and ends in the spring of 2018 (Table 1). Depth to water has been below ground surface for the entire period of record, and it appears that this well has never flowed from artesian pressure (Figure 2). Both the period-of-record and 20-year trends indicate statistically significant declining water levels (Table 3). Water levels in this well began to decline rapidly beginning in 2016, and the well went dry in 2018. This well has been dropped from the monitoring network due to lack of water.

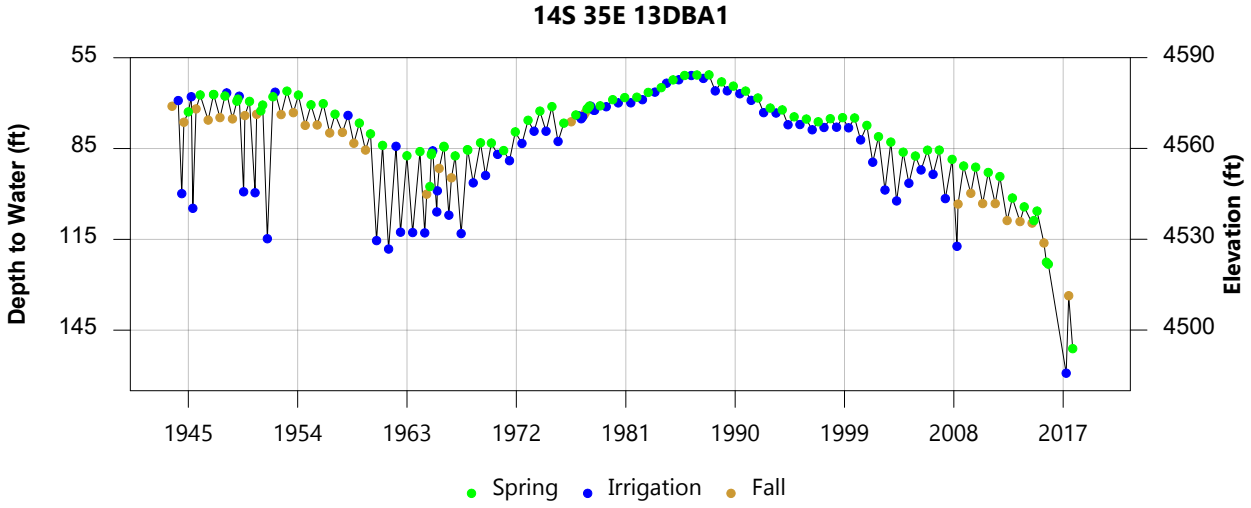

Figure 2. Water levels in well 14S 35E 13DBA1.

Well 14S 35E 22ABA1

Well 14S 35E 22ABA1 is actively monitored by IDWR and is located approximately five miles west of Malad City on the southwest corner of W 1000 N and N 3400 W. The driller's report indicates that the well obtains water from a gravel layer located approximately 300 feet below ground surface. The period of record begins in the summer of 2006 and continues into the spring of 2023 (Figure 3). Depth to water in this well has been below ground surface for the entire period of record, and it appears that this well has never flowed from artesian pressure. Because of the limited record, only the 2011-2023 water-level trend has been calculated. The trend indicates declining water levels over the period of record; however, it is not statistically significant, and only limited conclusions can be drawn (Table 3).

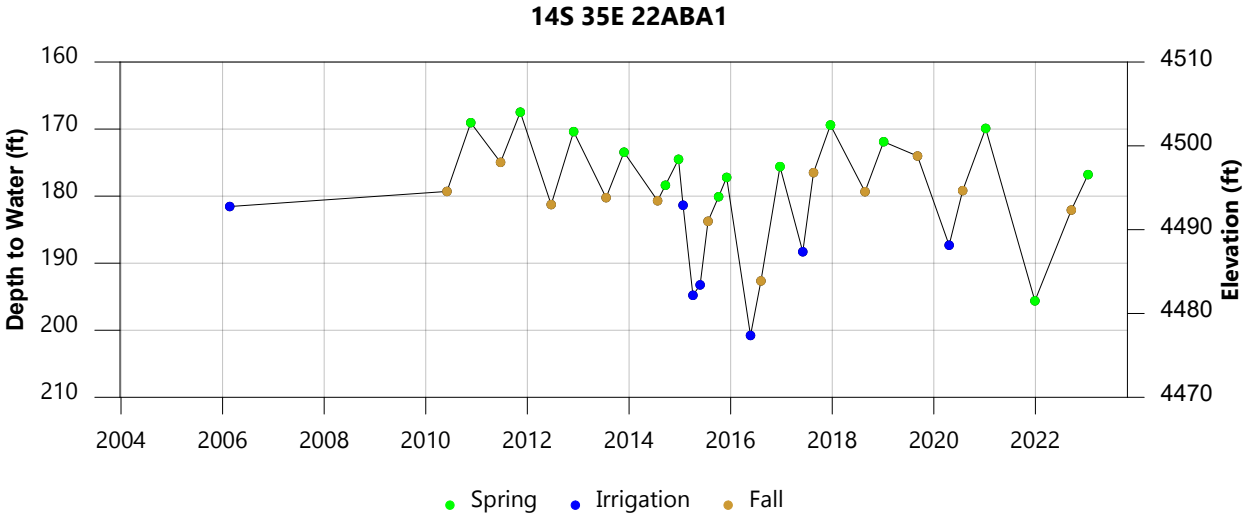

Figure 3. Water levels in well 14S 35E 22ABA1.

Well 15S 35E 01DAA1

Well 15S 35E 01DAA1 is actively monitored by IDWR and is located approximately 4.5 miles south-southwest of Malad City on the southwest corner of W Chugg Road and Smith Lane. A driller's report is not available for this well. The period of record begins in the summer of 1943 and ends in the spring of 2023 (Figure 4). Depth to water in this well was historically above ground surface; however, water-level declines have resulted in periods when this well ceases to flow. Both the period-of-record and 20-year trends indicate statistically significant declining water levels (Table). The well head was reconfigured in 2017 and was no longer measurable; however, the well was added back to the network in 2022.

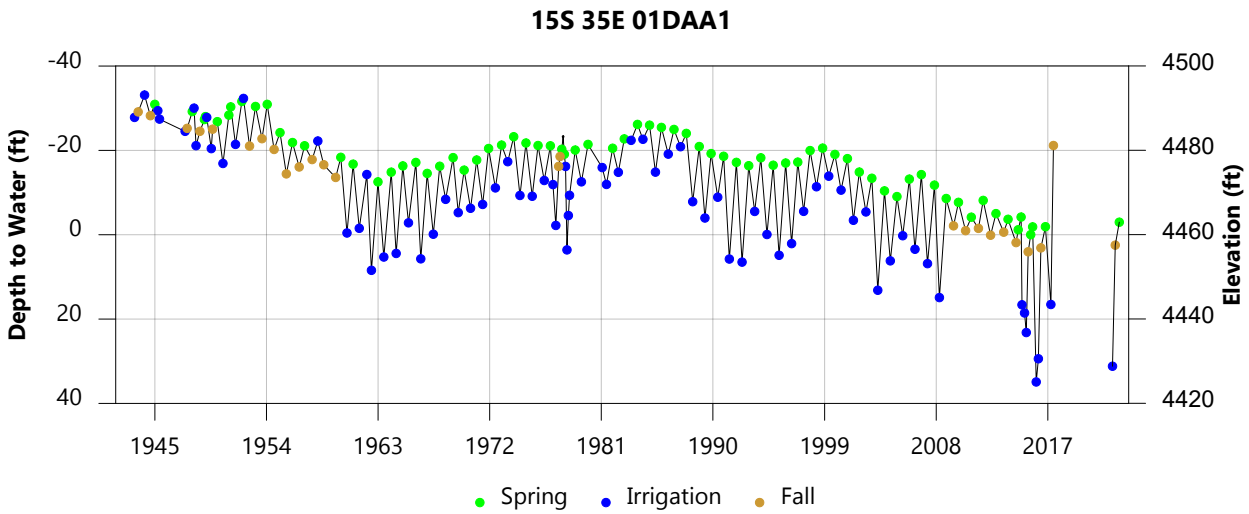

Figure 4. Water levels in well 15S 03E 01DAA1

Well 15S 35E 03BAA1

Well 15S 35E 03BAA1 is actively monitored by IDWR and is located approximately six miles west-southwest of Malad City just south of the intersection of N Edwards Road and State Highway 38. The driller's report indicates that the well obtains water from a zone of gravel and broken sandstone located approximately 90-120 feet below ground surface. The period of record begins in the summer of 2007 and continues the spring of 2023 (Figure 5). Depth to water in this well has been below ground surface for the entire period of record, and it appears that this well has never flowed from artesian pressure. Because of the limited record, only the 2011-2023 water-level trend has been calculated. The trend indicates declining water levels over the period of record (Table 3); however, it is not statistically significant, and only limited conclusions can be drawn.

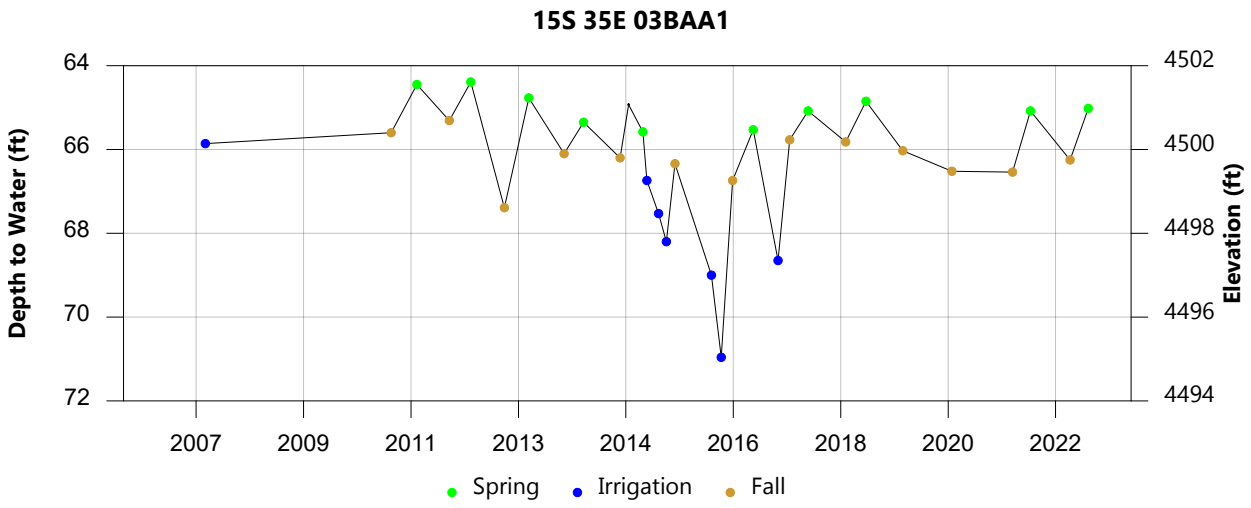

Figure 5. Water levels in well 15S 35E 03BAA1

Well 15S 35E 22AAB1

Well 15S 35E 22AAB1 is actively monitored by IDWR and is located approximately 7.8 miles southwest of Malad City just south of the intersection of N Edwards Road and State Highway 38. A driller's report is not available for this well. The period of record begins in the summer of 1963 and continues to the spring of 2023 (Figure 6). Depth to water has been below ground surface for the entire period of record, and it appears that this well has never flowed from artesian pressure. Both the period-of-record and 20-year trends indicate declining water levels (Table 3); however, only the 20-year trend is statistically significant.

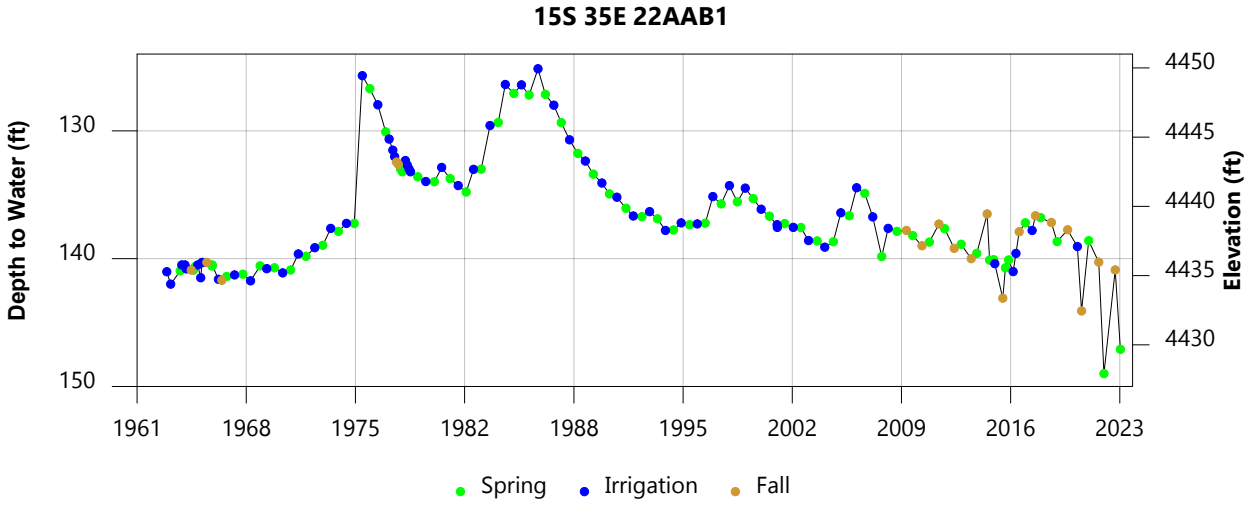

Figure 6. Water levels in well 15S 35E-22AAB1.

Well 15S 36E 22ABA1

Well 15S 35E 22AAB1 is actively monitored by IDWR and is located approximately six miles south of Malad City on the southwest corner of 5000 S and Cherry Creek-Woodruff Road. A driller's report is not available for this well. The period of record begins in the fall of 1943 and continues to the spring of 2023 (Figure 7). Depth to water in this well is above ground surface, and despite water-level declines, this well continues to flow due to artesian pressure. Both the period-of-record and 20-year trends indicate declining water levels (Table 3); however, only the period-of-record trend is statistically significant.

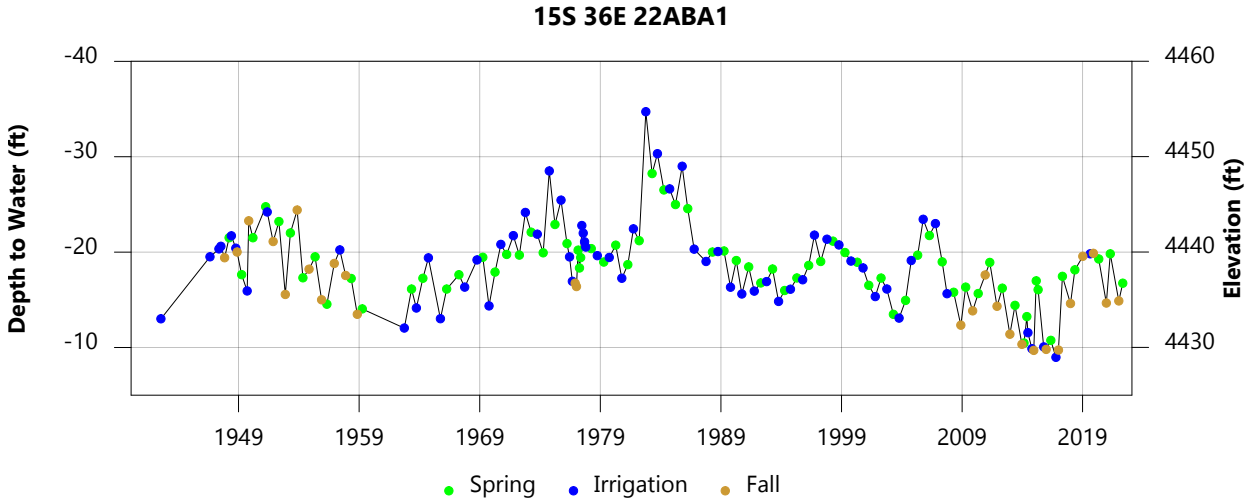

Figure 7. Water levels in well 15S 36E-22ABA1. Negative depths indicate that the water level is above land surface.

Well 16S 36E 14DBC1

Well 16S 36E 14DBC1 is actively monitored by IDWR and is located approximately 11.5 miles south of Malad City on Woodruff Lane approximately 0.4 miles west of Interstate 15. The driller's report indicates that the well casing is perforated from 68 – 81 feet below ground surface and obtains water from a gravel layer. Depth to water in this well has been below ground surface for the entire period of record, and it appears that this well has never flowed from artesian pressure (Figure 8). Although this well has been monitored since 1991, spring-season measurements are not available until 2011. Therefore, only the 2011-2023 water-level trend has been calculated. The trend indicates declining water levels (Table 3); however, it is not statistically significant, and only limited conclusions can be drawn.

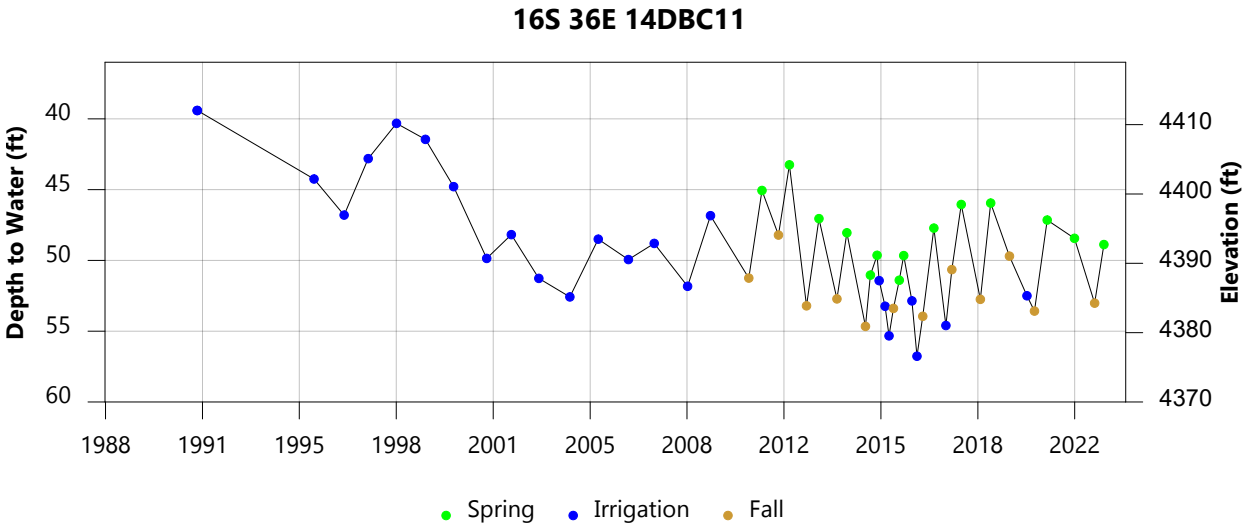

Figure 8. Water levels in well 16S 36E-14DBC1.

WELLS ADDED SINCE 2021

Seven landowners gave IDWR permission to monitor their wells in the fall of 2022 (Figure *1*). The additional wells are located in areas that provide water-level data that are more evenly distributed across the basin than prior to 2022. Because the wells have so few data, the depths to water are presented in Table 2 instead of individual hydrographs.

Well 13S 36E 10DAC1

Well 13S 36E 10DAC1 was added to the IDWR network in the fall of 2022 and is located approximately 7.5 miles north of Malad City off Colton Road, just west of Interstate 15 (Figure 1). The nearest recorded driller's report indicates that the well obtains water from bedrock and gravel; however, it is unclear if this log belongs to this well. The period of record begins in the fall of 2022 and continues into the spring of 2023 (Table 2).

Well 14S 35E 13DCD1

Well 14S 3E 13DCD1 was added to the IDWR network in the fall of 2022 and is located approximately 2.6 miles west of Malad City off W 1000 N road (Figure 1). The driller's report indicates that the well obtains water from gravel layers located approximately 100 – 240 feet below ground surface. The period of record begins in the fall of 2022 and continues into the spring of 2023 (Table 2).

Well 14S 35E 35BDC1

Well 14S 3E 35BDC1 was added to the IDWR network in the fall of 2022 and is located approximately 5 miles southwest of Malad City off S 4600 W (Figure 1). The nearest recorded driller's report indicates that the well obtains water primarily from gravel layers located approximately 40 – 145 feet below ground surface. The period of record begins in the fall of 2022 and continues into the spring of 2023 (Table 2).

Well 14S 35E 35BDD1

Well 14S 3E 35BDD1 was added to the IDWR network in the fall of 2022 and is located approximately 4.9 miles southwest of Malad City off S 4700 W (Figure 1). The driller's report indicates that the well obtains water from gravel layers located approximately 100 – 240 feet below ground surface. The driller's report indicates that the well obtains water primarily from gravel layers located approximately 40 – 145 feet below ground surface. The period of record begins in the fall of 2022 and continues into the spring of 2023 (Table 2).

Well 14S 36E 17CCC1

Well 14S 36E 17CCC1 was added to the IDWR network in the spring of 2023 and is located approximately 1.9 miles west-northwest of Malad City off W 1500 N (Figure 1). It does not appear that a driller's report exists for this well; however, the nearest driller's report indicates that the well obtains water from sand and gravel layers. The period of record consists of one measurement in March of 2023 and (Table 2).

Well 15S 36E 04CCB1

Well 15S 36E 04CCB1 was added to the IDWR network in the fall of 2022 and is located approximately 3.9 miles south of Malad City off S 1100 W (Figure 1). This is a flowing well. This is reportedly one of the oldest wells in the basin and it does not appear that a driller's report exists for this well; however, the nearest driller's report indicates that the well obtains water from gravel layers. The period of record consists of one measurement in March of 2023 and (Table 2).

Table 2. Water levels in wells added to the network since 2021.

Well Number	Depth to Water September 2022 (ft)	Depth to Water March 2023 (ft)
13S 36E 10DAC1	100.72	93.26
14S 35E 13DCD1	135.18	81.54
14S 35E 35BDC1	63.04	34.24
14S 35E 35BDD1	61.84	27.9
14S 36E 17CCC1	NA	169.64
15S 36E 04CCB1[1]	-0.55	-5.32

[1] Negative value represents water levels above land surface (flowing).

Water-Level Trends

Calculating a linear trend for a set of water-level data is a simple way to describe long-term water-level changes. However, a calculated trend is not always representative of the behavior if there are frequent and/or large water-level fluctuations, and/or if the calculated trend is small. Therefore, a statistical assessment of the calculated trend is an important step in determining the general water-level behavior over time. A statistically significant trend indicates that there is a non-zero trend in the data (at the chosen confidence interval), and the calculated trend is the best linear representation of changes over time. Lack of statistical significance indicates that the trend cannot be considered different than zero, and the calculated trend does not adequately represent changes over time. The significance in water-level trends has been set to 95% probability; therefore, any trend with a p-value less than 0.05 is statistically significant.

Trends in water-level changes have been calculated for the entire period-of-record of each well, and the most recent 20-years for wells with adequate data, using the Mann-Kendall (MK) test (Hirsch and Slack, 1984). The MK test was developed by the U.S. Geological Survey (USGS) and is the most frequently used test for trend in environmental sciences (Helsel and others, 2006).

Spring-season water levels are often the best indication of aquifer conditions because they are less impacted by irrigation-season water use. All water-level trends presented in Table have been calculated using only spring-season water levels.

Table 3. Water-level trends for spring-season measurements. Statistically significant trends are identified in bold.

Well Number	Period of Record	Period of Record Trend (ft/year)	Period of Record p-value	20-year Trend (ft/year)	20-Year p-value
14S 35E-13DBA1[1]	1945-2018	**-0.20**	**0.00**	**-1.85**	**0.00**
14S 35E-22ABA1	2011-2023[3]	-0.44	0.19	NA	NA
15S 35E-01DAA1[2]	1945-2017	**-0.27**	**0.00**	**-0.93**	**0.00**
15S 35E-03BAA1	2011-2022[4]	-0.05	0.42	NA	NA
15S 35E-22AAB1	1964-2021	-0.05	0.28	**-0.14**	**0.04**
15S 36E-22ABA1	1949-2021	**-0.04**	**0.03**	-0.01	0.96
16S 36E-14DBC1	2011-2022[5]	-0.84	0.07	NA	NA

[1] Well was dropped in 2018 due to lack of water.

[2] Well was dropped in 2017 due to lack of access.

[3] Full period of record is 2006-2023. Spring-season measurements available for 2011-2023.

[4] Full period of record is 2007-2022. Spring-season measurements available for 2011-2023.

[5] Full period of record is 1991-2022. Spring-season measurements available for 2011-2023.

All wells in the IDWR network exhibit declining water levels over the period of record, and trends in wells with enough data are also declining over the most recent 20-years. Not all trends are statistically significant (Table).

Conclusion

Seven wells were added to the network in the fall of 2022, and IDWR currently monitors aquifer water level in 12 wells. All water levels exhibit declining trends over the period of record, but only a few are statistically significant.

References

Helsel, D.R., Meuller, D.K., and Slack, J.R., 2006. Computer program for the Kendall family of trend tests. U.S. Geological Survey Scientific Investigations Report 2005-5275, 4p.

Hirsch, R.M., and Slack, J.R., 1984. A nonparametric trend test for seasonal data with serial dependence: Water Resources Research v. 20, p. 727–732.