Date: May 7, 2024

To: Jaime Short, Section Manager

From: Chris Beard, LHg, Hydrogeologist

Subject: HYDROGEOLOGIC ANALYSIS: WRIA 32 Basalt Trends

SUMMARY

A regional analysis of water conditions and availability was determined necessary to address several permit applications in WRIA 32, Walla Walla Watershed. This memorandum summarizes the purpose, methods, and findings of that analysis. I have reached the following conclusions:

1. Due to general declining water levels in the basalt aquifer, there is no additional ground water available for appropriation from this unit within the study area;

2. Issuing new permits from the basalt portion of the aquifer system is likely to impair existing rights, exempt wells, surface water and springs.

PURPOSE

The purpose of this study is to analyze the hydrogeologic/groundwater trends in a portion of the Walla Walla Basin to determine whether basalt groundwater is available for further appropriation.

Disclaimer: The conclusions included in this report are based on the data available to Ecology at the time of writing. The findings included are Ecology's interpretation of hydrogeologic conditions in the study area at this time. These interpretations are subject to change should future data or information be discovered that was not included in the report.

GEOLOGIC SETTING

The Walla Walla basin is a sub-basin of the greater Columbia Plateau Regional Aquifer System (CPRAS). The CPRAS covers roughly 44,000 square miles of southeastern Washington, northeastern Oregon, and western Idaho; and is generally comprised of the following hydrogeologic units: Overburden, Saddle Mountains, Mabton Interbed, Wanapum, Vantage Interbed, Grande Ronde, and Older Bedrock units (Vaccaro et al, 2015). The Saddle Mountains, Wanapum, and Grande Ronde are the three major basalt units that play a key role as water bearing units across the system. The focus of this study will be on water usage from the Columbia River Basalts. This study will not include the Overburden or "Gravel Aquifer" in the Walla Walla Basin, which has been closed by rule to new consumptive uses per Washington Administrative Code Chapter 173-532-040 (WAC 173-532).

The Walla Walla basin is cataloged as Water Resources Inventory Area (WRIA) 32. WRIA 32 is bounded to the north by the Snake River, to the east by the Blue Mountains, to the south by the Washington-Oregon state line, and to the west by the Columbia River. The cities of Walla Walla and College Place are located in a synclinal trough in which an alluvial fan deposited the sediments forming the unconsolidated aquifer overlying the basalts. These sediments were deposited by streams originating in the Blue Mountains. This Walla Walla Syncline is accompanied to the west by the Walla Walla Anticline. The synclinal structure is a topographical low in which groundwater accumulates and is generally bounded by the anticline to the west. The general exception would be groundwater that is connected to surface water and is discharged to streams and ultimately the Columbia River.

STUDY SETTING

The area of focus of this study is not the entirety of WRIA 32. This is due to the geologic structure of the basin which leads to groundwater trends that may vary across features that act as flow barriers or boundaries, varied land uses, or gaps in data. Instead, this study is limited to the area mostly contained within the Walla Walla Syncline. The area in question is east of the anticline, and generally to the south of the northernmost extent of Dry Creek (Figure 1). The areas west of the anticline and north of Dry Creek will be the subjects of future studies by Ecology.

HISTORICAL DATA

Basalt groundwater data in the Walla Walla Basin has historically had some gaps. The Department of Ecology has had very few dedicated basalt groundwater monitoring wells in the basin. Ecology currently has only one basalt monitoring well, but monitors a more extensive network of monitoring wells completed in the suprabasalt sediments (Gravel Aquifer). The USGS monitored a network of basalt wells starting around the 1940s, but most were discontinued in the late 70s to mid 80s. In a 2012 groundwater availability report for the CPRAS by the USGS, there is a figure indicating groundwater level trends across the study area (roughly 44,000 square miles) (Burns et al, 2012). However, there is minimal trend data indicated in the figure for the Walla Walla area. It is possible that at the time of the report there was too large of a data gap in the previously monitored wells to indicate any current trends. It is mentioned in the report that any areas with an inadequate period of record were omitted, which is potentially why trends in the Walla Walla Basin were absent.

Most other data indicating water level trends in the basalt for the basin are anecdotal. These include communications with irrigators indicating water levels in their wells are dropping, comparing static heads on well logs (discussed in more detail below), or the City of Walla Walla commencing Aquifer Storage and Recovery (ASR) operations to stabilize declining levels. While most of these indicate that basalt water levels have been declining for many years, none of them contain continuous data from a singular point to show what the long period trends are. Additionally, it is uncommon for any basalt groundwater system in the region to be immune to groundwater declines. These declines have been observed for decades in the Odessa subarea, Pullman/Palouse Basin, Quincy Basin, and Yakima Basin to name a few. It has generally been assumed that the Walla Walla Basin has experienced similar declines, but there have been limited data to support this assumption. It has historically been difficult for Ecology to make data-based water management decisions in the basin for applications involving wells completed in the basalt due to the lack of a robust data set.

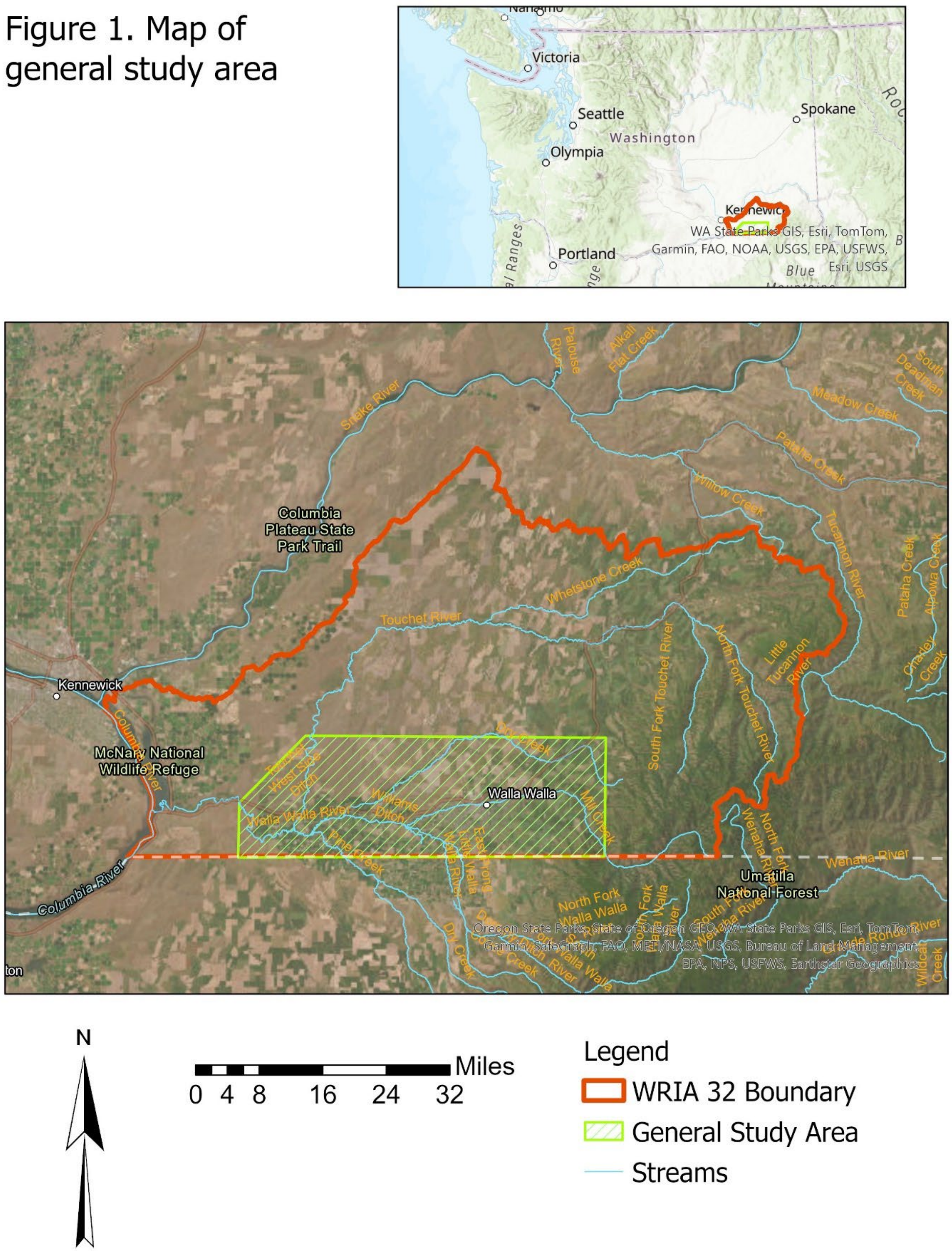

Figure 1. Map of general study area within WRIA 32 in Southeast Washington. Roughly bounded to the west by the anticline, east by the Blue Mountains, and north by the northernmost point of Dry Creek.

CURRENT DATA

As mentioned in the previous section, there has been an overall lack of long-term, continuous data to indicate groundwater trends in the basalt aquifer(s) in the Walla Walla Basin. In 2018, the USGS commenced a Walla Walla basin wide groundwater study. As part of this study, they began collecting data from basalt wells that were previously measured most recently in the 1970s and 1980s by USGS staff (Fasser and Dunn, 2022). Measurements at these wells were continued in 2018/2019 and generally occurred in the winter months prior to irrigation (February and March). While these wells do not have a continuous period of data collection (many with gaps of 40-50 years), they do show long-term trends since measuring was previously discontinued. For the most part, recent data aligns with the trends that were previously observed between the 1940s and 1980s. There are some exceptions where there is a dramatic change in trend direction, which is assumed to be associated with Walla Walla ASR operations (discussed later). These upward trends appear to be the exception.

As a part of this report, several of these USGS monitored wells were chosen that were completed in the basalt and had ample data to draw conclusions on water level changes/trends. Table 1 shows which wells were used, their USGS identification, and their location. Data for these wells were collected from the USGS National Water Information System in October 2023 (USGS, 2023). The locations of these USGS monitored wells are also included on the map in Figure 2.

Table 1. USGS Monitoring sites used for long term basalt groundwater trends.

USGS Site ID	USGS Site Name	Location				Depth (ft BGS)[1]	Unit[2]
		QQ	Section	Township	Range		
460516118151501	07N/36E-13F02	SE¼NW¼	13	7N	36E	808	Wanapum
460302118310201	07N/34E-26R01	SE¼SE¼	26	7N	34E	460	Wanapum
460252118232301	07N/35E-35A02	NE¼NE¼	35	7N	35E	1010	Wanapum
460517118141001	07N/37E-18E01	SW¼NW¼	18	7N	37E	1170	Grande Ronde
460418118171601	07N/36E-22H01	SE¼NE¼	22	7N	36E	1330	Grande Ronde
460356118181101	07N/36E-22N01	SW¼SW¼	22	7N	36E	789	Wanapum
460311118182001	07N/36E-28R01	SE¼SE¼	28	7N	36E	1090	Wanapum
460252118192201	07N/36E-33D02	NW¼NW¼	33	7N	36E	1410	Grande Ronde
460457118200901	07N/36E-17L01	NE¼SW¼	17	7N	36E	2730	Grande Ronde

[1] ft BGS = Feet below ground surface

[2] Unit well is completed in may not be accurate for all wells, they were pulled from a USGS model layer and did not have accurate elevation data for each well.

USGS Site ID	USGS Site Name	Location				Depth (ft BGS)[1]	Unit[2]
		QQ	Section	Township	Range		
460217118160201	07N/36E-35Q01	SW¼SE¼	35	7N	36E	936	Grande Ronde
460021118133401	06N/37E-07Q01	SW¼SE¼	7	6N	37E	290	Grande Ronde
460014118281805	06N/35E-18A05	NE¼NE¼	18	6N	35E	1300	Grande Ronde
460238118225301	07N/35E-36F04	SE¼NW¼	36	7N	35E	810	Wanapum
460127118215202	06N/36E-06M01	NW¼SW¼	6	6N	36E	610	Wanapum
460113118214201	06N/36E-07D02	Gov Lot 1	7	6N	36E	556	Saddle Mountains

The unit for each well may not be exact. These values were interpolated from the USGS GIS layers from the Three-dimensional model of the geologic framework for the Columbia Plateau Regional Aquifer System (Burns et al, 2011). As a part of estimating the unit that the wells were completed in, the QQ location was used and not the exact well location, making the elevation of the ground surface an estimate, as well as the depths of the units in that QQ. The unit listed in Table 1 is the *likely* unit that the well is completed in and may vary in reality. In general, each well has data beginning in the 1940s or 1950s continuing to the 1970s or 1980s followed by a multi-decadal gap and resuming in the late 2010s. Though there is a fairly large data gap, it is likely that groundwater trends continued to decline from the last time observed to current with a few exceptions (discussed later). Hydrographs for each well can be seen in Appendix A.

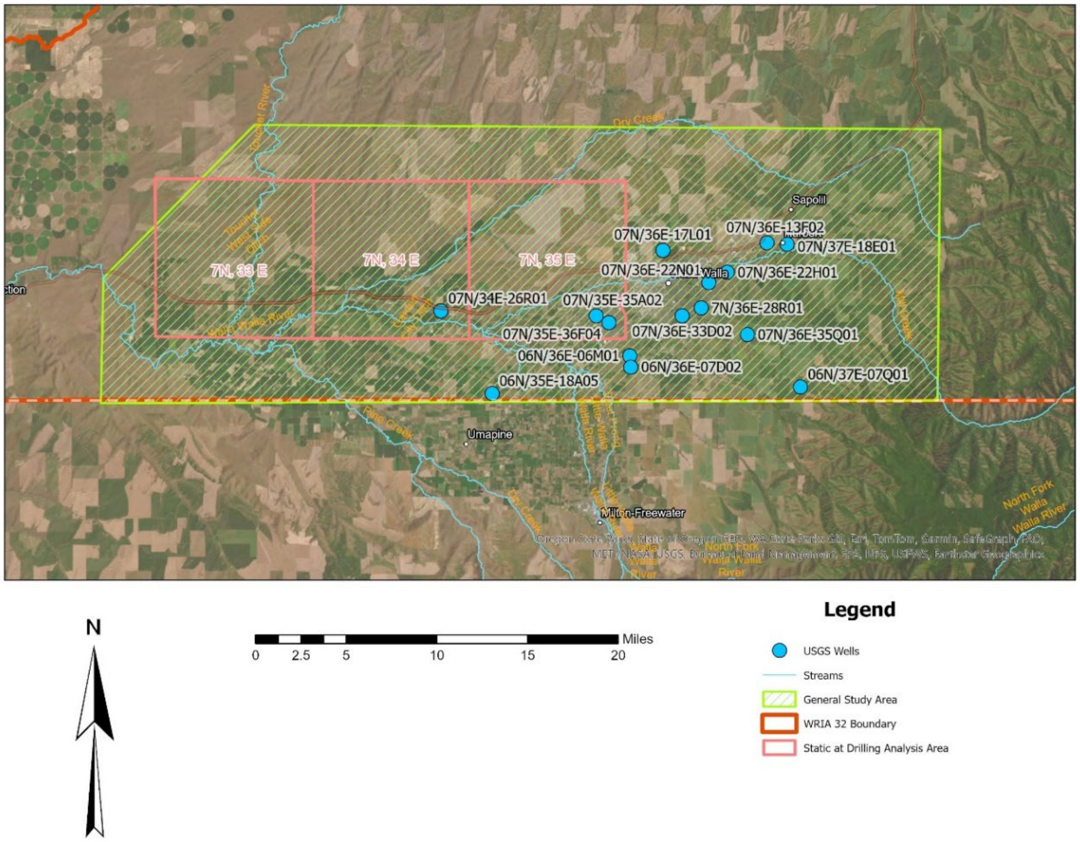

Figure 2. Locations of USGS monitoring wells and well log static water level analysis area.

DATA ANALYSIS

Water level data for each of the wells listed in Table 1 were plotted as depth below land surface versus time. The data were plotted as scatter plots instead of a line graph because the data points are all single measurements, discontinuous, and include a significant data gap. From here, groundwater trends can become obvious over long term in most cases, but less so in others. Seasonal irrigation effects can dramatically lower the static level of a well completed in basalt, sometimes up to and over 200 feet of head drop in a single season. These seasonal irrigation effects can skew the interpretation of the hydrograph, but generally spring high levels can be compared year to year. In several cases, there is an obvious decline over time of 150 feet or more in which the seasonal pumping effects don't factor as much. In these cases, a simple linear trend line is added to the hydrograph to give an estimate of decline in feet per year. This is seen clearly in the hydrograph for Well 07N/36E-13F02 in Figure 3.

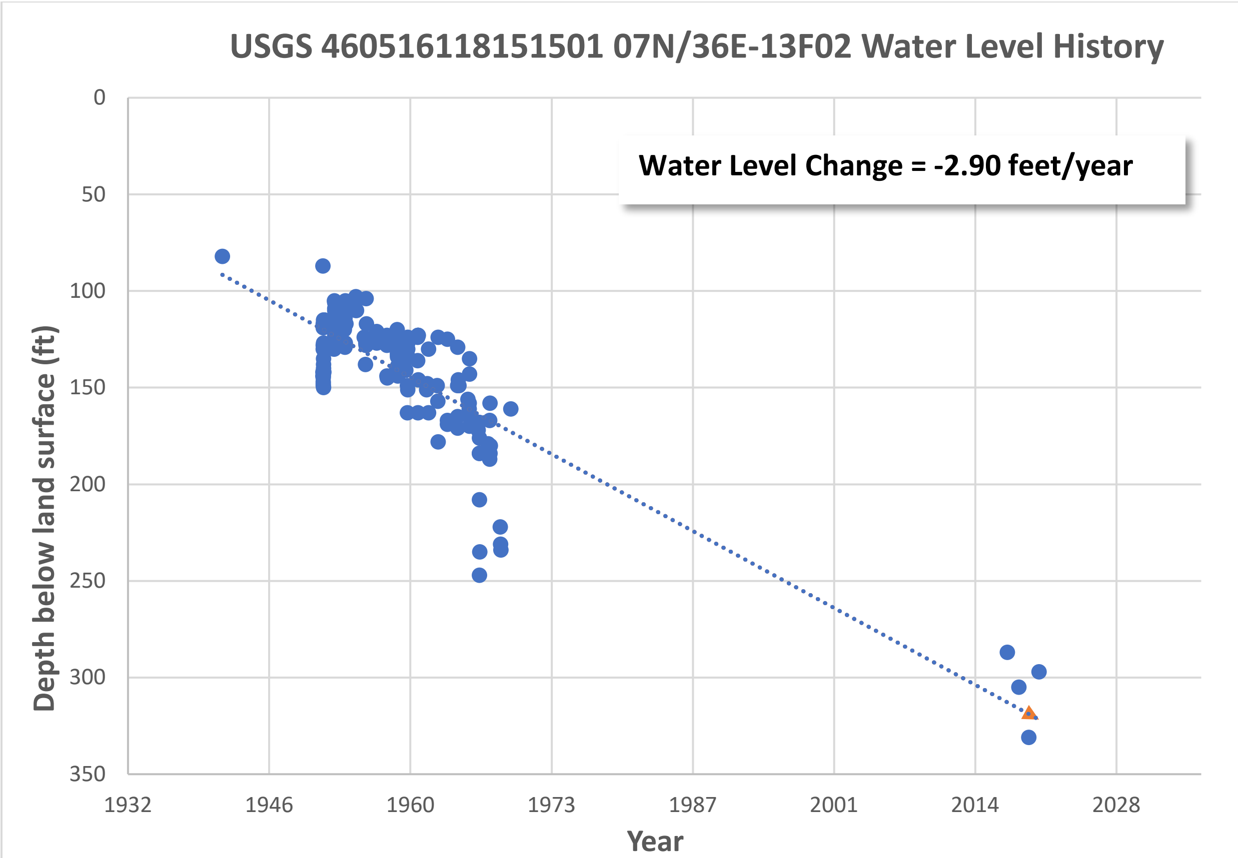

Figure 3. USGS monitoring well 07N/36E-13F02 water level history. This well shows a decline of roughly -2.9 feet per year over this period of record.

Other wells have dramatic seasonal effects, as seen in well 07N/34E-26R01 in Figure 4.

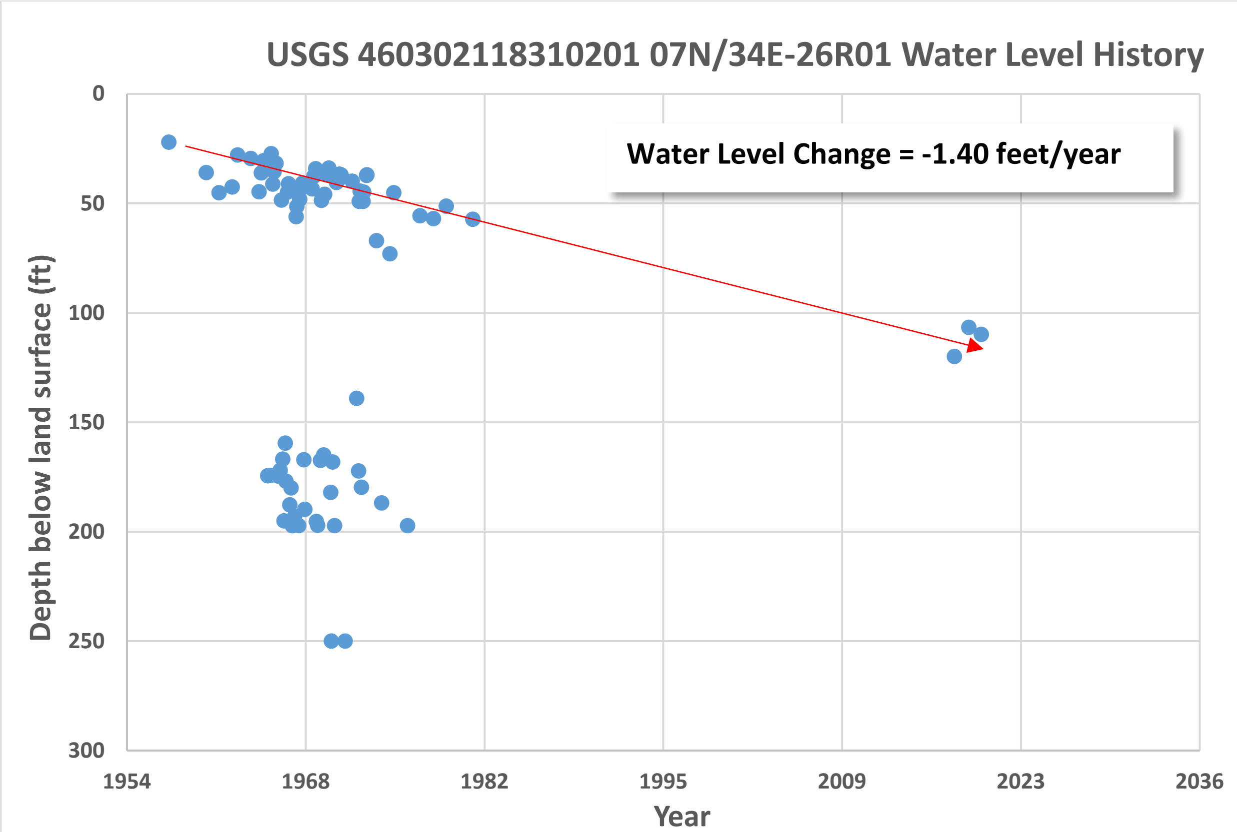

Figure 4. USGS monitoring well 07N/34E-26R01 water level history. This well shows a downward trend of roughly -1.4 feet/year while ignoring dramatic seasonal drawdowns.

In the case of 26R01, a simple linear trend is skewed by the pumping drawdown effects of up to 200 feet. For this well, a trend line is inferred by ignoring the outliers and only focusing on the high water measurements. When this is applied, we see that there is a decline of roughly 1.4 feet/year at this well over a 63 year period. Another complicating factor in screening out pumping drawdown effects is that the Walla Walla Basin does not have a reliable or standard irrigation season for many water rights. In several other basins, it is fairly common for the irrigation period to have a standard period of use, for example (hypothetically) April 1 to November 30. Walla Walla generally has a larger variation in the period of use for several irrigation rights, making it more difficult to remove data points that fall within or outside of the irrigation season. Effectively, this means that a data point on February 15 could be at 100 ft bgs one year and 250 ft bgs in another year within a short period (a couple of years). The following table is a summary of the wells listed in Table 1 with their calculated change in water level over the period of record. These locations and general water level changes are also displayed in the map in Figure 5. Figure 5 also includes the most recent ASR block designations to visualize areas where there has been an effect on water level from ASR.

Table 2. Calculated changes in water level for USGS monitored wells. All wells with a positive or change of 0.0 are located in ASR Block II.

USGS Site Name	Depth (ft BGS)	Water Level Change (ft/yr)	Unit
07N/36E-13F02	808	-2.90	Wanapum
07N/34E-26R01	460	-1.40	Wanapum
07N/35E-35A02	1010	-2.95	Wanapum
07N/37E-18E01	1170	-0.97	Grande Ronde
07N/36E-22H01	1330	1.86	Grande Ronde
07N/36E-22N01	789	0.00	Wanapum
07N/36E-28R01	1090	-1.25	Wanapum
07N/36E-33D02	1410	-1.20	Grande Ronde
07N/36E-17L01	2730	-0.75	Grande Ronde
07N/36E-35Q01	936	0.00	Grande Ronde
06N/37E-07Q01	290	0.18	Grande Ronde
06N/35E-18A05	1300	-1.59	Grande Ronde
07N/35E-36F04	810	-2.90	Wanapum
06N/36E-06M01	610	-0.71	Wanapum
06N/36E-07D02	556	-2.24	Saddle Mountains

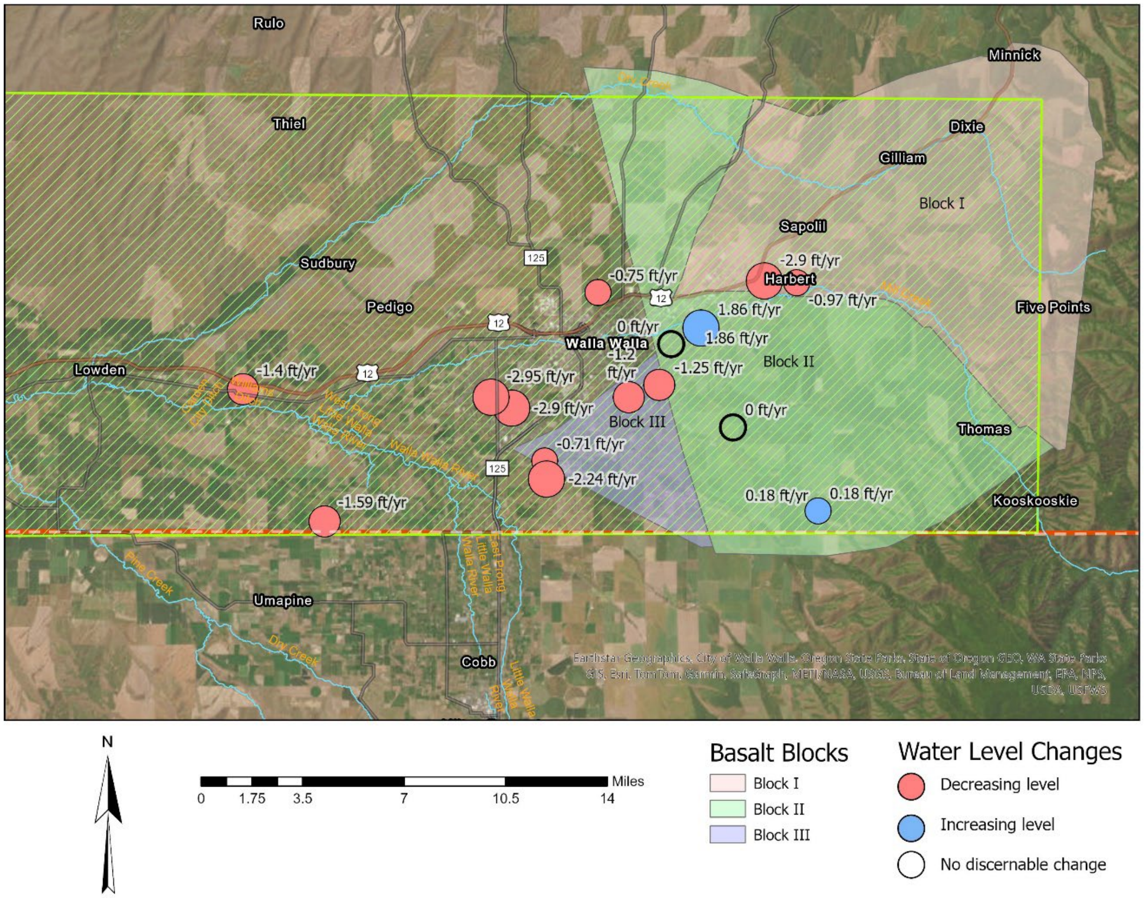

Figure 5. Map of USGS wells monitored labeled with water level change over period of record. Also included ASR block boundary designations for reference.

Another method utilized to fill in some of the data gaps where there was a lack of long-term continuous data was to compare static water levels collected at the time of drilling from well logs over time. The USGS data tends to be more robust nearer to Walla Walla and College Place. This exercise looked at wells thought to be completed in the Wanapum formation in the sections to the west (or in western half) of College Place. They are Township 7N, Ranges 33, 34, and 35 E.W.M. On their own, these data would be considered anecdotal as there are several factors that were not considered. Those factors are: well location elevation, groundwater gradient, and seasonal and spatial variability. But, when paired with other wells in the greater Walla Walla area that have a long-term record, the trends become comparable/similar. There was an initial attempt to separate the static levels during irrigation and non-pumping, but these effects appeared to be random similarly to what was discussed earlier. When plotting static water level vs. time, and ignoring all other factors, there appears to be a similar trend in several of the other USGS monitoring single point wells. The following four figures (Figures 6 through 9) show these trends, for wells in T. 7 N., R. 33 E., T. 7 N., R. 34 E., T. 7 N., R. 35 E., and all wells combined. The data for static water levels were collected from Ecology's well log database (Ecology, 2023).

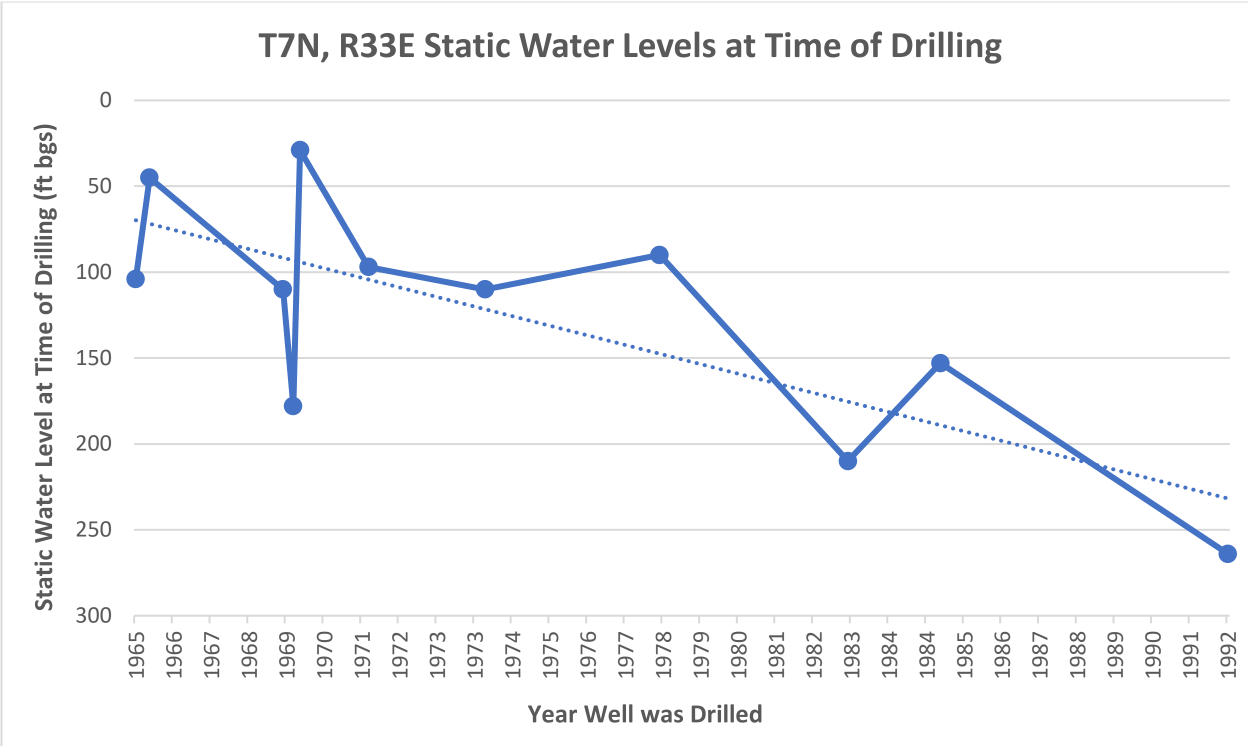

Figure 6. Static water levels from the well logs of wells in Township 7 North, Range 33 East. More data on these wells is available in Appendix B.

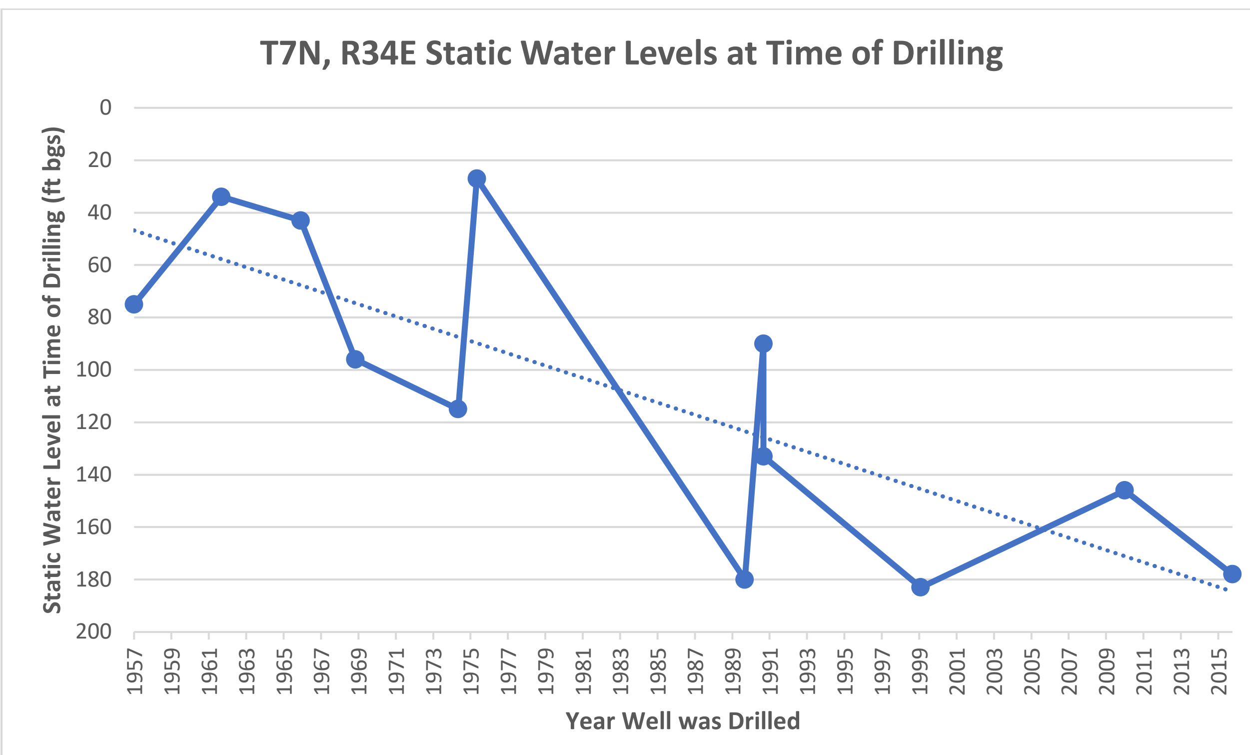

Figure 7. Static water levels from the well logs of wells in Township 7 North, Range 34 East. More data on these wells is available in Appendix B.

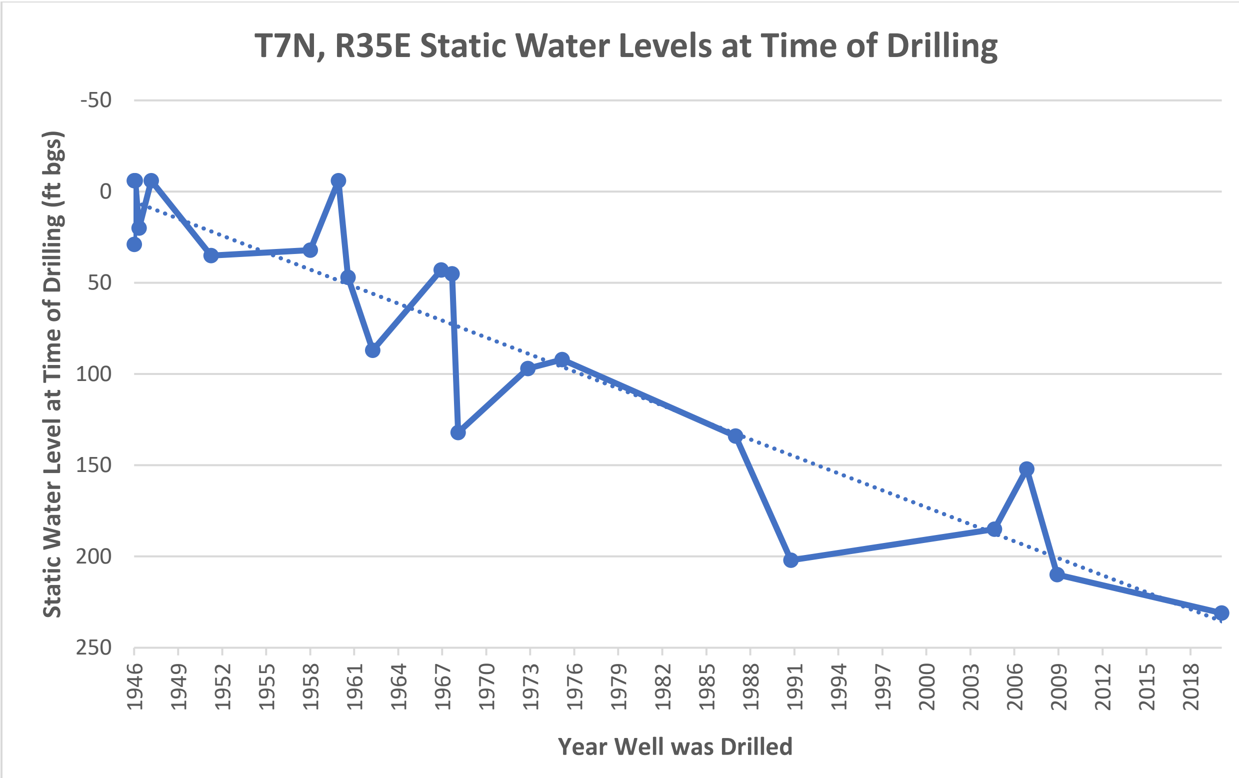

Figure 8. Static water levels from the well logs of wells in Township 7 North, Range 35 East. More data on these wells is available in Appendix B.

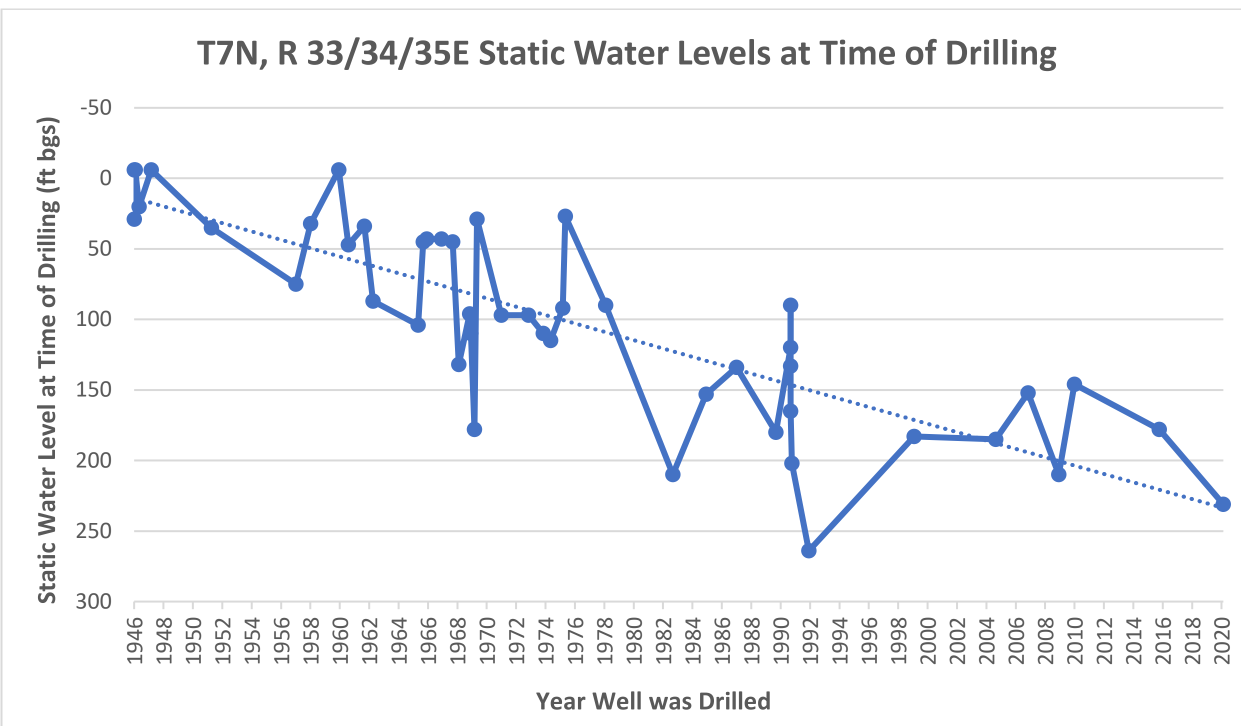

Figure 9. Composite of all static water levels collected from well logs for comparison across Township 7 North, Ranges 33, 34, and 35 East.

As shown in the figures above, static water levels have been declining in these areas for several decades, essentially the entire period of record. In the last figure combining all the data, we see an average decline of nearly 3 feet per year from 1946 to 2020. The exact decline may vary spatially, and some wells are possibly completed in a different unit than the Wanapum. However, without knowing what the exact level of decline is in the area, it is conservative to conclude that there is significant decline over time in the Wanapum aquifer. In addition, these declines are reflected in other long term USGS monitoring wells that are completed in the Wanapum. There are 7 USGS wells in this report completed in the Wanapum which have an average decline of 1.73 feet per year. If we get rid of any wells thought to be positively affected by ASR, that decline increases. The effect of ASR on regional groundwater levels is discussed in the following section.

AQUIFER STORAGE AND RECOVERY

The City of Walla Walla has been operating Aquifer Storage and Recovery (ASR) since 1999. To date, they have utilized City Well #1 and City Well #6 as ASR wells (Northwest Groundwater Services, 2023). ASR operations began in 1999 for Well #1 and 2003 for Well #6. It is believed that ASR wells operate within distinct hydraulically separated compartments or blocks. These blocks have been named; Block I, Block II, Block III, College Place Block, and North of College Place Block. These blocks or compartments are believed to be bounded by faults and folds and flow is "separated by low-permeability fault gouge, secondary mineral precipitation in the fault plane, or by offsetting of permeable interflow zones against low-permeability flow interiors" (Golder, 2007). Based on these block structures, it is believed that any water that is injected into a certain block will have minimal effect or leakage into a nearby block. The two current ASR wells, Nos. 1 and 6, are injecting into Blocks I and II, respectively. These operations are important to this report because this injected groundwater has "tricked" the hydrographs of nearby wells, resulting in higher-than-expected groundwater levels based on historical trends. Because of this artificially stored (or injected) groundwater, it gives the impression that the system within certain blocks have ceased to decline and is being recharged (which it is, but via ASR and not natural means). It is important because it would appear that more water would be available for appropriation based on recovering groundwater levels. However, this injected water is not considered new water available for new appropriations but is reserved for recovery for the City of Walla Walla ASR operations according to the provisions in the City's reservoir permit (R3-30526). For example, Well 6 (Block II) has been used for injection for several years but has been used minimally as a recovery well (Northwest Groundwater Services, 2023, Figure 5). Therefore, this water that has been injected is reserved for recovery within Block II by the City of Walla Walla and not for any other purpose without specific recovery permits for another use. In short, water injected as a part of ASR operations is not considered "new" water for appropriation but rather reallocated water.

There are multiple monitoring wells in which ASR operations have had a positive effect on the groundwater levels nearby. For clarity, a "positive effect" would be increasing static water levels over time. Some of the historic water level data for these wells showed dramatic decreases prior to nearby ASR operations. For example, USGS 460457118200901 07N/36E-17L01 was declining at a rate of over 4 feet/year between 1959 to 1985 at which point monitoring stopped. Monitoring was continued in 2018 at which point the trajectory of the water decline dramatically changed.

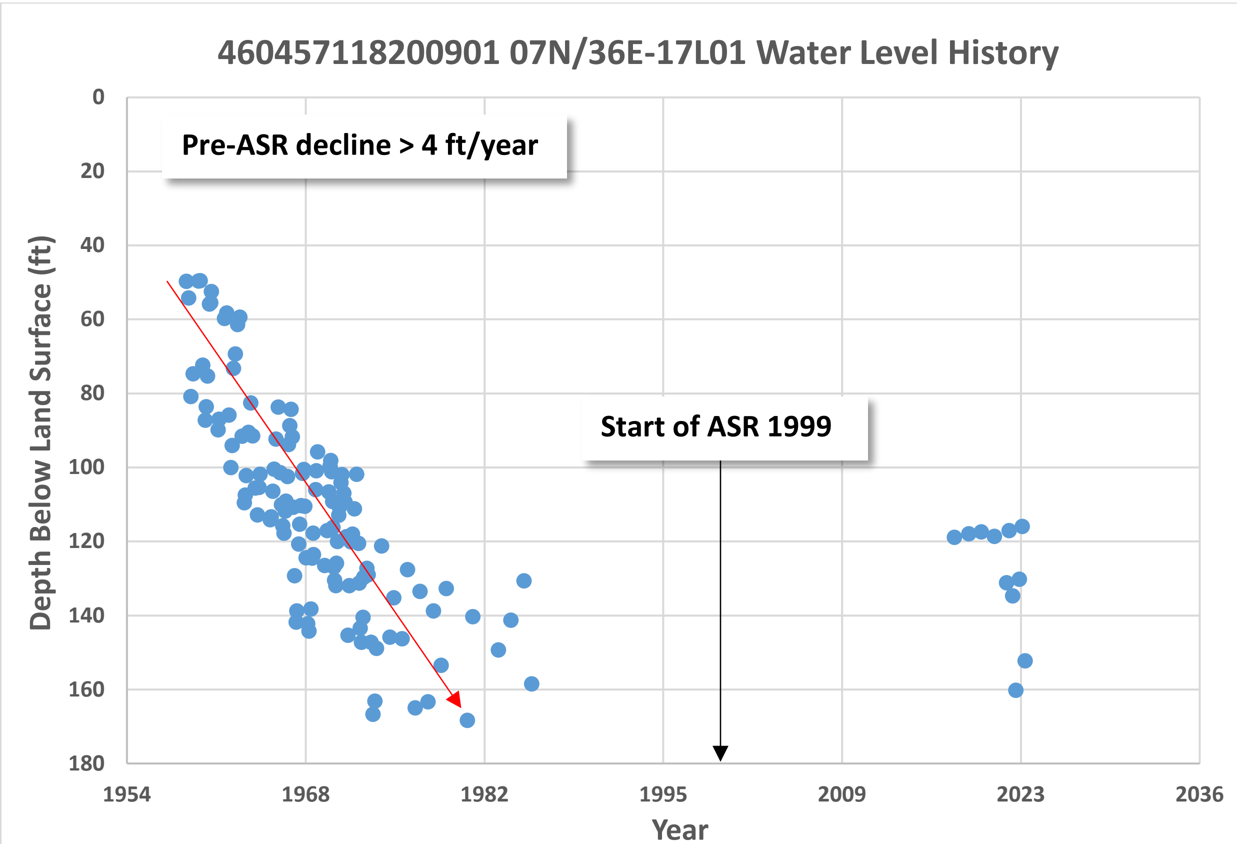

Figure 10. Example of a hydrograph showing a flattening or reversal in a declining water level trend. It is likely that nearby Walla Walla ASR operations are the cause of the water level change.

As seen in Figure 10, the water level in the well was declining steeply prior to the data gap at likely over 4 feet per year of decline. It is worth noting that this well is located in what is mapped as ASR Block III, and this block has not had any ASR activity as of yet. Either these mapped basalt blocks are not 100% hydraulically separated and there is some movement of water between blocks, or this well is within the boundary of an active ASR block and there just wasn't enough data at the time of boundary designation to accurately depict it. It is also possible that the downward trend started levelling out in the early 80s prior to ASR, but we don't have enough data to support that conclusion. However, we see a similar trend in wells located near ASR operations in Block II.

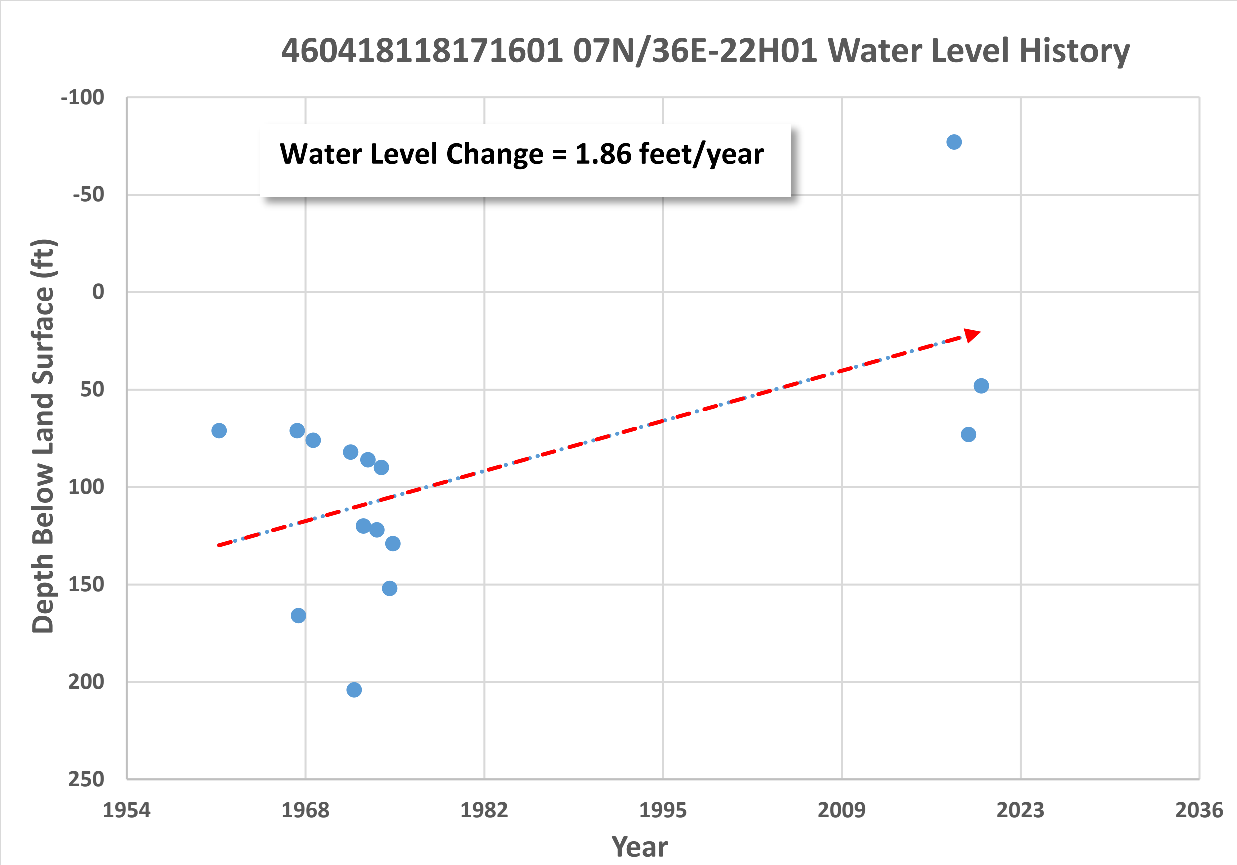

Figure 11. Example of monitored well that has an increasing trend over the period of record. This well is located in modeled ASR Block II in which the City of Walla Walla has been injecting water with minimal recovery.

Well 22H01 is located in Block II and shows an increasing trend over its period of record. There is even a measurement taken in February of 2018 that shows artesian pressure. This well doesn't have a robust amount of data to infer a pre-ASR trend, but it clearly shows that ASR has had a positive impact on water levels. This well is situated in ASR Block II in which the city has been injecting water since 2003 with minimal recovery of injected water.

In contrast to Block II, Block I has been used for injection and recovery since ASR's inception in Walla Walla. Wells 07N/36E-13F02 and 07N/37E-18E01 are located in Block I and show much different long-term trends than the wells in Block II. These wells show a trend of -2.90 and -0.97 ft/yr, respectively. As mentioned, the main difference is that Block I ASR has generally recovered the injected water as well as utilized other groundwater rights for withdrawal (varies year to year). Block II has been used solely for injection. At the time of this report, it is unknown what the City of Walla Walla has planned for the recovery of injected water in Block II. If there were to be a change in the implementation of ASR, it is likely that the trend of groundwater recovery would begin to reverse, and we would see similar long-term trends that we see in Block I. Because of the uncertainty in the future of ASR operations, the apparent stable groundwater status in Block II could change with a change in operations. Therefore, it is unlikely that these changes represent water that is available for new appropriations.

CONCLUSIONS

The data show that water levels have been declining long-term in the greater Walla Walla and College place area for several decades. Some of these declines have been locally stabilized or reversed due to ASR operations, but the unknown future of the City's ASR operations makes it difficult to predict if this is sustainable should the City of Walla Walla begin recovery of the water it injects into Block II. Outside of the local ASR effects, the declines appear to be ubiquitous. Because the basalt aquifer has been declining for a long time, it is likely that any new appropriations would further these declines as well as impair any current basalt water users. I recommend that any applications proposing to withdraw water from the basalt aquifer in Walla Walla be denied because of: further detriment to the source, potential injury to current users, and it is not in the public interest.

REFERENCES CITED

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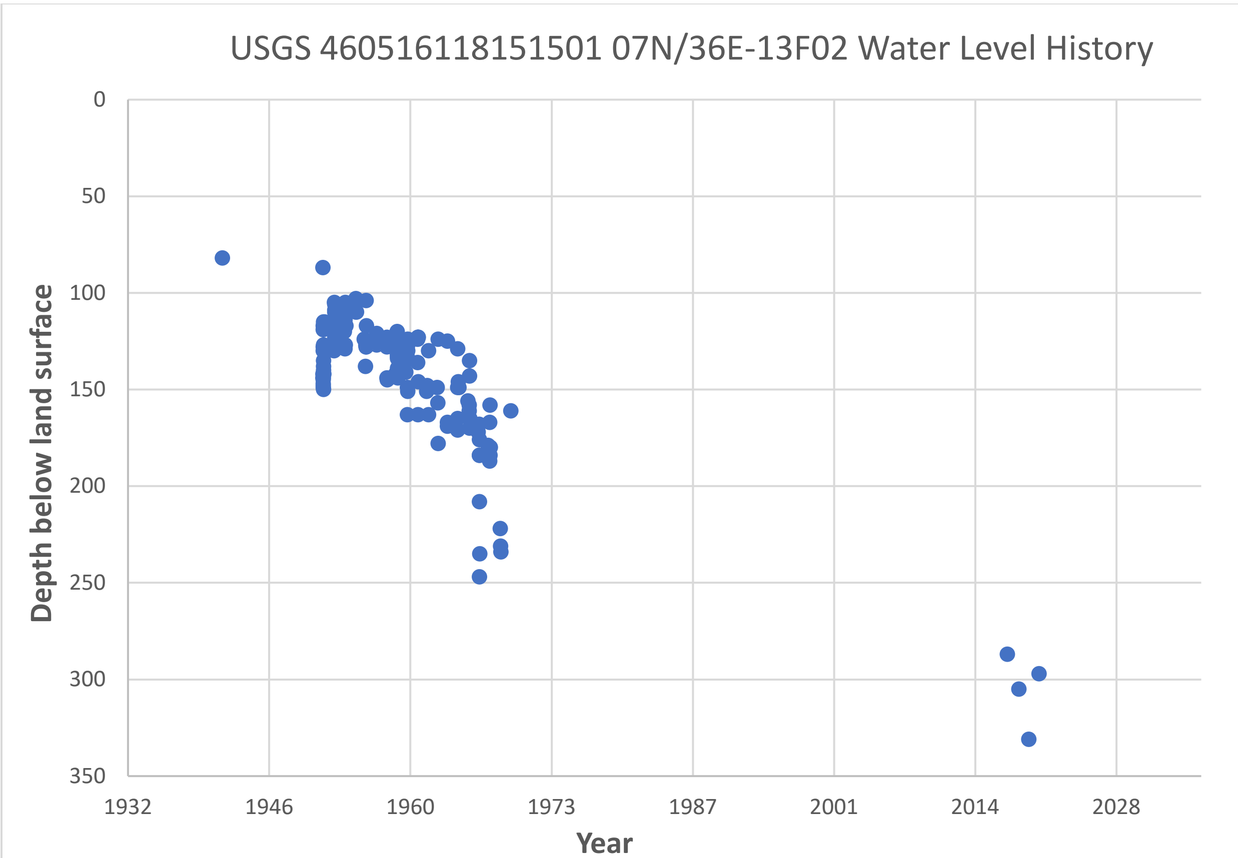
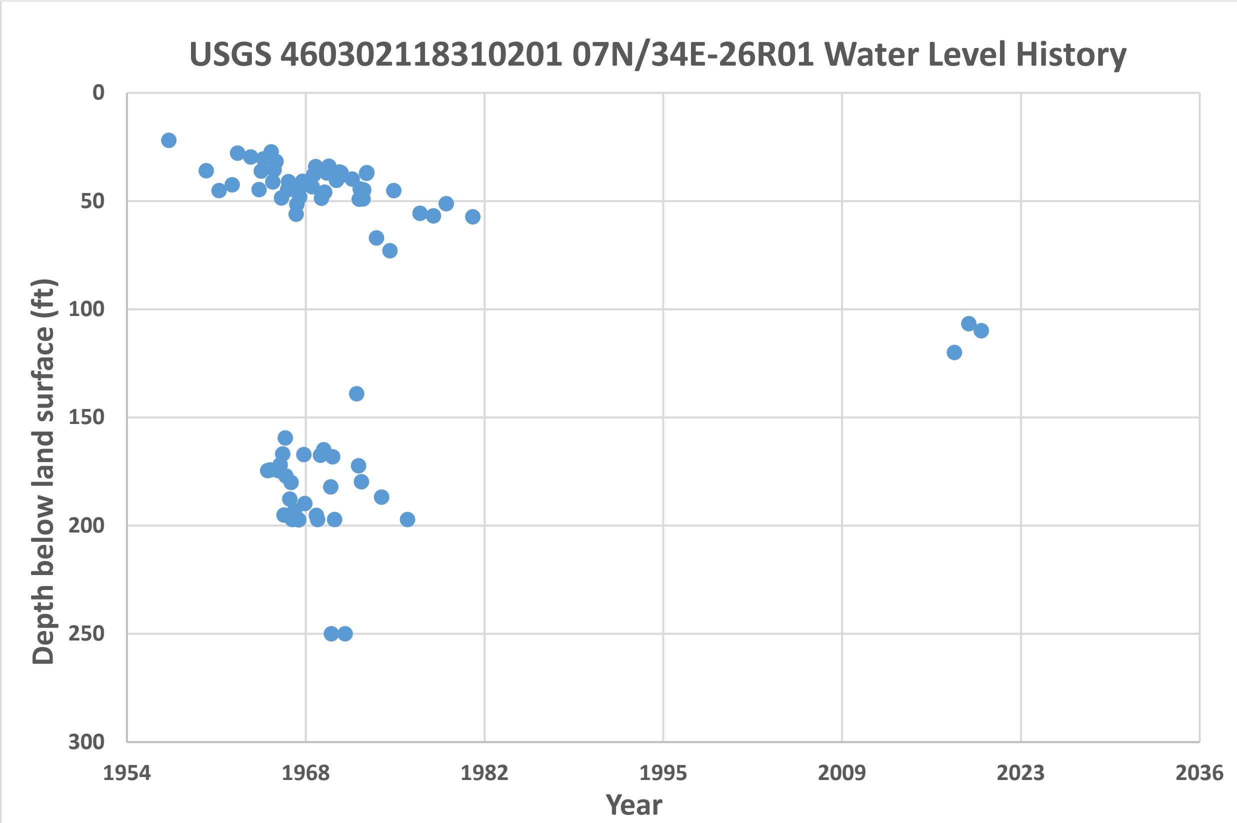
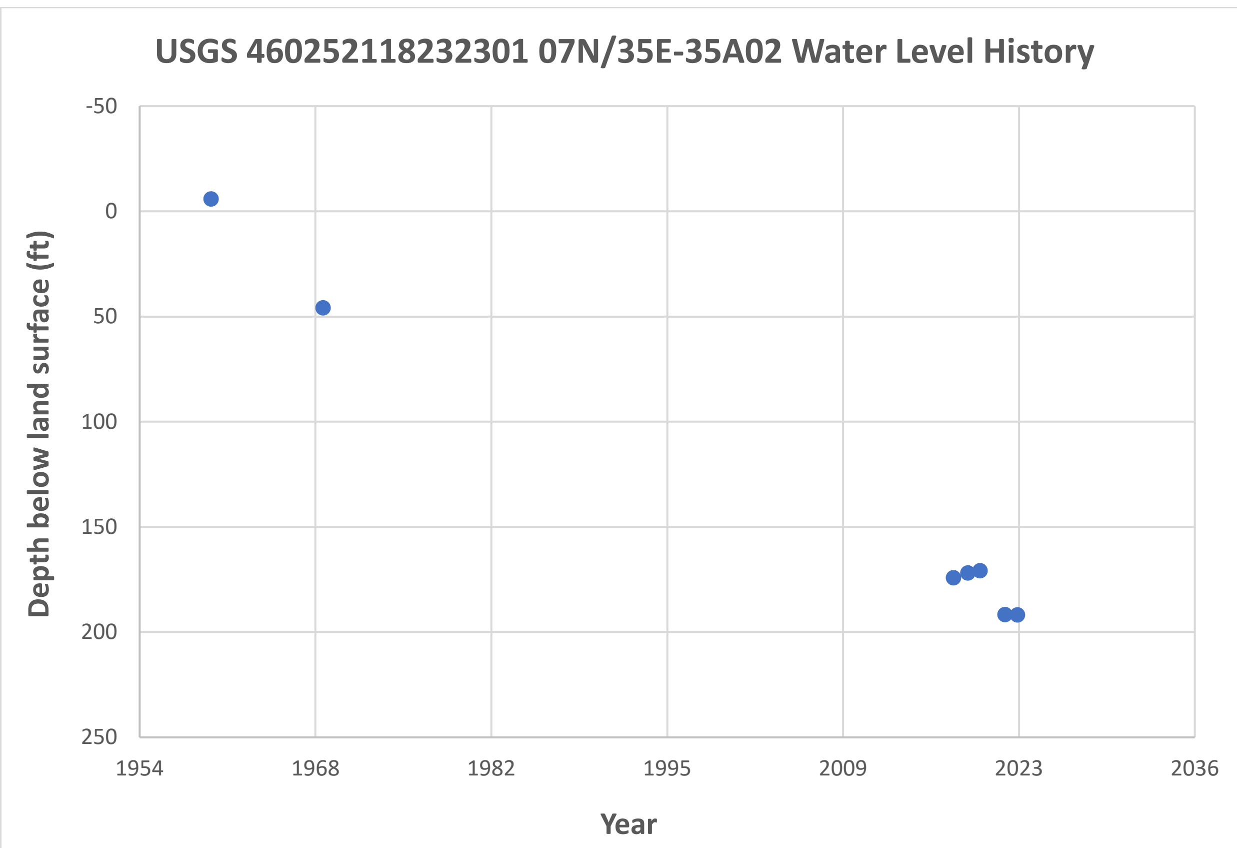
Washington State Department of Ecology, 2023, Washington State Well Report Viewer. https://appswr.ecology.wa.gov/wellconstruction/map/WCLSWebMap/default.aspx. Accessed October 2023.

APPENDIX A: USGS MONITORING WELLS WATER LEVEL HISTORY

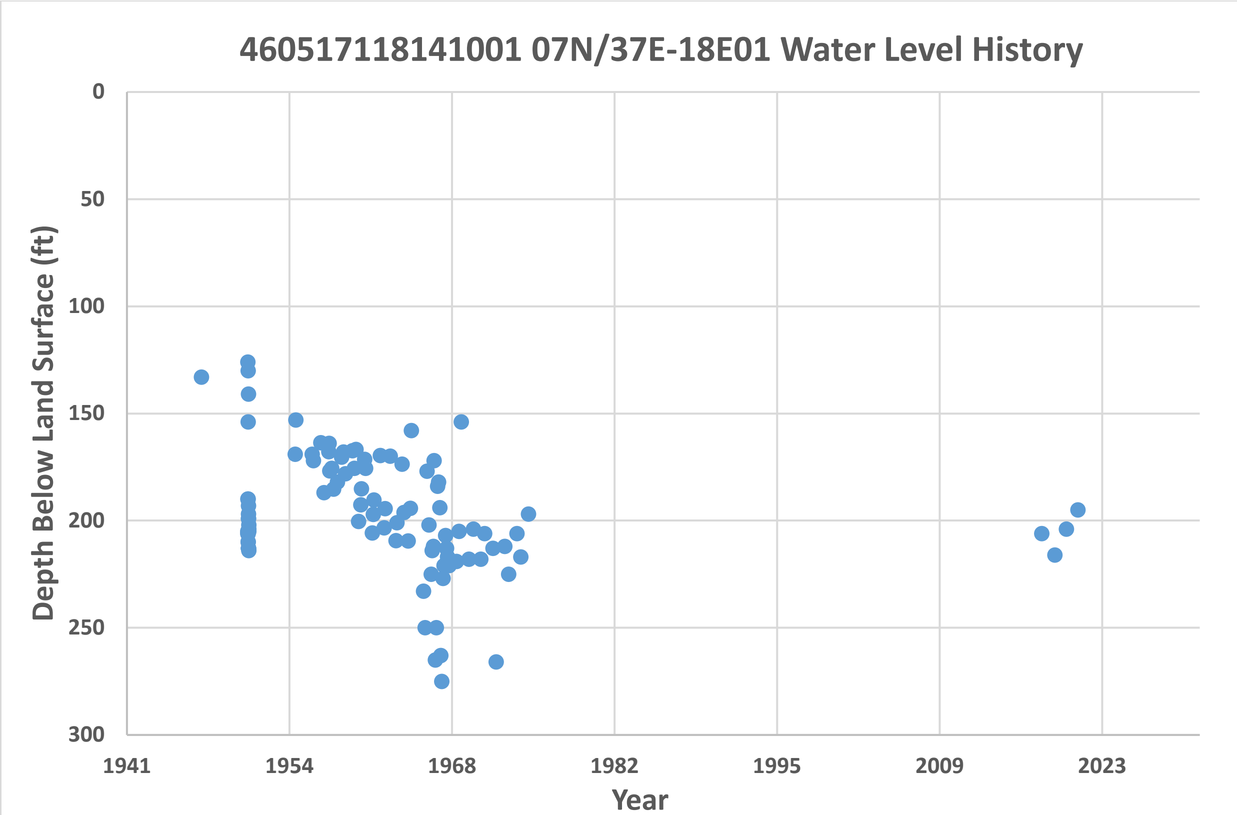


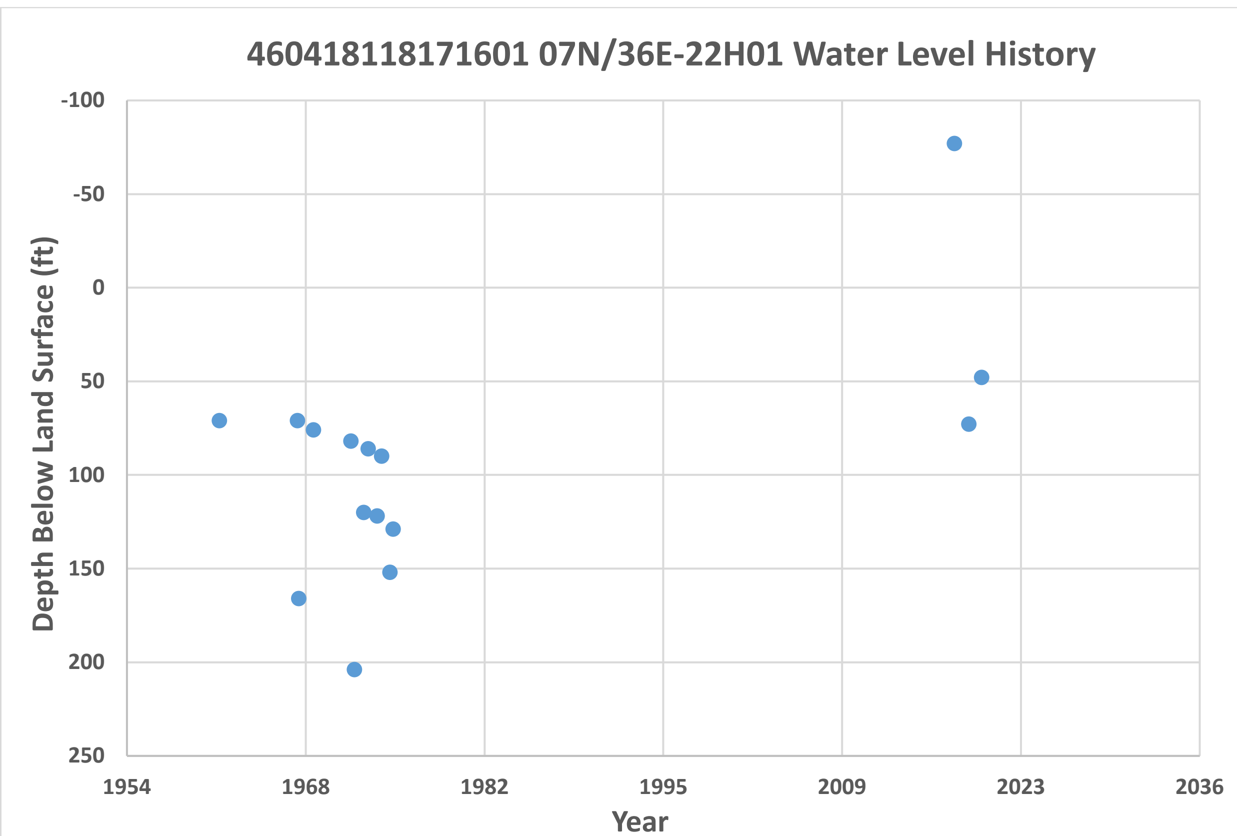


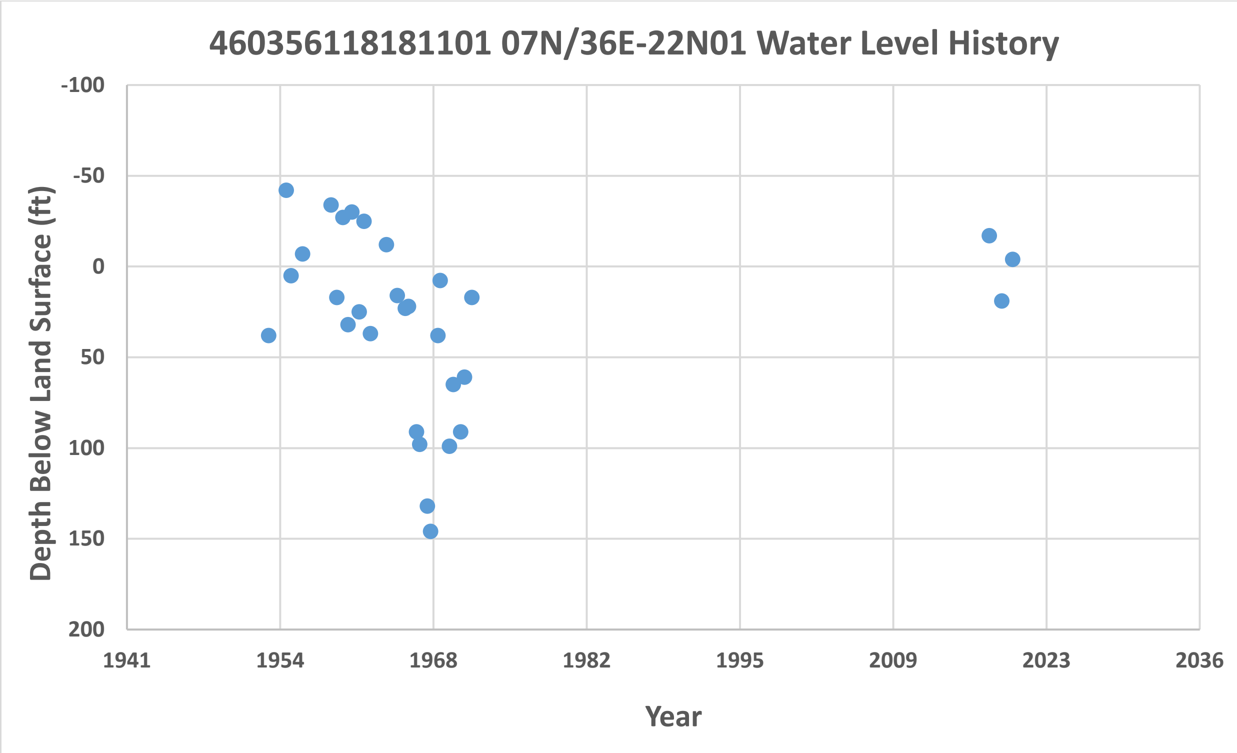
USGS 460302118310201 07N/34E-26R01 Water Level History
Depth below land surface (ft)
0
50
100
150
200
250
300
1954
1968
1982
1995
2009
2023
2036
Year

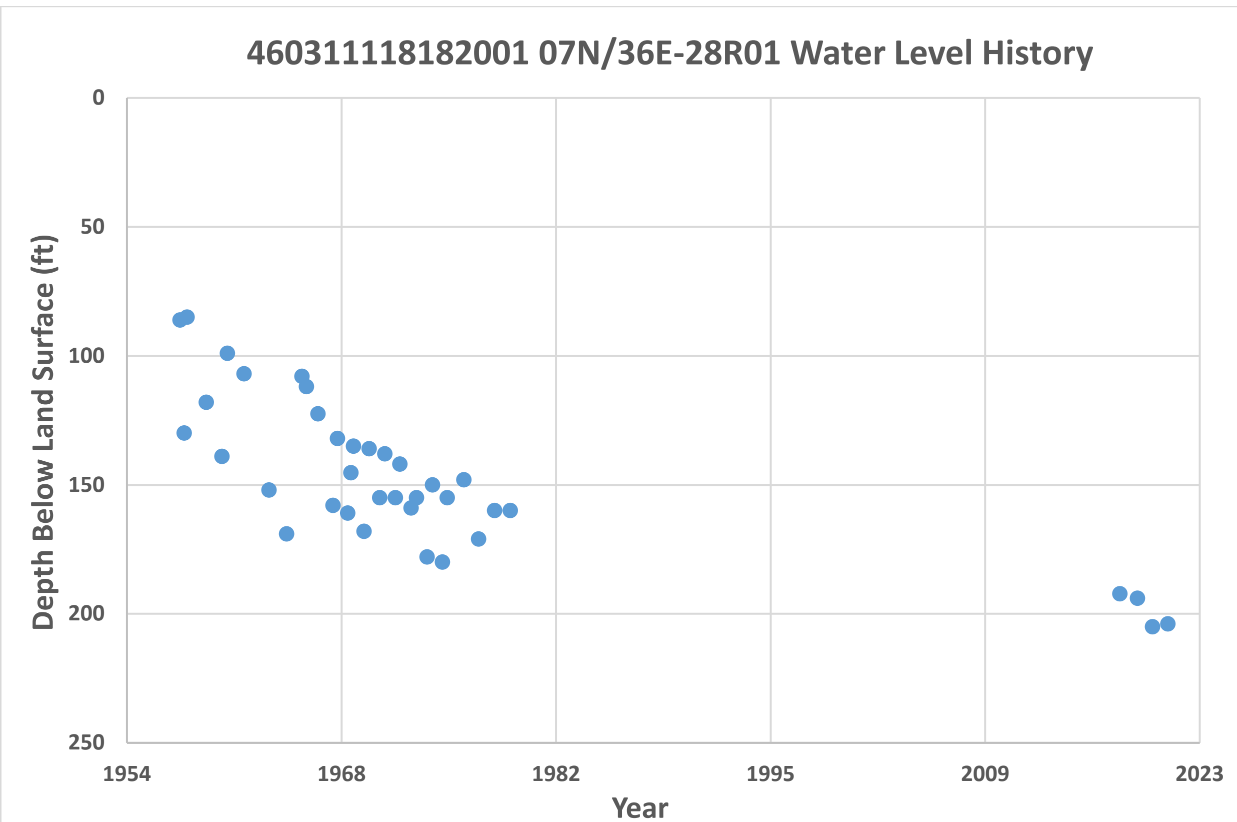


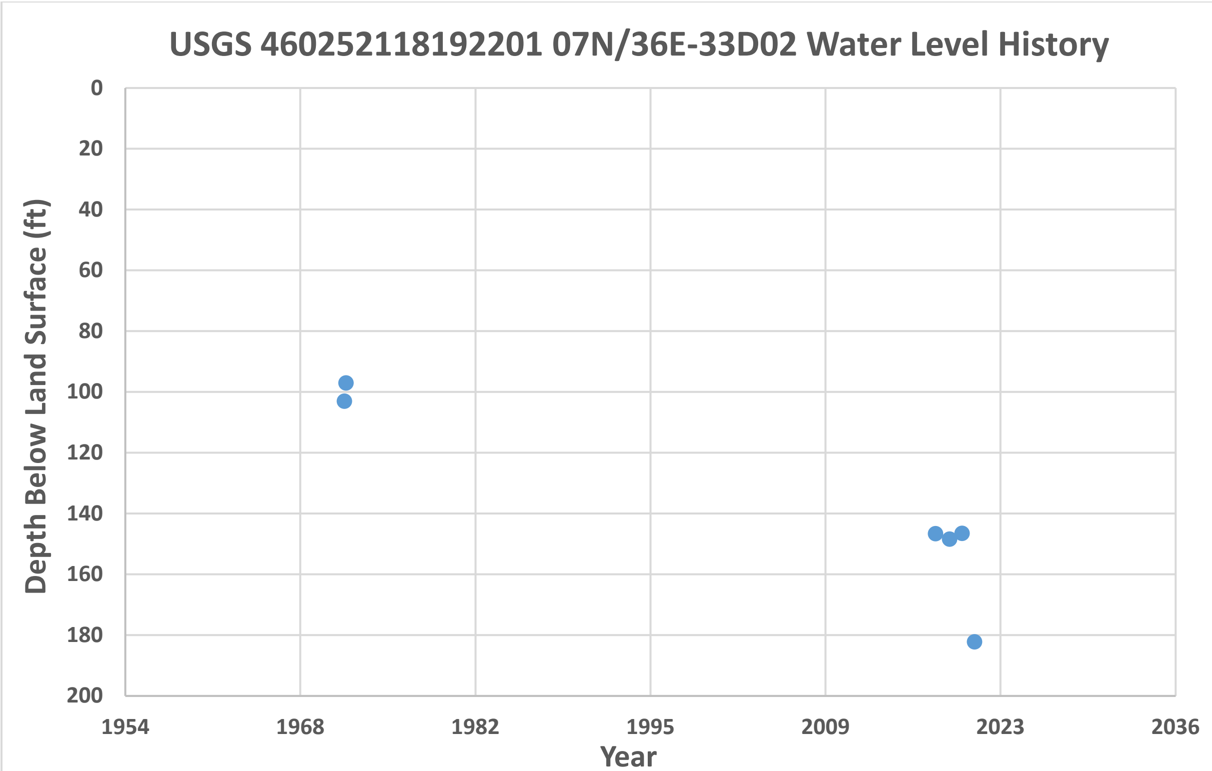
USGS 460252118232301 07N/35E-35A02 Water Level History
Depth below land surface (ft)
-50
0
50
100
150
200
250
1954
1968
1982
1995
2009
2023
2036
Year

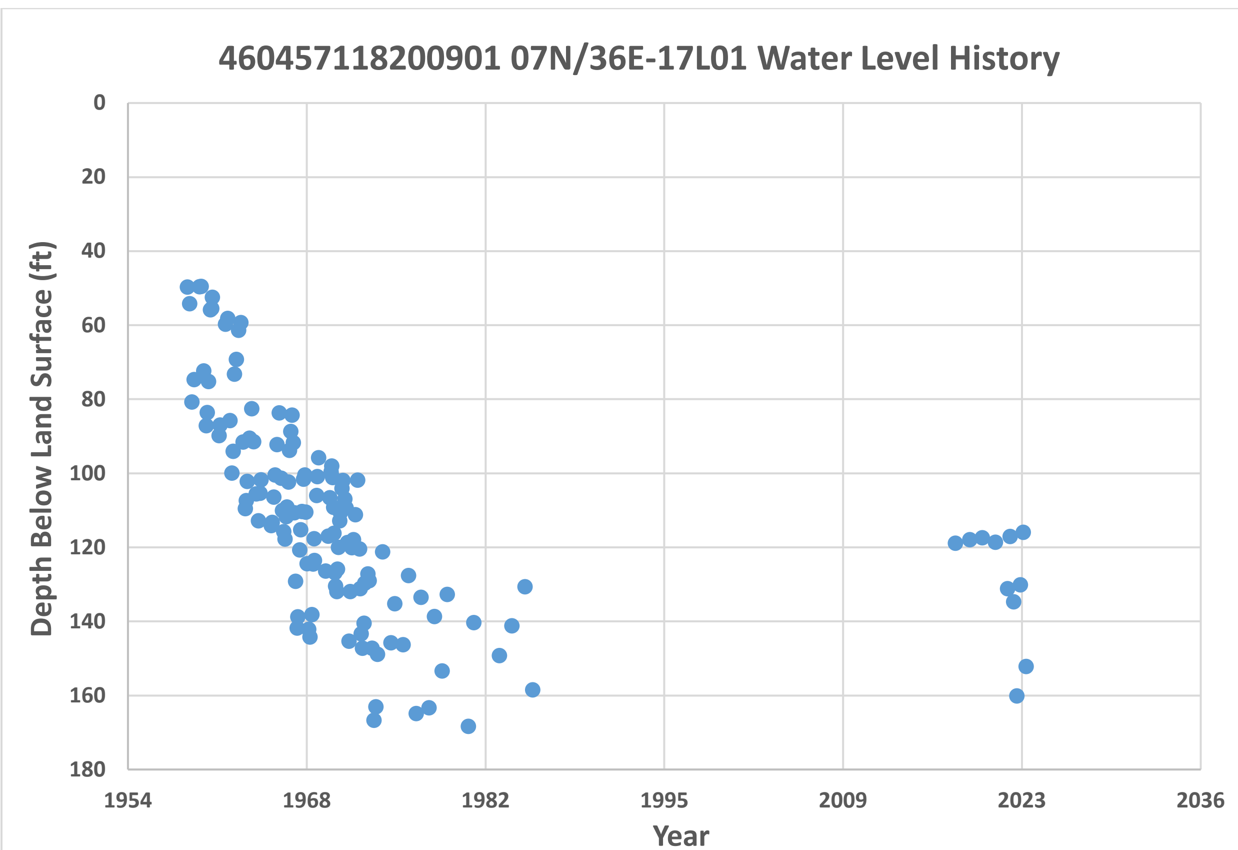

460517118141001 07N/37E-18E01 Water Level History
Depth Below Land Surface (ft)
0
50
100
150
200
250
300
1941
1954
1968
1982
1995
2009
2023
Year

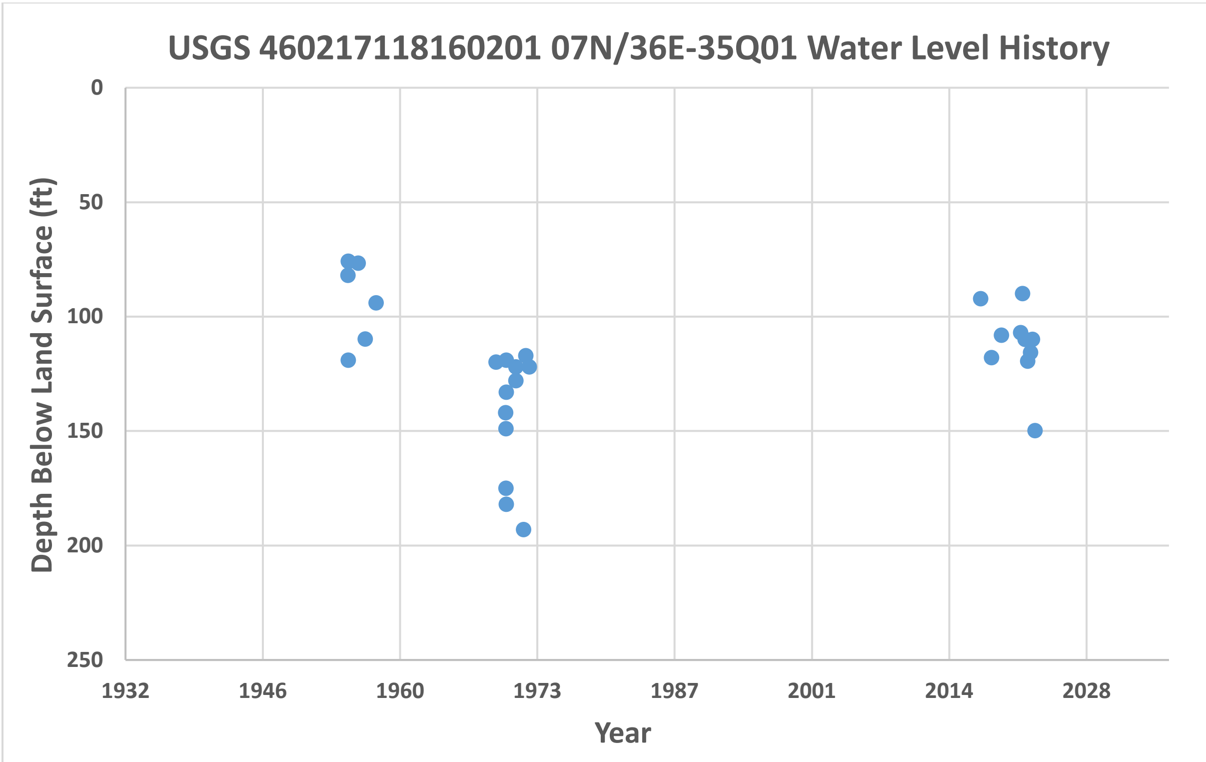

460418118171601 07N/36E-22H01 Water Level History
Depth Below Land Surface (ft)
-100
-50
0
50
100
150
200
250
1954
1968
1982
1995
2009
2023
2036
Year

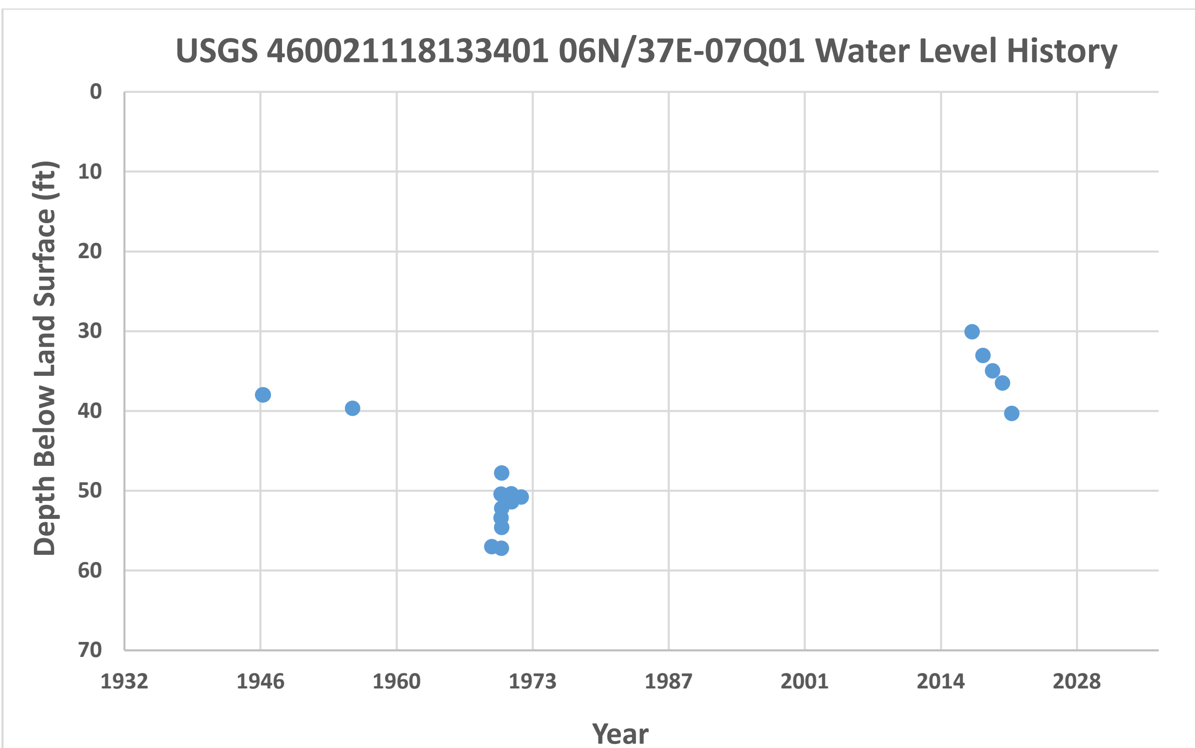

460356118181101 07N/36E-22N01 Water Level History
Depth Below Land Surface (ft)
-100
-50
0
50
100
150
200
1941
1954
1968
1982
1995
2009
2023
2036
Year


460311118182001 07N/36E-28R01 Water Level History
Depth Below Land Surface (ft)
0
50
100
150
200
250
1954
1968
1982
1995
2009
2023
Year


USGS 460252118192201 07N/36E-33D02 Water Level History
Depth Below Land Surface (ft)
0
20
40
60
80
100
120
140
160
180
200
1954
1968
1982
1995
2009
2023
2036
Year


460457118200901 07N/36E-17L01 Water Level History
Depth Below Land Surface (ft)
0
20
40
60
80
100
120
140
160
180
1954
1968
1982
1995
2009
2023
2036
Year


USGS 460217118160201 07N/36E-35Q01 Water Level History
Depth Below Land Surface (ft)
0
50
100
150
200
250
1932
1946
1960
1973
1987
2001
2014
2028
Year


USGS 460021118133401 06N/37E-07Q01 Water Level History
Depth Below Land Surface (ft)
0
10
20
30
40
50
60
70
1932
1946
1960
1973
1987
2001
2014
2028
Year

APPENDIX B: WELL DRILLING STATIC WATER LEVEL DATA

Township 7N, Range 33E Wells

Owner (Name on Well Log)	Section	Depth	Date	Static at time of drilling (ft bgs)
Arlt	26	863	September-1965	104
Harpe	26	850	January-1966	45
Harpe	26	637	April-1969	110
Mcdole	30	920	July-1969	178
Fulgham	35	1017	September-1969	29
Harpe	25	1090	May-1971	97
Mcdole	31	873	March-1974	110
Harpe	26	930	June-1978	90
Mcdole	30	1079	January-1983	210
Harpe	26	1100	April-1985	153
Weidert	30	905	April-1992	264

Township 7N, Range 34E Wells

Owner (Name on Well Log)	Section	Depth	Date	Static at time of drilling (ft bgs)
Lowden/Johnson	29	820	May-1957	75
Nibler	7	834	January-1962	34
Bergiven	35	753	April-1966	43
Hall	28	1225	March-1969	96
Buckley	21	675	September-1974	115
Riley	13	835	September-1975	27
Byerly	24	1035	January-1990	180
Riley	13	1065	January-1991	90
Baumann	28	810	January-1991	133
Buckley	22	1100	June-1999	183
Johnson	33	645	May-2010	146
Buckley	21	702	February-2016	178

Township 7N, Range 35E Wells

Owner (Name on Well Log)	Section	Depth	Date	Static at time of drilling (ft bgs)
Artesian #8	25	772	May-1946	29
Maple Co op	36	708	May-1946	-6
A corp	33	710	June-1946	-6
Maxson	33	760	September-1946	20
College Place	36	708	July-1947	-6
DOI	32	755	August-1951	35
Green Tank #11	25	752	May-1958	32
WW College	35	1022	April-1960	-6
WW College	33	760	December-1960	47
Martin	34	850	August-1962	87
Loney	31	1104	April-1967	43
College Place	36	734	January-1968	45
Green Tank #11	25	780	June-1968	132
Christensen	34	729	March-1973	97
WW College	35	802	July-1975	92
WW Coll. Farm	33	1003	May-1987	134
Malcom	35	757	February-1991	202
Green Tank #11	25	653	December-2004	185
WW River Estates	30	920	March-2007	152
Schmidt	28	780	April-2009	210
College Place	1	800	June-2020	231