MEMO

State of Idaho
Department of Water Resources
322 E Front Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 287-4800 Fax: (208) 287-6700

Date: May 21, 2021

To: Nick Miller

From: Dennis Owsley

Subject: Ground Water Resources South of Lake Lowell

Introduction

Per your request, a review of the status of the aquifer conditions in the area south of Lake Lowell in Canyon County has been conducted. The review was conducted as an update to the 2015 memo (Owsley, 2015) to help process water right applications and transfers in this area. In addition, the Department has fielded multiple inquiries from local citizens concerned with the availability of the ground water resources and potential well interference issues in the area.

The area of interest includes the southern portion of Canyon County, known as the "Dry Lake Area", between Lake Lowell and the Snake River (Figure 1). This memo summarizes the current ground water conditions based on the data available, and expands upon the Owsley (2015) memo.

Hydrogeology

The geology of the area consists of the sedimentary units of the Idaho Group capped by basalt flows and alluvial sediments associated with the Snake River Group (Stevens, 1962; Ralston and Chapman, 1970). The area has undergone significant faulting and both northeast and northwest trending faults are present (Otto and Wylie, 2003). Fault zones impact water temperatures by providing a conduit for geothermal water to flow upward into the overlying cold water aquifer within the Idaho Group (Mitchell, 1981).

Minor amounts of ground water can be encountered within the basalt flows and uppermost sedimentary sequences of the Snake River Group, but the primary aquifer of the area lies within the sedimentary units of the Idaho Group. In this area, the Idaho Group is composed of thick sequences of fine grained material (primarily clay and silt) interbedded with sand and gravel layers (Bartolino, 2020).

The primary sources of recharge to the aquifer are irrigation leakage (canal seepage and flood irrigation) and geothermal input (Otto and Wylie, 2003). Historically, water levels rose in response to newly developed irrigated lands, more than 100 feet in one particular well (Stevens, 1962). The primary sources of ground water discharge are through pumping of wells and direct discharge into the Snake River.

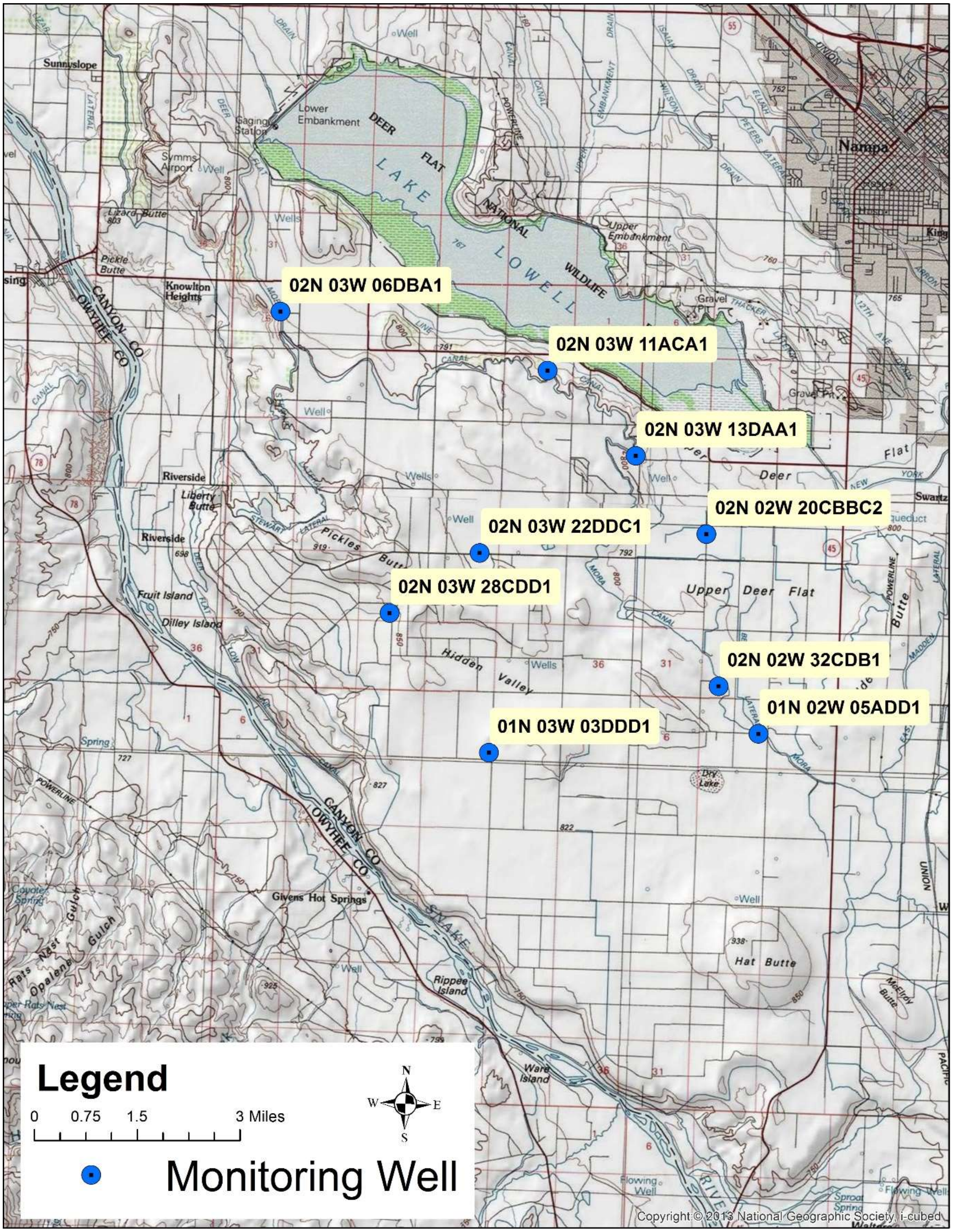


Figure 1. Map of the study area and monitoring well locations.

Depth to water in study area wells ranges from less than 50 to approximately 400 feet below ground surface, depending on the location and depth of the well. Shallow wells completed in the area indicate unconfined conditions may exist locally, but most wells completed at depth indicate confining conditions exist. Ground water flow direction in the study area is generally to the south/southwest, towards the Snake River (Owsley, 2015). Based on well driller reports in the area, well production rates range from a few gallons per minute (gpm) to over 3,000 gpm (Stevens, 1962). The wide range of well production rates is due to the variation in permeability of the interbedded lenses of clay, silt, sand, and gravel. In general, the higher the percentage of permeable sediments (sands and gravels) encountered in a well, the higher the overall yield of the well.

Analysis of Ground Water Conditions

IDWR maintains a ground water level monitoring network in the area that consists of nine spatially distributed wells of various depths (Figure 1). Water level data from three of the wells date back to the late 1960's and all wells are still included in the Treasure Valley ground water monitoring network (Table 1).

Table 1. Summary table of water level data

Well Number	Primary Water Use	Total Depth (feet)	Period of Monitoring Data	Water Level Change 2005 to 2020 (feet)
01N 02W 05ADD1	Irrigation	720	1967-2021	9.57
01N 03W 03DDD1	Domestic	731	1989-2021	64.68
02N 02W 20CBBC2	Public Water System	375	2003-2021	6.98
02N 02W 32CDB1	Domestic	240	1969-2019	5.22*
02N 03W 06DBA1	Domestic	247	1996-2021	4.83*
02N 03W 11ACA1	Domestic	160	1995-2021	0.1
02N 03W 13DAA1	Domestic	128	1995-2021	1.59
02N 03W 22DDC1	Irrigation	603	1967-2021	4.42
02N 03W 28CDD1	Domestic	485	1995-2021	83.16

** Water level change value is based on 2019 data, 2020 data was not available.*

Seasonal fluctuations in wells in the area vary significantly, both in timing and magnitude (Figure 2). The timing of the seasonal highs and lows in a particular well depend on the depth of the well and proximity to recharge sources. In general, shallow aquifers levels increase throughout the irrigation season in response to local recharge (irrigation leakage), whereas water levels in deeper wells decrease throughout the irrigation season in response to pumping demands.

The magnitude of seasonal fluctuations range from a few feet to upwards of 100 feet. The fluctuations are based on several factors that include 1) proximity to nearby pumping wells; 2) proximity to recharge sources; and 3) the depth and aquifer material a well is completed in. Wells completed in low permeable material likely will experience greater seasonal fluctuations and produce larger cones of depression than wells completed in higher transmissivity zones of the aquifer. Well-to-well impacts (overlapping cones of depression) are more likely to occur in wells completed in low transmissivity material and in close proximity to any other wells.

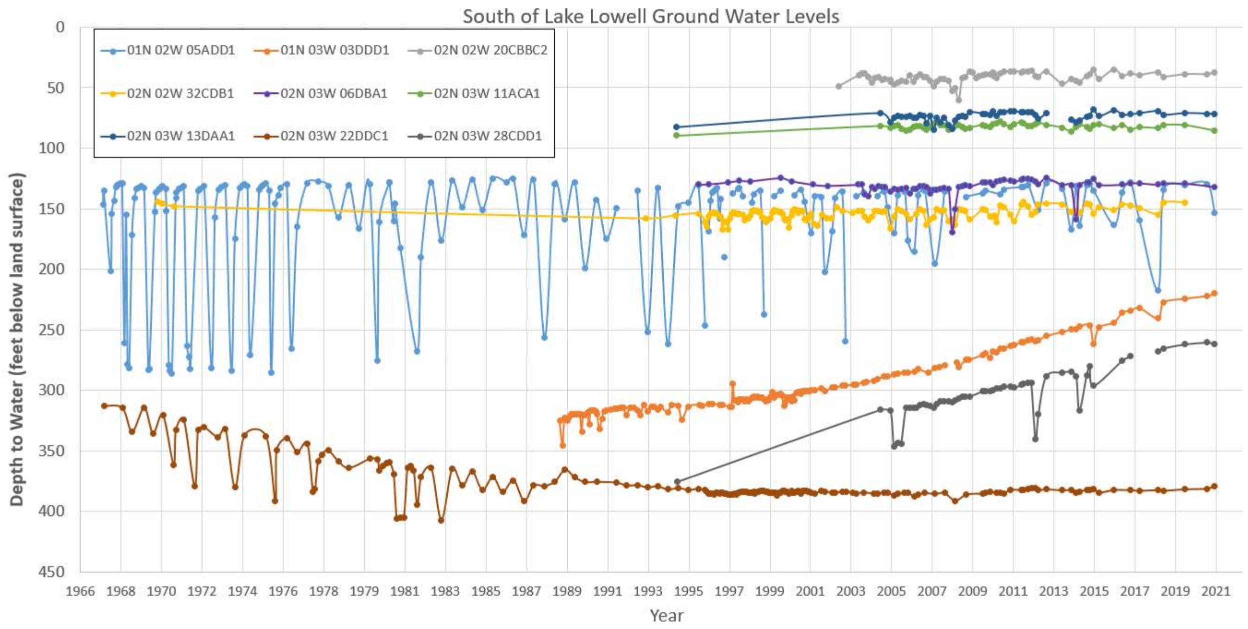


Figure 2. Hydrographs of the wells monitored in the area.

The low permeable sediments that create the confining conditions dominate the subsurface and are much less permeable than the lenses of sand that comprise the aquifer. However, these confining units are not completely impermeable, allowing for recharge to slowly percolate from overlying shallow aquifers and surface recharge sources to replenish the underlying aquifer. Based on seasonal trends and anecdotal evidence of well interference issues, the potential exists for the rates of withdrawal to exceed the rate of recharge on a short-term, or seasonal basis.

Although seasonal influences exist, the overall trend of the aquifer levels in the area appears to be stable or rising on a long-term basis (Figure 2). This indicates the aquifer is being replenished by a volume equal to or greater than the current volume of water discharged on an annual basis.

Only one well in Figure 2 has indicated any type of ground water decline. This well, 02N 03W 22DDC1, had historically shown declining water levels from the late 1960’s through the late 1980’s. Since that time, the aquifer levels have stabilized for the past four decades. These declines were attributed to nearby pumping wells, and the stabilization of the water level in this well corresponds to the reduction of ground water pumping in the near vicinity of this well (Bendixson, 2005). All of the other eight wells monitored in the area show stable or increasing water levels over time.

The isolated instance of the ground water declines in the 1970’s and 1980’s in and near well 02N 03W 22DDC1 is an indication that this portion of the aquifer can be pumped to a point of overdraft. The stabilization of water levels in this area since the 1980’s shows that a reduction in pumping can be used to mitigate and stabilize areas of declining water levels. Currently, none of the water level data shows any indication that any portion of the aquifer in this area is currently in overdraft.

A contour map was created to visualize the more recent ground water level change between 2005 and 2020 (Figure 3). As shown in Figure 3, all of the wells show an increase in water levels, ranging from 0.1 feet to over 80 feet. Discrete change values for the nine wells used in the kriging can also be seen in Table 1 above. These results are similar to previous water level change analyses conducted in this area (Owsley, 2015). This positive change also indicates the aquifer is being replenished by a volume of water equal to or greater than the current volume of water discharged on an annual basis.

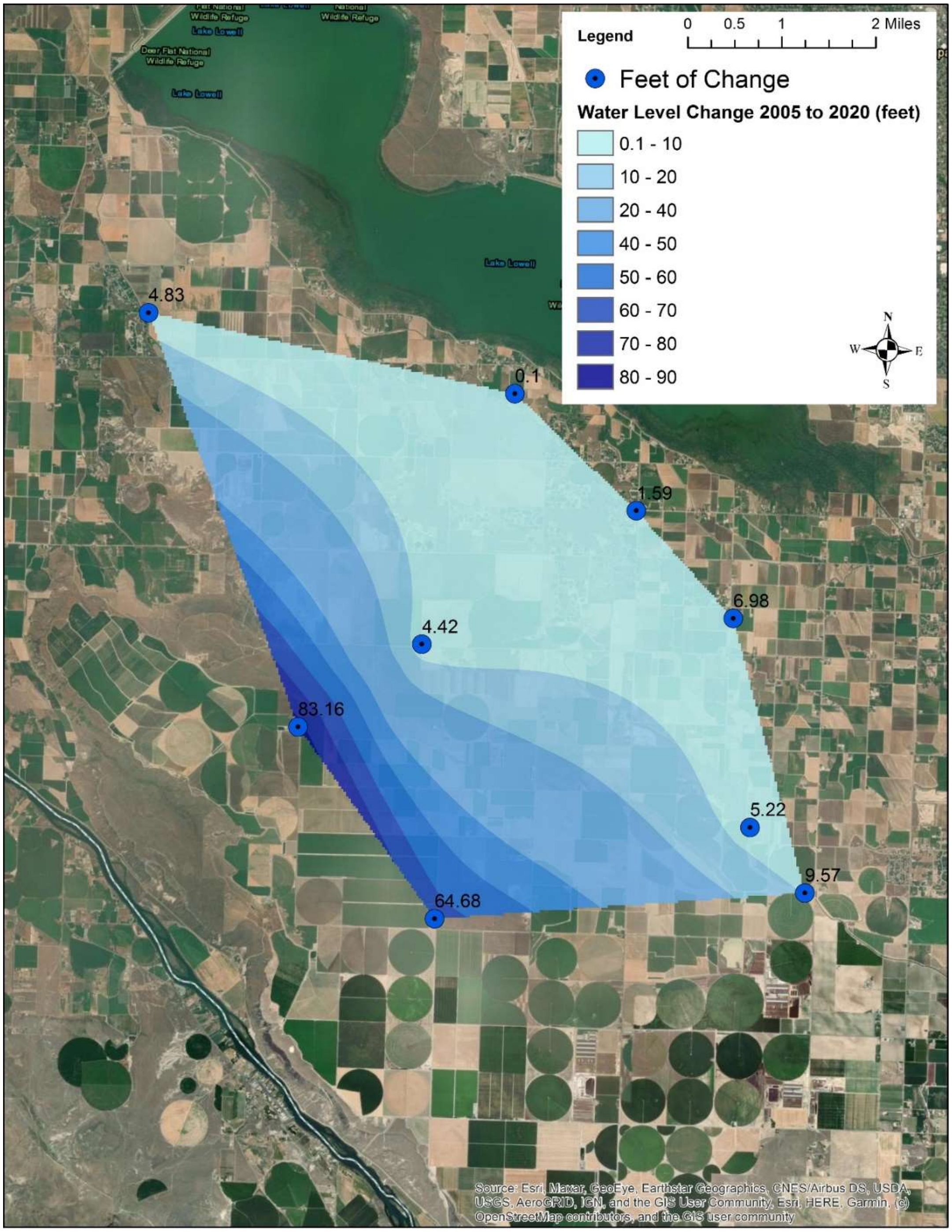


Figure 3. Map showing water level change from 2005 through 2020.

Conclusions

An analysis of data from nine IDWR monitoring wells indicates that the ground water resources in the Dry Lake area are adequate for the current uses. The rather stable or increasing water levels over time indicate recharge sources are equal to, or in excess of the ground water withdrawals. The well issues that have been brought forth to the department are likely a reflection of the low transmissivity nature of the aquifer in this area, well construction issues, and well hydraulic issues.

References

Bendixson, S., 2005. South Canyon County Ground Water Conditions. Memorandum to Glen Saxton and Hal Anderson, dated March 21, 2005. Idaho Department of Water Resources.

Bartolino, J., 2020. Hydrogeologic Framework of the Treasure Valley and Surrounding Area, Idaho and Oregon. U.S. Geological Investigations Report 2019-5138.

Mitchell, J. C., 1981. Geological, Hydrological, Geochemical and Geophysical Investigations of the Nampa Caldwell and Adjacent Areas, Southwestern Idaho. Water Information Bulletin No. 30, Geothermal Investigations in Idaho, Part 11. Idaho Department of Water Resources.

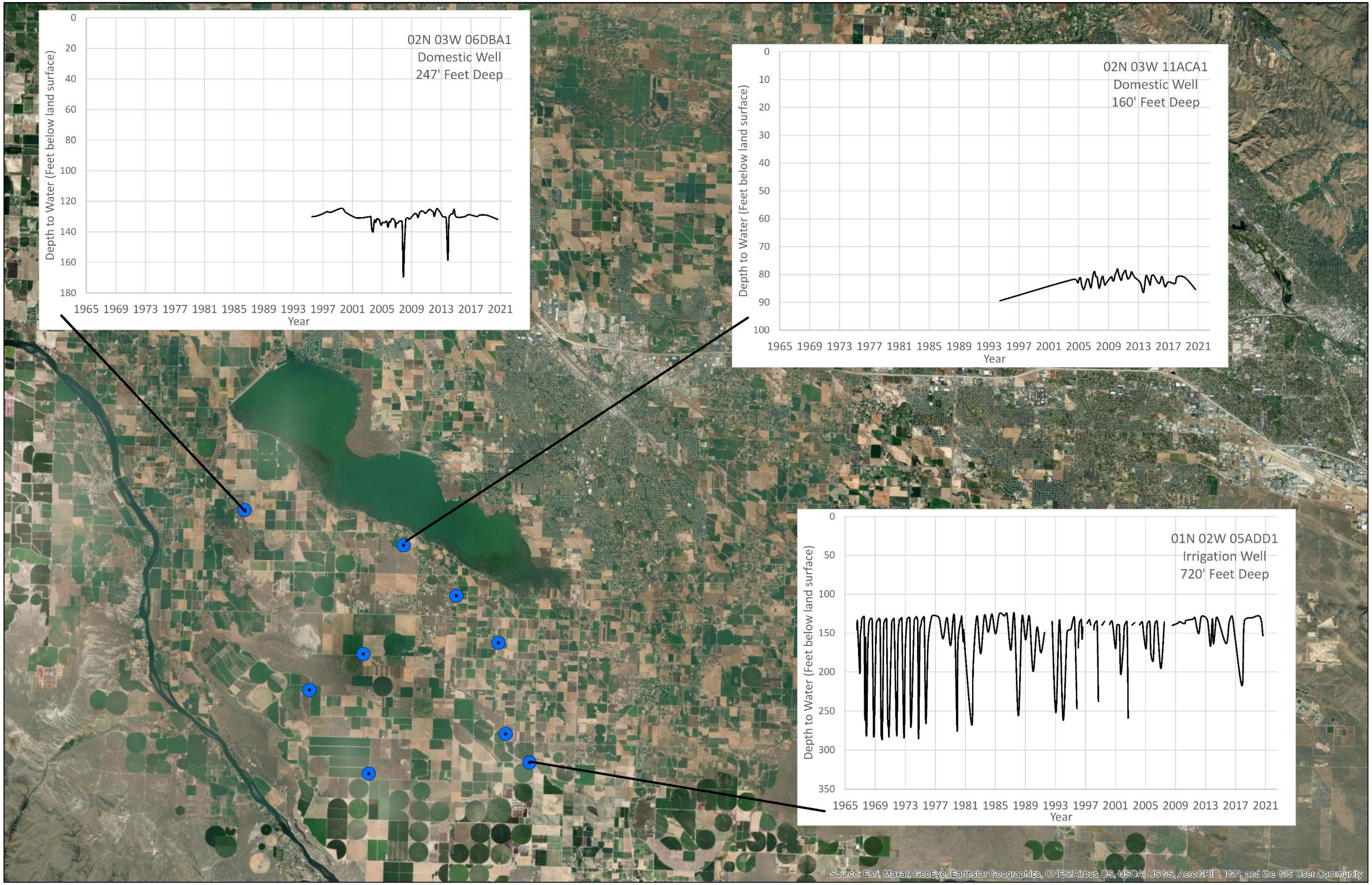
Otto, B.R., and Wylie, A.H., 2003. Hydrogeologic analysis of water supply for the city of Greenleaf, Canyon County Idaho. Idaho Water Resources Research Institute Research Report.

Owsley, D., 2015. Review of water availability in southern Ada and Canyon Counties. Memorandum to Nick Miller, dated December 29, 2015. Idaho Department of Water Resources.

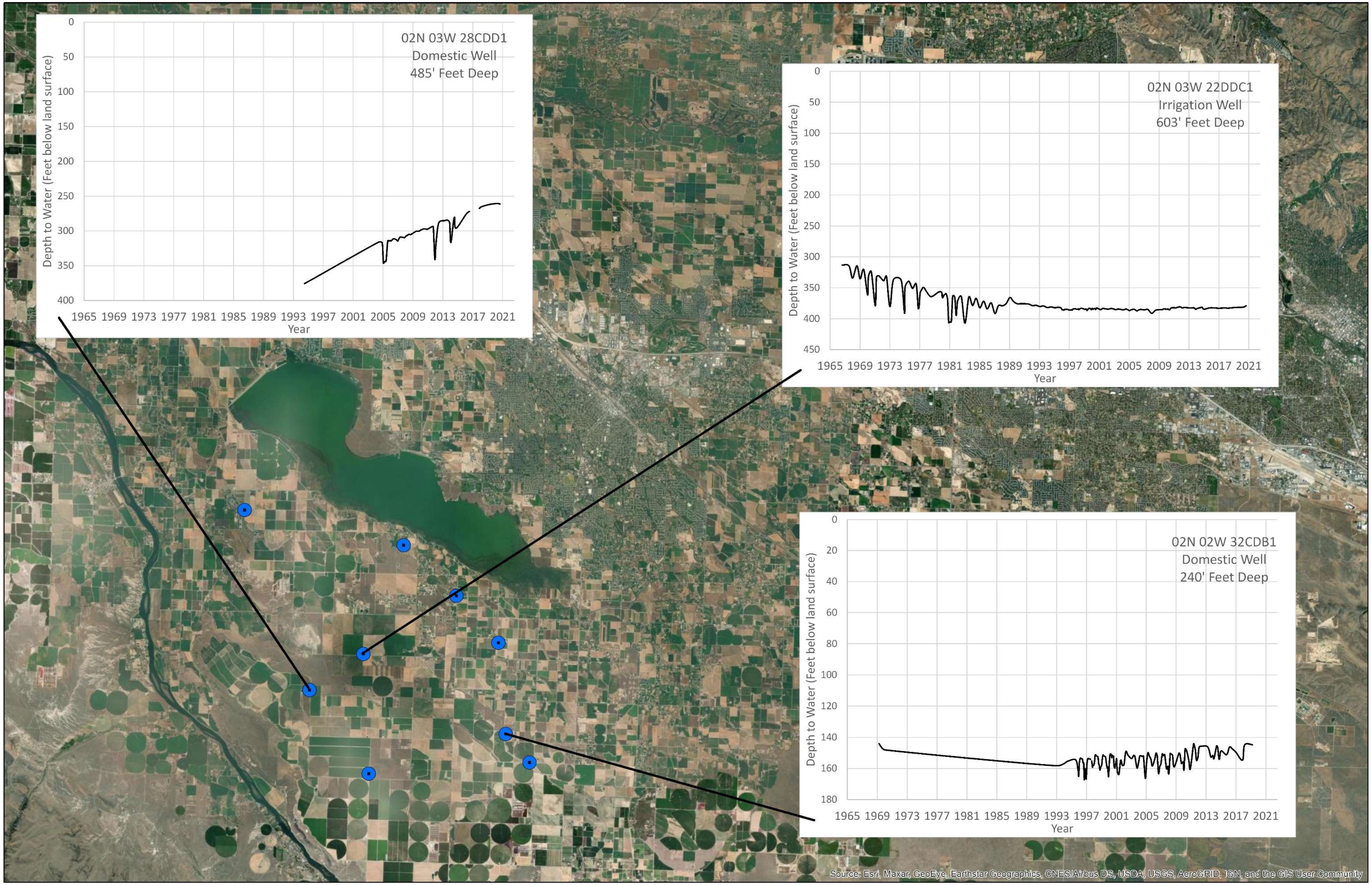
Ralston, D.R. and Chapman, S.L., 1970. Ground-Water Resource of Southern Ada and Western Elmore Counties, Idaho. Water Information Bulletin No.15, Idaho Department of Reclamation.

Stevens, P.R., 1962. Effect of Irrigation on Ground Water in Southern Canyon County, Idaho, U.S. Geological Survey Water Supply Paper 1685, 74 pages.

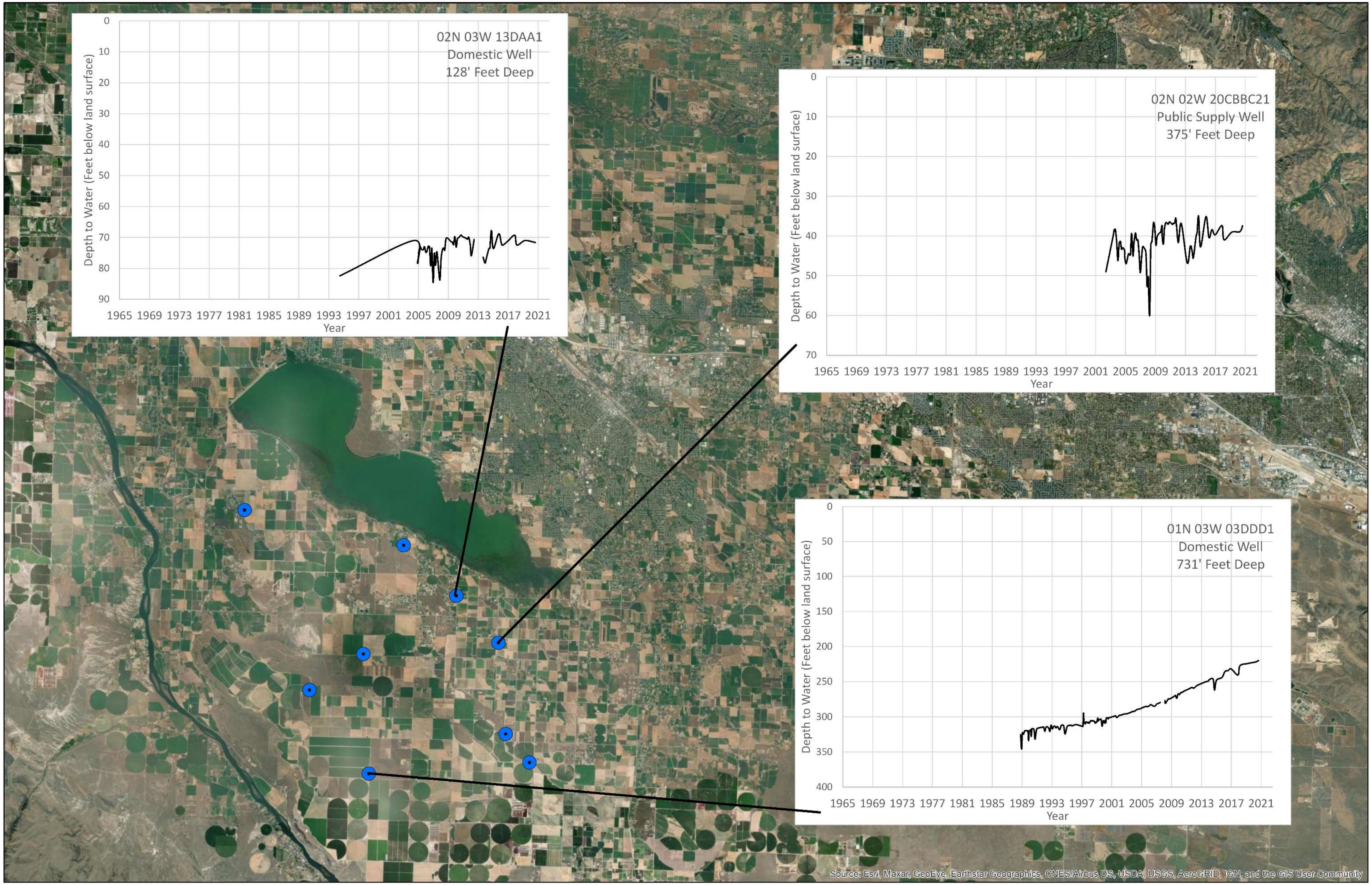
APPENDIX – WELL HYDROGRAPHS



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community