Rupp Ranches

Groundwater Characterization Report

Permit G-17272

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Prepared for:
Oregon Water Resources Department

On Behalf of:
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Abbreviations and Acronyms

^{14}C	radiocarbon
^{3}H	tritium
bgs	below ground surface
$CaCO_3$	calcium carbonate
CFC	chlorofluorocarbon
cfs	cubic feet per second
CRBG	Columbia River Basalt Group
DO	dissolved oxygen
gpd/ft	gallons per day per foot
gpm	gallons per minute
GSI	GSI Water Solutions, Inc.
IRZ	IRZ Consulting, LLC
ORP	oxidation-reduction potential
OWRD	Oregon Water Resources Department
Rupp	Rupp Ranches
SCADA	Supervisory Control and Data Acquisition
TU	tritium units
LSR	least square regression
GMWL	global meteoric water line
pMC	percent modern carbon

1 Introduction

This groundwater characterization report was developed to meet the conditions of Permit G-17272, held by Rupp Ranches (Rupp). The requirements for the groundwater characterization report include a discussion of basalt stratigraphy and structures, a geologic cross section, the results of aquifer testing, groundwater chemistry and age dating results, and an evaluation of groundwater availability in the area including potential for interference with senior wells and wells in the Stage Gulch Critical Groundwater Area, and the mechanism and potential for natural recharge and discharge. To meet these requirements, GSI Water Solutions, Inc. (GSI), developed a groundwater sampling plan, collected water samples at the irrigation wells, developed a geologic cross section, analyzed groundwater age dating results, and characterized groundwater availability in the area. The results of these analyses and evaluations are included in this report.

The information obtained from the Rupp wells was used to help estimate the availability and sustainability of the Columbia River Basalt Group (CRBG) aquifer system underlying the study area. The study area is defined as the area surrounding the Rupp wells, covering an area of approximately 80 square miles (Figure 1). Figure 2 shows a close up of the location of the four Rupp wells and the associated cross-section line that includes the four Rupp wells. The Stage Gulch Critical Groundwater Area is located approximately 1 mile to the south of the study area. The groundwater assessment includes water quality, water age, and aquifer properties to estimate the sustainability of groundwater resource in the area.

Rupp Wells 1, 2, 3, and 4 are irrigation wells constructed in 2011–2012 for Juniper Canyon Farms. All four wells appropriate water from the CRBG. Table 1 describes the construction of the four Rupp wells.

Table 1. Rupp Well Construction Summary

	Well 1 (UMAT 57044)	Well 2 (UMAT 57042)	Well 3 (UMAT 57041)	Well 4 (UMAT 57043)
Ground Surface Elevation (ft amsl)[A]	942	1,036	1,056	1,045
Total Depth (ft)	820	635	552	990
Open Interval (ft bgs)	734–820	580–635	494–552	700–990
Static Water Level (ft bgs)[B]	512.38	220.38	243.19	610.80
CRBG Water Bearing Zones	Wanapum Basalt: Frenchman Springs Member; Sand Hollow and Silver Falls Flows	Wanapum Basalt: Frenchman Springs Member; Sand Hollow Flow	Wanapum Basalt: Frenchman Springs Member; Sentinel Gap and Sand Hollow Flows	Wanapum Basalt: Frenchman Springs Member; Sand Hollow and Silver Falls Flows

Notes

[A] Estimated from Google Earth

[B] Static water Level measurement taken on February 5, 2025

amsl = above mean sea level

bgs = below ground surface

ft = feet

2 Hydrogeologic Setting

The following section is based on a 2009 letter report by Terry Tolan (GSI, 2009), which was submitted to the Oregon Water Resources Department (OWRD) to support the groundwater permit application.

2.1 Geology

The study area is located in the northern part of the Umatilla Basin near the Oregon/Washington border (Figure 1). A close-up of the location of the four Rupp wells and the cross section generated for this report can be found in Figure 2. Figure 3 provides a cross section spanning the four Rupp wells, which displays the basalt stratigraphy, well open intervals and static water levels.

The Umatilla Basin is filled by a relatively thin (10 to 200 foot-thick) sequence of Late Tertiary and Quaternary sediments (typically referred to as suprabasalt sediments) overlying a thick sequence of Miocene-age continental flood basalt of the CRBG. The CRBG are the primary host rock for the "basalt aquifer" groundwater system in the Umatilla Basin. The total thickness of the CRBG in the Umatilla Basin is not precisely known, but is estimated to exceed 5,000 feet in thickness (Reidel et al., 1989a and 1989b).

Regional studies indicate the CRBG consists of over 300, widespread, individual flows assigned in this portion of the Umatilla Basin to the three formations listed below from youngest to oldest:

- Saddle Mountains Basalt (Pomona and Umatilla Members).
- Wanapum Basalt (Priest Rapids and Frenchman Springs Members). All four Rupp wells are completed in the Frenchman Springs Member, which includes the Sentinel Gap, Sand Hollow and Silver Falls flows. Wells 1 and 4 are completed in the Silver Falls and overlying Sand Hollow flows. Well 2 is completed only in the Sand Hollow flow, and Well 3 is completed in both the Sand Hollow and the overlying Sentinel Gap flow. The two wells completed in the deeper flows (Well 1 and 4) have deeper water levels than the wells completed in the shallower flow (Figure 3). Appendix A contains the well logs of the four Rupp wells.
- Grande Ronde Basalt (Sentinel Bluffs, Winter Water, Umtanum, and Ortley Members).

Each of these formations has been subdivided into a series of distinctive, mappable, members (Figures 4 and 5) (Swanson et al., 1979a; Beeson et al., 1985; Reidel et al., 1989b). Some of the CRBG units present at the study area are separated by sedimentary interbeds of the Ellensburg Formation. These sedimentary interbeds can range in composition from indurated silt and clay, to diatomite and volcaniclastic deposits, to fluvial sand and gravel. Ellensburg Formation sedimentary interbeds that are likely to be present within the study area are:

- Selah Member - between the Pomona and Umatilla Members of the Saddle Mountains Basalt.
- Mabton Member – between the Umatilla Member of the Saddle Mountains Basalt and the Priest Rapids Member of the Wanapum Basalt.
- Quincy/Squaw Creek Member – between the Priest Rapids and Frenchman Springs Members of the Wanapum Basalt.
- Vantage Member – between the Frenchman Springs Member of the Wanapum basalt and Sentinel Bluffs Member of the Grande Ronde Basalt.

Because the flood-basalt flows of the CRBG host the basalt aquifer system beneath the study area, it is important to have an accurate understanding of the physical characteristics of these flows to better

understand their hydraulic characteristics and behavior. The primary physical characteristics of CRBG flows were largely developed during the flow emplacement process. The factors that control the emplacement process and overall geometry of individual basalt lava flows or flow fields include rate/volume of lava erupted, lava composition/ temperature (rheology), vent geometry, topography, and environmental conditions (Shaw and Swanson, 1970; Reidel and Tolan, 1992; Reidel et al., 1994; Beeson et al., 1989; Self et al., 1997; Beeson and Tolan, 1996). There are two basic types of flow geometries, compound and sheet (Figure 6).

Individual, large volume CRBG flows (especially Grande Ronde and Wanapum Basalts) are voluminous, thick (commonly more than 100 feet thick), and generally do not display a complex flow lobe structure, but instead display the characteristics of sheet flows (Swanson et al., 1979a, 1979b; Tolan et al., 1989; Reidel et al., 1989b, 1994; Reidel and Tolan, 1992; Beeson et al., 1985, 1989; Beeson and Tolan, 1990, 1996; Reidel, 1998). Generally, aerially extensive CRBG flows only exhibit physical features and characteristics expected of sheet flows, with the complex internal features associated with compound flows found only at flow margins (Beeson et al., 1989; Reidel and Tolan, 1992; Reidel et al., 1994; Beeson and Tolan, 1996; Reidel, 1998).

Examination of vertical exposures through CRBG flows reveals that they all exhibit the same basic three-part internal arrangement of features (Figure 7). These intraflow structures originated during the emplacement and cooling of the lava flow and are referred to as the flow top, flow interior, and flow bottom. The combination of a flow top of one flow and the flow bottom of the overlying flow is commonly referred to as the “interflow zone.”

A simple vesicular flow top (Figure 7) commonly consists of glassy to fine-grained basalt that displays a rapid increase in the density of vesicles near the top of the flow (DOE, 1988; McMillan et al., 1989). Vesicles may be isolated or interconnected, resulting in lower and higher permeability and porosity (DOE, 1988). Tension cooling joints, related to flow top formation/flow emplacement, augment the permeability and porosity of the flow top.

A flow top breccia (Figure 7) consists of angular, scoriaceous to vesicular fragments of basaltic rubble that lie above a zone of non-fragmented, vesicular basalt. Flow top breccias can be very thick (in some cases they comprise half the entire thickness of the flow, more than 100 feet in thickness) and very laterally extensive (DOE, 1988). Laterally extensive flow top breccias can have a high degree of interconnected pore space resulting in formation of widespread and highly permeable aquifers at the tops of individual basalt flows (Newcomb, 1969; DOE, 1988).

CRBG flow interiors typically consist of dense, non-vesicular, glassy to crystalline basalt that contains numerous cooling joints that formed when the lava shrank as it solidified. CRBG cooling joints often form regular patterns or styles, with the two most common being entablature-colonnade and columnar-blocky jointing (Figure 7). Studies on the nature and characteristics of cooling joints within the CRBG (DOE, 1988; Lindberg, 1989) have found that undisturbed joints are narrow, averaging 0.009 inches wide, and that there is no difference in joint widths between entablature and columnar-blocky jointing despite the extreme difference in their appearance. DOE (1988) and Lindberg (1989) also found that joints are typically 77 to +99 percent filled with secondary minerals (clay, silica, zeolite) and open spaces (voids) that do occur are not well connected. In situ hydraulic testing of CRBG dense interiors at the Hanford Site (Strait and Mercer, 1987; DOE, 1988) has found them to typically be aquitards and in their undisturbed state act as confining “layers” within the CRBG aquifer system.

The physical characteristics of CRBG flow bottoms are largely dependent on the environmental conditions the molten lava encountered as it flowed across the Earth’s surface. If the lava flow encountered relatively

dry ground conditions, the flow bottom typically consists of a narrow (less than 3 feet thick) zone of sparsely vesicular, glassy to very fine-grained basalt. This type of flow bottom structure is very common within the CRBG. If advancing flows encountered lakes, rivers, and areas of water-saturated, unconsolidated sediments, more complex flow bottom structures formed (Mackin, 1961; Grolier and Bingham, 1978; Swanson et al., 1979a, 1979b; DOE, 1988; Beeson et al., 1989). Examples of flow bottom structures include:

- Pillow lava complexes (Figures 6 and 7), which form when lava flows into standing water.
- Hyaloclastite complexes which form when lava flows into running water.
- Spiracles which form when lava rapidly crosses wet ground and the water is explosively converted to steam which creates an irregular, cylindrical void that can be partially filled with glassy angular debris. Spiracles can range from 3 to 50 plus feet in diameter and can extend upward within the flow for distances of 3 to +100 feet. Spiracles generally terminate within the flow, but in rare cases can pass entirely through the flow.
- Peperite which is a basalt/sediment breccia, which forms when lava invades water saturated sediment and explosively mixes with the sediment.
- Invasive flow forms when lava burrows into underlying sediments. Lava typically forms crude pillow-like structures within the sedimentary layer. In extreme cases, the advancing flow burrows into, and through, the sediment and rafts it away on top of the flow.

2.2 Structural Geology

The study area is situated in an upland area along the northern margin of the Umatilla Basin. This upland area is the result of uplift and deformation along the northwest-trending Horse Heaven Hills anticlinal ridge system/Wallula Fault Zone and the northeast-trending Columbia Hills anticlinal ridge system (Figure 5). Both the Horse Heaven Hills anticlinal ridge system/Wallula Fault Zone and the Columbia Hills anticlinal ridge system are regional-scale structural features that are considered to be part of the Yakima Fold Belt (Reidel et al., 1989a; Tolan and Reidel, 1989). A number of mapped, subsidiary, northwest-trending faults are associated with the Wallula Fault Zone (e.g., Vansycle Canyon, Warm Springs Canyon). The Horse Heaven Hills anticlinal ridge system/Wallula Fault Zone separates the Umatilla Basin from the Pasco and Walla Walla Basins to the north (Figure 5).

The presence of faults (or suspected faults) is important because they can potentially modify the hydraulic behavior of the CRBG aquifer system. Groundwater investigations in the Columbia Plateau area have determined that faults can affect the occurrence and movement of groundwater through CRBG aquifers (e.g., Newcomb, 1959, 1961, 1969; Gephart et al., 1979; Oberlander and Miller, 1981; Lite and Grondin, 1988; DOE, 1988; Burt, 1989; Johnson et al., 1993; Wozniak, 1995; Packard et al., 1996; Tolan et al., 2000; Tolan and Lindsey, 2000). Faults have been found to impact the CRBG aquifer system in a number of ways, including:

- Forming barriers to the lateral and vertical movement of groundwater; a series of faults can create hydrologically isolated areas.
- Providing a vertical pathway (of varying length) for groundwater movement allowing otherwise confined CRBG aquifers to be in direct hydraulic communication.
- Exposing interflow zones creating local opportunities for aquifer recharge and/or discharge.

For example, groundwater data suggests that the structural features associated with the northeast-trending Columbia Hills anticlinal ridge system form a groundwater barrier that separates the CRBG aquifer system in the Umatilla Basin from the CRBG aquifer system that underlies the Horse Heaven Plateau to the north (Davies-Smith et al., 1988; Packard et al., 1996). Unpublished groundwater data indicates that the Wallula Fault Zone forms a hydrologic barrier that separates the CRBG aquifer system in the Umatilla Basin from the CRBG aquifer system in the Pasco Basin and Walla Walla Basins to the north.

Based on surface geologic mapping of the CRBG in the Wallula Gap area (Gardner et al., 1981; Swanson et al., 1979b, 1981; Madin and Geitgey, 2007), the exposed Saddle Mountains and Wanapum Basalt flows do contain intraflow structures (e.g., flow top breccias, pillow complexes) that could host high-yield aquifers. The absence of high-yield aquifers within the upper CRBG section could be due to a combination of factors that include low rates of natural recharge, numerous natural discharge areas resulting from uplift and deep incision of this portion of the CRBG, and the potential effects of faulting on lateral continuity (north, south, east, and west) of the CRBG intraflow zones.

3 Data Collection Methods

This section summarizes the methods used to collect and analyze aquifer testing and water quality data. A 72-hour aquifer test was conducted by IRZ Consulting, LLC (IRZ) at Well 1 from October 27 to October 30, 2014. Water quality and age-dating samples were collected at Wells 1 and 2 on May 7, 2025, and Wells 3 and 4 on May 12, 2025.

3.1 Aquifer Testing Methods

IRZ conducted a 72-hour aquifer test at Well 1 and collected water levels in Well 4. Refer to Appendix B for IRZ's Aquifer Testing Report. Well 1 was pumped at roughly 860 gallons per minute (gpm) while flow rates and water levels were continuously monitored.

3.1.1 Water Level Measurements

Well 1: Prior to beginning the aquifer test, an airline was installed in Well 1. The pressure of the airline was automatically recorded every 30 minutes throughout the duration of the test. The air pressure inside the airline was then converted to water level in feet below ground surface (bgs).

Well 4: Prior to the start of the aquifer test, a pressure transducer was installed in Well 4. Pressure readings were recorded every 30 minutes throughout the duration of the test. Pressure readings were converted to water level in feet bgs.

3.1.2 Flow Rate

The pumping rate at Well 1 was recorded using the existing Supervisory Control and Data Acquisition (SCADA) data system. Water was continuously pumped through a nearby irrigation pivot equipped with a pressure regulator to provide consistent back pressure to the system. The goal of operating the system in this manner was to maintain a consistent flow rate throughout testing. Because the CRBG is a confined aquifer, and the discharge water generated during the test was applied to the land surface, the water levels would not have been impacted by return flows.

3.2 Water Quality Sampling Methods

The water sampling methods detailed below were provided to OWRD in a 2024 technical memorandum (GSI, 2024). OWRD approved the sampling plan on December 6, 2024.

3.2.1 Sampling Procedure for General Chemistry

Groundwater samples were collected using the following procedures at each well:

- **Water Level Measurement.** The sampling process began with collection of a static water level measurement prior to turning on the pump.
- **Well Purging.** Each well was pumped for a sufficient period to allow for (1) the removal of three borehole volumes from the well, based on the recorded static water level and total well depth, and (2) stabilization of field parameters.
  - *Field Parameter Collection.* A multiparameter meter and turbidimeter were used to collect field parameters via a flow through cell. Readings were collected at 5-minute intervals until three successive readings meet the following criteria for stabilization:

  - pH: ± 0.1
  - Conductivity: ± 3%
  - Oxidation-reduction potential (ORP): ± 10 millivolts
  - Dissolved oxygen (DO) and turbidity: ± 10 percent

- **Sample Collection.** Field personnel began filling sample bottles after field parameters stabilized and three borehole volumes had been purged. Bottles were placed on ice immediately after filling.
  - *Collection Point.* Samples were collected from a sample tap located on the well discharge, prior to any mixing with water in other parts of the irrigation system.

3.2.2 Sampling for Groundwater Age Dating Analytes

The sampling methods and requirements for the groundwater age-dating analytes were provided by the specific laboratories:

- Tritium, radiocarbon, and stable isotopes were analyzed by Isotech using Isotech's proprietary Isoflasks. The Isoflasks were filled from a vacuum using a low-flow flexible tube.
- Chlorofluorocarbons (CFCs) were collected in small glass bottles via a copper cube secured to the discharge. The glass bottles were filled in a large beaker while fully submerged, minimizing head space.
- Helium and neon were collected in copper tubes by pinching both ends of the tube after the tube had been sufficiently purged through. Both the CFCs and helium and neon bottles samples were sent to the Utah Noble Gas Lab.

3.2.3 Laboratory Analyses

Water samples were analyzed by four independent laboratories, based on the requested analyses listed below. Appendix C contains a complete list of the water quality analyses. Appendix D contains the laboratory reports.

- General Chemistry (common ions, including fluoride) were analyzed by Anatek Labs in Spokane, Washington.
  - Wells 3 and 4 were resampled for nitrate and nitrite on May 15, 2025, due to the samples being out of hold time upon receipt by the laboratory. These analyses were conducted by Umpqua Labs in Pendleton, Oregon.
- Water quality parameters (pH, dissolved solids, specific conductance) were recorded by GSI and IRZ during sampling using a YSI multi-parameter meter.
- Groundwater dating analytes [radiocarbon, stable isotopes, tritium, CFCs:
  - Tritium, radiocarbon, and stable isotopes were analyzed by Isotech Labs in Champaign, Illinois.
  - CFCs, helium, and neon were analyzed by the Noble Gas Lab at the University of Utah in Salt Lake City, Utah. The laboratory was not able to perform the helium and neon analyses due to air bubbles being present in the copper tubes.

4 Hydrogeologic Assessment

The following section provides an assessment of the hydrogeology of the Rupp area, including aquifer parameters and potential for interference with water wells located within the Stage Gulch Critical Groundwater Area.

4.1 Aquifer Testing Results

IRZ's aquifer test was analyzed by GSI to estimate aquifer properties, which include:

- Aquifer transmissivity was calculated using the time-drawdown method of the late-stage water levels observed at Well 1. Noise in the late-time drawdown data suggests a possible change in the aquifer properties and two drawdown curves, were evaluated to generate a range of transmissivity values. Figure 8 shows the transmissivity calculations for both the drawdown curves.
- The Cooper-Jacob method was applied to calculate theoretical drawdown at any given distance from Well 1 during testing.

Transmissivity was estimated for the aquifer at Well 1 (which appropriates water from the same water-bearing zone as Well 4 [Figure 3]) using both the early and late-time slope of the time-drawdown graph (Figure 8). Noise in the late-time drawdown data during the aquifer test results in a range of possible transmissivity values. Transmissivity is estimated to be between 3,300 and 8,400 gallons per day per foot (gpd/ft). It is possible that a negative hydraulic boundary, such as a fault, may have resulted in the increased drawdown observed during the final day of the aquifer test.

Values of storativity in the CRBG are commonly between 10^{-4} and 10^{-5}, reflecting the high degree of confinement of the interflow zones and incompressible aquifer matrix (Conlon et al., 2005; McFarland and Morgan, 1996). Higher values of storativity calculated from some aquifer tests may indicate less confinement in some parts of the CRBG system. For the purpose of this report, the storativity of the CRBG is estimated to be 0.0005 (based on Golder, 1996).

The aquifer testing data (Appendix B) does not show any significant water level interference at Well 4 while Well 1 was pumping. Well 1 is located approximately 14,000 feet from Well 4.

The Cooper Jacob method was used to calculate theoretical drawdown for the range of transmissivity values at a distance from Well 1 both at the rate it was pumping during the aquifer test and when the wells are pumping at 5,610 gpm, the maximum rate allowed in water right G-17272. The Cooper-Jacob method non-equilibrium method assumes a horizontally and vertically homogenous aquifer and calculates instantaneous drawdown at a radius from the pumping well. As discussed previously, faulting in CRBG flows may create conditions in which lateral and/or vertical flow pathways are either created or reduced.

Theoretical drawdown was calculated at both the distance from Well 1 to Well 4 (14,000 feet), and the distance between Well 1 and the boundary of the Stage Gulch Critical Groundwater Area (32,000 feet) using the range of transmissivities noted above (which is more conservative than only using the higher, early value). The assumed duration of pumping was over the irrigation season (245 days). The maximum distance at which approximately 10 feet of drawdown would be observed is approximately 4.2 miles. The four Rupp wells are between approximately 4,500 and 5,100 feet away from each other from east to west, which indicates pumping interference is not likely to be observed between the wells for shorter durations, and may impart around 20 feet of interference if the pumping rate was held steady at the maximum permitted rate over the irrigation season (which is not how the farm would actually operate; these calculations were

completed to be consistent with OWRD practice).,The pumping response is not likely to propagate to other wells within the Stage Gulch Critical Groundwater Area, even with the conservative estimate of continuous pumping over the irrigation season.

5 Water Quality Analysis

This section summarizes the water quality results of the samples that were collected at Wells 1, 2, 3, and 4 in May 2025. The four Rupp wells were sampled for various inorganic compounds and age dating analytes. Appendix C provides all water quality data for the four Rupp wells.

5.1 Field Parameters and Inorganics

Generally, the water quality was consistent across the four Rupp wells. All analyzed constituents were within Oregon drinking water quality thresholds.

Observed water quality differences support the hydrogeologic framework described above, indicating that Wells 1 and 4 are completed in a similar geologic unit that is different than the water-bearing zones from which Wells 2 and 3 produce water (Figure 3). For example: Wells 1 and 4 had a hardness level of approximately 21 milligrams calcium carbonate ($CaCO_3$) per liter, while Wells 2 and 3 were both analyzed at 120 milligrams $CaCO_3$ per liter. The pH values at Wells 1 and 4 were recorded at approximately 8.5 pH units and the pH values of Wells 2 and 3 were approximately 7.9 pH units. Chloride and sulfate are slightly elevated in Wells 1 and 4 compared to Wells 2 and 3, and the hardness in Wells 1 and 4 is much lower than observed in Wells 2 and 3. The geochemical similarities between Wells 2 and 3, and Wells 1 and 4 is another line of evidence that these wells are in hydraulic communication with one another, and is consistent with the water levels observed in the wells.

Well 1 did not have a detectable concentration of Nitrate, and Wells 2, 3, and 4 all detected nitrate at 6.06, 3.98, and 0.47 milligrams per liter, respectively. Although all four wells are reported to have cement and/or bentonite seals into competent basalt, it is possible local structures, such as faulting, could allow for surficial water with higher nitrate concentrations to move downwards into the basalt aquifer system.

5.2 Age Dating Analysis

5.2.1 Groundwater Age

5.2.1.1 Tritium

An estimated groundwater age was determined using sampling data from four groundwater wells. Ages based on tritium (^3H) can provide only a qualitative assessment of age due to the non-unique concentrations in the atmospheric concentration history (Johnson et al., 2024). The median tritium concentration was 0.55 TU (tritium units) and ranged from 0.45 to 0.70 TU. The tritium concentration in recent precipitation in the area was around 3.5 TU (Jurgens, 2018). All wells sampled in this study demonstrate a tritium age of <70 years, which suggests one of two things: (1) the groundwater is derived from fully modern source waters or more likely, (2) the sampling point reflects a mixed signal, with predominantly late Pleistocene water and a small amount of younger (<70 years old) recharge, which is enough to bias stable isotopes. The consistency between tritium results and the detection of nitrates above 1 mg/l suggests an anthropogenic source. These lines of evidence suggest that there is a modern component of water in the wells.

5.2.1.2 Radiocarbon

Samples for radiocarbon (^{14}C) analysis were collected from the four wells. Ages were calculated using a piston flow model and assume an initial radiocarbon concentration of 100 pMC (percent modern carbon). The median radiocarbon age was 11,412 years before present and ranged from 5,463 years to 18,167

years (Table 2), which identifies with late Pleistocene–early Holocene. This is in line with the most recent study completed by Johnson et al. (2024), which focused heavily on the western side of the Umatilla basin and had a median groundwater age of around 11,100 years. These ages may be underestimated by 10,000 to 20,000 years, and corrections using dissolved inorganic carbon concentrations were beyond the scope of this study. Uncertainty calculations were also not included. All samples are considered to be mixtures of modern and premodern water even without sufficient age correction. Ages at Wells 1 through 4 are comparatively younger than other wells in the north of Hermiston (Johnson et al., 2024). Radiocarbon and tritium ages of all four wells and literature values are compared on Figure 9.

Table 2: Calculated Radiocarbon Age

Well ID	Radiocarbon Age (years before present)
UMAT 57044 (Rupp Well 1)	18,167
UMAT 57042 (Rupp Well 2)	6,144
UMAT 57041 (Rupp Well 3)	5,463
UMAT 57043 (Rupp Well 4)	15,876

5.2.1.3 Carbon Fluorocarbons

Recharge ages for Wells 1 through 4 were estimated using chlorofluorocarbon tracers (CFC-11, CFC-12, and CFC-113). Once widely used in refrigeration, aerosols, and foam production, these compounds entered the atmosphere from the 1940s and dissolved into groundwater, allowing concentrations to indicate recharge between the mid-1940s and late 1990s; production was largely phased out by the 1990s, so they serve as markers of modern or mixed groundwater (Chambers et al., 2019). The recharge age of Wells 1 through 4 ranges from 1949 to 1962 with an average of 1954. All wells sampled in this study show apparent CFC ages within the post-1940s range, which suggests one of two possibilities: (1) the groundwater is derived predominantly from recharge which occurred more than 80 years ago, or more likely, (2) the samples reflect a mixed signal attributed to a small contribution of younger, which occurred between 1949 to 1962. These findings are consistent with tritium age dating and nitrate results, which also indicate that a portion of the groundwater is less than 70 years old. Minimal amounts of modern recharge at this site does still occur on the order of <3 millimeters/year (Johnston et al. 2024). However, it's important to note that literature values which have characterized the fraction of modern water across the Umatilla Basin have composed at maximum 0.6% of the groundwater composition (Johnston et al. 2024).

5.2.1.4 Mean Age

Mean groundwater age was calculated for Wells 1 through 4. The median of the sample mean was 11,412 years and ranged from 5,310 years to 17,650 years. All samples exceeded 1,000 years. Water in the northwestern portion of the basin is considered late Pleistocene water. Water of this age is generally characterized by extremely low, less than 3 millimeters/year, of recharge. Johnson et al. (2024) found that across the basin, groundwater age did not vary with current precipitation gradients, suggesting that modern recharge is minimal. This dataset amongst others in the area have historically shown a strong age-depth

correlation, which indicates slow, localized infiltration, while major fault zones act as hydraulic barriers that limit lateral connectivity.

5.2.2 Groundwater Source

Stable oxygen ($\delta^{18}O$) and hydrogen ($\delta^{2}H$) isotope ratios in groundwater are used to determine recharge sources. Wells 1-4 range from $\delta^{2}H$= -115‰ to -140‰ and $\delta^{18}O$ = -14‰ to -17‰. Stable isotope compositions in this range typically align with precipitation formed in cooler climatic conditions (i.e., the Pleistocene). In Figure 10, all four wells plot along a straight line subparallel to and to the right of the global meteoric water line (GMWL) (slope = 8.64, r^2=0.94). The GMWL describes the global annual average relationship between hydrogen and oxygen isotope ratios in natural meteoric waters. Evidence of the groundwater at this site being dissimilar to modern recharge is most starkly observed at Well 1 and Well 4 which are significantly more deplete ($\delta^{2}H$= -139‰; $\delta^{18}O$ = -17‰) than modern precipitation ($\delta^{2}H$ = -100 to -110‰; $\delta^{18}O$ =-11‰ to -14‰, Johnston et al. 2024) for this region. When compared to literature values in Johnston et al. (2024), Wells 1and 4 plot most similarly to groundwater greater than 12,000 years old.

6 Groundwater Use and Development

This section identifies and characterizes existing groundwater rights in the study area. Table 3 summarizes the existing water right authorizations in the area, according to OWRD. Figure 11 shows the authorized points of appropriation identified in the study area. In the interest of simplifying the analysis, each well was given a corresponding reference number, as shown in the second column of Table 3.

Table 3. Authorized Points of Appropriation Within Study Area

Well ID	Reference Well Number	Aquifer	Water Right	Use Code	Maximum Authorized Appropriation	Season of Use
UMAT 57044 (Rupp Well 1)	1	CRBG	G 17272	Irrigation	12.5 cfs, 2,000 acre-feet per year	March–October
UMAT 57042 (Rupp Well 2)	2	CRBG				
UMAT 57041 (Rupp Well 3)	3	CRBG				
UMAT 57043 (Rupp Well 4)	4	CRBG				
UMAT 57711	5	CRBG	G 18193	Irrigation	0.75 cfs	March–October
UMAT 55719	6	CRBG	87419	Agriculture	0.33 cfs	Year round
UMAT 55672	7	CRBG	87420	Irrigation	7.44 cfs	March–October
UMAT 55752	8	CRBG				
UMAT 56199	9	CRBG				

Notes

cfs = cubic feet per second

CRBG

Of the nine points of appropriation (POAs) that were identified in the study area, all produce water from the CRBG aquifer system. All but one (UMAT 55719) are used for irrigation and are authorized to operate from March to October.

Wells one through four are the Rupp wells. These wells are located in the northern portion of the study area (Figure 1). These wells are operated by Rupp and extract water from the Wanapum basalt of the CRBG (Figure 3). The current permit stipulates a maximum cumulative rate of 12.5 cubic feet per second (cfs), with a total usage not to exceed 2,000 acre-feet per year. However, a Final Order dated January 14, 2020 (Permit G-17272), completely curtails the use of water under the permit due to static water levels declining below established reference levels. Rupp may request reconsideration of the curtailment once water levels have recovered above the reference elevations.

Well 5 is the only well located in the southeastern area of the study area (Figure 11) and is completed to 102 feet bgs. The water right permit associated with this POA was first issued in April of 2019 to irrigate 60 areas of land. The only reported water usage was a combined 0.03 acre-feet in the months of April and May of 2022. However, the maximum allowed rate of appropriation from the well is 0.75 cfs.

Wells 6, 7, 8, and 9, are located in the same general vicinity in the southwestern area of the study area and are completed between 871 and 1671 feet bgs (Figure 11). Well 6 is defined as an agricultural well and is authorized to use a maximum rate of 0.33 cfs. The most recent water use data shows that Well 6 pumped between 148.36 and 214.27 acre-feet between 2017 and 2021.

Wells 7, 8, and 9 are all authorized under Certificate 87420 for irrigation of 595.0 acres. Reported water use has been submitted only for Well 9 during the period between 2017 and 2022. The annual use for Well 9 ranged between 244 and 568 acre-feet per year. Prior to 2014, water use was reported for all three wells.

A search of the OWRD well report database website[1] found a total of 36 water supply wells within the study area (Appendix E). All 36 wells were completed within the CRBG aquifer system. A review of the data and information contained within these well reports indicate:

- The combined thickness of the Saddle Mountains Basalt and Wanapum Basalt is estimated to be at least 1,000 feet thick at the study area (GSI, 2009). Only 4 of the 36 wells have a completed depth that exceeds 1,000 feet and thus may be open to water-bearing zones within the Grande Ronde Basalt. Two wells (UMAT 56199 and UMAT 58217) (Appendix E) may penetrate a short distance into the Grande Ronde Basalt with completed depths of 1,671 and 1,379 feet bgs, respectively. However, the deepest geochemical data available (UMAT 3856) extends to 1,008 feet bgs and shows that the Silver Falls Flow of the Wanapum Basalt exists to a depth of at least 1,008 feet bgs.
- Reported pumping rates for wells in the study area appear to vary greatly, ranging from as low as 10 to 1,925 gpm. 22 of the 36 wells are classified as domestic use, and have a reported yield between 10 to 75 gpm. Domestic wells are typically characterized by a relatively low yield.

The current groundwater use within the study area, based on water use reporting, appears to be limited and primarily utilized during the summer months for irrigation. A review of groundwater elevation information for the study area indicates that some wells have shown declining water levels, while others appear to show increasing (or recovering) water levels from approximately 2020 to present. Rupp Wells 2 and 3 appear to be recovering, as well as UMAT 56199, 55752, and 57711. Figure 12 shows the total reported water use for the Rupp wells and the corresponding annual static water levels. Rupp stopped using Well 2 after the 2015 water year, Well 4 was not used after the 2018 water year, and Wells 1 and 3 were not used after the 2019 water year. With the cessation of pumping, the aquifer saw an immediate response. Water levels in Wells 1, 2, and 3 have recovered to the reference levels established by OWRD that need to be met prior to resuming groundwater pumping (Figure 13).

[1] https://apps.wrd.state.or.us/apps/gw/well_log/Default.aspx

7 Conclusions

This section describes the conclusions surrounding the availability of the groundwater resource in the Rupp study area.

The study area is located in a relative highland of the eastern portion of the Umatilla Basin. This highland is hydraulically isolated from the Walla Walla basin to the northeast due to the many structures that run parallel to the Horse Heaven Anticline. The study area is not known for yielding especially productive water supply wells; many of the wells in the study area are located downgradient in the lower elevation portion of the study area (Figure 1).

Groundwater resources in the study area appear to be relatively minimally utilized, producing water from the Wanapum Basalt Formation of the CRBG. Of the 37 wells that are in the study area, 28 are for exempt use, and the majority of groundwater production is during the irrigation season. Exempt wells are typically completed in shallower sections of the CRBG, have smaller diameters, and produce limited amounts of water due to smaller demands compared to irrigation wells.

Rupp Wells 1 and 4 (completed in the Sand Hollow and Silver Falls flows of the Wanapum Basalt) appear to be in hydraulic communication, and Wells 2 and 3 (completed in the Sand Hollow flow of the Wanapum Basalt) appear to be in hydraulic communication (Figure 3). These connections are apparent in groundwater level and geochemical data.

The age of the groundwater at the four Rupp wells appears to be relatively old; between 5,310 and 17,650 years before present. Groundwater ages of Wells 1 and 4 are more than twice as old as Wells 2 and 3, suggesting the Silver Falls flow of the Wanapum Basalt has a recharge source further from the study area than the overlying Sentinel Gap and Sand Hollow flows, or does not recharge water as effectively. Additionally, the known presence of faulting to the east of the site may inhibit groundwater flow upgradient of the site.

Based on the age-dating analysis, the groundwater in the vicinity of the Rupp property is primarily derived from ancient recharge that occurred during the late Pleistocene to early Holocene, under much colder climatic conditions than present. The sources of this recharge appear to be:

1. Direct infiltration of precipitation during the late Pleistocene, likely from snowmelt or cold-season precipitation at higher elevations.

2. Localized recharge zones in upland areas where thin soils, fractured basalt flow tops, or permeable sedimentary interbeds allowed infiltration into the Columbia River Basalt aquifer system.

Low-level tritium detections and CFCs data suggest some influence from recent recharge no younger than 1962, but the overall evidence strongly indicates that the groundwater is predominantly late Pleistocene in origin.

The aquifer testing analyses of Well 1 yields a range of transmissivities from between 3,300 and 8,400 gpd/ft at the site. Based on this range of aquifer transmissivity, a distance-drawdown evaluation of the four Rupp wells indicates that they are not likely to impact senior water right holders in the Stage Gulch Critical Groundwater area, even when all four wells are pumping at the maximum allowable discharge authorized by Permit G-17272.

Rebounding water levels during periods of non-use suggest ongoing recharge to and stabilization of the aquifer. It appears that groundwater levels for Wells 2 and 3 (completed in the Sand Hollow flow) have recovered to within 10-20 feet of the reference levels established for these wells after 6 years of non-use. The water level in Well 1 (completed in the Sand Hollow and Silver Falls flows) rebounded with a reduction of use between 2017 and 2019, and had equilibrated with the reference level after three years of non-use. The slowest recovery has been Well 4, which appropriates water from the Sand Hollow flow and deeper portions of the Silver Falls flow.

The two deeper Rupp wells appropriate water that is older than the shallower wells, as shown by groundwater quality and age-dating analysis. The best way to manage the resource in this area is to track water level trends. A balance of pumping and recharge can likely be obtained by monitoring water use and water levels on an annual basis.

8 References

GSI. 2024. Rupp Ranches Water Chemistry Sampling Plan. Technical memorandum to Justin Iverson, OWRD. From GSI Water Solutions. November 22, 2024.

GSI, 2009. Hydrogeologic Assessment of the Juniper Canyon Area. Letter report to Doug Woodcock, OWRD. From Terry Tolan, GSI Water Solutions. March 2, 2009.

Golder. 1996. City of Salem Aquifer Storage and Recovery Pilot Project Technical Memorandum on the ASR Pilot Test. March 29. Prepared for Montgomery Watson Americas, Inc.

Conlon, T.D., K.C. Wozniak, D. Woodcock, N.B. Herrera, B.J. Fisher, D.S. Morgan, K.K. Lee, and S.R. Hinkle. 2005. *Ground-Water Hydrology of the Willamette Basin, Oregon.* U.S. Geological Survey Scientific Investigations Report 2005-5168, 83 p.

Chambers, L.A., D.C. Gooddy, and A.M. Binley. 2019. "Use and Application of CFC-11, CFC-12, CFC-113 and SF_6 as Environmental Tracers of Groundwater Residence Time: A Review." *Geoscience Frontiers* 10 (5): 1643–1652.

McFarland, W.D., and D.S. Morgan. 1996. Description of the ground-water flow system in the Portland Basin, Oregon and Washington. U.S. Geological Survey Water-Supply Paper 2470-A, 58 p.

Beeson, M.H. and T.L. Tolan. 1990. "The Columbia River Basalt Group in the Cascade Range, a middle Miocene reference datum for structural analysis." *American Geophysical Union Journal of Geophysical Research*, v. 95, no. B12, p. 19,547-19,559.

Beeson, M.H. and T.L. Tolan. 1996. Field trip guide to Columbia River Basalt intracanyon flows in western Oregon and Washington - Ginkgo, Rosalia, and Pomona flows. Cordilleran Section Meeting of the Geological Society of America, Portland, Oregon, 35 p.

Beeson, M.H., K.R. Fecht, S.P. Reidel, and T.L. Tolan. 1985. "Regional correlations within the Frenchman Springs Member of the Columbia River Basalt Group - new insights into middle Miocene tectonics of northwestern Oregon." *Oregon Geology*, v. 47, no. 8, p. 87-96.

Beeson, M.H., T.L. Tolan, and J.L. Anderson. 1989. The Columbia River Basalt Group in western Oregon, geologic structures and other factors that controlled emplacement patterns, in, Reidel. S.P., and Hooper, P.R., eds., Volcanism and Tectonism in the Columbia River Flood-Basalt Province. Geological Society of America Special Paper 239, p. 223-246.

Burt, W.C. 1989. The hydrogeology of structurally complex basalts in Black Rock and Dry Creek Valleys, Washington. University of Idaho, Moscow, Idaho, M.S. thesis, 78 p.

Davies-Smith, A., E.L. Bolke, and C.A. Collins. 1988. Geohydrology and digital simulation of the ground-water flow system in the Umatilla Plateau and Horse Heaven Hills area, Oregon and Washington. U.S. Geological Survey Water-Resources Investigations Report 87-4268, 72 p.

Gardner, J.N., M.G. Snow, M.G., and K.R. Fecht, K.R. 1981. Geology of the Wallula Gap area, Washington: Rockwell Hanford Operations, Richland, Washington, RHO-BWI-LD-9, 67 p.

Gephart, R.E., R.C. Arnett, R.G. Baca, L.S. Leonhart, F.A. Spane, Jr. 1979. Hydrologic studies within the Columbia Plateau, Washington: an integration of current knowledge: Richland, Washington, Rockwell Hanford Operations, RHO-BWI-ST-5.

Grolier, M.J. and J.W. Bingham. 1978. "Geology of parts of Grant, Adams, and Franklin Counties, east-central Washington." Washington State Division of Geology and Earth Resources Bulletin 71, 91 p.

Johnson, V.G., D.L. Graham, and S.P. Reidel. 1993. Methane in Columbia River basalt aquifers, isotopic and geohydrologic evidence for a deep coal-bed gas source in the Columbia Basin, Washington. The American Association of Petroleum Geologists Bulletin, v. 77, no. 7, p. 1192-1207.

Johnson, H.M., K. Ely and A.T. Maher. 2024. Timing and Source of Recharge to the Columbia River Basalt Groundwater System in Northeastern Oregon. Groundwater, 62: 761-777. https://doi.org/10.1111/gwat.13404

Jurgens, B.C., 2018. Data for Tritium deposition in precipitation in the United States, 1953-2023 (ver. 2.0, May 2023). U.S. Geological Survey data release. https://doi.org/10.5066/P92CEFXN.

Lindberg, J.W. 1989. A numerical study of cooling joint width and secondary mineral infilling in four Grande Ronde Basalt flows of the central Columbia Plateau, Washington, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province: Geological Society of America Special Paper 239, p. 169-185.

Lite, K.E., Jr. and G.H. Grondin. 1988. Hydrogeology of the basalt aquifers near Mosier, Oregon - a ground water resources assessment. Oregon Department of Water Resources Ground Water Report, no. 33, 119 p.

Mackin, J.H. 1961. A stratigraphic section in the Yakima Basalt and Ellensburg Formation in south-central Washington. Washington Division of Mines and Geology Reports of Investigations 19, 45 p.

Madin, I.P., and R.P. Geitgey. 2007. Preliminary geologic map of the Umatilla Basin, Morrow and Umatilla Counties, Oregon. Oregon Department of Geology and Mineral Industries Open-File Report O-07-15, scale 1:100,000, 3 plates, 19 p.

McMillan, K., P.E. Long, and R.W. Cross. 1989. Vesiculation in Columbia River basalts, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province: Boulder, Colorado, Geological Society of America Special Paper 239, p. 157-168.

Newcomb, R.C. 1959. Some preliminary notes on ground water in the Columbia River basalt: Northwest Science, v. 33, no. 1, p. 1-18.

Newcomb, R.C. 1961. Storage of ground water behind subsurface dams in the Columbia River basalt, Washington, Oregon, and Idaho. U.S. Geological Survey Professional Paper 238A, 15 p.

Newcomb, R.C. 1969. Effect of tectonic structure on the occurrence of ground water in the basalt of the Columbia River Group of The Dalles area, Oregon and Washington. U.S. Geological Survey Professional Paper 383-C, 33 p.

Oberlander, P.L. and D.W. Miller. 1981. Hydrologic studies in the Umatilla structural basin - an integration of current knowledge. Oregon Department of Water Resources, unpublished preliminary report, 41 p.

Packard, F.A., A.J. Hansen, Jr., and H.H. Bauer. 1996. Hydrogeology and simulation of flow and the effects of development alternatives on the basalt aquifers of the Horse Heaven Hills, south-central Washington. U.S. Geological Survey Water-Resources Investigations Report 94-4068, 92 p.

Reidel, S.P. 1998. "Emplacement of Columbia River flood basalt." *American Geophysical Union Journal of Geophysical Research*, v. 103, no. B11, p. 27,393-27,410.

Reidel, S.P. and T.L. Tolan. 1992. Eruption and emplacement of a flood basalt - an example from the large-volume Teepee Butte Member, Columbia River Basalt Group. Geological Society of America Bulletin, v. 104, no. 12, p. 1650 -1671.

Reidel, S.P., K.R. Fecht, M.C. Hagood, and T.L. Tolan. 1989a. The geologic evolution of the central Columbia Plateau, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province: Geological Society of America Special Paper 239, p. 247-264.

Reidel, S.P., T.L. Tolan, and M.H. Beeson. 1994. Factors that influenced the eruptive and emplacement histories of flood basalt flows; a field guide to selected vents and flows of the Columbia River Basalt Group, in, Swanson, D.A., and Haugerud, R.A., eds., Geologic field trips in the Pacific Northwest. Seattle, Washington, Department of Geological Sciences, University of Washington Publication, v. 1, chp. 1B, p. 1-18.

Reidel, S.P., T.L. Tolan, P.R. Hooper, M.H. Beeson, K.R. Fecht, R.D. Bentley, and J.L. Anderson. 1989b. The Grande Ronde Basalt, Columbia River Basalt Group - stratigraphic descriptions and correlations in Washington, Oregon, and Idaho, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province. Geological Society of America Special Paper 239, p. 21-53.

Self, S., T. Thordarson, and Keszthelyi, 1997, Emplacement of continental flood basalt flows, *in*, Mahoney, J.J., and Coffin, M.F., eds, Large igneous provinces: American Geophysical Union, Geophysical Monograph 100, p. 381-410.

Shaw, H.R. and D.A. Swanson. 1970. Eruption and flow rates of flood basalts, in, Gilmour, E.H., and Stradling, D., eds., Proceedings of the second Columbia River basalt symposium: Eastern Washington College Press, Cheney, Washington, p. 271-299.

Strait, S.R. and R.B. Mercer. 1987. Hydraulic property data from selected test zones on the Hanford Site: Rockwell Hanford Operations, Richland, Washington, SD-BWI-DP-051, rev. 2, 31 p.

Swanson, D.A., J.L. Anderson, V.E. Camp, P.R. Hooper, W.H. Taubeneck, and T.L. Wright. 1981. Reconnaissance geologic map of the Columbia River Basalt Group, northern Oregon and western Idaho: U.S. Geological Survey Open-File Report 81-797, scale 1:250,000.

Swanson, D.A., T.L. Wright, P.R. Hooper, and R.D. Bentley. 1979a. Revision in the stratigraphic nomenclature of the Columbia River Basalt Group: U.S. Geological Survey Bulletin 1457-G, 59 p.

Swanson, D.A., Anderson, J.L., Bentley, R.D., Camp, V.E., Gardner, J.N., and Wright, T.L. 1979b. Reconnaissance geologic map of the Columbia River Basalt Group in Washington and adjacent Idaho: U.S. Geological Survey Open-File Report 79-1363, scale 1:250,000.

Tolan, T.L., and K.A. Lindsey. 2000. Hydrogeologic evaluation of the Port of Morrow well number 4, Umatilla Basin, Oregon: Daniel B. Stephens & Associates, Inc., Richland, Washington, consultant report prepared for the Port of Morrow, Boardman, Oregon, v. 1 & 2, 98 p., 2 plates.

Tolan, T.L. and S.P. Reidel. 1989. Structure map of a portion of the Columbia River flood-basalt province, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province: Geological Society of America Special Paper 239, Plate 1, scale 1:576,000.

Tolan, T.L., N.P. Campbell, N.P., and K.A. Lindsey. 2000. Exploring the hydrogeology of the Columbia River Basalt Group - a field guide to selected localities in the Columbia Plateau, Washington: Third Washington State Hydrogeology Symposium, October 14-15, 2000, Tacoma, Washington, 66 p.

Tolan, T.L., S.P. Reidel, M.H. Beeson, J.L. Anderson, K.R. Fecht, and D.A. Swanson, 1989, Revisions to the estimates of the areal extent and volume of the Columbia River Basalt Group, in, Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River flood-basalt province: Geological Society of America Special Paper 239, p. 1-20.

Tolan, T.L., B.S. Martin, S.P. Reidel, J.L. Anderson, K.A. Lindsey, and W. Burt, 2009. An introduction to the stratigraphy, structural geology, and hydrogeology of the Columbia River flood-basalt province – a primer for the GSA Columbia River Basalt Group field trips, *in*, O'Connor, J.E., R.J. Dorsey, and I.P. Madin, eds., Volcanoes to Vineyards – geologic field trips through the dynamic landscape of the Pacific Northwest: Geological Society of America Field Trip Guide 15, p. 599-643.

DOE. 1988. Site characterization plan, Reference Repository Location, Hanford Site, Washington - consultation draft: Washington, D.C., Office of Civilian Radioactive Waste Management, DOE/RW-0164, v. 1 & 2. U.S. Department of Energy.

Wozniak, K.C. 1995. Chapter 2 - Hydrogeology, in, Hydrogeology, groundwater chemistry, and land uses in the lower Umatilla Basin Groundwater Management Area, northern Morrow and Umatilla Counties, Oregon - Final Review Draft: Salem, Oregon, Oregon Department of Environmental Quality Report, p. 2.1-2.80.

Figures

FIGURE 1

Study Area Overview

Rupp Ranches Groundwater Characterization Report

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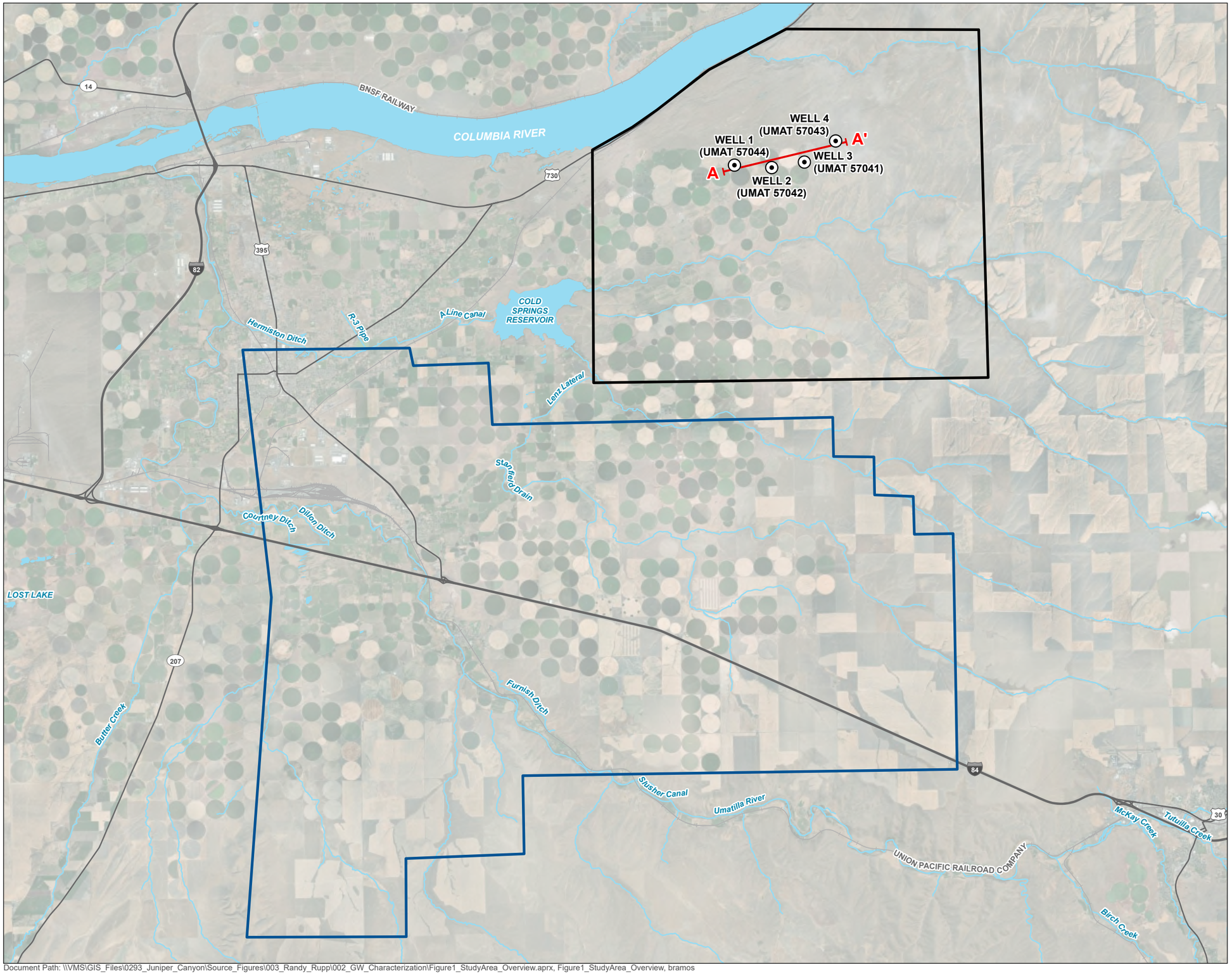

LEGEND

- Well
- Cross Section Line
- Study Area
- Stage Gulch Critical Groundwater Area

All Other Features

- Major Road
- Railroad
- Watercourse
- Waterbody

PROJECT LOCATION

N

0 6,500 13,000 19,500
FEET

Date: November 21, 2025
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

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FIGURE 2

Cross Section Overview

Rupp Ranches Groundwater Characterization Report

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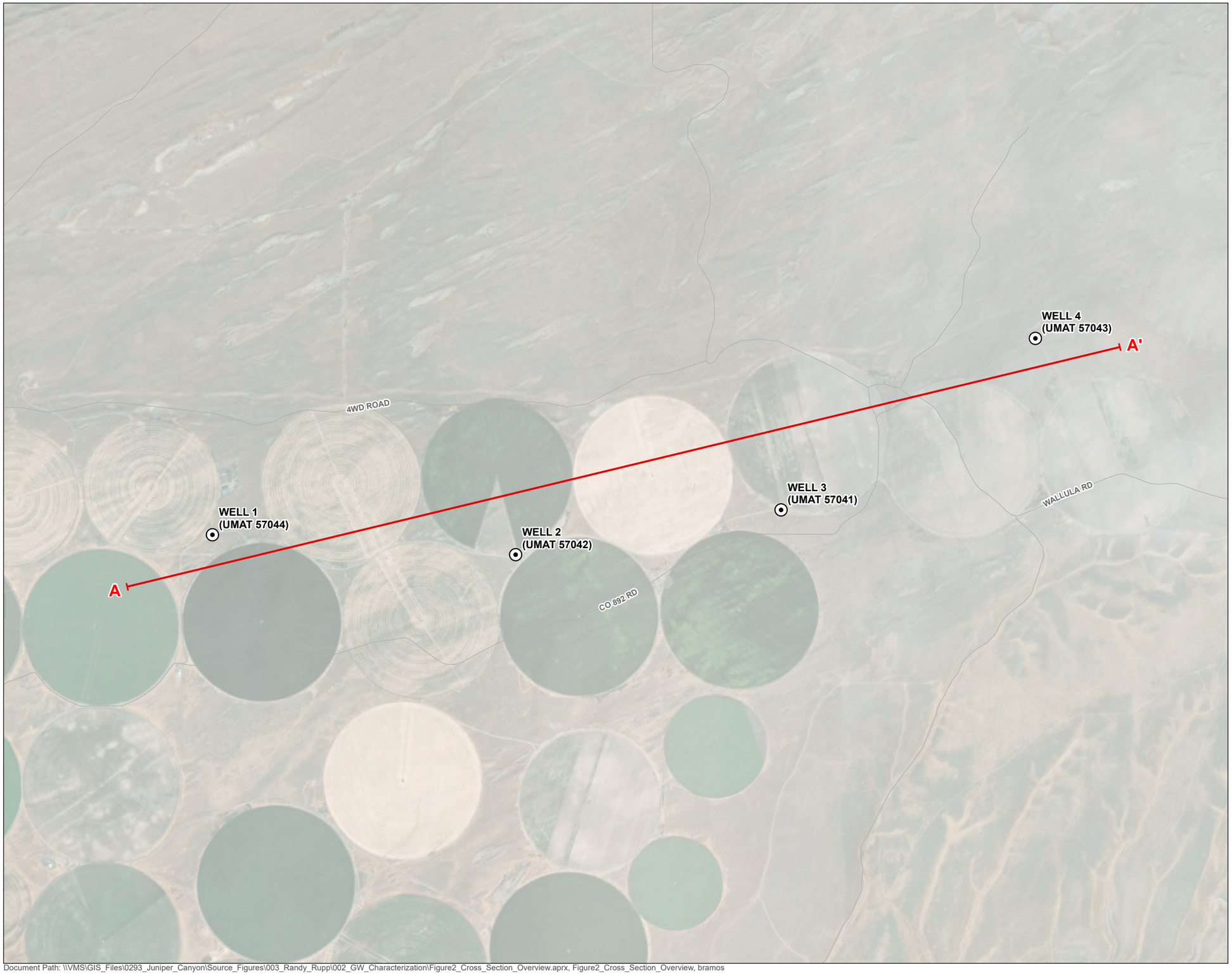

LEGEND

- Well
- Cross Section Line

All Other Features

- Road

N

0 800 1,600 2,400
FEET

Date: November 21, 2025
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

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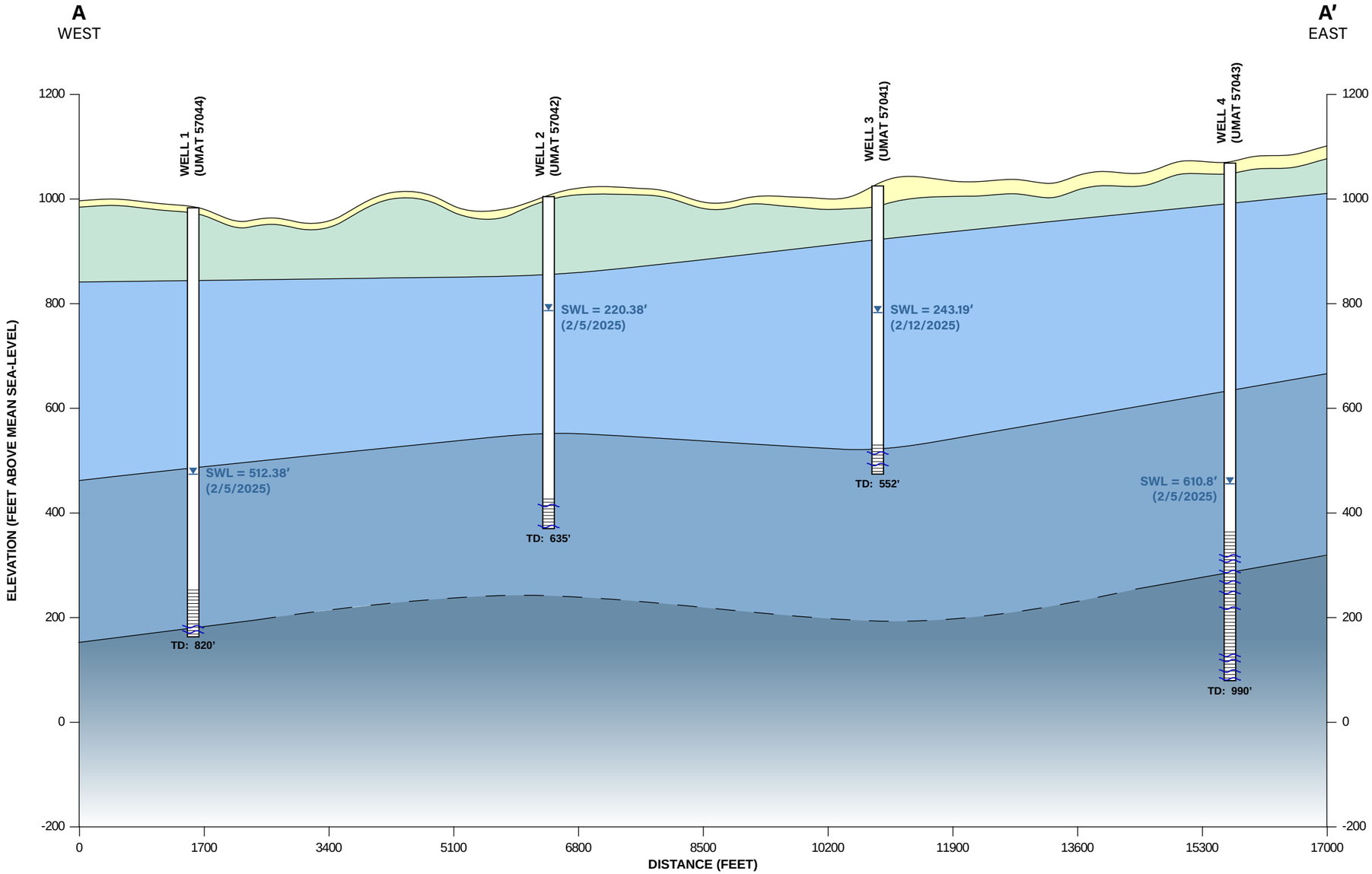

LEGEND

- Surficial Sediments
- Alkali Canyon Formation
- Wanapum Basalt, Frenchman Springs Member, Sentinel Gap
- Wanapum Basalt, Frenchman Springs Member, Sand Hollow
- Wanapum Basalt, Frenchman Springs Member, Silver Falls

WELL LEGEND

- Sealed
- Open Interval
- Water-Bearing Zone

TD: 820' (feet below ground surface)

FIGURE 3

Cross Section A-A'

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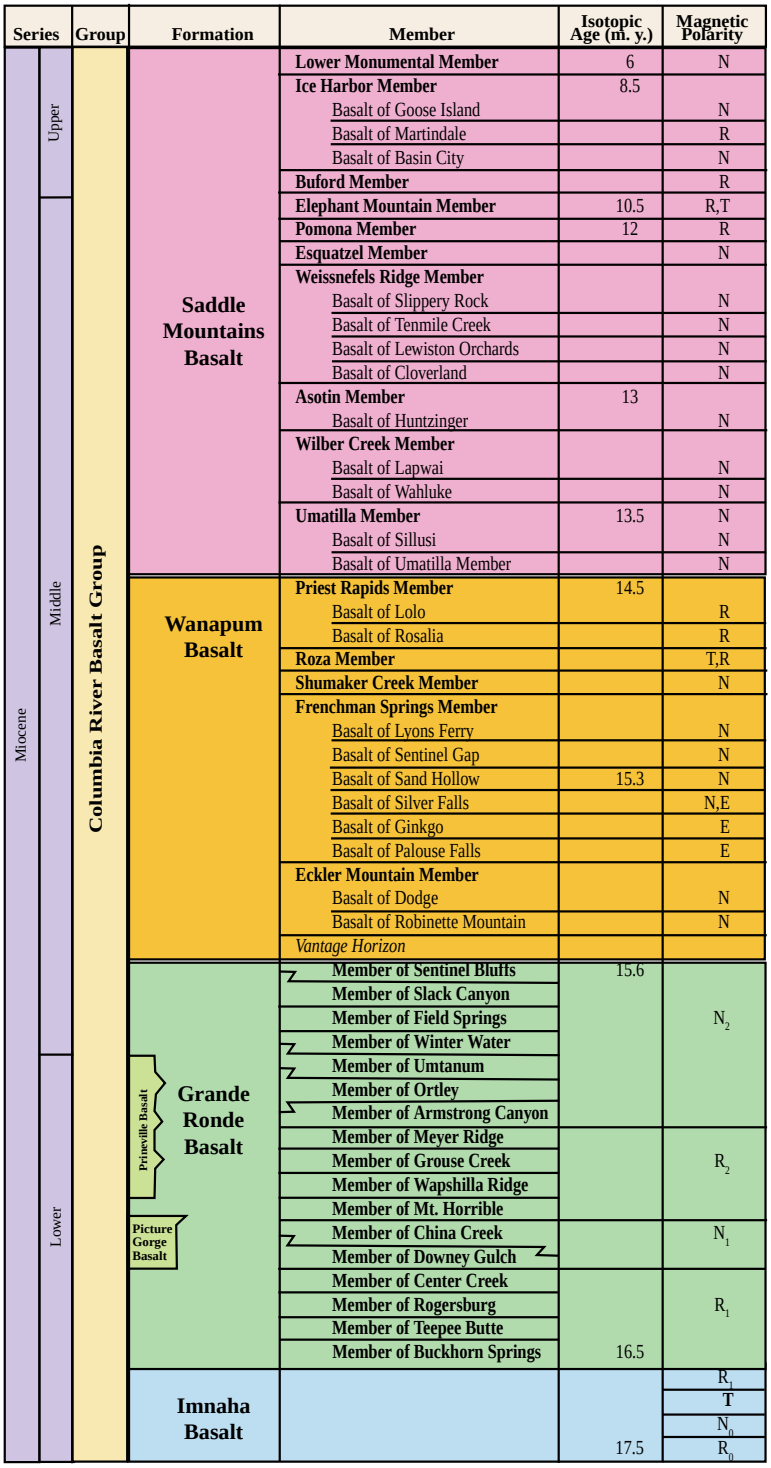

Series	Group	Formation	Member	Isotopic Age (m. y.)	Magnetic Polarity
Miocene / Upper	Columbia River Basalt Group	Saddle Mountains Basalt	Lower Monumental Member	6	N
			Ice Harbor Member	8.5	
			Basalt of Goose Island		N
			Basalt of Martindale		R
			Basalt of Basin City		N
			Buford Member		R
			Elephant Mountain Member	10.5	R,T
			Pomona Member	12	R
			Esquatzel Member		N
			Weissnefels Ridge Member		
			Basalt of Slippery Rock		N
			Basalt of Tenmile Creek		N
			Basalt of Lewiston Orchards		N
			Basalt of Cloverland		N
			Asotin Member	13	
			Basalt of Huntzinger		N
			Wilber Creek Member		
			Basalt of Lapwai		N
			Basalt of Wahluke		N
			Umatilla Member	13.5	N
			Basalt of Sillusi		N
			Basalt of Umatilla Member		N
Middle		Wanapum Basalt	Priest Rapids Member	14.5	
			Basalt of Lolo		R
			Basalt of Rosalia		R
			Roza Member		T,R
			Shumaker Creek Member		N
			Frenchman Springs Member		
			Basalt of Lyons Ferry		N
			Basalt of Sentinel Gap		N
			Basalt of Sand Hollow	15.3	N
			Basalt of Silver Falls		N,E
			Basalt of Ginkgo		E
			Basalt of Palouse Falls		E
			Eckler Mountain Member		
			Basalt of Dodge		N
			Basalt of Robinette Mountain		N
			Vantage Horizon		
Lower		Grande Ronde Basalt (Prineville Basalt)	Member of Sentinel Bluffs	15.6	N_2
			Member of Slack Canyon		
			Member of Field Springs		
			Member of Winter Water		
			Member of Umtanum		
			Member of Ortley		
			Member of Armstrong Canyon		
			Member of Meyer Ridge		R_2
			Member of Grouse Creek		
			Member of Wapshilla Ridge		
			Member of Mt. Horrible		
		Picture Gorge Basalt	Member of China Creek		N_1
			Member of Downey Gulch		
		Grande Ronde Basalt	Member of Center Creek		R_1
			Member of Rogersburg		
			Member of Teepee Butte		
			Member of Buckhorn Springs	16.5	
		Imnaha Basalt		17.5	R_1 / T / N_0 / R_0

Nomenclature of the Columbia River Basalt Group (from Reidel and others, 2002)

FIGURE 4

Stratigraphy of the Columbia River Basalt Group

Rupp Ranches Groundwater Characterization Report

NOTE

Modified from Tolan and others (1989) and Reidel and others (1989b).

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FIGURE 5

Geologic Structures

Rupp Ranches Groundwater Characterization Report

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WELL 1 (UMAT 57044)
WELL 2 (UMAT 57042)
WELL 3 (UMAT 57041)
WELL 4 (UMAT 57043)

WASHINGTON
OREGON
BENTON CO.
UMATILLA CO.
WALLA WALLA CO.
UMATILLA CO.

Columbia Canal Number 2
Walla Walla River
MOUND POND
YELLEPIT POND
COLD SPRINGS RESERVOIR
A Line Canal
Lenz Lateral
Touchet West Side Ditch
Touchet River
Pine Creek
Greasewood Creek
HORSE HEAVEN ANTICLINE
VANSYCLE CYN FAULT
WALLULA FAULT
HELIX FAULT

LEGEND

- Well
- Cross Section Line
- Defined Study Area
- Fold
- Fault

Surficial Geology

- Saddle Mountain Basalt
- Wanapum Basalt
- Grande Ronde Basalt
- Alluvial deposits
- Missoula Flood deposits
- Eolian deposits

All Other Features

- Stage Gulch Critical Groundwater Area
- State Boundary
- County Boundary
- Major Road
- Watercourse
- Waterbody

N

0 6,000 12,000 18,000
FEET

Date: November 21, 2025
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

GSI Water Solutions, Inc.

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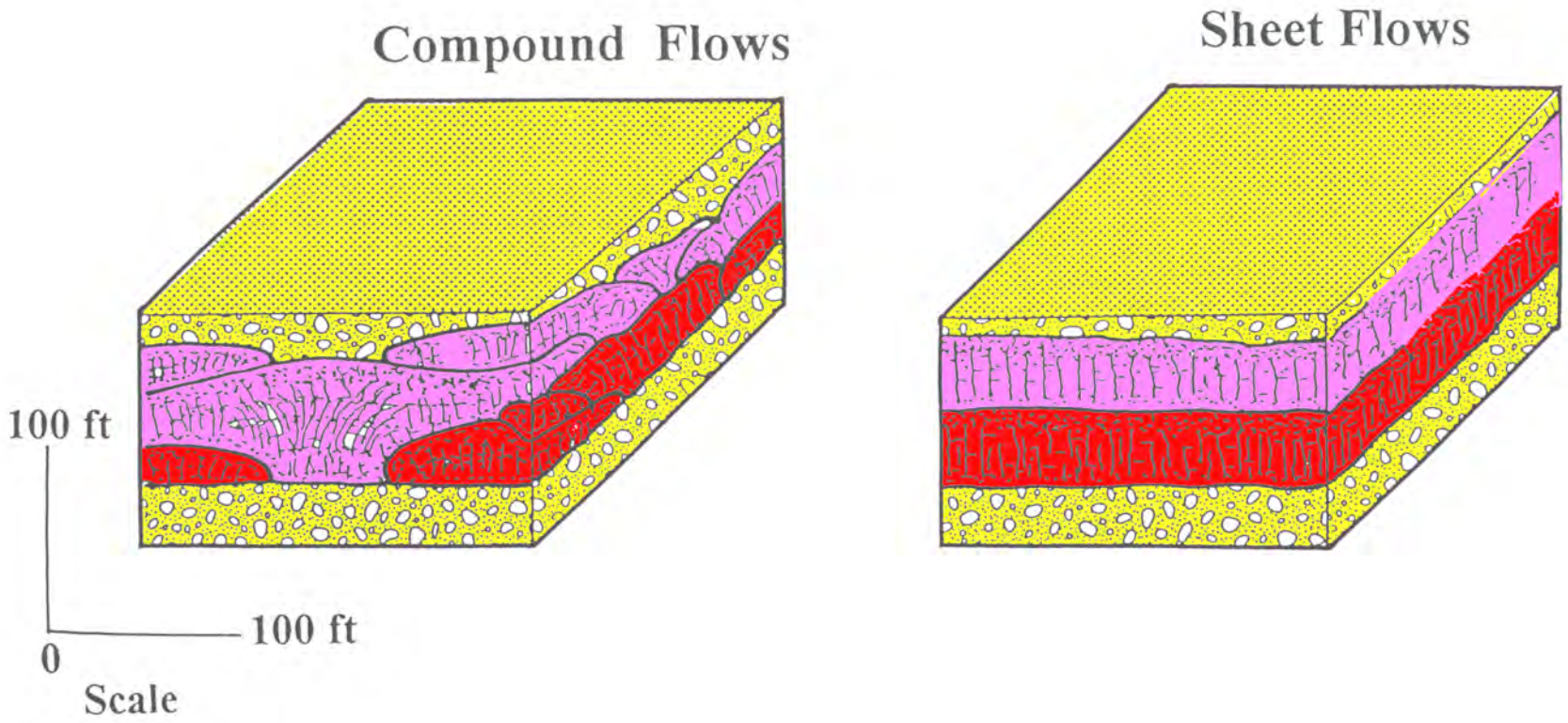


FIGURE 6

Compound and Sheet Flow Structure

Rupp Ranches Groundwater Characterization Report

NOTES
From Tolan et al. (2009).
Two individual lava flows (purple – younger flow; red – older flow) are portrayed with sediments (yellow) both below and above these lava flows.

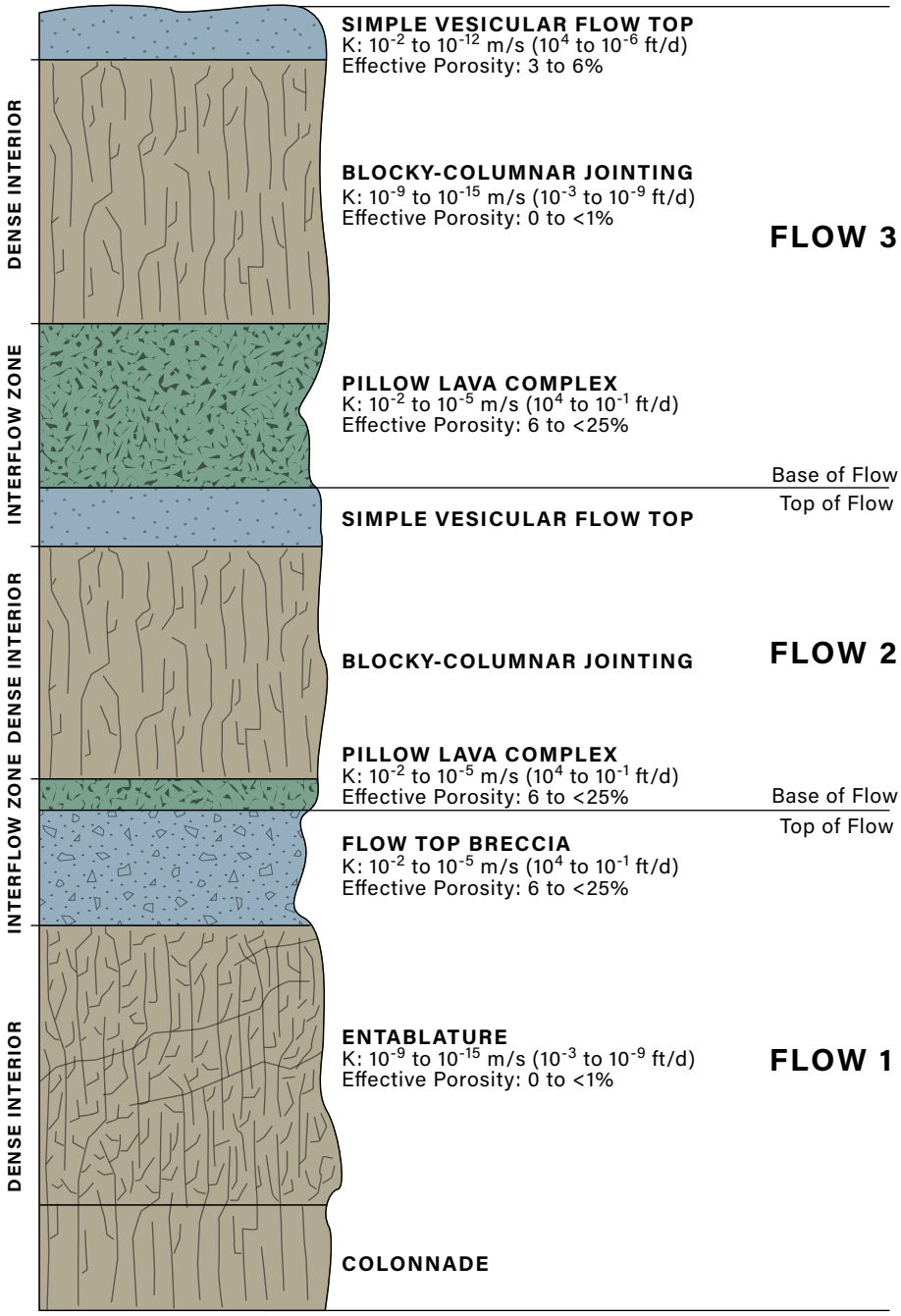


FIGURE 7

Common Columbia River Basalt Group Intraflow Structures

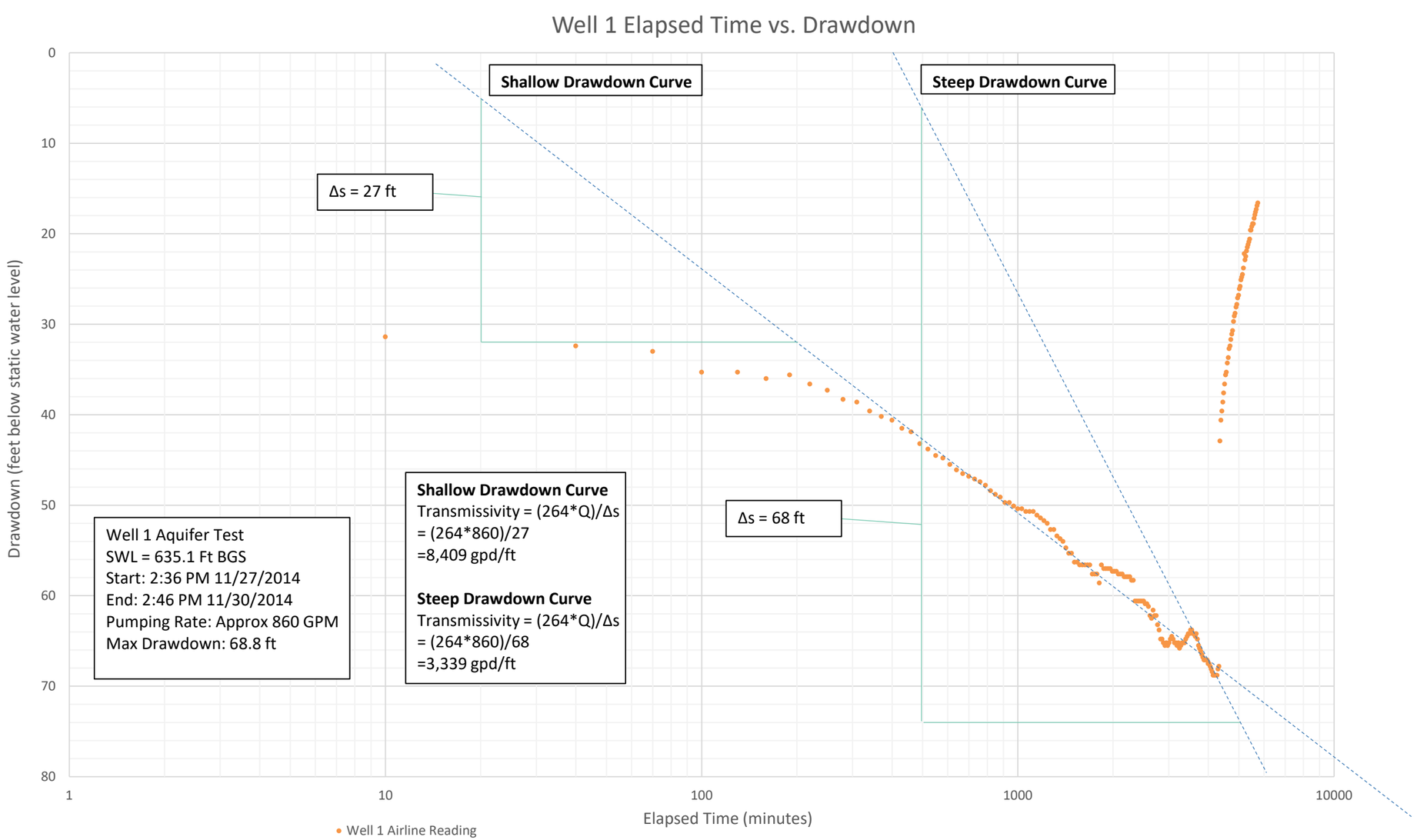
Rupp Ranches Groundwater Characterization Report

NOTE

Flow tops are highlighted in blue, dense interiors in brown, and flow bottoms in green. From Tolan et al. (2000).

GSI Water Solutions, Inc.

Y:\0293_Juniper_Canyon\Source_Figures\003_Randy_Rupp\002_GW_Characterization



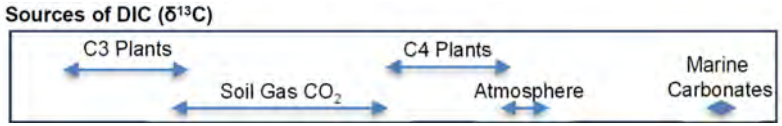
NOTES
Δs = drawdown during one log cycle (feet) Q
= Pumping test discharge (gpm)

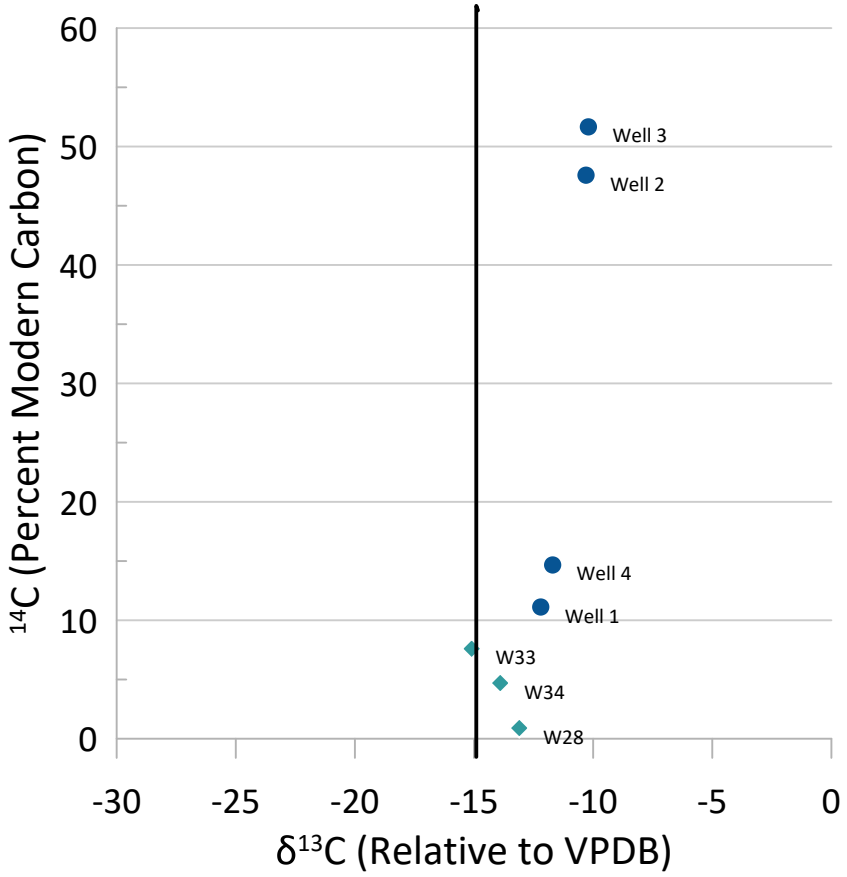
FIGURE 8

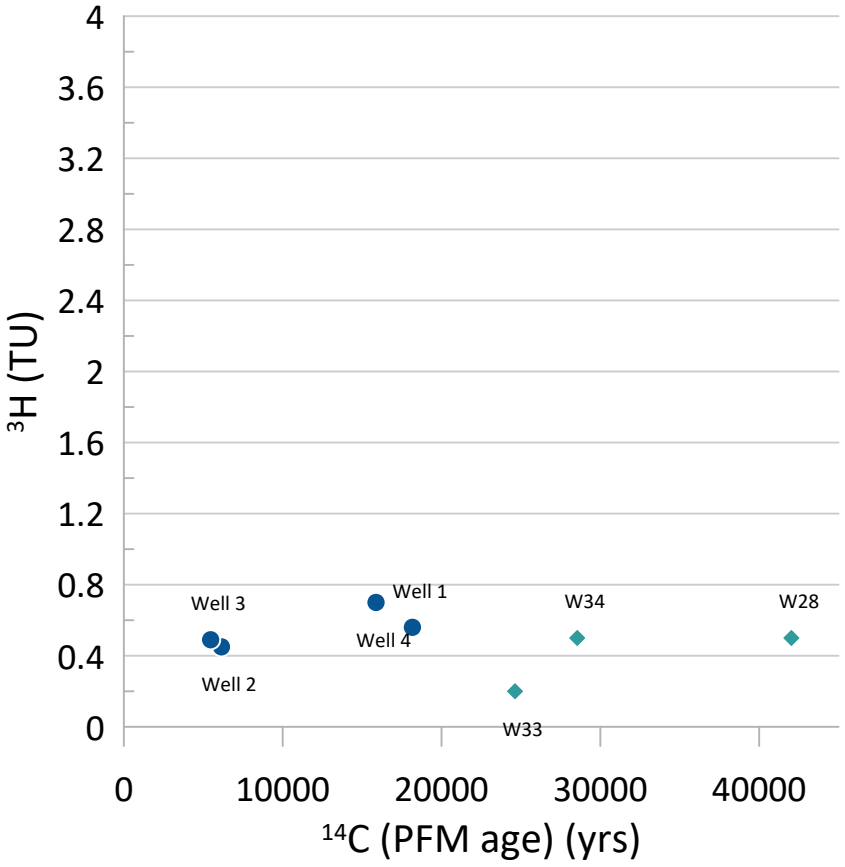
Rupp Well 1 Time-Drawdown Graph

Rupp Ranches Groundwater Characterization Report

GSI Water Solutions, Inc.







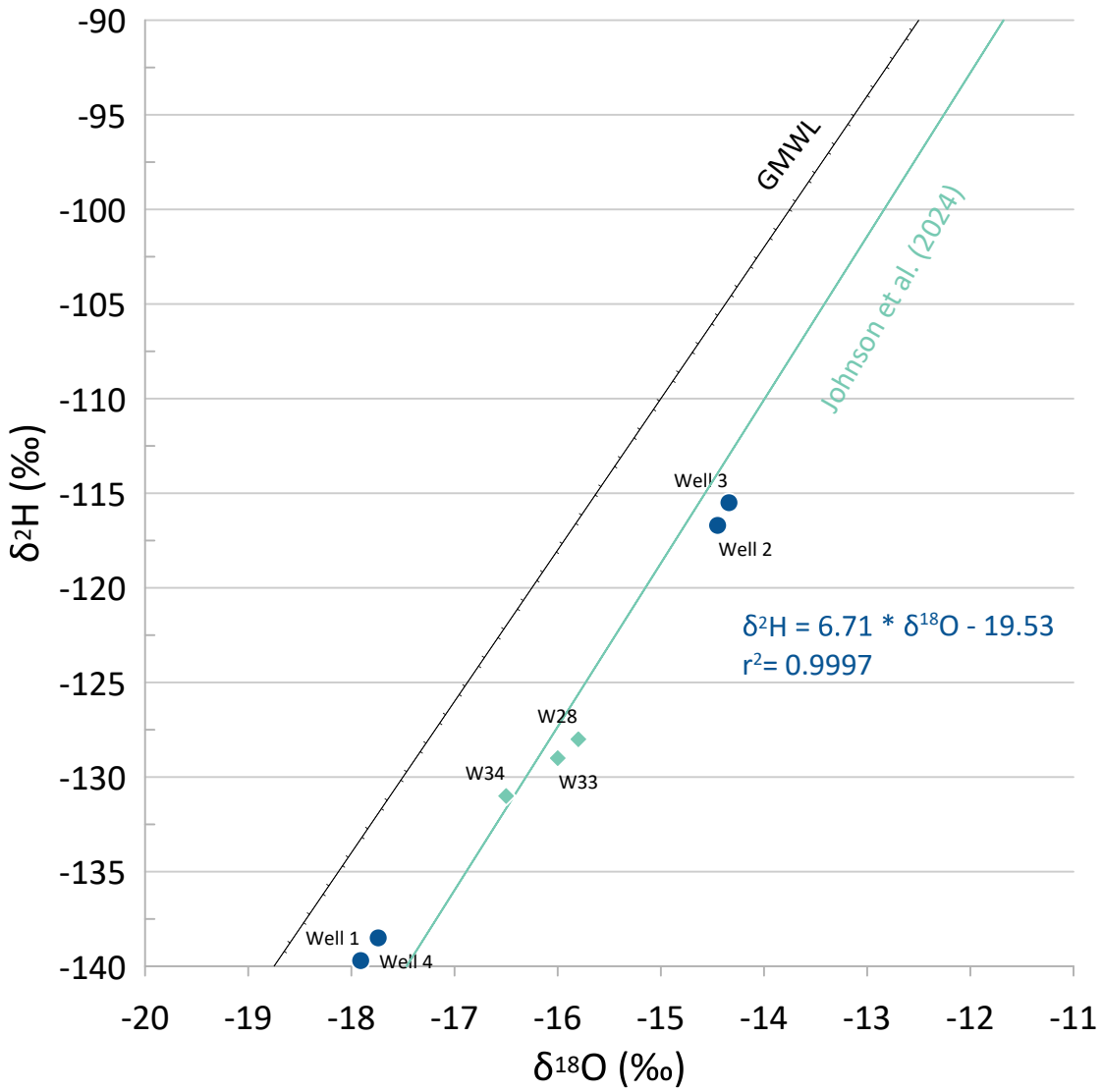
LEGEND

- Rupp Ranch Wells
- Johnson et al. (2024)

NOTE(S)
PFM = Piston Flow Model

FIGURE 9
Groundwater Age Estimation - Radiocarbon (^{14}C) and Tritium (^{3}H)
Rupp Ranches Groundwater Characterization Report

GSI Water Solutions, Inc.



LEGEND

- Rupp Ranch Wells
- GWML
- Johnson et al. (2024)

NOTE(S)

FIGURE 10

Groundwater Age Estimation - Oxygen ($\delta^{18}O$) vs Deterium ($\delta^{2}H$)

Rupp Ranches Groundwater Characterization Report

GSI Water Solutions, Inc.

FIGURE 11

Authorized Points of Appropriation

Rupp Ranches Groundwater Characterization Report

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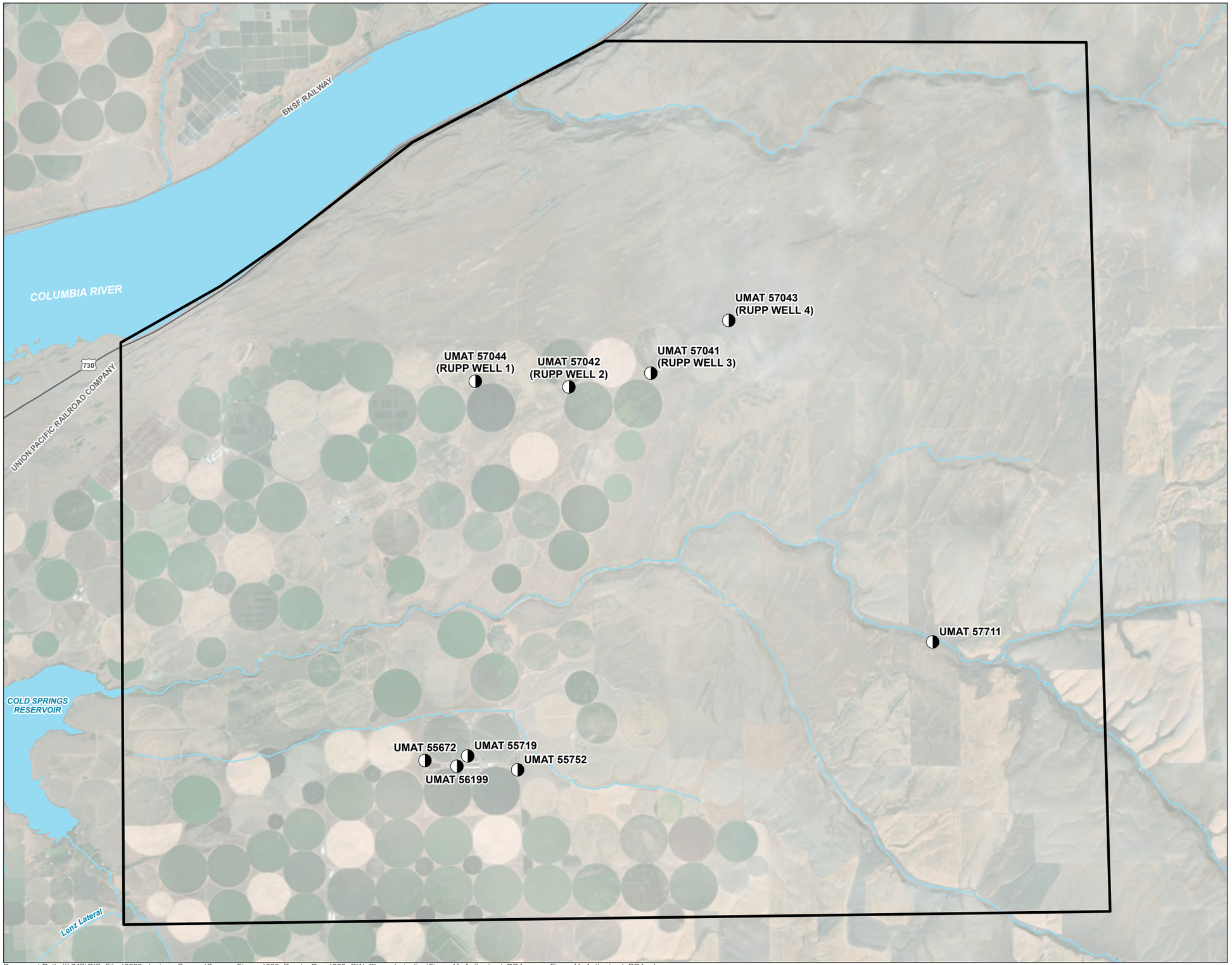


LEGEND

- Authorized Point of Appropriation
- Study Area

All Other Features

- Major Road
- Railroad
- Watercourse
- Waterbody

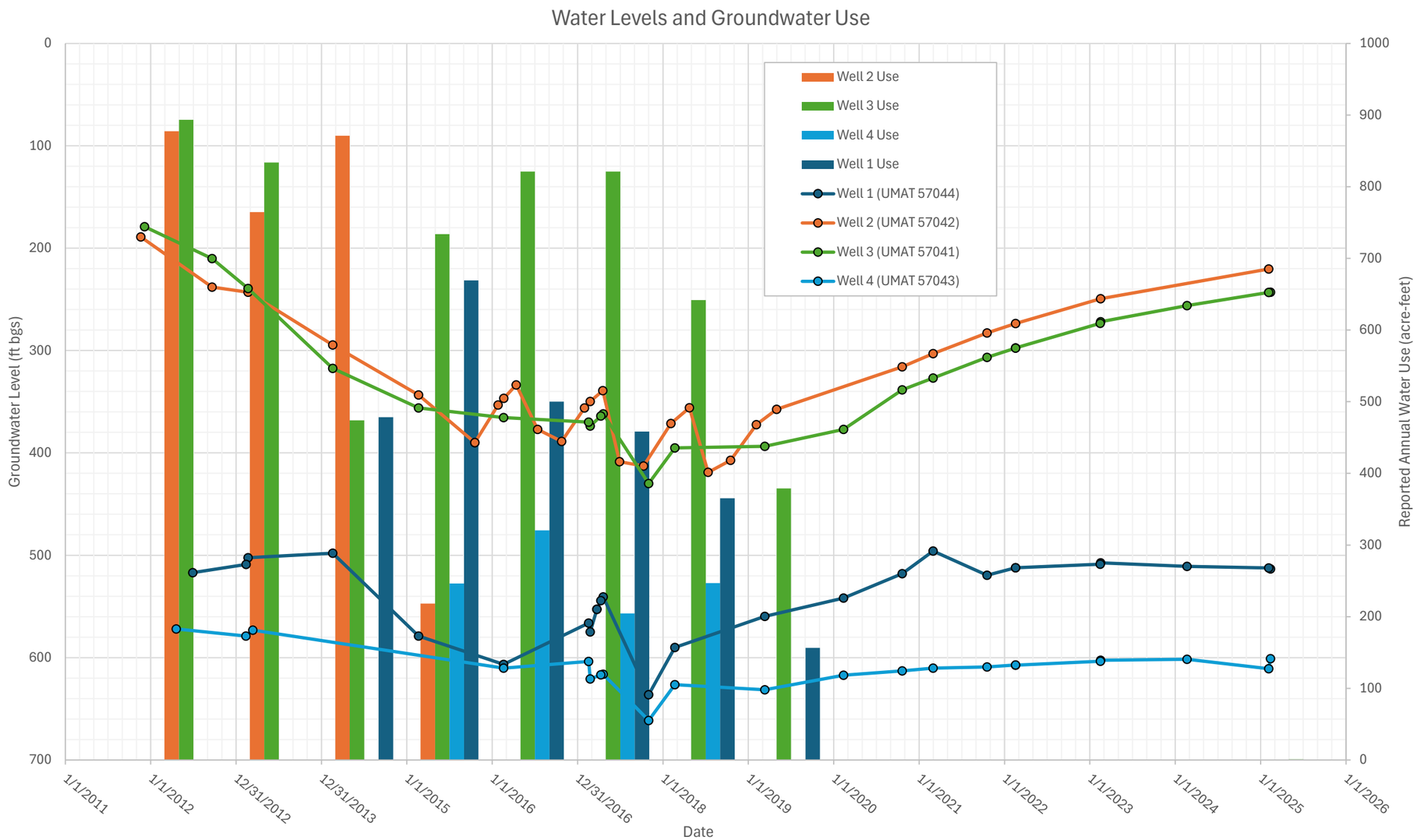
N

0 2,600 5,200 7,800
FEET

Date: February 16, 2026
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

GSI Water Solutions, Inc.

Document Path: \\VMS\GIS_Files\0293_Juniper_Canyon\Source_Figures\003_Randy_Rupp\002_GW_Characterization\Figure11_Authorized_POAs.aprx, Figure11_Authorized_POAs, bramos



NOTES
Water usage is is a cumulative value based on the water year

FIGURE 12

Rupp Groundwater Levels and Usage

Rupp Ranches Groundwater Characterization Report

GSI Water Solutions, Inc.

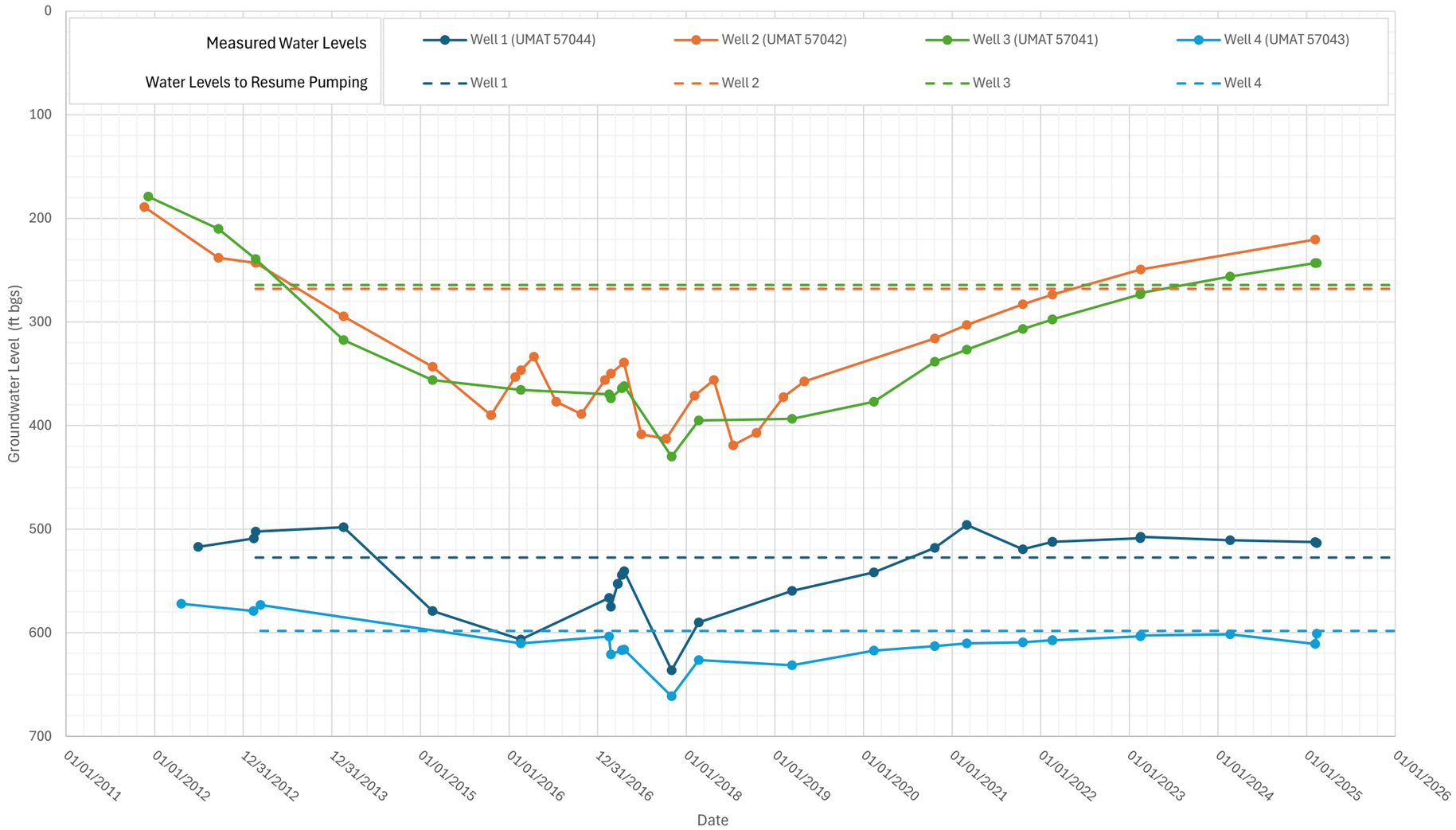


FIGURE 13

Rupp Groundwater Levels and Reference Levels

Rupp Ranches Groundwater Characterization Report

GSI Water Solutions, Inc.

APPENDIX A

Rupp Ranches Well Logs

UMAT 57044

UMAT 57044

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108650
START CARD # 1016763

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Kranichwood st
City Richland State Wa Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 820 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Scks/lbs
24	0	110	Bentonite	0	110		7040
20	110	805	cement	0	734		24yds
15	805	820					

How was seal placed: Method ■ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		20	-	1	110	.375	✓		✓	
✓		16	+	2	734	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ■ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
2000			2

Temperature 80 °F Lab analysis ☐ Yes By RECEIVED BY OWRD
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

SEP 13 2012
SALEM, OR

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 N or S Range 30 E or W W.M.
Sec 15 SW 1/4 of the NE 1/4 Tax Lot 100
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___' ___.___" or ___ ___.___ ___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___' ___.___" or ___ ___ ___.___ ___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd
Hermiston Oregon

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	6-29-12			517

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes
WATER BEARING ZONES Depth water was first found 121

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
6-7-12	133	147	20			121
6-11-12	582	597	400			121
6-15-12	390	605	2000			360
6-29-12	740	805	4000			517

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	5
Silty sand	5	60
Silty sand with gravel	60	62
Silty sand	62	107
Broken brown basalt	107	110
Broken brown + black basalt	110	133
Soft reddish brown basalt	133	147
Broken brown	147	214
Medium hard black basalt	214	226
Soft broken brown	226	320
Hard black basalt	320	326
Reddish brown soft	326	345
Hard black basalt	345	361
Soft black with green	361	370
Med hard brown + black	370	385
Hard black	385	436

Date Started 5-25-12 Completed 6-29-12

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 7-9-12
Signed _____
Contact Info. (optional)

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3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57044

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108650

START CARD # 206577

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Kranichwood st
City Richland State Wa Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 820 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Sacks/lbs
24	0	110	Bentonite	0	110		7040
20	110	805	Cement	0	734		24yds
15	805	820					

How was seal placed: Method ■ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		20	-	1	110	.375	✓		✓	
✓		16	+	2	734	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 N or S Range 30 E or W W.M.
Sec 15 SW 1/4 of the NE 1/4 Tax Lot 100
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___ . ___ " or ___ ___ . ___ ___ ___ ___ DMS or DD
Long ___ ° ___ ' ___ . ___ " or ___ ___ . ___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd
Hermiston Oregon

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	6-29-12			517

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
6-7-12	133	147				121
6-11-12	582	597				121
6-15-12	390	605				360
6-29-12	740	805				517

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	5
Silty sand	5	60
Silty Sand with gravel	60	62
Silty sand	62	107
Broken brown basalt	107	110
Broken brown + black basalt	110	133
Soft redish brown basalt	133	147
Broken brown	147	214
Medium hard black basalt	214	226
Soft broken brown	226	320
Hard black basalt	320	326
Redish brown soft	326	345
Hard black basalt	345	361
Soft black with Green	361	370
Med hard brown + black	370	385
Hard black	385	436

Date Started 5-25-12 Completed 6-29-12

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. All materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 7-9-12
Signed _____
Contact Info. (optional)

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ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57044

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108650

START CARD # 200577

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name _____ Last Name _____
Company _____
Address _____
City _____ State _____ Zip _____

(2) TYPE OF WORK ☐ New Well ☐ Deepening ☐ Conversion
☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community
☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection
☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Sacks/lbs

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County umatilla Twp 5 N or S Range 30 E or W W.M.
Sec 15 SW 1/4 of the NE 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___ ___.___" or ___ ___.___ ___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___ ___.___" or ___ ___ ___.___ ___ ___ ___ ___ DMS or DD

Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)

(11) WELL LOG Ground Elevation _____

Material	From	To
Soft black + Green	436	570
Med hard brown + black	570	592
Soft broken brown	592	597
Hard black	597	620
Hard Grey	620	790
Pourous broken brown	790	805
Hard black	805	820

Date Started _____ Completed _____

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number _____ Date _____
Signed _____
Contact Info. (optional)

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THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57042

UMAT 57042

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108634

START CARD # 1015305

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Ranchwood St.
City Richland State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 635 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Sacks/lbs
20	0	135	cement	0	580	27 yards	
20	580	635	open hole				

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16	+	2	580	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ■ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
2000			2

Temperature 72 °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

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SALEM, OR

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 N or S Range 30 E or W W.M.
Sec 14 SW 1/4 of the NE 1/4 Tax Lot 100
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___ . ___ " or ___ . ___ DMS or DD
Long ___ ° ___ ' ___ . ___ " or ___ . ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd Hermiston OR

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	11-20-11			169

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes
WATER BEARING ZONES Depth water was first found 190

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
10-5-11	0	275	40			190
10-10-11	275	360	150			180
10-20-11	360	448	50			189

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	7
Brown clay	7	133
Broken brown basalt	133	165
Small gravel	165	177
Fractured black basalt	177	193
Medium hard black basalt	193	248
Soft Green Clay + black basalt	248	277
Hard black basalt	277	299
Hard Grey basalt	299	330
Pourous black basalt	330	361
Soft Grey basalt	361	366
Soft black basalt	366	373
Medium hard black basalt	373	392
Very hard black basalt	392	437
Green Clay	437	441
Soft fractured black basalt	441	448

Date Started 10-3-11 Completed 11-25-11

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
SEP 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 11-25-11
Signed _____
Contact Info. (optional)

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ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57042

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108634

START CARD # 1015305

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Ranchwood St.
City Richland State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion
☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community
☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection
☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Sacks/lbs
20	0	135	cement	0	580	27 yards	

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16	+	2	580	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 ☐N or S Range 30 ☐E or W W.M.
Sec 14 SW 1/4 of the NE 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___ ___.___" or ___ ___.___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___ ___.___" or ___ ___ ___.___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd Hermiston OR

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
10-5-11	0	275				190
10-10-11	275	360				180
10-20-11	360	445				149

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	7
Brown clay	7	133
Broken brown basalt	133	165
Small gravel	165	177
Fractured black basalt	177	193
Medium hard black basalt	193	248
Soft Green clay + black basalt	248	277
Hard black basalt	277	299
Hard Grey basalt	299	330
Porous black basalt	330	361
Soft Grey basalt	361	366
Soft black basalt	366	373
Medium hard black basalt	373	392
Very hard black basalt	392	437
Green Clay	437	441
Soft fractured black basalt	441	448

Date Started 10-3-11 Completed 11-20-11

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____

Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 11-25-11

Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57042

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 109634

START CARD # 1015305

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name Rowdy Last Name Rupp
Company Rupp Ranches
Address 176 Kinnewood St.
City Richland State WA. Zip 99352

(2) TYPE OF WORK ☐ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD ☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Scks/lbs

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 N or S Range 30 E or W W.M.
Sec 14 SW 1/4 of the NE 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___°___'___.___" or ___.___ DMS or DD
Long ___°___'___.___" or ___.___ DMS or DD
Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)

(11) WELL LOG Ground Elevation _____

Material	From	To
Hard black basalt	448	471
Porous black & brown clay	471	564
Medium hard black basalt	564	531
Soft black basalt with some brown	531	561
Hard black basalt	561	582
Soft porous black basalt	582	595
Porous light brown basalt	595	615
Fractured black basalt	615	617
Hard grey basalt	617	635

Date Started _____ Completed _____

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____ SALEM, OR

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number _____ Date _____

Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57041

UMAT 57041

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108633

START CARD # 1015191

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Ranchwood St.
City Richland State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 552 ft.

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Sacks/lbs
20	0	540	cement	0	494	21 yds	
16	540	552	open hole				

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16	+	2	494	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ■ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
4000			2

Temperature 72 °F Lab analysis ☐ Yes By RECEIVED BY OWRD
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

SEP 13 2012
SALEM, OR

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 ■ N or ☐ S Range 30 ■ E or ☐ W W.M.
Sec 13 SE 1/4 of the NW 1/4 Tax Lot 100
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___ . ___ " or ___ . ___ ___ ___ ___ DMS or DD
Long ___ ° ___ ' ___ . ___ " or ___ . ___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd Hermiston

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	12-6-11			179

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found 178

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
10-27-11	6	285	35			178
10-31-11	285	485	100			178
11-1-11	485	522	4000			179

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	5
Silty Sand	5	22
Silty Brown Sand reddish dark	22	38
Brown Silt with gravel	38	102
Broken brown basalt	102	191
Medium hard black basalt	191	202
Soft Broken brown	202	206
Fractured black	206	214
Hard black basalt	214	247
Soft brown & black basalt	247	270
Hard black basalt	270	332
Soft black with green clay	332	341
Hard black basalt	341	350
Soft brown basalt	350	361
Hard black basalt	361	381
Soft brown & black basalt	381	392

Date Started 10-21-11 Completed 12-6-11

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are to the best of my knowledge and belief.

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____

(bonded) Water Well Constructor Certification SALEM, OR
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 12-10-11

Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57041

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108633

START CARD # 1015191

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name Rancy Last Name Rupp
Company Rupp Ranches
Address 176 Ryan Chwood St.
City Richland State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ■ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 552 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Scks/lbs
20	0	540	cement	0	494	21 yrds	
16	540	552					

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16	+	2	494	.375	✓		✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 ■ N ☐ S Range 30 ☐ E ■ W W.M.
Sec 13 SE 1/4 of the NW 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___.___ " or ___.___ DMS or DD
Long ___ ° ___ ' ___.___ " or ___.___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd Hermiston

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
10-27-11	0	285				178
10-31-11	285	485				178
11-1-11	485	522				179

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	5
Silty Sand	5	22
Silty Brown Sand reddish duh	22	38
Brown silt with gravel	38	102
Broken brown basalt	102	191
Medium hard black basalt	191	202
Soft Broken brown	202	206
Fractured black	206	214
Hard black basalt	214	247
Soft brown & black basalt	247	270
Hard black basalt	270	332
Soft black with green clay	332	341
Hard black basalt	341	350
Soft brown basalt	350	361
Hard black basalt	361	381
Soft brown & black basalt	381	392

Date Started 10-21-11 Completed 12-6-11

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number _____ Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 12-10-11
Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57041

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 108633

START CARD # 1015181

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 176 Kraichwood St.
City Richland State WA. Zip 99352

(2) TYPE OF WORK ☐ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Scks/lbs

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 ☒N or S Range 30 ☒E or W W.M.
Sec 13 SE 1/4 of the NW 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___' ___.___" or ___ ___.___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___' ___.___" or ___ ___ ___.___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) Juniper Rd Hermiston

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)

(11) WELL LOG Ground Elevation _____

Material	From	To
Soft Porous black with green clay	372	418
Soft brown & black basalt	418	440
Very hard black basalt	440	448
Soft black with green clay	448	453
Hard black basalt	453	469
Soft black with green clay	469	491
Hard black basalt	491	501
Soft black basalt	501	510
Porous brown basalt	510	532
Solid Grey basalt	532	552

Date Started _____ Completed _____

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____

SALEM, OR

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number _____ Date _____

Signed _____

Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57043

UMAT 57043

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L L108632

START CARD # 1015601

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 178 Kranchwood st
City Kennewick State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD ■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community ☐ Industrial/Commercial ■ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 990 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amount	Sacks/lbs
20	0	810	Cement grout	0	700	24 yards	
16	810	990	Open hole				

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16		2	700	.375			✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ■ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
3000			2

Temperature 72 °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

RECEIVED BY OWRD
SEP 13 2012
SALEM, OR

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5 ☐ N ☒ or S Range 31.0 ☐ E ☒ or W W.M.
Sec 7 NW 1/4 of the SW 1/4 Tax Lot 100
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___' ___ ___.___" or ___ ___.___ ___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___' ___ ___.___" or ___ ___ ___.___ ___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	4-20-12			572

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes
WATER BEARING ZONES Depth water was first found 166

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
12-21-11	166	189	50			166
12-25-11	635	655	1000			166
4-18-12	930	975	3000			572

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	22
Broken brown basalt	22	77
Hard black basalt	77	102
Soft brown basalt	102	138
Hard black basalt	138	161
Soft pourous rock	161	189
Med hard fractured black	189	200
Very hard black basalt	200	244
Soft brown & black with green	244	360
Hard black	360	368
Soft black pourous basalt	368	412
Hard black basalt	412	436
Soft brown basalt	436	471
Hard black basalt	471	480
Soft brown basalt	480	527
Hard black basalt	527	635

Date Started 12-16-11 Completed 4-19-12

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012

License Number 1 Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

SALEM, OR

License Number 1906 Date 4-22-12
Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57043

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L L108632

START CARD # 1015601

Instructions for completing this report are on the last page of this form.

1) LAND OWNER Owner Well I.D. _____
First Name Randy Last Name Rupp
Company Rupp Ranches
Address 1781 Kranchwood st
City Kennewick State WA Zip 99352

(2) TYPE OF WORK ■ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD ■ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community ☐ Industrial/Commercial ■ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well 990 ft.

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Sacks/lbs
20	0	810	cement grout	0	700	24 yards	
16	810	990					

How was seal placed: Method ☐ A ■ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd
✓		16	+	2	700	.375			✓	

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County Umatilla Twp 5.0 ◉ or S Range 31.0 ◉ or W W.M.
Sec 7 NW 1/4 of the SW 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___' ___ ___.___" or ___ ___.___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___' ___ ___.___" or ___ ___ ___.___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well	4-20-12			572

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
12-21-11	166	169	50			166
12-25-11	635	655	1000			166
4-18-12	930	975	3000			572

(11) WELL LOG Ground Elevation _____

Material	From	To
Sand	0	22
Broken brown basalt	22	77
Hard black basalt	77	102
Soft brown basalt	102	138
Hard black basalt	138	161
Soft porous red	161	189
Med hard fractured black	189	200
Very hard black basalt	200	244
Soft brown + black with green	244	360
Hard black	360	368
Soft black porous basalt	368	412
Hard black basalt	412	436
Soft brown basalt	436	471
Hard black basalt	471	480
Soft brown basalt	480	527
Hard black basalt	527	635

Date Started 12-16-11 Completed 4-19-12

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

RECEIVED BY OWRD
JUL 16 2012
SALEM, OR

License Number 1 Date _____
Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1906 Date 4-22-12
Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

UMAT 57043

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 109632

START CARD # 1015601

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Owner Well I.D. _____
First Name _____ Last Name _____
Company _____
Address _____
City _____ State _____ Zip _____

(2) TYPE OF WORK ☐ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Community ☐ Industrial/Commercial ☐ Livestock ☐ Dewatering ☐ Injection ☐ Thermal ☐ Other _____

(5) BORE HOLE CONSTRUCTION Special Standard: ☐ Yes (attach copy)
Depth of Completed Well _____ ft.

BORE HOLE Dia	From	To	Material	SEAL From	To	Amount	Scks/lbs

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Filter pack from _____ ft. to _____ ft. Material _____ Size _____
Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Csng	Linr	Dia	+	From	To	Gauge	Steel	Plastic	Welded	Thrd

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____
Temporary casing ☐ Yes Diameter _____ From _____ To _____

(7) PERFORATIONS/SCREENS
Perforations Method _____
Screens Type _____ Material _____

Perf	Scrn	Csng	Linr	Screen Dia	From	To	Screen/ slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature _____ °F Lab analysis ☐ Yes By _____
Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)
County _____ Twp _____ N or S Range _____ E or W W.M.
Sec _____ _____ 1/4 of the _____ 1/4 Tax Lot _____
Tax Map Number _____ Lot _____
Lat ___ ___° ___ ___' ___.___" or ___ ___.___ ___ ___ ___ DMS or DD
Long ___ ___° ___ ___' ___.___" or ___ ___ ___.___ ___ ___ ___ DMS or DD
Street Address of Well (or nearest address) _____

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL (ft)
Existing Well/Predeepening				
Completed Well				

Flowing Artesian? ☐ Yes Dry Hole? ☐ Yes

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL (psi)	+	SWL (ft)
[redacted]						

(11) WELL LOG Ground Elevation _____

Material	From	To
Soft Pomeus brown brown	635	655
Medium hard black basalt	655	748
Soft black	748	772
Soft pomeus red basalt	772	776
Soft black	776	791
Hard black with quartz	791	820
Greenish brown stone	820	839
Black pomeus basalt	839	845
Soft fractured black	845	879
Medium hard grey basalt	879	930
Soft grey with green	930	975
Hard black basalt	975	990

Date Started _____ Completed _____

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are to the best of my knowledge and belief.

RECEIVED BY OWRD

License Number _____ Date JUL 16 2012

Signed _____

SALEM, OR

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number _____ Date _____

Signed _____
Contact Info. (optional)

E-RECEIVED
3/9/2026
OWRD

ORIGINAL – WATER RESOURCES DEPARTMENT ONE COPY FOR CONSTRUCTOR ONE COPY FOR CUSTOMER
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK 10/16/2006

APPENDIX B

IRZ Consulting LLC, Aquifer Testing Report

JSH Farms – Rupp Well #1
Well Test Report

Background

JSH Farms leases several pivots from Randy Rupp that are served by wells. These wells are authorized under a water right permit issued by the State of Oregon. One of the provisions under that permit is that a 72 hour well test be performed on at least one of the wells being utilized under the permit.

At this time three wells are being utilized to irrigate several of the proposed pivots associated with the project. A fourth well has been drilled, but currently is not tied into the irrigation system. 2014 was the third year of operation for the project. In 2012 and 2013 Wells 2 and 3 were utilized as the sources of water. From analyzing the well logs and monitoring the static and dynamic water levels it appears that both of these wells are yielding from the same shallow basalt aquifer. The Spring static water levels in both of these wells have declined significantly each of the past two years, indicating that the volume removed from the shallow basalt aquifer has exceeded the recharge rate.

Well 1 was subsequently completed and a pump installed for the 2014 irrigation season. From analyzing the well log, the shallow basalt aquifer yielding water in Wells 1 and 2 was cased and sealed off in Well 1. This well penetrated into a medium depth aquifer that static water level measurements indicate has a static water elevation of approximately 300 feet lower than the static water elevations in Wells 2 and 3. This indicates that Well 1 is yielding from a totally different aquifer than Wells 2 and 3.

Owing to the fact that Wells 2 and 3 were showing significant declines in previous years, Well 1 was utilized to supply a share of the required water for the project during the 2014 irrigation season. Static and dynamic water levels were monitored during the irrigation season. These levels continued to drop throughout the irrigation season.

Well 4 was completed into the medium depth aquifer similar to Well 1, and additionally into a deeper water bearing zone not penetrated in Well 1. Oregon Department of Water Resources allowed these multiple zones to produce in the well, as it appears that they have similar static water levels, indicating that they have the same source. Since this well yields water from two different water bearing zones, the yield of this well is based upon the composite water availability of both zones.

Given the history of Wells 2 and 3 it appeared that getting aquifer information associated with Well 1 was the best course of action. Additionally it would provide an opportunity to see how the pumping of Well 1 would impact Well 4. A plan was put into place on how to proceed, and the following describes the process and associated results of testing Well 1 for 72 hours.

Process

In order to determine Well 1 aquifer characteristics it was necessary to have the well pumped at a constant rate for the entire 72 hours. Additionally the change in the dynamic water level in the well would be recorded. It was determined that a single center pivot could be operated for the entire 72 hours providing the constant demand. The subject pivot has pressure regulators that would keep the flow constant no matter where the pivot was located in the field. The flow was monitored and recorded by a SCADA recording system, and verified by field observations of the system flow meter.

To measure and monitor the dynamic water level an automated airline, recorder and satellite transmitter were installed in Well 1. With this piece of equipment the dynamic water level in the well was automatically recorded every 30 minutes and sent via satellite to the IRZ office in Hermiston. This minimized on the ground manual recording of data.

To determine the impacts to Well 4 a recording pressure transducer was placed in Well 4. This pressure transducer recorded the change in the static water level in Well 4 before, during and after the test.

To prepare for the test Well 1 was not operated for several days. The automated airline was installed in Well 1 and the pressure transducer was installed in Well 4. With everything in place the test commenced at 2:36 PM on October 27, 2014. The test ran continuously for 72 hours without incident until approximately 2:46 PM on October 30, 2014. The following are the results of that test:

Results

Well 1 was pumped continuously at an approximate rate of 860 gallons per minute for 72 hours. The flow data from the SCADA system indicates that there were some minor fluctuations during the test, but nothing of any significance. (See Appendix A) The recorded dynamic water level data shows a continuous decline for the entire 72 hours. (See Appendix B) The water level in Well 4, over 14,000 feet from Well 1, showed no impact for nearly 36 hours after the test started. From that point to several hours after the test a continuous small decline was recorded. (See Appendix C)

The data resulting from the 72 hour test was analyzed to determine aquifer characteristics, and the impact on Well 4. Given that Well 4 was over 14,000 feet from Well 1, and the fact that it is yielding from multiple water bearing zones, at least one of which isn't yielding to Well 1, it was determined that Well 4 could not be utilized as a direct monitoring well for the test. This required utilizing the information collected in Well 1 to determine the aquifer characteristics. This is somewhat problematic in that well efficiency can impact those results. However given the 72 hour nature of the test credible data was gathered and utilized.

The test data indicates that significant seasonal drawdown will take place ranging from 100 to 150 feet a year depending upon the rate of pumping. This indicates an aquifer that is not very efficient, and certainly raises many red flags. In addition when looking at the dynamic water levels that have been recorded over the irrigation season it appears even worse. The actual seasonal drawdown was over 200 feet. This indicates that there is likely some type of barrier in the yielding aquifer that restricts flow to the well after a period of time. During the 72 hour test the barrier did not impact the yield, but it appears obvious that one exists.

Conclusions

From the test it appears that this well is not very productive, and the data recorded during the irrigation season indicates even poorer capabilities than the 72 hour test. What is unknown is how completely the well will recover back to the original static water levels. Based upon the test and historical dynamic water levels it will be critical that full recovery takes place for the long term use of this well at its current demand.

The test also indicated that Wells 1 and 4 are directly connected with a common water bearing zone. It also appears that the deeper water bearing zone penetrated and yielding in Well 4 reduces the impact that the pumping of Well 1 has on Well 4, and subsequently the impact of the pumping of Well 4 will have on Well 1.

The Spring static water level measurements will provide critical information for determining the sustainable pumping levels out of the three existing wells. Based upon those determinations a plan on how to proceed in the near and long term can be established. It is highly likely that utilizing Well 4 in some fashion will need to be a part of that plan.

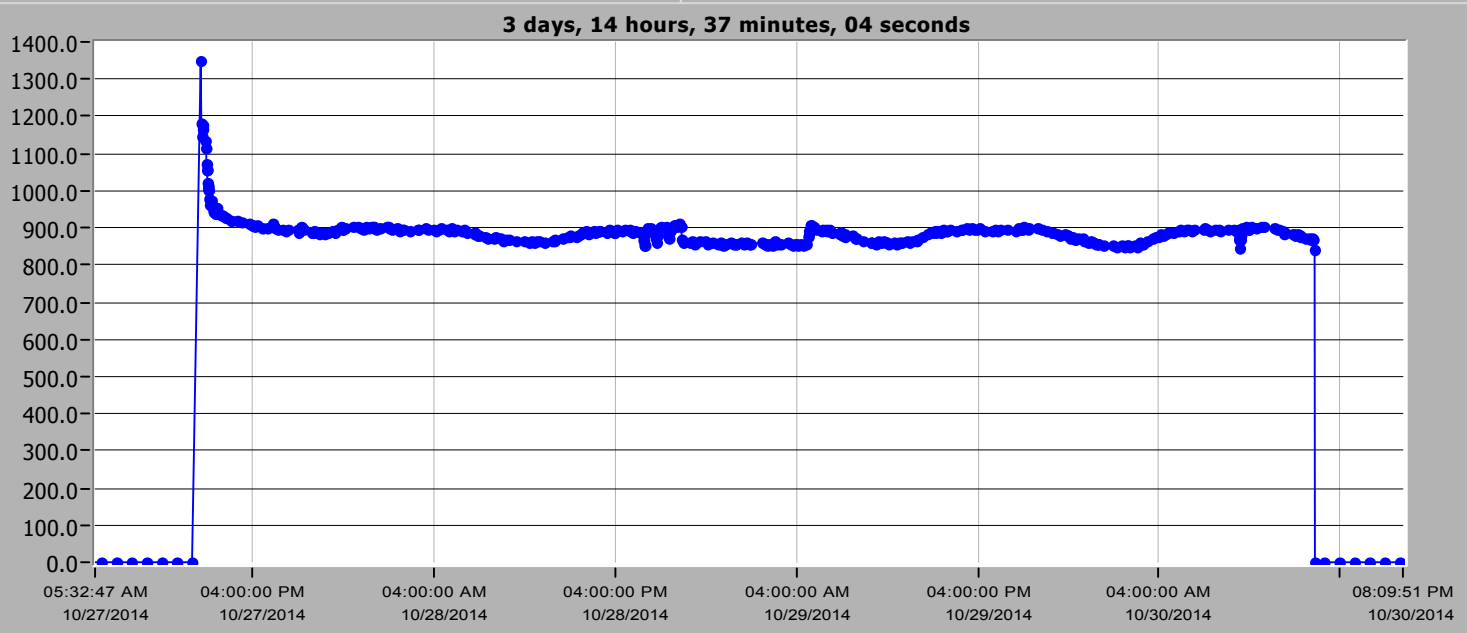
Thomas R Buchholtz PE
IRZ Consulting

500 N. 1st Street | Hermiston, Oregon 97838 | 541.567.0252 office | www.irz.com
2815 St. Andrews Loop, Suite A | Pasco, Washington 99301 | 509.544.2295 office

APPENDIX A

Start Month October Day 25 Year 2014 Hour 12 am

End Month October Day 30 Year 2014 Hour Midnight



Trend Mode

Trend Interval

Continuous

Select	RUPP CL100 FLOW RATE	Value
Select	No Selection	Value
Select	No Selection	Value
Select	No Selection	Value
Select	No Selection	Value
Select	No Selection	Value
Select	No Selection	Value
Select	No Selection	Value

Auto-Scaling and Zooming

Update Charts

APPENDIX B

JSH/Rupp Well 1 Test Airline Data

Sensor Value	Units	Ft of H2O	Ft below GS	Ft Change Below Static	Timestamp	Time Since Start Minutes	Time Since Shut Down
31.85265	PSI	73.5	666.5	31.4	10/27/2014 14:46	10	
31.42608	PSI	72.5	667.5	32.4	10/27/2014 15:16	40	
31.1417	PSI	71.8	668.1	33.0	10/27/2014 15:46	70	
30.14637	PSI	69.5	670.4	35.3	10/27/2014 16:16	100	
30.14637	PSI	69.5	670.4	35.3	10/27/2014 16:46	130	
29.86199	PSI	68.9	671.1	36.0	10/27/2014 17:16	160	
30.00418	PSI	69.2	670.7	35.6	10/27/2014 17:46	190	
29.57761	PSI	68.2	671.7	36.6	10/27/2014 18:17	220	
29.29323	PSI	67.6	672.4	37.3	10/27/2014 18:46	250	
28.86666	PSI	66.6	673.4	38.3	10/27/2014 19:16	280	
28.72447	PSI	66.3	673.7	38.6	10/27/2014 19:46	310	
28.2979	PSI	65.3	674.7	39.6	10/27/2014 20:16	340	
28.01352	PSI	64.6	675.3	40.2	10/27/2014 20:46	370	
27.87133	PSI	64.3	675.7	40.6	10/27/2014 21:16	400	
27.44476	PSI	63.3	676.6	41.5	10/27/2014 21:46	430	
27.30257	PSI	63.0	677.0	41.9	10/27/2014 22:17	460	
26.73381	PSI	61.7	678.3	43.2	10/27/2014 22:46	490	
26.44943	PSI	61.0	678.9	43.8	10/27/2014 23:17	520	
26.16505	PSI	60.4	679.6	44.5	10/27/2014 23:46	550	
26.02286	PSI	60.0	679.9	44.8	10/28/2014 0:17	580	
25.73848	PSI	59.4	680.6	45.5	10/28/2014 0:46	610	
25.4541	PSI	58.7	681.2	46.1	10/28/2014 1:17	640	
25.31191	PSI	58.4	681.6	46.5	10/28/2014 1:46	670	
25.16972	PSI	58.1	681.9	46.8	10/28/2014 2:16	700	
25.02753	PSI	57.7	682.2	47.1	10/28/2014 2:46	730	
24.88534	PSI	57.4	682.5	47.4	10/28/2014 3:16	760	
24.74315	PSI	57.1	682.9	47.8	10/28/2014 3:47	790	
24.45877	PSI	56.4	683.5	48.4	10/28/2014 4:17	820	
24.31658	PSI	56.1	683.9	48.8	10/28/2014 4:47	850	
24.17439	PSI	55.8	684.2	49.1	10/28/2014 5:17	880	
23.89001	PSI	55.1	684.8	49.7	10/28/2014 5:46	910	
23.89001	PSI	55.1	684.8	49.7	10/28/2014 6:17	940	
23.74782	PSI	54.8	685.2	50.1	10/28/2014 6:47	970	
23.60563	PSI	54.4	685.5	50.4	10/28/2014 7:16	1000	
23.60563	PSI	54.4	685.5	50.4	10/28/2014 7:47	1030	
23.46344	PSI	54.1	685.8	50.7	10/28/2014 8:16	1060	
23.46344	PSI	54.1	685.8	50.7	10/28/2014 8:47	1090	
23.46344	PSI	54.1	685.8	50.7	10/28/2014 9:16	1120	
23.32125	PSI	53.8	686.2	51.1	10/28/2014 9:47	1150	

JSH - Rupp Well 1 Test Airline Data

23.17906	PSI	53.5	686.5	51.4	10/28/2014 10:16	1180	
23.03687	PSI	53.1	686.8	51.7	10/28/2014 10:46	1210	
22.89468	PSI	52.8	687.1	52.0	10/28/2014 11:16	1240	
22.6103	PSI	52.2	687.8	52.7	10/28/2014 11:46	1270	
22.6103	PSI	52.2	687.8	52.7	10/28/2014 12:16	1300	
22.32592	PSI	51.5	688.5	53.4	10/28/2014 12:46	1330	
22.18373	PSI	51.2	688.8	53.7	10/28/2014 13:16	1360	
22.04154	PSI	50.8	689.1	54.0	10/28/2014 13:46	1390	
21.75716	PSI	50.2	689.8	54.7	10/28/2014 14:17	1420	
21.47278	PSI	49.5	690.4	55.3	10/28/2014 14:46	1450	
21.47278	PSI	49.5	690.4	55.3	10/28/2014 15:16	1480	
21.04621	PSI	48.5	691.4	56.3	10/28/2014 15:46	1510	
21.04621	PSI	48.5	691.4	56.3	10/28/2014 16:16	1540	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 16:47	1570	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 17:16	1600	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 17:46	1630	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 18:16	1660	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 18:46	1690	
20.47745	PSI	47.2	692.7	57.6	10/28/2014 19:16	1720	
20.47745	PSI	47.2	692.7	57.6	10/28/2014 19:46	1750	
20.47745	PSI	47.2	692.7	57.6	10/28/2014 20:16	1780	
20.05088	PSI	46.2	693.7	58.6	10/28/2014 20:47	1810	
20.90402	PSI	48.2	691.7	56.6	10/28/2014 21:17	1840	
20.76183	PSI	47.9	692.1	57.0	10/28/2014 21:47	1870	
20.76183	PSI	47.9	692.1	57.0	10/28/2014 22:17	1900	
20.76183	PSI	47.9	692.1	57.0	10/28/2014 22:47	1930	
20.76183	PSI	47.9	692.1	57.0	10/28/2014 23:17	1960	
20.61964	PSI	47.6	692.4	57.3	10/28/2014 23:47	1990	
20.61964	PSI	47.6	692.4	57.3	10/29/2014 0:17	2020	
20.61964	PSI	47.6	692.4	57.3	10/29/2014 0:47	2050	
20.47745	PSI	47.2	692.7	57.6	10/29/2014 1:17	2080	
20.47745	PSI	47.2	692.7	57.6	10/29/2014 1:47	2110	
20.47745	PSI	47.2	692.7	57.6	10/29/2014 2:17	2140	
20.33526	PSI	46.9	693.0	57.9	10/29/2014 2:47	2170	
20.33526	PSI	46.9	693.0	57.9	10/29/2014 3:17	2200	
20.33526	PSI	46.9	693.0	57.9	10/29/2014 3:47	2230	
20.33526	PSI	46.9	693.0	57.9	10/29/2014 4:17	2260	
20.19307	PSI	46.6	693.4	58.3	10/29/2014 4:47	2290	
20.19307	PSI	46.6	693.4	58.3	10/29/2014 5:17	2320	
19.19774	PSI	44.3	695.7	60.6	10/29/2014 5:47	2350	
19.19774	PSI	44.3	695.7	60.6	10/29/2014 6:17	2380	
19.19774	PSI	44.3	695.7	60.6	10/29/2014 6:47	2410	
19.19774	PSI	44.3	695.7	60.6	10/29/2014 7:17	2440	
19.19774	PSI	44.3	695.7	60.6	10/29/2014 7:47	2470	

JSH - Rupp Well 1 Test Airline Data

19.19774	PSI	44.3	695.7	60.6	10/29/2014 8:17	2500	
19.05555	PSI	44.0	696.0	60.9	10/29/2014 8:46	2530	
19.05555	PSI	44.0	696.0	60.9	10/29/2014 9:17	2560	
18.91336	PSI	43.6	696.3	61.2	10/29/2014 9:46	2590	
18.48679	PSI	42.6	697.3	62.2	10/29/2014 10:16	2620	
18.3446	PSI	42.3	697.6	62.5	10/29/2014 10:46	2650	
18.77117	PSI	43.3	696.7	61.6	10/29/2014 11:16	2680	
18.48679	PSI	42.6	697.3	62.2	10/29/2014 11:46	2710	
18.48679	PSI	42.6	697.3	62.2	10/29/2014 12:16	2740	
18.06022	PSI	41.7	698.3	63.2	10/29/2014 12:46	2770	
17.77584	PSI	41.0	698.9	63.8	10/29/2014 13:16	2800	
17.34927	PSI	40.0	699.9	64.8	10/29/2014 13:46	2830	
17.34927	PSI	40.0	699.9	64.8	10/29/2014 14:17	2860	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 14:46	2890	
17.06489	PSI	39.4	700.6	65.5	10/29/2014 15:17	2920	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 15:46	2950	
17.06489	PSI	39.4	700.6	65.5	10/29/2014 16:16	2980	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 16:46	3010	
17.34927	PSI	40.0	699.9	64.8	10/29/2014 17:16	3040	
17.49146	PSI	40.3	699.6	64.5	10/29/2014 17:46	3070	
17.34927	PSI	40.0	699.9	64.8	10/29/2014 18:16	3100	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 18:46	3130	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 19:16	3160	
17.06489	PSI	39.4	700.6	65.5	10/29/2014 19:47	3190	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 20:16	3220	
16.9227	PSI	39.0	700.9	65.8	10/29/2014 20:46	3250	
17.06489	PSI	39.4	700.6	65.5	10/29/2014 21:16	3280	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 21:46	3310	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 22:16	3340	
17.20708	PSI	39.7	700.3	65.2	10/29/2014 22:46	3370	
17.34927	PSI	40.0	699.9	64.8	10/29/2014 23:16	3400	
17.49146	PSI	40.3	699.6	64.5	10/29/2014 23:47	3430	
17.63365	PSI	40.7	699.3	64.2	10/30/2014 0:16	3460	
17.63365	PSI	40.7	699.3	64.2	10/30/2014 0:47	3490	
17.77584	PSI	41.0	698.9	63.8	10/30/2014 1:16	3520	
17.77584	PSI	41.0	698.9	63.8	10/30/2014 1:47	3550	
17.63365	PSI	40.7	699.3	64.2	10/30/2014 2:16	3580	
17.63365	PSI	40.7	699.3	64.2	10/30/2014 2:47	3610	
17.49146	PSI	40.3	699.6	64.5	10/30/2014 3:17	3640	
17.63365	PSI	40.7	699.3	64.2	10/30/2014 3:47	3670	
17.34927	PSI	40.0	699.9	64.8	10/30/2014 4:17	3700	
17.06489	PSI	39.4	700.6	65.5	10/30/2014 4:47	3730	
16.9227	PSI	39.0	700.9	65.8	10/30/2014 5:17	3760	
16.78051	PSI	38.7	701.2	66.1	10/30/2014 5:47	3790	

JSH - Rupp Well 1 Test Airline Data

16.63832	PSI	38.4	701.6	66.5	10/30/2014 6:17	3820	
16.49613	PSI	38.0	701.9	66.8	10/30/2014 6:46	3850	
16.35394	PSI	37.7	702.2	67.1	10/30/2014 7:17	3880	
16.35394	PSI	37.7	702.2	67.1	10/30/2014 7:47	3910	
16.35394	PSI	37.7	702.2	67.1	10/30/2014 8:17	3940	
16.35394	PSI	37.7	702.2	67.1	10/30/2014 8:46	3970	
16.21175	PSI	37.4	702.6	67.5	10/30/2014 9:17	4000	
16.21175	PSI	37.4	702.6	67.5	10/30/2014 9:47	4030	
16.06956	PSI	37.1	702.9	67.8	10/30/2014 10:17	4060	
15.92737	PSI	36.7	703.2	68.1	10/30/2014 10:46	4090	
15.78518	PSI	36.4	703.5	68.4	10/30/2014 11:17	4120	
15.64299	PSI	36.1	703.9	68.8	10/30/2014 11:46	4150	
15.64299	PSI	36.1	703.9	68.8	10/30/2014 12:16	4180	
15.64299	PSI	36.1	703.9	68.8	10/30/2014 12:47	4210	
15.64299	PSI	36.1	703.9	68.8	10/30/2014 13:16	4240	
15.64299	PSI	36.1	703.9	68.8	10/30/2014 13:46	4270	
15.92737	PSI	36.7	703.2	68.1	10/30/2014 14:16	4300	
16.06956	PSI	37.1	702.9	67.8	10/30/2014 14:46	4330	0
26.876	PSI	62.0	678.0	42.9	10/30/2014 15:16	4360	30
27.87133	PSI	64.3	675.7	40.6	10/30/2014 15:46	4390	60
28.2979	PSI	65.3	674.7	39.6	10/30/2014 16:17	4420	90
28.72447	PSI	66.3	673.7	38.6	10/30/2014 16:47	4450	120
29.15104	PSI	67.2	672.7	37.6	10/30/2014 17:16	4480	150
29.57761	PSI	68.2	671.7	36.6	10/30/2014 17:46	4510	180
30.00418	PSI	69.2	670.7	35.6	10/30/2014 18:16	4540	210
30.14637	PSI	69.5	670.4	35.3	10/30/2014 18:46	4570	240
30.57294	PSI	70.5	669.4	34.3	10/30/2014 19:16	4600	270
30.85732	PSI	71.2	668.8	33.7	10/30/2014 19:47	4630	300
31.28389	PSI	72.2	667.8	32.7	10/30/2014 20:17	4660	330
31.42608	PSI	72.5	667.5	32.4	10/30/2014 20:46	4690	360
31.71046	PSI	73.1	666.8	31.7	10/30/2014 21:16	4720	390
31.99484	PSI	73.8	666.2	31.1	10/30/2014 21:46	4750	420
32.13703	PSI	74.1	665.8	30.7	10/30/2014 22:16	4780	450
32.5636	PSI	75.1	664.8	29.7	10/30/2014 22:47	4810	480
32.84798	PSI	75.8	664.2	29.1	10/30/2014 23:17	4840	510
32.99017	PSI	76.1	663.9	28.8	10/30/2014 23:47	4870	540
33.27455	PSI	76.8	663.2	28.1	10/31/2014 0:17	4900	570
33.41674	PSI	77.1	662.9	27.8	10/31/2014 0:47	4930	600
33.70112	PSI	77.7	662.2	27.1	10/31/2014 1:16	4960	630
33.84331	PSI	78.1	661.9	26.8	10/31/2014 1:46	4990	660
34.12769	PSI	78.7	661.2	26.1	10/31/2014 2:17	5020	690
34.26988	PSI	79.0	660.9	25.8	10/31/2014 2:47	5050	720
34.55426	PSI	79.7	660.2	25.1	10/31/2014 3:17	5080	750
34.69645	PSI	80.0	659.9	24.8	10/31/2014 3:47	5110	780

JSH - Rupp Well 1 Test Airline Data

34.83864	PSI	80.4	659.6	24.5	10/31/2014 4:17	5140	810
35.12302	PSI	81.0	658.9	23.8	10/31/2014 4:47	5170	840
35.83397	PSI	82.7	657.3	22.2	10/31/2014 5:17	5200	870
35.54959	PSI	82.0	658.0	22.9	10/31/2014 5:46	5230	900
35.69178	PSI	82.3	657.6	22.5	10/31/2014 6:17	5260	930
35.97616	PSI	83.0	657.0	21.9	10/31/2014 6:47	5290	960
36.11835	PSI	83.3	656.6	21.5	10/31/2014 7:17	5320	990
36.26054	PSI	83.6	656.3	21.2	10/31/2014 7:47	5350	1020
36.40273	PSI	84.0	656.0	20.9	10/31/2014 8:17	5380	1050
36.54492	PSI	84.3	655.7	20.6	10/31/2014 8:47	5410	1080
36.97149	PSI	85.3	654.7	19.6	10/31/2014 9:16	5440	1110
36.97149	PSI	85.3	654.7	19.6	10/31/2014 9:47	5470	1140
37.11368	PSI	85.6	654.3	19.2	10/31/2014 10:16	5500	1170
37.25587	PSI	85.9	654.0	18.9	10/31/2014 10:46	5530	1200
37.25587	PSI	85.9	654.0	18.9	10/31/2014 11:16	5560	1230
37.54025	PSI	86.6	653.4	18.3	10/31/2014 11:46	5590	1260
37.68244	PSI	86.9	653.0	17.9	10/31/2014 12:17	5620	1290
37.82463	PSI	87.2	652.7	17.6	10/31/2014 12:46	5650	1320
37.96682	PSI	87.6	652.4	17.3	10/31/2014 13:17	5680	1350
38.10901	PSI	87.9	652.0	16.9	10/31/2014 13:47	5710	1380
38.2512	PSI	88.2	651.7	16.6	10/31/2014 14:17	5740	1410

APPENDIX C

JSH/Rupp Well 1 Test Well 4 Transducer Readings

Rec #	Date/Time	Pressure (psi)	Ft H2O	Time Since Pumping Started Minutes	Drawdown Ft
1	10/27/2014 9:00	0.002	0.004613		
2	10/27/2014 9:30	-0.02	-0.04613		
3	10/27/2014 10:00	-0.265	-0.61128		
4	10/27/2014 10:30	-0.262	-0.60436		
5	10/27/2014 11:00	-0.33	-0.76121		
6	10/27/2014 11:30	-0.322	-0.74276		
7	10/27/2014 12:00	11.103	25.61129		
8	10/27/2014 12:30	11.1	25.60437		
9	10/27/2014 13:00	11.097	25.59745		
10	10/27/2014 13:30	11.095	25.59284		
11	10/27/2014 14:00	11.093	25.58822		
12	10/27/2014 14:30	11.092	25.58592		
13	10/27/2014 15:00	11.09	25.5813	24	0.01
14	10/27/2014 15:30	11.089	25.579	54	0.01
15	10/27/2014 16:00	11.089	25.579	84	0.01
16	10/27/2014 16:30	11.088	25.57669	114	0.01
17	10/27/2014 17:00	11.088	25.57669	144	0.01
18	10/27/2014 17:30	11.089	25.579	174	0.01
19	10/27/2014 18:00	11.088	25.57669	204	0.01
20	10/27/2014 18:30	11.089	25.579	234	0.01
21	10/27/2014 19:00	11.089	25.579	264	0.01
22	10/27/2014 19:30	11.088	25.57669	294	0.01
23	10/27/2014 20:00	11.085	25.56977	324	0.01
24	10/27/2014 20:30	11.085	25.56977	354	0.01
25	10/27/2014 21:00	11.082	25.56285	384	0.02
26	10/27/2014 21:30	11.079	25.55593	414	0.02
27	10/27/2014 22:00	11.076	25.54901	444	0.02
28	10/27/2014 22:30	11.072	25.53978	474	0.03
29	10/27/2014 23:00	11.069	25.53286	504	0.03
30	10/27/2014 23:30	11.067	25.52825	534	0.03
31	10/28/2014 0:00	11.063	25.51902	564	0.04
32	10/28/2014 0:30	11.058	25.50749	594	0.04
33	10/28/2014 1:00	11.055	25.50057	624	0.04
34	10/28/2014 1:30	11.053	25.49596	654	0.05
35	10/28/2014 2:00	11.05	25.48904	684	0.05
36	10/28/2014 2:30	11.047	25.48211	714	0.05
37	10/28/2014 3:00	11.046	25.47981	744	0.05
38	10/28/2014 3:30	11.046	25.47981	774	0.05
39	10/28/2014 4:00	11.045	25.4775	804	0.05
40	10/28/2014 4:30	11.046	25.47981	834	0.05
41	10/28/2014 5:00	11.048	25.48442	864	0.05

42	10/28/2014 5:30	11.049	25.48673	894	0.05
43	10/28/2014 6:00	11.052	25.49365	924	0.05
44	10/28/2014 6:30	11.056	25.50288	954	0.04
45	10/28/2014 7:00	11.057	25.50518	984	0.04
46	10/28/2014 7:30	11.06	25.5121	1014	0.04
47	10/28/2014 8:00	11.065	25.52364	1044	0.04
48	10/28/2014 8:30	11.069	25.53286	1074	0.03
49	10/28/2014 9:00	11.071	25.53748	1104	0.03
50	10/28/2014 9:30	11.072	25.53978	1134	0.03
51	10/28/2014 10:00	11.073	25.54209	1164	0.03
52	10/28/2014 10:30	11.071	25.53748	1194	0.03
53	10/28/2014 11:00	11.073	25.54209	1224	0.03
54	10/28/2014 11:30	11.07	25.53517	1254	0.03
55	10/28/2014 12:00	11.069	25.53286	1284	0.03
56	10/28/2014 12:30	11.065	25.52364	1314	0.04
57	10/28/2014 13:00	11.064	25.52133	1344	0.04
58	10/28/2014 13:30	11.062	25.51672	1374	0.04
59	10/28/2014 14:00	11.061	25.51441	1404	0.04
60	10/28/2014 14:30	11.061	25.51441	1434	0.04
61	10/28/2014 15:00	11.057	25.50518	1464	0.04
62	10/28/2014 15:30	11.058	25.50749	1494	0.04
63	10/28/2014 16:00	11.056	25.50288	1524	0.04
64	10/28/2014 16:30	11.054	25.49826	1554	0.05
65	10/28/2014 17:00	11.054	25.49826	1584	0.05
66	10/28/2014 17:30	11.05	25.48904	1614	0.05
67	10/28/2014 18:00	11.054	25.49826	1644	0.05
68	10/28/2014 18:30	11.056	25.50288	1674	0.04
69	10/28/2014 19:00	11.055	25.50057	1704	0.04
70	10/28/2014 19:30	11.056	25.50288	1734	0.04
71	10/28/2014 20:00	11.056	25.50288	1764	0.04
72	10/28/2014 20:30	11.055	25.50057	1794	0.04
73	10/28/2014 21:00	11.055	25.50057	1824	0.04
74	10/28/2014 21:30	11.055	25.50057	1854	0.04
75	10/28/2014 22:00	11.057	25.50518	1884	0.04
76	10/28/2014 22:30	11.056	25.50288	1914	0.04
77	10/28/2014 23:00	11.054	25.49826	1944	0.05
78	10/28/2014 23:30	11.054	25.49826	1974	0.05
79	10/29/2014 0:00	11.052	25.49365	2004	0.05
80	10/29/2014 0:30	11.05	25.48904	2034	0.05
81	10/29/2014 1:00	11.048	25.48442	2064	0.05
82	10/29/2014 1:30	11.046	25.47981	2094	0.05
83	10/29/2014 2:00	11.045	25.4775	2124	0.05
84	10/29/2014 2:30	11.045	25.4775	2154	0.05
85	10/29/2014 3:00	11.044	25.47519	2184	0.06
86	10/29/2014 3:30	11.042	25.47058	2214	0.06
87	10/29/2014 4:00	11.042	25.47058	2244	0.06
88	10/29/2014 4:30	11.042	25.47058	2274	0.06

89	10/29/2014 5:00	11.044	25.47519	2304	0.06
90	10/29/2014 5:30	11.046	25.47981	2334	0.05
91	10/29/2014 6:00	11.049	25.48673	2364	0.05
92	10/29/2014 6:30	11.052	25.49365	2394	0.05
93	10/29/2014 7:00	11.055	25.50057	2424	0.04
94	10/29/2014 7:30	11.057	25.50518	2454	0.04
95	10/29/2014 8:00	11.062	25.51672	2484	0.04
96	10/29/2014 8:30	11.066	25.52594	2514	0.03
97	10/29/2014 9:00	11.068	25.53056	2544	0.03
98	10/29/2014 9:30	11.07	25.53517	2574	0.03
99	10/29/2014 10:00	11.073	25.54209	2604	0.03
100	10/29/2014 10:30	11.076	25.54901	2634	0.02
101	10/29/2014 11:00	11.078	25.55362	2664	0.02
102	10/29/2014 11:30	11.079	25.55593	2694	0.02
103	10/29/2014 12:00	11.08	25.55824	2724	0.02
104	10/29/2014 12:30	11.08	25.55824	2754	0.02
105	10/29/2014 13:00	11.079	25.55593	2784	0.02
106	10/29/2014 13:30	11.078	25.55362	2814	0.02
107	10/29/2014 14:00	11.075	25.5467	2844	0.03
108	10/29/2014 14:30	11.073	25.54209	2874	0.03
109	10/29/2014 15:00	11.071	25.53748	2904	0.03
110	10/29/2014 15:30	11.071	25.53748	2934	0.03
111	10/29/2014 16:00	11.069	25.53286	2964	0.03
112	10/29/2014 16:30	11.067	25.52825	2994	0.03
113	10/29/2014 17:00	11.066	25.52594	3024	0.03
114	10/29/2014 17:30	11.063	25.51902	3054	0.04
115	10/29/2014 18:00	11.064	25.52133	3084	0.04
116	10/29/2014 18:30	11.064	25.52133	3114	0.04
117	10/29/2014 19:00	11.063	25.51902	3144	0.04
118	10/29/2014 19:30	11.062	25.51672	3174	0.04
119	10/29/2014 20:00	11.06	25.5121	3204	0.04
120	10/29/2014 20:30	11.058	25.50749	3234	0.04
121	10/29/2014 21:00	11.058	25.50749	3264	0.04
122	10/29/2014 21:30	11.058	25.50749	3294	0.04
123	10/29/2014 22:00	11.056	25.50288	3324	0.04
124	10/29/2014 22:30	11.057	25.50518	3354	0.04
125	10/29/2014 23:00	11.056	25.50288	3384	0.04
126	10/29/2014 23:30	11.054	25.49826	3414	0.05
127	10/30/2014 0:00	11.051	25.49134	3444	0.05
128	10/30/2014 0:30	11.049	25.48673	3474	0.05
129	10/30/2014 1:00	11.046	25.47981	3504	0.05
130	10/30/2014 1:30	11.041	25.46827	3534	0.06
131	10/30/2014 2:00	11.041	25.46827	3564	0.06
132	10/30/2014 2:30	11.039	25.46366	3594	0.06
133	10/30/2014 3:00	11.034	25.45213	3624	0.07
134	10/30/2014 3:30	11.031	25.44521	3654	0.07
135	10/30/2014 4:00	11.029	25.44059	3684	0.07

136	10/30/2014 4:30	11.028	25.43829	3714	0.07
137	10/30/2014 5:00	11.027	25.43598	3744	0.07
138	10/30/2014 5:30	11.026	25.43367	3774	0.07
139	10/30/2014 6:00	11.027	25.43598	3804	0.07
140	10/30/2014 6:30	11.027	25.43598	3834	0.07
141	10/30/2014 7:00	11.028	25.43829	3864	0.07
142	10/30/2014 7:30	11.029	25.44059	3894	0.07
143	10/30/2014 8:00	11.03	25.4429	3924	0.07
144	10/30/2014 8:30	11.03	25.4429	3954	0.07
145	10/30/2014 9:00	11.033	25.44982	3984	0.07
146	10/30/2014 9:30	11.035	25.45443	4014	0.06
147	10/30/2014 10:00	11.035	25.45443	4044	0.06
148	10/30/2014 10:30	11.037	25.45905	4074	0.06
149	10/30/2014 11:00	11.037	25.45905	4104	0.06
150	10/30/2014 11:30	11.037	25.45905	4134	0.06
151	10/30/2014 12:00	11.037	25.45905	4164	0.06
152	10/30/2014 12:30	11.034	25.45213	4194	0.07
153	10/30/2014 13:00	11.031	25.44521	4224	0.07
154	10/30/2014 13:30	11.03	25.4429	4254	0.07
155	10/30/2014 14:00	11.029	25.44059	4284	0.07
156	10/30/2014 14:30	11.025	25.43137	4314	0.07
157	10/30/2014 15:00	11.023	25.42675	4344	0.08
158	10/30/2014 15:30	11.021	25.42214	4374	0.08
159	10/30/2014 16:00	11.019	25.41753	4404	0.08
160	10/30/2014 16:30	11.019	25.41753	4434	0.08
161	10/30/2014 17:00	11.015	25.4083	4464	0.08
162	10/30/2014 17:30	11.012	25.40138	4494	0.09
163	10/30/2014 18:00	11.011	25.39907	4524	0.09
164	10/30/2014 18:30	11.009	25.39446	4554	0.09
165	10/30/2014 19:00	11.007	25.38985	4584	0.09
166	10/30/2014 19:30	11.005	25.38523	4614	0.09
167	10/30/2014 20:00	11.005	25.38523	4644	0.09
168	10/30/2014 20:30	11.004	25.38293	4674	0.1
169	10/30/2014 21:00	11.002	25.37831	4704	0.1
170	10/30/2014 21:30	11.003	25.38062	4734	0.1
171	10/30/2014 22:00	11.004	25.38293	4764	0.1
172	10/30/2014 22:30	11.003	25.38062	4794	0.1
173	10/30/2014 23:00	11.004	25.38293	4824	0.1
174	10/30/2014 23:30	11.002	25.37831	4854	0.1
175	10/31/2014 0:00	11.004	25.38293	4884	0.1
176	10/31/2014 0:30	11.004	25.38293	4914	0.1
177	10/31/2014 1:00	10.998	25.36909	4944	0.1
178	10/31/2014 1:30	11.001	25.37601	4974	0.1
179	10/31/2014 2:00	11.001	25.37601	5004	0.1
180	10/31/2014 2:30	10.994	25.35986	5034	0.11
181	10/31/2014 3:00	10.992	25.35525	5064	0.11
182	10/31/2014 3:30	10.992	25.35525	5094	0.11

183	10/31/2014 4:00	10.988	25.34602	5124	0.11
184	10/31/2014 4:30	10.986	25.34141	5154	0.11
185	10/31/2014 5:00	10.983	25.33449	5184	0.12
186	10/31/2014 5:30	10.979	25.32526	5214	0.12
187	10/31/2014 6:00	10.98	25.32757	5244	0.12
188	10/31/2014 6:30	10.976	25.31834	5274	0.12
189	10/31/2014 7:00	10.975	25.31603	5304	0.13
190	10/31/2014 7:30	10.974	25.31373	5334	0.13
191	10/31/2014 8:00	10.975	25.31603	5364	0.13
192	10/31/2014 8:30	10.978	25.32295	5394	0.12
193	10/31/2014 9:00	10.978	25.32295	5424	0.12
194	10/31/2014 9:30	10.98	25.32757	5454	0.12
195	10/31/2014 10:00	10.98	25.32757	5484	0.12
196	10/31/2014 10:30	10.982	25.33218	5514	0.12
197	10/31/2014 11:00	10.985	25.3391	5544	0.12
198	10/31/2014 11:30	10.988	25.34602	5574	0.11
199	10/31/2014 12:00	10.995	25.36217	5604	0.11
200	10/31/2014 12:30	11.001	25.37601	5634	0.1
201	10/31/2014 13:00	-0.511	-1.17872	5664	11.61

APPENDIX C

Rupp Ranches Water Quality Data Summary

Appendix C: Rupp Ranches Water Quality Data Summary

Analyte	Units	MDL[1]	Regulatory Criteria	Well 1 (UMAT 57044)	Well 2 (UMAT 57042)	Well 3 (UMAT 57041)	Well 4 (UMAT 57043)
				5/7/2025	5/7/2025	5/12/2025	5/12/2025
Field Parameters							
Temperature	°Celsius	NA	None	27.0	21.8	20.7	25.7
Conductivity	µS/cm	NA	None	403.5	446.1	415.4	393.7
Dissolved Oxygen	%	NA	None	5.1	52.3	86.1	3.3
pH	Units	NA	6.5-8.5	8.46	7.86	7.86	8.48
Turbidity	NTU	NA	None	3.01	1.14	2.34	2.79
ORP	mV	NA	None	25.1	99.0	135.4	-197.4
Inorganics							
Alkalinity	mg CaCO3/L	5.00	None	154	189	158	141
Ammonia as N	mg/L	0.0200	None	<0.00800	<0.0200	0.0203	<0.0200
Bicarbonate	mg CaCO3/L	5.00	None	152	189	158	138
Carbonate	mg CaCO3/L	5.00	None	<5.00	<5.00	<5.00	<5.00
Chloride	mg/L	0.150	250	13.0	9.08	5.21	13.2
Cyanide	mg/L	0.0100	0.2	<0.00400	<0.00400	<0.00400	<0.00400
Fluoride	mg/L	0.100	4.0/2.0	1.23	0.473	0.435	0.966
Hardness	mg CaCO3/L	6.00	250	21.7	120	120	21.2
Nitrate as N	mg/L	0.10	10	<0.100	6.06	3.98[(2)]	0.47[(2)]
Nitrite as N	mg/L	0.03	1	<0.100	<0.100	<0.03[(2)]	<0.03[(2)]
Sulfate	mg/L	0.150	250	30.4	15.0	10.0	32.5
TDS	mg/L	-	500	261	281	278	128
Silica (as SiO2)	mg/L	0.214	None	65.0	76.2	76.4	75.9
Silicon	mg/L	0.100	None	30.8	36.5	35.8	35.7
Gasses							
Methane, dissolved	cc/L	-	-	0.00095	0.0004	0.0003	0.0014
	ppm	-	-	0.00063	0.0003	0.0002	0.00097
Ethane, dissolved	cc/L	-	-	<0.0001	<0.0001	<0.0001	<0.0001
	ppm	-	-	<0.0002	<0.0002	<0.0002	<0.0001
Propane, dissolved	cc/L	-	-	<0.0001	<0.0001	<0.0001	<0.0001
	ppm	-	-	<0.0002	<0.0002	<0.0002	<0.0002
Isotopes							
δD H2O	‰	-	-	-139.7	-116.7	-115.5	-138.5
δ18O H2O	‰	-	-	-17.91	-14.45	-14.34	-17.74
Tritium	TU	-	-	<0.56	<0.45	<0.49	<0.70
δ13C DIC	‰	-	-	-12.2	-10.3	-10.2	-11.7
14C DIC	pMC	-	-	11.12	47.58	51.66	14.67
Apparent Groundwater Age	Years BP	-	-	~17650	~5970	~5310	~15420
CFC Sample 1							
CFC-11	pmoles/kg	-	-	0.083622176	0.049269787	0.12778306	0.162614592
CFC-12	pmoles/kg	-	-	0.031241491	0.085323494	0.098909681	0.173757833
CFC-113	pmoles/kg	-	-	0.001859864	0.003379879	0.00259361	0.005359896
CFC Sample 2							
CFC-11	pmoles/kg	-	-	0.067909839	0.066505713	0.120548084	0.126888241
CFC-12	pmoles/kg	-	-	0.051044366	0.080753323	0.092343888	0.110173061
CFC-113	pmoles/kg	-	-	0.001911013	0.00192475	0.003183485	0.002640623
CFC Sample 3							
CFC-11	pmoles/kg	-	-	0.047320659	0.008760259	0.125681794	0.120780029
CFC-12	pmoles/kg	-	-	0.254473534	0.047574059	0.094864336	0.130226126
CFC-113	pmoles/kg	-	-	0.002028285	0.001740795	0.003286319	0.002393282

Notes

[1] Detection limits vary. See the individual sample reports for specific detection limits.

[(2)] Nitrate and Nitrite was resampled at Wells 3 and 4 on 5/15/2025

— = not analyzed

µS/cm = microSiemens per centimeter

alk = alkalinity

MDL = method detection limit

mg/L = milligrams per liter

mV = millivolts

NA = not applicable

NTU = nephelometric turbidity unit

ORP = oxidation-reduction potential

BP = before present

APPENDIX D

Laboratory Reports

ANATEK LABS

Analytical Results Report For:

IRZ Consulting

Project:

Rupp Ranches

Anatek Work Order:

WFE0448

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Anatek Spokane - 504 E Sprague Ste. D - Spokane, WA 99202 - 509-838-3999 - spokane@anateklabs.com - FL NELAP E871099
Anatek Yakima - 4802 Tieton Drive - Yakima, WA 98908 - 509-225-9404 - yakima@anateklabs.com - FL NELAP E871190
Anatek Wenatchee - 3019 Gs Center Rd - Wenatchee, WA 98801 - 509-701-8362

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Client:	IRZ Consulting	Work Order:	WFE0448
Address:	500 N. First jSt.	Project:	Rupp Ranches
	Hermiston, OR 97838	Reported:	5/28/2025 14:23
Attn:	Gina Gray		

Analytical Results Report

Sample Location:	Well 2 (57042)		
Lab/Sample Number:	WFE0448-01	Collect Date:	05/07/25 11:30
Date Received:	05/08/25 10:25	Collected By:	Joanthan/Swathi
Matrix:	Groundwater		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
Alkalinity	189	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Ammonia/N	ND	mg/L	0.0200	5/12/25 13:20	BDM	SM 4500-NH3 H	
Bicarbonate	189	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Carbonate	ND	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Chloride	9.08	mg/L	0.150	5/9/25 4:24	BAM	EPA 300.0	
Cyanide	<0.00400	mg/L	0.0100	5/16/25 16:30	BDM	SM 4500-CN E	
Fluoride	0.473	mg/L	0.100	5/9/25 4:24	BAM	EPA 300.0	
Hardness	120	mg CaCO3/L	6.00	5/12/25 10:06	ALH	SM 2340 C	
Nitrate/N	6.06	mg/L	0.100	5/9/25 4:24	BAM	EPA 300.0	
Nitrate/N + Nitrite/N	6.06	mg/L	0.200	5/9/25 4:24	BAM	Calculation	
Nitrite/N	ND	mg/L	0.100	5/9/25 4:24	BAM	EPA 300.0	
Sulfate	15.0	mg/L	0.150	5/9/25 4:24	BAM	EPA 300.0	
TDS	281	mg/L		5/12/25 17:02	EMG	SM 2540 C	
Metals by ICP-MS							
Silica (as SiO2)	76.2	mg/L	0.214	5/15/25 12:57	JLG	EPA 200.8	M2
Silicon	36.5	mg/L	0.100	5/15/25 12:57	JLG	EPA 200.8	M2

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Sample Location:	Well 1 (57044)		
Lab/Sample Number:	WFE0448-02	Collect Date:	05/07/25 14:00
Date Received:	05/08/25 10:25	Collected By:	Joanthan/Swathi
Matrix:	Groundwater		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
Alkalinity	154	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Ammonia/N	<0.00800	mg/L	0.0200	5/12/25 13:25	BDM	SM 4500-NH3 H	
Bicarbonate	152	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Carbonate	ND	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Chloride	13.0	mg/L	0.150	5/9/25 8:14	BAM	EPA 300.0	
Cyanide	<0.00400	mg/L	0.0100	5/16/25 16:34	BDM	SM 4500-CN E	
Fluoride	1.23	mg/L	0.100	5/9/25 8:14	BAM	EPA 300.0	
Hardness	21.7	mg CaCO3/L	3.00	5/12/25 10:06	ALH	SM 2340 C	
Nitrate/N	ND	mg/L	0.100	5/9/25 8:14	BAM	EPA 300.0	
Nitrate/N + Nitrite/N	0.0830	mg/L	0.200	5/9/25 8:14	BAM	Calculation	
Nitrite/N	ND	mg/L	0.100	5/9/25 8:14	BAM	EPA 300.0	
Sulfate	30.4	mg/L	0.300	5/20/25 3:53	BAM	EPA 300.0	
TDS	261	mg/L		5/12/25 17:02	EMG	SM 2540 C	
Metals by ICP-MS							
Silica (as SiO2)	65.0	mg/L	21.4	5/15/25 18:18	JLG	EPA 200.8	M2
Silicon	30.8	mg/L	10.0	5/15/25 18:18	JLG	EPA 200.8	M2

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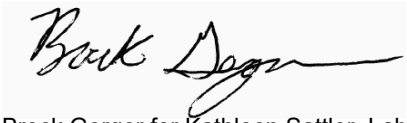
Authorized Signature,



Brock Gerger for Kathleen Sattler, Lab Manager

M2	Matrix spike recovery was low; the associated blank spike recovery was acceptable. Potential matrix effect.
M4	Spike sample analysis required a dilution such that the spike recovery calculation does not provide useful information. Blank spike recovery acceptable.
PQL	Practical Quantitation Limit
ND	Not Detected
MCL	EPA's Maximum Contaminant Level
Dry	Sample results reported on a dry weight basis
*	Not a state-certified analyte
RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was spiked or duplicated.

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Quality Control Data

Inorganics

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0405 - W Ions										
Blank (BFE0405-BLK1)					Prepared & Analyzed: 05/08/25 08:53					
Fluoride	ND		0.100	mg/L						
Chloride	ND		0.150	mg/L						
Nitrite as N	ND		0.100	mg/L						
Nitrate as N	ND		0.100	mg/L						
Sulfate	ND		0.150	mg/L						
Blank (BFE0405-BLK2)					Prepared & Analyzed: 05/09/25 01:37					
Fluoride	ND		0.100	mg/L						
Chloride	ND		0.150	mg/L						
Nitrite as N	ND		0.100	mg/L						
Nitrate as N	ND		0.100	mg/L						
Sulfate	ND		0.150	mg/L						
LCS (BFE0405-BS1)					Prepared & Analyzed: 05/08/25 09:35					
Fluoride	4.16			mg/L	4.00		104	90-110		
Chloride	4.08			mg/L	4.00		102	90-110		
Nitrite as N	4.13			mg/L	4.00		103	90-110		
Nitrate as N	4.17			mg/L	4.00		104	90-110		
Sulfate	4.10			mg/L	4.00		103	90-110		
LCS Dup (BFE0405-BSD1)					Prepared & Analyzed: 05/09/25 02:19					
Fluoride	3.85			mg/L	4.00		96.3	90-110	7.54	20
Chloride	3.75			mg/L	4.00		93.7	90-110	8.46	20
Nitrite as N	3.90			mg/L	4.00		97.6	90-110	5.65	20
Nitrate as N	3.87			mg/L	4.00		96.8	90-110	7.31	20
Sulfate	3.79			mg/L	4.00		94.6	90-110	8.01	20
Matrix Spike (BFE0405-MS1)		**Source: WFE0408-05**			Prepared & Analyzed: 05/08/25 18:39					
Fluoride	4.64		0.100	mg/L	4.00	0.283	109	80-120		
Chloride	24.0		0.150	mg/L	4.00	19.9	103	80-120		
Nitrite as N	4.46		0.100	mg/L	4.00	ND	111	80-120		
Nitrate as N	10.2		0.100	mg/L	4.00	5.89	107	80-120		
Sulfate	121		0.150	mg/L	4.00	118	74.3	80-120		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0405 - W Ions (Continued)										
Matrix Spike (BFE0405-MS2)		**Source: WFE0375-05**			Prepared & Analyzed: 05/08/25 20:44					
Fluoride	4.58		0.100	mg/L	4.00	0.224	109	80-120		
Chloride	135	M4	0.150	mg/L	4.00	135	NR	80-120		
Nitrite as N	3.56		0.100	mg/L	4.00	ND	89.0	80-120		
Nitrate as N	5.11		0.100	mg/L	4.00	0.776	108	80-120		
Sulfate	21.2		0.150	mg/L	4.00	17.3	96.7	80-120		
Matrix Spike Dup (BFE0405-MSD1)		**Source: WFE0408-05**			Prepared & Analyzed: 05/08/25 19:00					
Fluoride	4.58		0.100	mg/L	4.00	0.283	108	80-120	1.34	20
Chloride	24.0		0.150	mg/L	4.00	19.9	104	80-120	0.0500	20
Nitrite as N	4.40		0.100	mg/L	4.00	ND	110	80-120	1.31	20
Nitrate as N	10.1		0.100	mg/L	4.00	5.89	106	80-120	0.561	20
Sulfate	121		0.150	mg/L	4.00	118	76.6	80-120	0.0751	20
Matrix Spike Dup (BFE0405-MSD2)		**Source: WFE0375-05**			Prepared & Analyzed: 05/08/25 21:05					
Fluoride	4.62		0.100	mg/L	4.00	0.224	110	80-120	0.891	20
Chloride	135	M4	0.150	mg/L	4.00	135	NR	80-120	0.0378	20
Nitrite as N	3.60		0.100	mg/L	4.00	ND	89.9	80-120	0.978	20
Nitrate as N	5.14		0.100	mg/L	4.00	0.776	109	80-120	0.663	20
Sulfate	21.2		0.150	mg/L	4.00	17.3	99.0	80-120	0.415	20
Batch: BFE0484 - W FIA										
Blank (BFE0484-BLK1)					Prepared & Analyzed: 05/12/25 13:53					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK2)					Prepared & Analyzed: 05/12/25 10:55					
Ammonia/N	ND		0.0200	mg/L						

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0484 - W FIA (Continued)										
Blank (BFE0484-BLK3)					Prepared & Analyzed: 05/12/25 11:27					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK4)					Prepared & Analyzed: 05/12/25 11:51					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK5)					Prepared & Analyzed: 05/12/25 12:08					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK6)					Prepared & Analyzed: 05/12/25 12:28					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK7)					Prepared & Analyzed: 05/12/25 12:46					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK8)					Prepared & Analyzed: 05/12/25 13:05					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLK9)					Prepared & Analyzed: 05/12/25 13:23					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLKA)					Prepared & Analyzed: 05/12/25 10:30					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0484-BLKB)					Prepared & Analyzed: 05/12/25 17:01					
Ammonia/N	ND		0.0200	mg/L						
LCS (BFE0484-BS1)					Prepared & Analyzed: 05/12/25 10:29					
Ammonia/N	0.196		0.0200	mg/L	0.200		98.2	90-110		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0484 - W FIA (Continued)										
LCS (BFE0484-BS2)					Prepared & Analyzed: 05/12/25 11:26					
Ammonia/N	0.197		0.0200	mg/L	0.200		98.5	90-110		
LCS (BFE0484-BS3)					Prepared & Analyzed: 05/12/25 11:49					
Ammonia/N	0.202		0.0200	mg/L	0.200		101	90-110		
LCS (BFE0484-BS4)					Prepared & Analyzed: 05/12/25 12:26					
Ammonia/N	0.196		0.0200	mg/L	0.200		97.9	90-110		
LCS (BFE0484-BS5)					Prepared & Analyzed: 05/12/25 13:04					
Ammonia/N	0.195		0.0200	mg/L	0.200		97.4	90-110		
LCS (BFE0484-BS6)					Prepared & Analyzed: 05/12/25 13:51					
Ammonia/N	0.208		0.0200	mg/L	0.200		104	90-110		
MRL Check (BFE0484-MRL1)					Prepared & Analyzed: 05/12/25 10:32					
Ammonia/N	0.00900		0.0200	mg/L	0.0100		90.0	50-150		
Matrix Spike (BFE0484-MS1)		**Source: WFE0229-04**			Prepared & Analyzed: 05/12/25 11:29					
Ammonia/N	0.196		0.0200	mg/L	0.200	ND	97.8	80-120		
Matrix Spike (BFE0484-MS2)		**Source: WFE0229-05**			Prepared & Analyzed: 05/12/25 11:32					
Ammonia/N	0.203		0.0200	mg/L	0.200	ND	101	80-120		
Matrix Spike (BFE0484-MS3)		**Source: WFE0229-06**			Prepared & Analyzed: 05/12/25 11:35					
Ammonia/N	0.200		0.0200	mg/L	0.200	ND	99.9	80-120		
Matrix Spike (BFE0484-MS4)		**Source: WFE0229-07**			Prepared & Analyzed: 05/12/25 11:38					
Ammonia/N	0.215		0.0200	mg/L	0.200	0.00890	103	80-120		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0484 - W FIA (Continued)										
Matrix Spike (BFE0484-MS5)		**Source: WFE0229-08**			Prepared & Analyzed: 05/12/25 11:41					
Ammonia/N	0.202		0.0200	mg/L	0.200	ND	101	80-120		
Matrix Spike (BFE0484-MS6)		**Source: WFE0229-09**			Prepared & Analyzed: 05/12/25 11:44					
Ammonia/N	0.196		0.0200	mg/L	0.200	ND	98.0	80-120		
Matrix Spike Dup (BFE0484-MSD1)		**Source: WFE0229-04**			Prepared & Analyzed: 05/12/25 11:31					
Ammonia/N	0.206		0.0200	mg/L	0.200	ND	103	80-120	5.28	20
Matrix Spike Dup (BFE0484-MSD2)		**Source: WFE0229-05**			Prepared & Analyzed: 05/12/25 11:34					
Ammonia/N	0.186		0.0200	mg/L	0.200	ND	93.2	80-120	8.42	20
Matrix Spike Dup (BFE0484-MSD3)		**Source: WFE0229-06**			Prepared & Analyzed: 05/12/25 11:37					
Ammonia/N	0.193		0.0200	mg/L	0.200	ND	96.6	80-120	3.41	20
Matrix Spike Dup (BFE0484-MSD4)		**Source: WFE0229-07**			Prepared & Analyzed: 05/12/25 11:40					
Ammonia/N	0.214		0.0200	mg/L	0.200	0.00890	103	80-120	0.186	20
Matrix Spike Dup (BFE0484-MSD5)		**Source: WFE0229-08**			Prepared & Analyzed: 05/12/25 11:43					
Ammonia/N	0.194		0.0200	mg/L	0.200	ND	97.2	80-120	3.69	20
Matrix Spike Dup (BFE0484-MSD6)		**Source: WFE0229-09**			Prepared & Analyzed: 05/12/25 11:46					
Ammonia/N	0.202		0.0200	mg/L	0.200	ND	101	80-120	2.87	20
Batch: BFE0523 - W Wet Chem										
Blank (BFE0523-BLK1)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0523 - W Wet Chem (Continued)										
Blank (BFE0523-BLK2)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						
Blank (BFE0523-BLK3)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						
Blank (BFE0523-BLK4)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						
Blank (BFE0523-BLK5)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						
Blank (BFE0523-BLK6)					Prepared & Analyzed: 05/12/25 17:02					
TDS	<10			mg/L						
LCS (BFE0523-BS1)					Prepared & Analyzed: 05/12/25 17:02					
TDS	513			mg/L	500		103	80-120		
LCS (BFE0523-BS2)					Prepared & Analyzed: 05/12/25 17:02					
TDS	428			mg/L	500		85.6	80-120		
LCS (BFE0523-BS3)					Prepared & Analyzed: 05/12/25 17:02					
TDS	478			mg/L	500		95.6	80-120		
Duplicate (BFE0523-DUP1)		**Source: WFE0232-01**			Prepared & Analyzed: 05/12/25 17:02					
TDS	956			mg/L		860			10.6	20
Duplicate (BFE0523-DUP2)		**Source: WFE0340-01**			Prepared & Analyzed: 05/12/25 17:02					
TDS	392			mg/L		364			7.41	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0523 - W Wet Chem (Continued)										
Duplicate (BFE0523-DUP3)		**Source: WFE0358-04**			Prepared & Analyzed: 05/12/25 17:02					
TDS	243			mg/L		333			31.2	20
Batch: BFE0525 - W Wet Chem										
Blank (BFE0525-BLK1)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	ND		3.00	mg CaCO3/L						
Blank (BFE0525-BLK2)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	ND		3.00	mg CaCO3/L						
Blank (BFE0525-BLK3)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	ND		3.00	mg CaCO3/L						
LCS (BFE0525-BS1)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	50.2		3.00	mg CaCO3/L	50.0		100	90-110		
LCS (BFE0525-BS2)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	50.2		3.00	mg CaCO3/L	50.0		100	90-110		
LCS Dup (BFE0525-BSD1)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	49.7		3.00	mg CaCO3/L	50.0		99.5	90-110	0.985	20
LCS Dup (BFE0525-BSD2)					Prepared & Analyzed: 05/12/25 10:06					
Hardness	50.2		3.00	mg CaCO3/L	50.0		100	90-110	0.00	20
Duplicate (BFE0525-DUP1)		**Source: WFE0553-02**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	14.8		3.00	mg CaCO3/L		14.8			0.00	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0525 - W Wet Chem (Continued)										
Duplicate (BFE0525-DUP2)		**Source: WFE0362-01**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	ND		3.00	mg CaCO3/L		ND				20
Matrix Spike (BFE0525-MS1)		**Source: WFE0448-01**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	221		6.00	mg CaCO3/L	100	120	100	80-120		
Matrix Spike (BFE0525-MS2)		**Source: WFE0481-04**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	284		6.00	mg CaCO3/L	100	177	106	80-120		
Matrix Spike Dup (BFE0525-MSD1)		**Source: WFE0448-01**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	223		6.00	mg CaCO3/L	100	120	102	80-120	0.889	20
Matrix Spike Dup (BFE0525-MSD2)		**Source: WFE0481-04**			Prepared & Analyzed: 05/12/25 10:06					
Hardness	280		6.00	mg CaCO3/L	100	177	102	80-120	1.40	20
Batch: BFE0787 - W Wet Chem										
Blank (BFE0787-BLK1)					Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L						
Alkalinity	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Blank (BFE0787-BLK2)					Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Alkalinity	ND		5.00	mg CaCO3/L						
Blank (BFE0787-BLK3)					Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	ND		5.00	mg CaCO3/L						
Alkalinity	ND		5.00	mg CaCO3/L						
Carbonate	ND		5.00	mg CaCO3/L						

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
Blank (BFE0787-BLK4)					Prepared & Analyzed: 05/16/25 12:51					
Alkalinity	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Carbonate	ND		5.00	mg CaCO3/L						
LCS (BFE0787-BS1)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	54.7		5.00	mg CaCO3/L	50.0		109	85-115		
Bicarbonate	54.7		5.00	mg CaCO3/L	50.0		109	85-115		
LCS (BFE0787-BS2)					Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	56.6		5.00	mg CaCO3/L	50.0		113	85-115		
Alkalinity	56.6		5.00	mg CaCO3/L	50.0		113	85-115		
LCS (BFE0787-BS3)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	24.1		5.00	mg CaCO3/L	25.0		96.5	85-115		
Bicarbonate	24.1		5.00	mg CaCO3/L	25.0		96.5	85-115		
LCS (BFE0787-BS4)					Prepared & Analyzed: 05/16/25 12:51					
Bicarbonate	54.2		5.00	mg CaCO3/L	50.0		108	85-115		
Alkalinity	54.8		5.00	mg CaCO3/L	50.0		110	85-115		
LCS Dup (BFE0787-BSD1)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	55.4		5.00	mg CaCO3/L	50.0		111	85-115	1.32	20
Bicarbonate	54.4		5.00	mg CaCO3/L	50.0		109	85-115	0.504	20
LCS Dup (BFE0787-BSD2)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	56.6		5.00	mg CaCO3/L	50.0		113	85-115	0.177	20
Bicarbonate	56.6		5.00	mg CaCO3/L	50.0		113	85-115	0.177	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
LCS Dup (BFE0787-BSD3)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	24.2		5.00	mg CaCO3/L	25.0		96.8	85-115	0.290	20
Bicarbonate	24.2		5.00	mg CaCO3/L	25.0		96.8	85-115	0.290	20
LCS Dup (BFE0787-BSD4)					Prepared & Analyzed: 05/16/25 12:51					
Alkalinity	55.3		5.00	mg CaCO3/L	50.0		111	85-115	0.908	20
Bicarbonate	54.3		5.00	mg CaCO3/L	50.0		109	85-115	0.203	20
Duplicate (BFE0787-DUP1)		**Source: WFE0524-02**			Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L		ND				20
Alkalinity	67.1		5.00	mg CaCO3/L		66.6			0.648	20
Bicarbonate	67.1		5.00	mg CaCO3/L		66.6			0.648	20
Duplicate (BFE0787-DUP2)		**Source: WFE0395-01**			Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L		ND				20
Bicarbonate	17.3		5.00	mg CaCO3/L		16.8			2.58	20
Alkalinity	17.3		5.00	mg CaCO3/L		16.8			2.58	20
Matrix Spike (BFE0787-MS1)		**Source: WFE0232-08**			Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	318		5.00	mg CaCO3/L	66.7	248	105	80-120		
Alkalinity	318		5.00	mg CaCO3/L	66.7	248	105	85-115		
Matrix Spike (BFE0787-MS2)		**Source: WFE0458-02**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	296		5.00	mg CaCO3/L	66.7	225	106	85-115		
Bicarbonate	296		5.00	mg CaCO3/L	66.7	225	106	80-120		
Matrix Spike Dup (BFE0787-MSD1)		**Source: WFE0232-08**			Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	320		5.00	mg CaCO3/L	66.7	248	109	80-120	0.909	20
Alkalinity	320		5.00	mg CaCO3/L	66.7	248	109	85-115	0.909	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
Matrix Spike Dup (BFE0787-MSD2)		**Source: WFE0458-02**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	297		5.00	mg CaCO3/L	66.7	225	107	85-115	0.146	20
Bicarbonate	297		5.00	mg CaCO3/L	66.7	225	107	80-120	0.146	20
Batch: BFE0833 - W FIA										
Blank (BFE0833-BLK1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:07					
Cyanide	ND		0.0100	mg/L						
LCS (BFE0833-BS1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:05					
Cyanide	0.105		0.0100	mg/L	0.100		105	90-110		
MRL Check (BFE0833-MRL1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:08					
Cyanide	0.00750		0.0100	mg/L	0.0100		75.0	50-150		
Matrix Spike (BFE0833-MS1)		**Source: WFE0448-01**			Prepared: 05/16/25 14:00- Analyzed: 05/16/25 16:37					
Cyanide	0.108		0.0100	mg/L	0.100	<0.00400	108	80-120		
Matrix Spike Dup (BFE0833-MSD1)		**Source: WFE0448-01**			Prepared: 05/16/25 14:00- Analyzed: 05/16/25 16:38					
Cyanide	0.106		0.0100	mg/L	0.100	<0.00400	106	80-120	1.31	20
Batch: BFE0916 - W Ions										
Blank (BFE0916-BLK1)					Prepared & Analyzed: 05/19/25 09:46					
Sulfate	ND		0.150	mg/L						
Blank (BFE0916-BLK2)					Prepared & Analyzed: 05/20/25 02:29					
Sulfate	ND		0.150	mg/L						

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0916 - W Ions (Continued)										
LCS (BFE0916-BS1)					Prepared & Analyzed: 05/19/25 10:28					
Sulfate	3.70			mg/L	4.00		92.6	90-110		
LCS Dup (BFE0916-BSD1)					Prepared & Analyzed: 05/20/25 01:48					
Sulfate	3.72			mg/L	4.00		93.0	90-110	0.512	20
Matrix Spike (BFE0916-MS1)		**Source: WFE0232-05**			Prepared & Analyzed: 05/19/25 12:54					
Sulfate	30.1		0.150	mg/L	4.00	20.6	238	80-120		
Matrix Spike (BFE0916-MS2)		**Source: WFE0942-03**			Prepared & Analyzed: 05/19/25 18:50					
Sulfate	46.7		0.150	mg/L	4.00	42.6	101	80-120		
Matrix Spike Dup (BFE0916-MSD1)		**Source: WFE0232-05**			Prepared & Analyzed: 05/19/25 13:15					
Sulfate	30.0		0.150	mg/L	4.00	20.6	235	80-120	0.327	20
Matrix Spike Dup (BFE0916-MSD2)		**Source: WFE0942-03**			Prepared & Analyzed: 05/19/25 19:11					
Sulfate	46.7		0.150	mg/L	4.00	42.6	103	80-120	0.146	20

Quality Control Data
(Continued)

Metals by ICP-MS

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0704 - W 3010 Digest										
Blank (BFE0704-BLK1)					Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:50					
Silica (as SiO2)	ND		0.214	mg/L						
Silicon	ND		0.100	mg/L						
LCS (BFE0704-BS1)					Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:55					
Silicon	9.32		0.100	mg/L	10.0		93.2	85-115		
Matrix Spike (BFE0704-MS1)		**Source: WFE0448-01**			Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:59					
Silicon	ND	M2	0.100	mg/L	10.0	36.5	NR	70-130		
Matrix Spike Dup (BFE0704-MSD1)		**Source: WFE0448-01**			Prepared: 05/15/25 09:15- Analyzed: 05/15/25 13:01					
Silicon	ND	M2	0.100	mg/L	10.0	36.5	NR	70-130		20

ANATEK LABS

WFE0448

Due 05/22/25

Analytical Services Quotation

For: **GSI Water Solutions, Inc.**
650 NE Holladay Street, Suite 900
Portland, OR 97232

Effective: 02/21/2025
Expires: 02/21/2026

Project: Rupp Ranches
Manager: Matt Thomas

Prepared by: Brock Gerger

Pricing Summary

Analysis	Method	Qty	TAT (days)	Unit Price	Extended Price
Drinking Water					
[Group Analysis]					
Nitrate + Nitrite by EPA 300.0	varies	1	10	$55.00	$55.00
Inorganics					
Nitrate/N by EPA 300.0	EPA 300.0	1	10	$10.00	$10.00
Ammonia/N by SM 4500-NH3 H	SM 4500-NH3 H	1	10	$60.00	$60.00
Carbonate & Bicarbonate by SM2320-B	SM 2320 B	1	10	$110.00	$110.00
Chloride by EPA 300.0	EPA 300.0	1	10	$10.00	$10.00
Cyanide by SM 4500-CN E	SM 4500-CN E	1	10	$65.00	$65.00
Fluoride by EPA 300.0	EPA 300.0	1	10	$10.00	$10.00
Hardness by SM 2340 C	SM 2340 C	1	10	$70.00	$70.00
Alkalinity by SM 2320 B	SM 2320 B	1	10	$55.00	$55.00
Ion Prep	EPA 300.0	1	10	$35.00	$35.00
TDS by SM 2540 C	SM 2540 C	1	10	$60.00	$60.00
Nitrite/N by EPA 300.0	EPA 300.0	1	10	$10.00	$10.00
Sulfate by EPA 300.0	EPA 300.0	1	10	$10.00	$10.00
Metals by ICP-MS					
Silicon by EPA 200.8	EPA 200.8	1	10	$15.00	$15.00
Metals Prep	EPA 200.8	1	10	$40.00	$40.00
			Bid Total:		**$615.00**

WFE0448

Due: 05/22/25

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Chain of Custody Record

1282 Alturas Drive, Moscow
504 E Sprague Ste D, Spokane
3019 Gs Center Rd. Wenatchee
4802 Tieton Drive, Yakima

Company Name: IRZ Consulting	Project Manager: Gina Gray
Address: 500 N First St.	Project Name & #: Rupp Ranches
City: Hermiston State: OR Zip: 97838	Purchase Order #:
Phone: 541 567 0252	Sampler Name & Phone: Jonathan - 541 571 1123 Swathi - 541 571 1113
Email Address(es): samples@irz.com	

Turn Aro

Please refer to our normal turn around times at www.anateklabs.com/pricing-lists

- [x] Normal
- [ ] Next Day*
- [ ] 2nd Day*
- [ ] Other*_____

- [ ] Phone
- [ ] Email

*All rush order requests must have prior approval

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Preservative: General Chemistry
	Well 2 (57042)	11:30 AM 5/7/25	GW			X
	Well 1 (57044)	2:00 PM 5/7/25	GW			X

Note Special Instructions/Comments

Inspection Checklist

Received Intact?	Y	N
Labels & Chains Agree?	Y	N
Containers Sealed?	Y	N
No VOC Head Space?	Y	N
Cooler?	Y	N
Ice/Ice Packs Present?	Y	N

Temperature (°C): 3.0/3.1 IR6

Number of Containers:

Shipped Via:

Preservative:

Date & Time:

Inspected By:

	Printed Name	Signature	Company	Date	Time
Relinquished by	Janet Perez		IRZ	5/7	3:26
Received by	Joseph Rippin		Anatek	5/8/25	10:25
Relinquished by					
Received by					
Relinquished by					
Received by					

Samples submitted to Anatek Labs may be subcontacted to other accredited labs if necessary. This message serves as notice of this possibility. Subcontracted analyses will be clearly noted on the analytical report.

Form COC01.03 - Eff 30 Oct 2023

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3/9/2026
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ANATEK LABS

Analytical Results Report For:

IRZ Consulting

Project:

Rupp Ranches

Anatek Work Order:

WFE0706

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Anatek Spokane - 504 E Sprague Ste. D - Spokane, WA 99202 - 509-838-3999 - spokane@anateklabs.com - FL NELAP E871099
Anatek Yakima - 4802 Tieton Drive - Yakima, WA 98908 - 509-225-9404 - yakima@anateklabs.com - FL NELAP E871190
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Client:	IRZ Consulting	Work Order:	WFE0706
Address:	500 N. First jSt.	Project:	Rupp Ranches
	Hermiston, OR 97838	Reported:	5/29/2025 17:18
Attn:	Gina Gray		

Analytical Results Report

Sample Location:	Well 3 (57041)		
Lab/Sample Number:	WFE0706-01	Collect Date:	05/12/25 09:20
Date Received:	05/14/25 10:25	Collected By:	Joanthan/Swathi
Matrix:	Groundwater		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
Alkalinity	158	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Ammonia/N	0.0203	mg/L	0.0200	5/19/25 12:13	BDM	SM 4500-NH3 H	
Bicarbonate	158	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Carbonate	ND	mg CaCO3/L	5.00	5/15/25 9:37	ALH	SM 2320 B	
Chloride	5.21	mg/L	0.150	5/15/25 7:52	BAM	EPA 300.0	
Cyanide	<0.00400	mg/L	0.0100	5/16/25 16:35	BDM	SM 4500-CN E	
Fluoride	0.435	mg/L	0.100	5/15/25 7:52	BAM	EPA 300.0	
Hardness	120	mg CaCO3/L	6.00	5/22/25 15:21	ALH	SM 2340 C	
Nitrate/N	4.10	mg/L	0.100	5/15/25 7:52	BAM	EPA 300.0	H3
Nitrate/N + Nitrite/N	4.13	mg/L	0.200	5/15/25 7:52	BAM	Calculation	
Nitrite/N	ND	mg/L	0.100	5/15/25 7:52	BAM	EPA 300.0	H3
Sulfate	10.0	mg/L	0.150	5/15/25 7:52	BAM	EPA 300.0	
TDS	278	mg/L		5/15/25 14:19	EMG	SM 2540 C	
Metals by ICP-MS							
Silica (as SiO2)	76.4	mg/L	0.214	5/15/25 13:06	JLG	EPA 200.8	M2
Silicon	35.8	mg/L	0.100	5/15/25 13:06	JLG	EPA 200.8	M2

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Sample Location:	Well 4 (57043)		
Lab/Sample Number:	WFE0706-02	Collect Date:	05/12/25 13:00
Date Received:	05/14/25 10:25	Collected By:	Joanthan/Swathi
Matrix:	Groundwater		

Analyte	Result	Units	PQL	Analyzed	Analyst	Method	Qualifier
Inorganics							
Alkalinity	141	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Ammonia/N	ND	mg/L	0.0200	5/19/25 12:15	BDM	SM 4500-NH3 H	
Bicarbonate	138	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Carbonate	ND	mg CaCO3/L	5.00	5/16/25 12:51	ALH	SM 2320 B	
Chloride	13.2	mg/L	0.150	5/14/25 21:04	BAM	EPA 300.0	
Cyanide	<0.00400	mg/L	0.0100	5/16/25 16:39	BDM	SM 4500-CN E	
Fluoride	0.966	mg/L	0.100	5/14/25 21:04	BAM	EPA 300.0	
Hardness	21.2	mg CaCO3/L	3.00	5/22/25 15:21	ALH	SM 2340 C	
Nitrate/N	0.428	mg/L	0.100	5/14/25 21:04	BAM	EPA 300.0	H3
Nitrate/N + Nitrite/N	0.428	mg/L	0.200	5/14/25 21:04	BAM	Calculation	
Nitrite/N	ND	mg/L	0.100	5/14/25 21:04	BAM	EPA 300.0	H3
Sulfate	32.5	mg/L	0.300	5/24/25 10:17	BAM	EPA 300.0	
TDS	128	mg/L		5/15/25 14:19	EMG	SM 2540 C	
Metals by ICP-MS							
Silica (as SiO2)	75.9	mg/L	21.4	5/15/25 18:20	JLG	EPA 200.8	M2
Silicon	35.7	mg/L	10.0	5/15/25 18:20	JLG	EPA 200.8	M2

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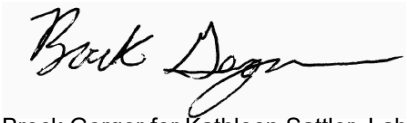
Authorized Signature,



Brock Gerger for Kathleen Sattler, Lab Manager

H3	Sample was received past holding time.
M2	Matrix spike recovery was low; the associated blank spike recovery was acceptable. Potential matrix effect.
PQL	Practical Quantitation Limit
ND	Not Detected
MCL	EPA's Maximum Contaminant Level
Dry	Sample results reported on a dry weight basis
*	Not a state-certified analyte

RPD	Relative Percent Difference
%REC	Percent Recovery
Source	Sample that was spiked or duplicated.

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Quality Control Data

Inorganics

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0692 - W Ions										
Blank (BFE0692-BLK1)					Prepared & Analyzed: 05/14/25 09:14					
Fluoride	ND		0.100	mg/L						
Chloride	ND		0.150	mg/L						
Nitrite as N	ND		0.100	mg/L						
Nitrate as N	ND		0.100	mg/L						
Sulfate	ND		0.150	mg/L						
LCS (BFE0692-BS1)					Prepared & Analyzed: 05/14/25 09:55					
Fluoride	4.00			mg/L	4.00		100	90-110		
Chloride	3.76			mg/L	4.00		93.9	90-110		
Nitrite as N	4.00			mg/L	4.00		99.9	90-110		
Nitrate as N	3.90			mg/L	4.00		97.6	90-110		
Sulfate	3.60			mg/L	4.00		90.1	90-110		
Matrix Spike (BFE0692-MS1)		**Source: WFE0672-05**			Prepared & Analyzed: 05/14/25 18:17					
Fluoride	4.65		0.100	mg/L	4.00	0.366	107	80-120		
Chloride	16.0		0.150	mg/L	4.00	11.9	101	80-120		
Nitrite as N	4.25		0.100	mg/L	4.00	0.0260	106	80-120		
Nitrate as N	4.15		0.100	mg/L	4.00	0.0640	102	80-120		
Sulfate	30.8		0.150	mg/L	4.00	26.9	97.8	80-120		
Matrix Spike Dup (BFE0692-MSD1)		**Source: WFE0672-05**			Prepared & Analyzed: 05/14/25 18:38					
Fluoride	4.84		0.100	mg/L	4.00	0.366	112	80-120	3.84	20
Chloride	16.2		0.150	mg/L	4.00	11.9	107	80-120	1.48	20
Nitrite as N	4.43		0.100	mg/L	4.00	0.0260	110	80-120	4.22	20
Nitrate as N	4.34		0.100	mg/L	4.00	0.0640	107	80-120	4.36	20
Sulfate	31.1		0.150	mg/L	4.00	26.9	105	80-120	0.943	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0738 - W Wet Chem										
Blank (BFE0738-BLK1)					Prepared & Analyzed: 05/15/25 14:19					
TDS	<13			mg/L						
Blank (BFE0738-BLK2)					Prepared & Analyzed: 05/15/25 14:19					
TDS	<10			mg/L						
Blank (BFE0738-BLK3)					Prepared & Analyzed: 05/15/25 14:19					
TDS	<10			mg/L						
Blank (BFE0738-BLK4)					Prepared & Analyzed: 05/15/25 14:19					
TDS	<13			mg/L						
LCS (BFE0738-BS1)					Prepared & Analyzed: 05/15/25 14:19					
TDS	494			mg/L	500		98.8	80-120		
LCS (BFE0738-BS2)					Prepared & Analyzed: 05/15/25 14:19					
TDS	544			mg/L	500		109	80-120		
Duplicate (BFE0738-DUP1)		**Source: WFE0544-04**			Prepared & Analyzed: 05/15/25 14:19					
TDS	12700			mg/L		13000			2.42	20
Duplicate (BFE0738-DUP2)		**Source: WFE0477-01**			Prepared & Analyzed: 05/15/25 14:19					
TDS	384			mg/L		402			4.58	20
Batch: BFE0787 - W Wet Chem										
Blank (BFE0787-BLK1)					Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Alkalinity	ND		5.00	mg CaCO3/L						

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
Blank (BFE0787-BLK2)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Carbonate	ND		5.00	mg CaCO3/L						
Blank (BFE0787-BLK3)					Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	ND		5.00	mg CaCO3/L						
Alkalinity	ND		5.00	mg CaCO3/L						
Carbonate	ND		5.00	mg CaCO3/L						
Blank (BFE0787-BLK4)					Prepared & Analyzed: 05/16/25 12:51					
Alkalinity	ND		5.00	mg CaCO3/L						
Bicarbonate	ND		5.00	mg CaCO3/L						
Carbonate	ND		5.00	mg CaCO3/L						
LCS (BFE0787-BS1)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	54.7		5.00	mg CaCO3/L	50.0		109	85-115		
Bicarbonate	54.7		5.00	mg CaCO3/L	50.0		109	85-115		
LCS (BFE0787-BS2)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	56.6		5.00	mg CaCO3/L	50.0		113	85-115		
Bicarbonate	56.6		5.00	mg CaCO3/L	50.0		113	85-115		
LCS (BFE0787-BS3)					Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	24.1		5.00	mg CaCO3/L	25.0		96.5	85-115		
Alkalinity	24.1		5.00	mg CaCO3/L	25.0		96.5	85-115		
LCS (BFE0787-BS4)					Prepared & Analyzed: 05/16/25 12:51					
Alkalinity	54.8		5.00	mg CaCO3/L	50.0		110	85-115		
Bicarbonate	54.2		5.00	mg CaCO3/L	50.0		108	85-115		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
LCS Dup (BFE0787-BSD1)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	55.4		5.00	mg CaCO3/L	50.0		111	85-115	1.32	20
Bicarbonate	54.4		5.00	mg CaCO3/L	50.0		109	85-115	0.504	20
LCS Dup (BFE0787-BSD2)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	56.6		5.00	mg CaCO3/L	50.0		113	85-115	0.177	20
Bicarbonate	56.6		5.00	mg CaCO3/L	50.0		113	85-115	0.177	20
LCS Dup (BFE0787-BSD3)					Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	24.2		5.00	mg CaCO3/L	25.0		96.8	85-115	0.290	20
Bicarbonate	24.2		5.00	mg CaCO3/L	25.0		96.8	85-115	0.290	20
LCS Dup (BFE0787-BSD4)					Prepared & Analyzed: 05/16/25 12:51					
Alkalinity	55.3		5.00	mg CaCO3/L	50.0		111	85-115	0.908	20
Bicarbonate	54.3		5.00	mg CaCO3/L	50.0		109	85-115	0.203	20
Duplicate (BFE0787-DUP1)		**Source: WFE0524-02**			Prepared & Analyzed: 05/15/25 09:37					
Carbonate	ND		5.00	mg CaCO3/L		ND				20
Alkalinity	67.1		5.00	mg CaCO3/L		66.6			0.648	20
Bicarbonate	67.1		5.00	mg CaCO3/L		66.6			0.648	20
Duplicate (BFE0787-DUP2)		**Source: WFE0395-01**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	17.3		5.00	mg CaCO3/L		16.8			2.58	20
Bicarbonate	17.3		5.00	mg CaCO3/L		16.8			2.58	20
Carbonate	ND		5.00	mg CaCO3/L		ND				20
Matrix Spike (BFE0787-MS1)		**Source: WFE0232-08**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	318		5.00	mg CaCO3/L	66.7	248	105	85-115		
Bicarbonate	318		5.00	mg CaCO3/L	66.7	248	105	80-120		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0787 - W Wet Chem (Continued)										
Matrix Spike (BFE0787-MS2)		**Source: WFE0458-02**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	296		5.00	mg CaCO3/L	66.7	225	106	85-115		
Bicarbonate	296		5.00	mg CaCO3/L	66.7	225	106	80-120		
Matrix Spike Dup (BFE0787-MSD1)		**Source: WFE0232-08**			Prepared & Analyzed: 05/15/25 09:37					
Bicarbonate	320		5.00	mg CaCO3/L	66.7	248	109	80-120	0.909	20
Alkalinity	320		5.00	mg CaCO3/L	66.7	248	109	85-115	0.909	20
Matrix Spike Dup (BFE0787-MSD2)		**Source: WFE0458-02**			Prepared & Analyzed: 05/15/25 09:37					
Alkalinity	297		5.00	mg CaCO3/L	66.7	225	107	85-115	0.146	20
Bicarbonate	297		5.00	mg CaCO3/L	66.7	225	107	80-120	0.146	20
Batch: BFE0833 - W FIA										
Blank (BFE0833-BLK1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:07					
Cyanide	ND		0.0100	mg/L						
LCS (BFE0833-BS1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:05					
Cyanide	0.105		0.0100	mg/L	0.100		105	90-110		
MRL Check (BFE0833-MRL1)					Prepared: 05/16/25 14:00- Analyzed: 05/16/25 15:08					
Cyanide	0.00750		0.0100	mg/L	0.0100		75.0	50-150		
Matrix Spike (BFE0833-MS1)		**Source: WFE0448-01**			Prepared: 05/16/25 14:00- Analyzed: 05/16/25 16:37					
Cyanide	0.108		0.0100	mg/L	0.100	ND	108	80-120		
Matrix Spike Dup (BFE0833-MSD1)		**Source: WFE0448-01**			Prepared: 05/16/25 14:00- Analyzed: 05/16/25 16:38					
Cyanide	0.106		0.0100	mg/L	0.100	ND	106	80-120	1.31	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0858 - W FIA										
Blank (BFE0858-BLK1)					Prepared & Analyzed: 05/19/25 11:09					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK2)					Prepared & Analyzed: 05/19/25 11:28					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK3)					Prepared & Analyzed: 05/19/25 11:49					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK4)					Prepared & Analyzed: 05/19/25 12:10					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK5)					Prepared & Analyzed: 05/19/25 12:31					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK6)					Prepared & Analyzed: 05/19/25 12:59					
Ammonia/N	ND		0.0200	mg/L						
Blank (BFE0858-BLK7)					Prepared & Analyzed: 05/19/25 13:19					
Ammonia/N	ND		0.0200	mg/L						
LCS (BFE0858-BS1)					Prepared & Analyzed: 05/19/25 11:07					
Ammonia/N	0.194		0.0200	mg/L	0.200		97.2	90-110		
LCS (BFE0858-BS2)					Prepared & Analyzed: 05/19/25 11:47					
Ammonia/N	0.200		0.0200	mg/L	0.200		100	90-110		
LCS (BFE0858-BS3)					Prepared & Analyzed: 05/19/25 12:26					
Ammonia/N	0.194		0.0200	mg/L	0.200		97.2	90-110		

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0858 - W FIA (Continued)										
LCS (BFE0858-BS4)					Prepared & Analyzed: 05/19/25 13:17					
Ammonia/N	0.192		0.0200	mg/L	0.200		96.0	90-110		
MRL Check (BFE0858-MRL1)					Prepared & Analyzed: 05/19/25 11:10					
Ammonia/N	0.0103		0.0200	mg/L	0.0100		103	50-150		
Matrix Spike (BFE0858-MS1)		**Source: WFE0706-01**			Prepared & Analyzed: 05/19/25 12:35					
Ammonia/N	0.204		0.0200	mg/L	0.200	0.0203	92.1	80-120		
Matrix Spike (BFE0858-MS2)		**Source: WFE0706-02**			Prepared & Analyzed: 05/19/25 12:38					
Ammonia/N	0.170		0.0200	mg/L	0.200	ND	85.2	80-120		
Matrix Spike (BFE0858-MS3)		**Source: WFE0800-01**			Prepared & Analyzed: 05/19/25 12:44					
Ammonia/N	0.187		0.0200	mg/L	0.200	ND	93.4	80-120		
Matrix Spike (BFE0858-MS4)		**Source: WFE0800-03**			Prepared & Analyzed: 05/19/25 12:50					
Ammonia/N	0.187		0.0200	mg/L	0.200	ND	93.4	80-120		
Matrix Spike Dup (BFE0858-MSD1)		**Source: WFE0706-01**			Prepared & Analyzed: 05/19/25 12:37					
Ammonia/N	0.206		0.0200	mg/L	0.200	0.0203	92.9	80-120	0.779	20
Matrix Spike Dup (BFE0858-MSD2)		**Source: WFE0706-02**			Prepared & Analyzed: 05/19/25 12:40					
Ammonia/N	0.179		0.0200	mg/L	0.200	ND	89.6	80-120	4.92	20
Matrix Spike Dup (BFE0858-MSD3)		**Source: WFE0800-01**			Prepared & Analyzed: 05/19/25 12:46					
Ammonia/N	0.188		0.0200	mg/L	0.200	ND	94.0	80-120	0.747	20
Matrix Spike Dup (BFE0858-MSD4)		**Source: WFE0800-03**			Prepared & Analyzed: 05/19/25 12:52					
Ammonia/N	0.189		0.0200	mg/L	0.200	ND	94.4	80-120	0.958	20

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Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE1152 - W Wet Chem										
Blank (BFE1152-BLK1)					Prepared & Analyzed: 05/22/25 15:21					
Hardness	ND		3.00	mg CaCO3/L						
Blank (BFE1152-BLK2)					Prepared & Analyzed: 05/22/25 15:21					
Hardness	ND		3.00	mg CaCO3/L						
LCS (BFE1152-BS1)					Prepared & Analyzed: 05/22/25 15:21					
Hardness	50.2		3.00	mg CaCO3/L	50.0		100	90-110		
LCS Dup (BFE1152-BSD1)					Prepared & Analyzed: 05/22/25 15:21					
Hardness	50.2		3.00	mg CaCO3/L	50.0		100	90-110	0.00	20
Duplicate (BFE1152-DUP1)		**Source: WFE0706-02**			Prepared & Analyzed: 05/22/25 15:21					
Hardness	25.6		3.00	mg CaCO3/L		21.2			18.9	20
Matrix Spike (BFE1152-MS1)		**Source: YFE0559-01**			Prepared & Analyzed: 05/22/25 15:21					
Hardness	156		6.00	mg CaCO3/L	100	57.1	98.5	80-120		
Matrix Spike Dup (BFE1152-MSD1)		**Source: YFE0559-01**			Prepared & Analyzed: 05/22/25 15:21					
Hardness	158		6.00	mg CaCO3/L	100	57.1	100	80-120	1.26	20
Batch: BFE1216 - W Ions										
Blank (BFE1216-BLK1)					Prepared & Analyzed: 05/23/25 11:39					
Sulfate	ND		0.150	mg/L						
Blank (BFE1216-BLK2)					Prepared & Analyzed: 05/25/25 02:40					
Sulfate	ND		0.150	mg/L						

Anatek Labs, Inc.

1282 Alturas Drive - Moscow, ID 83843 - (208) 883-2839 - email moscow@anateklabs.com
504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Quality Control Data
(Continued)

Inorganics (Continued)

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE1216 - W Ions (Continued)										
LCS (BFE1216-BS1)					Prepared & Analyzed: 05/23/25 12:21					
Sulfate	3.95			mg/L	4.00		98.7	90-110		
LCS Dup (BFE1216-BSD1)					Prepared & Analyzed: 05/25/25 02:19					
Sulfate	3.76			mg/L	4.00		94.0	90-110	4.91	20
Matrix Spike (BFE1216-MS1)		**Source: WFE0550-06**			Prepared & Analyzed: 05/23/25 16:31					
Sulfate	4.09		0.150	mg/L	4.00	ND	102	80-120		
Matrix Spike (BFE1216-MS2)		**Source: WFE0550-07**			Prepared & Analyzed: 05/24/25 02:17					
Sulfate	4.10		0.150	mg/L	4.00	0.110	99.7	80-120		
Matrix Spike Dup (BFE1216-MSD1)		**Source: WFE0550-06**			Prepared & Analyzed: 05/23/25 16:52					
Sulfate	4.16		0.150	mg/L	4.00	ND	104	80-120	1.77	20
Matrix Spike Dup (BFE1216-MSD2)		**Source: WFE0550-07**			Prepared & Analyzed: 05/24/25 02:38					
Sulfate	4.14		0.150	mg/L	4.00	0.110	101	80-120	1.12	20

Quality Control Data
(Continued)

Metals by ICP-MS

Analyte	Result	Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: BFE0704 - W 3010 Digest										
Blank (BFE0704-BLK1)					Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:50					
Silica (as SiO2)	ND		0.214	mg/L						
Silicon	ND		0.100	mg/L						
LCS (BFE0704-BS1)					Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:55					
Silicon	9.32		0.100	mg/L	10.0		93.2	85-115		
Matrix Spike (BFE0704-MS1)		**Source: WFE0448-01**			Prepared: 05/15/25 09:15- Analyzed: 05/15/25 12:59					
Silicon	ND	M2	0.100	mg/L	10.0	36.5	NR	70-130		
Matrix Spike Dup (BFE0704-MSD1)		**Source: WFE0448-01**			Prepared: 05/15/25 09:15- Analyzed: 05/15/25 13:01					
Silicon	ND	M2	0.100	mg/L	10.0	36.5	NR	70-130		20

WFE0706

Due: 05/28/25

ANATEK LABS

Chain of Custody Record

1282 Alturas Drive, Moscow I
504 E Sprague Ste D, Spokane
3019 Gs Center Rd. Wenatchee,
4802 Tieton Drive, Yakima W

Company Name: IRZ Consulting	Project Manager: Gina Gray
Address: 500N 1st st.	Project Name & #: Rupp Ranches
City: Hermiston State: OR Zip: 97838	Purchase Order #:
Phone: 541 567 0252	Sampler Name & Phone: Jonathan – 541 571 1123 Swathi – 541 571 1113
Email Address(es): samples@irz.com	

Turn Arou

Please refer to our normal turn around times at www.anateklabs.com/pricing-lists

- [x] Normal
- [ ] Next Day*
- [ ] 2nd Day*
- [ ] Other*_____

- [ ] Phone
- [ ] Email

*All rush order requests must have prior approval

List Analyses Requested

Lab ID	Sample Identification	Sampling Date/Time	Matrix	# of Containers	Sample Volume	Preservative:	General Chemistry
	Well 3 (57041)	5/12/25 9:20 AM	GW				X
	Well 4 (57043)	5/12/25, 1:00 PM	GW				X

Note Special Instructions/Comments

Inspection Checklist

Received Intact?	Y	N
Labels & Chains Agree?	Y	N
Containers Sealed?	Y	N
No VOC Head Space?	Y	N
Cooler?	Y	N
Ice/Ice Packs Present?	Y	N

Temperature (°C): 2.8/2.9 IR6
Number of Containers: ~~15~~ 14
Shipped Via: UPS
Preservative:
Date & Time:
Inspected By:

	Printed Name	Signature	Company	Date	Time
Relinquished by	Swathi Palle	Swathy	IRZ consulting	5/12/25	3:20 PM
Received by	Joseph Rippin		Anatek	5/13/25	1053
Relinquished by					
Received by					
Relinquished by					
Received by					

Samples submitted to Anatek Labs may be subcontacted to other accredited labs if necessary. This message serves as notice of this possibility. Subcontracted analyses will be clearly noted on the analytical report.

Form COC01.03 - Eff 30 Oct 2023

P250+6
P125+8

UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 5051604

GSI Water Solutions, Inc	Project: No Project	Date Reported: 05/28/25
650 NE Holladay Street	Project #: RUPP Ranches Nitrate Resample	Date Sampled: 05/15/25 12:20
Portland, OR 97214		Date Received: 05/16/25 10:00
	Client Contact: GSI Water Solutions, Inc	Sampled By: R. Ford

Sample Location: Well 3-20250515 URC Sample #: 5051604-01 Matrix: Drinking Water

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
USEPA 300.0									
Nitrite as N (‡)	1041	ND	mg/L	0.03	1	05/16/25 13:08	05/16/25	SAM	
Nitrate as N (‡)	1040	3.98	mg/L	0.10	10	05/16/25 13:08	05/16/25	SAM	

UMPQUA Research Company/MC

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

Dan Phillips, Laboratory Manager

UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 5051604

GSI Water Solutions, Inc	Project: No Project	Date Reported: 05/28/25
650 NE Holladay Street	Project #: RUPP Ranches Nitrate Resample	Date Sampled: 05/15/25 13:40
Portland, OR 97214		Date Received: 05/16/25 10:00
	Client Contact: GSI Water Solutions, Inc	Sampled By: R. Ford

Sample Location: Well 4-20250515 URC Sample #: 5051604-02 Matrix: Drinking Water

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
USEPA 300.0									
Nitrite as N (‡)	1041	ND	mg/L	0.03	1	05/16/25 13:08	05/16/25	SAM	
Nitrate as N (‡)	1040	0.47	mg/L	0.10	10	05/16/25 13:08	05/16/25	SAM	

UMPQUA Research Company/MC

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
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Dan Phillips, Laboratory Manager

UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 5051604

Qualifiers and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the MRL (minimum reporting limit)
NA	Not Applicable
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MRL	Minimum Reporting Limit
MDL	Minimum Detection Limit
BML	Benchmark Level
(‡)	ORELAP Accredited Analyte
(~)	Due to rounding of individual analytes, the "total" may vary slightly from the sum of the individual analyte values.

UMPQUA Research Company/MC

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

Dan Phillips, Laboratory Manager

ISOTECH
a Stratum Reservoir brand
1308 Parkland Court
Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967730 **Job #:** 62433

Sample Name: Well 1 (57044)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/07/2025 16:45 **Date Received:** 05/09/2025 **Date Reported:** 06/19/2025

Component	Dissolved gas cc/L	Dissolved gas mg/L
Methane	0.00095	0.00063
Ethane	<0.0001	<0.0002
Propane	<0.0001	<0.0002

Remarks:

nd = not detected. na = not analyzed.

ISOTECH
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1308 Parkland Court
Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967731 **Job #:** 62433

Sample Name: Well 2 (57042)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/07/2025 11:50 **Date Received:** 05/09/2025 **Date Reported:** 06/19/2025

Component	Dissolved gas cc/L	Dissolved gas mg/L
Methane	0.0004	0.0003
Ethane	<0.0001	<0.0002
Propane	<0.0001	<0.0002

Remarks:

nd = not detected. na = not analyzed.

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Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967732 **Job #:** 62433

Sample Name: Well 3 (57041)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/12/2025 10:35 **Date Received:** 05/14/2025 **Date Reported:** 06/19/2025

Component	Dissolved gas cc/L	Dissolved gas mg/L
Methane	0.0003	0.0002
Ethane	<0.0001	<0.0002
Propane	<0.0001	<0.0002

Remarks:

nd = not detected. na = not analyzed.

ISOTECH
a Stratum Reservoir brand
1308 Parkland Court
Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967733 **Job #:** 62433

Sample Name: Well 4 (57043)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/12/2025 13:15 **Date Received:** 05/14/2025 **Date Reported:** 06/19/2025

Component	Dissolved gas cc/L	Dissolved gas mg/L
Methane	0.0014	0.00097
Ethane	<0.0001	<0.0001
Propane	<0.0001	<0.0002

Remarks:

nd = not detected. na = not analyzed.

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a Stratum Reservoir brand
1308 Parkland Court
Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967730 **Job #:** 62433

Sample Name: Well 1 (57044)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/07/2025 16:45 **Date Received:** 05/09/2025 **Date Reported:** 06/19/2025

δD of water	-139.7‰ relative to VSMOW
$\delta^{18}O$ of water	-17.91‰ relative to VSMOW
Tritium content of water	<0.56 TU
$\delta^{13}C$ of DIC	-12.2‰ relative to VPDB
^{14}C content of DIC	11.12 ± 0.08 percent modern carbon
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water
Counting TU values are calculated for date of sample collection, as provided by the submitter. If no such date is provided, the sample arrival date at our laboratory is used.14C DIC Subcontracted to BETA Analytical.

ISOTECH
a Stratum Reservoir brand
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Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967731 **Job #:** 62433

Sample Name: Well 2 (57042)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/07/2025 11:50 **Date Received:** 05/09/2025 **Date Reported:** 06/19/2025

δD of water	-116.7‰ relative to VSMOW
$\delta^{18}O$ of water	-14.45‰ relative to VSMOW
Tritium content of water	<0.45 TU
$\delta^{13}C$ of DIC	-10.3‰ relative to VPDB
^{14}C content of DIC	47.58 ± 0.17 percent modern carbon
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water
Counting TU values are calculated for date of sample collection, as provided by the submitter. If no such date is provided, the sample arrival date at our laboratory is used.14C DIC Subcontracted to BETA Analytical.

ISOTECH
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Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967732 **Job #:** 62433

Sample Name: Well 3 (57041)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/12/2025 10:35 **Date Received:** 05/14/2025 **Date Reported:** 06/19/2025

δD of water	-115.5‰ relative to VSMOW
$\delta^{18}O$ of water	-14.34‰ relative to VSMOW
Tritium content of water	<0.49 TU
$\delta^{13}C$ of DIC	-10.2‰ relative to VPDB
^{14}C content of DIC	51.66 ± 0.19 percent modern carbon
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water
Counting TU values are calculated for date of sample collection, as provided by the submitter. If no such date is provided, the sample arrival date at our laboratory is used.14C DIC Subcontracted to BETA Analytical.

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a Stratum Reservoir brand
1308 Parkland Court
Champaign, IL 61821
P 217-398-3490
isotechlabs.com

Lab #: 967733 **Job #:** 62433

Sample Name: Well 4 (57043)

Company: GSI Water Solutions

Container: Isoflask & Plastic Bottle

Field/Site Name: Rupp Ranches

Date Sampled: 05/12/2025 13:15 **Date Received:** 05/14/2025 **Date Reported:** 06/19/2025

δD of water	-138.5‰ relative to VSMOW
$\delta^{18}O$ of water	-17.74‰ relative to VSMOW
Tritium content of water	<0.70 TU
$\delta^{13}C$ of DIC	-11.7‰ relative to VPDB
^{14}C content of DIC	14.67 ± 0.09 percent modern carbon
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water
Counting TU values are calculated for date of sample collection, as provided by the submitter. If no such date is provided, the sample arrival date at our laboratory is used.14C DIC Subcontracted to BETA Analytical.

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

June 11, 2025

Steve Pelphrey
Isotech Laboratories, Inc. (USA)
1308 Parkland Court
Champaign, IL 61821
USA

Dear Steve Pelphrey,

Job 62433 GSI

Enclosed are the radiocarbon dating results for the sample(s) recently sent to us. The samples provided plenty of carbon for accurate radiocarbon measurements. The results were obtained on the DIC and are reported both as percent modern carbon (pMC) and fraction of modern (F14C). The report sheet also includes the method used, material type, and applied pretreatments.

DIC extraction consisted of injecting sample water into an acid bath attached to an evacuated collection line. pH was reduced to < 1 and evolved CO2 was dried with methanol slush and collected in liquid nitrogen. CO2 was then graphitized over cobalt in a hydrogen atmosphere to produce the target for our AMS. Reported radiocarbon results are relative to NIST SRM-4990C.

Also mentioned on the report is an "Apparent Radiocarbon Age". This is for reference only. It would illustrate the residence time of the water in the absence of any hydro-geochemical effects. The best illustration of age would have to be derived by incorporating the radiocarbon pMC or fraction modern result into models which take the hydrologic conditions of the aquifer under study into account. The Apparent Radiocarbon Age is used as a relational tool, of understandable units to the layman, to interpret hydrologic differences between wells and to monitor temporal changes.

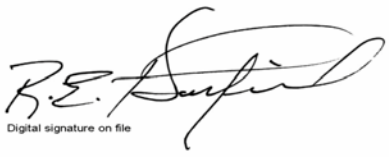
Given the complex nature of groundwater DIC14 chemistry, duplicate measurements within 1-2 pMC are reasonable for a single water sample. For very low DIC concentration waters (e.g. < 20 mg/L HCO3) DIC14 and waters with complex organic chemistry, results can vary significantly outside of this expectation. Please take this into consideration in your interpretation of results.

Reported carbon isotopes (13C) are relative to VPDB and deuterium and oxygen isotopes (2H and 18O) are reported relative to VSMOW. Measurement was performed using gas-bench Isotope Ratio Mass Spectrometer (IRMS) and Cavity Ring-Down Spectrometer (CRDS).

We analyzed the samples on a sole priority basis. No students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. The analysis was a combined effort of our entire professional staff. The results are ISO/IEC 17025:2017 accredited.

Our invoice has been sent separately. Thank you for your prior efforts in arranging payment. As always, if you have any questions or would like to discuss the results, don't hesitate to contact us.

Sincerely,



Mr. Ron Hatfield
Laboratory Management Group / President

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Steve Pelphrey
Isotech Laboratories, Inc. (USA)

Report Date: June 11, 2025
Received Date: May 27, 2025

Laboratory Number	pMC	$F^{14}C$	δ13C o/oo
Beta-752463	11.12 +/- 0.08 pMC	0.1112 +/- 0.0008	-11.92

967730
Standard AMS (14 business days)
ANALYZED MATERIAL/PRETREATMENT: (Water DIC):acidify-gas strip
COMMENT:

The equivalent "Apparent" radiocarbon age to the reported pMC/fMDN values is ~ 17650 BP (not adjusted for any hydro-geoc hemical effects on meteoric water 14CO2). Given the complex nature of groundwater DIC14 chemistry, duplicate measurements within 1-2 pMC are reasonable for a single water sample. For very low DIC concentration waters (< 20 mg/L HCO3) DIC14 and waters with complex organic chemistry, results can vary significantly outside of this expectation.

Laboratory Number	pMC	$F^{14}C$	δ13C o/oo
Beta-752464	47.58 +/- 0.17 pMC	0.4758 +/- 0.0018	-10.07

967731
Standard AMS (14 business days)
ANALYZED MATERIAL/PRETREATMENT: (Water DIC):acidify-gas strip
COMMENT:

The equivalent "Apparent" radiocarbon age to the reported pMC/fMDN values is ~ 5970 BP (not adjusted for any hydro-geoc hemical effects on meteoric water 14CO2). Given the complex nature of groundwater DIC14 chemistry, duplicate measurements within 1-2 pMC are reasonable for a single water sample. For very low DIC concentration waters (< 20 mg/L HCO3) DIC14 and waters with complex organic chemistry, results can vary significantly outside of this expectation.

Laboratory Number	pMC	$F^{14}C$	δ13C o/oo
Beta-752465	51.66 +/- 0.19 pMC	0.5166 +/- 0.0019	-10.08

967732
Standard AMS (14 business days)
ANALYZED MATERIAL/PRETREATMENT: (Water DIC):acidify-gas strip
COMMENT:

The equivalent "Apparent" radiocarbon age to the reported pMC/fMDN values is ~ 5310 BP (not adjusted for any hydro-geoc hemical effects on meteoric water 14CO2). Given the complex nature of groundwater DIC14 chemistry, duplicate measurements within 1-2 pMC are reasonable for a single water sample. For very low DIC concentration waters (< 20 mg/L HCO3) DIC14 and waters with complex organic chemistry, results can vary significantly outside of this expectation.

Laboratory Number	pMC	$F^{14}C$	δ13C o/oo
Beta-752466	14.67 +/- 0.09 pMC	0.1467 +/- 0.0009	-11.58

967733
Standard AMS (14 business days)
ANALYZED MATERIAL/PRETREATMENT: (Water DIC):acidify-gas strip
COMMENT:

The equivalent "Apparent" radiocarbon age to the reported pMC/fMDN values is ~ 15420 BP (not adjusted for any hydro-geoc hemical effects on meteoric water 14CO2). Given the complex nature of groundwater DIC14 chemistry, duplicate measurements within 1-2 pMC are reasonable for a single water sample. For very low DIC concentration waters (< 20 mg/L HCO3) DIC14 and waters with complex organic chemistry, results can vary significantly outside of this expectation.

To validate report, scan this QR code on a mobile device or go to https://verify.betalabservices.com and enter the requested information.

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta using In-house NEC spectrometers and ThermoFisher Isotope Ratio Mass Spectrometers (IRMS).

The pMC and F14C activities were calculated relative to the Modern 14C Standard (NIST 4990C - Ocalic Acide II) using the Libby half-life of 5569 years and the quoted errors are representative of the 1-sigma counting statistics. The pMC and F14C activities reported represent both the Measured 14C and Conventional 14C activities. The "Apparent Radiocarbon Age" listed is provided solely for reference and is representative of the Measured 14C activity (uncorrected for isotopic fractionation). In some circumstances, it may suggest the residence time of the organics in the water and/or may be used as a relational tool, to interpret hydrologic differences to monitor temporal changes. Given the complex nature of aqueous 14CDOC chemistry, duplicate measurements typically produce results that agree within +/- 2 pMC, which is reasonable for a single water sample and represent ensemble averages of pooled organic carbon. d13C stable isotope ratios are reported relative to VPDB.

ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date June 11, 2025

Submitter Steve Pelphrey

QA MEASUREMENTS

Reference 1	
Expected Value	23.05 +/- 0.20 pMC
Measured Value	22.79 +/- 0.11 pMC
Agreement	Accepted
Reference 2	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 3	
Expected Value	110.69 +/- 0.40 pMC
Measured Value	110.89 +/- 0.41 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date June 11, 2025

ISOTECH
a Stratum Reservoir brand

www.isotechlabs.com

Address: 1308 Parkland Court Champaign, IL 61821-1826 Phone: 217-398-3490

SEND DATA TO:

Name: Gina Gray.
Company: IRZ Consulting
Address: 500 N 1st Street.
City/State Hermiston, OR 97838
Phone: 541 567 0252
Email: samples@irz.com

SEND INVOICE TO: (if different from SEND DATA TO:)

Name:
Company:
Address:
City/State
Phone:
Email:

Project: Rupp Ranches
Location:

Purchase Order #:
Sampled By: ~~Jonathan~~ IRZ Consulting.

Select One: ☑ Standard ☐ Priority ☐ Rush

Sample Description

Container Number	Sample Identification	Date Sampled	~~Time~~	Analyses Requested	Comments
	Well 1 (57044)	5/7/2025	(1bag, 2 bottles)	See the analysis package back side.	Not field filtered, need to be done at lab.
	Well 2 (57042)	5/7/2025	(1bag, 2bottles)		

Chain-of-Custody Record

	Signature	Company	Date	Time
Relinquished by	Swathi Palle Swathy	IRZ Consulting	5/8/25	3:00 PM.
Received by	Dustin Barding/SR Isotech		5/9/25	8:55
Relinquished by				
Received by				
Relinquished by				
Received by				

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www.isotechlabs.com

Address: 1308 Parkland Court Champaign, IL 61821-1826 Phone: 217-398-3490

SEND DATA TO:

Name: Gina Gray
Company: IRZ Consulting, LLC
Address: 500 N 1st St.
City/State Hermiston/OR 97838
Phone: 541 567 0252
Email: samples@irz.com

SEND INVOICE TO: (if different from SEND DATA TO:)

Name:
Company:
Address:
City/State
Phone:
Email:

Project: Rupp Ranches
Location: Well 3 and Well 4 (57043). (57041)
Purchase Order #:
Sampled By: IRZ Consulting.

Select One: ☑ Standard ☐ Priority ☐ Rush

Sample Description

Container Number	Sample Identification	Date Sampled	Time	Analyses Requested	Comments
	Well 3 (57041)	5/12/25		See analysis Package in the backside of the COC.	Samples are unfiltered, and should be lab filtered.
	Well 4 (57043)	5/12/25			

Chain-of-Custody Record

	Signature	Company	Date	Time
Relinquished by	Swathi Palle	IRZ Consulting	5/13/25	2:25pm
Received by	Brody Tuggle / SR Isotech		5/14/25	1145
Relinquished by				
Received by				
Relinquished by				
Received by				

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SAMPLE ID	CFC-11 (pmoles/kg)	CFC-12 (pmoles/kg)	CFC-113 (pmoles/kg)	Salinity (‰)	Recharge Elev. (m)	Recharge Temp (C)	Comments	Pwater	Elev. correction	KRT_11	KRT_12	KRT_113	eq. air conc_11 (ppt)	eq. air conc_12 (ppt)	eq. air conc_113 (ppt)	CFC-11 Rech. year	CFC-12 Rech. year	CFC-113 Rech. year
								0.006	0.993975	0.0387	0.0094	0.01263	0	0	0	#N/A	#N/A	1943
CFC25-0267 Well 1	0.08362218	0.03124149	0.00185986	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	4.0542	5.8356	0.29189	1955	1949	1950.5
CFC25-0267 Well 1	0.06790984	0.05104437	0.00191101	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	3.2924	9.5346	0.29992	1954.5	1951	1950.5
CFC25-0267 Well 1	0.04732066	0.25447353	0.00202829	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	2.2942	47.533	0.31832	1953.5	1962.5	1951
								0.006	0.993975	0.0387	0.0094	0.01263	0	0	0	#N/A	#N/A	1943
CFC25-0268 Well 2	0.04926979	0.08532349	0.00337988	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	2.3887	15.938	0.53044	1953.5	1954.5	1953.5
CFC25-0268 Well 2	0.06650571	0.08075332	0.00192475	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	3.2244	15.084	0.30207	1954.5	1954	1950.5
CFC25-0268 Well 2	0.00876026	0.04757406	0.00174079	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	0.4247	8.8864	0.2732	1949	1951	1950
								0.006	0.993975	0.0387	0.0094	0.01263	0	0	0	#N/A	#N/A	1943
CFC25-0318 Well4	0.16261459	0.17375783	0.0053599	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	7.8839	32.456	0.84119	1958	1959.5	1956.5
CFC25-0318 Well4	0.12688824	0.11017306	0.00264062	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	6.1518	20.579	0.41442	1957	1956	1952
CFC25-0318 Well4	0.12078003	0.13022613	0.00239328	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	5.8557	24.325	0.3756	1956.5	1957	1951.5
								0.006	0.993975	0.0387	0.0094	0.01263	0	0	0	#N/A	#N/A	1943
CFC25-0317 Well-3	0.12778306	0.09890968	0.00259361	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	6.1952	18.475	0.40704	1957	1955.5	1952
CFC25-0317 Well-3	0.12054808	0.09234389	0.00318348	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	5.8445	17.249	0.49962	1956.5	1955	1953
CFC25-0317 Well-3	0.12568179	0.09486434	0.00328632	0	100	10		0.0121	0.976095	0.0211	0.0055	0.00653	6.0934	17.72	0.51576	1956.5	1955	1953.5

APPENDIX E

Water Wells in Study Area

OWRD Well ID	Location				Use	Date Completed	Completed Depth (ft bgs)	Reported Yield (gpm)	Static Water Level Post-Construction (ft bgs)
	1/4 1/4 Section	Section	Township	Range					
UMAT 2994	SW/SE	12	4N	30E	Domestic	30764	28	40	10
UMAT 3013	Unknown	9	4N	31E	Domestic	21416	504	23	160
UMAT 3014	SW/SE	9	4N	31E	Domestic	19359	342	0	160
UMAT 3848	Unknown	17	5N	30E	Domestic	26281	220	10	160
UMAT 3849	NE/NE	19	5N	30E	Domestic	28286	685	42	345
UMAT 3850	Unknown	25	5N	30E	Domestic	27344	300	12	140
UMAT 3851	Unknown	25	5N	30E	Domestic	25325	270	30	37
UMAT 3852	Unknown	25	5N	30E	Domestic	21460	215	0	17
UMAT 3853	Unknown	24	5N	30E	Domestic	21423	193	25	18
UMAT 3857	SE/SE	34	5N	30E	Domestic	28090	364	75	131
UMAT 3859	Unknown	15	5N	31E	Domestic	30715	402	10	275
UMAT 3861	NW/SW	34	5N	31E	Domestic	28467	490	75	67
UMAT 3862	NW/	34	5N	31E	Domestic	23252	220	25	30
UMAT 3863	Unknown	34	5N	31E	Domestic	23116	174	12	105
UMAT 54201	Unknown	15	5N	31E	Domestic	37011	404	20	192
UMAT 54910	NE/SE	6	4N	31E	Domestic	37869	527	30	113
UMAT 55398	NE/NE	30	5N	30E	Domestic	38477	535	12	163
UMAT 5629	SW/NW	30	5N	31E	Domestic	33627	125	0	110
UMAT 6567	NE/SE	33	5N	31E	Domestic	34933	500	40	109
UMAT 55943	SE/NE	3	4N	30E	Industrial	39209	1060	40	383
UMAT 2993	NE/SE	8	4N	30E	Irrigation	24481	968	880	83
UMAT 55961	NW/SW	3	4N	30E	Irrigation	39256	883	30	310
UMAT 56199	NW/SE	3	4N	30E	Irrigation	39651	1671	1925	504
UMAT 57041	NW/SE	13	5N	30E	Irrigation	40883	552	4000	179
UMAT 57042	NE/SW	14	5N	30E	Irrigation	40867	635	2000	189
UMAT 57044	NE/SW	15	5N	30E	Irrigation	41089	820	2000	517
UMAT 3012	Unknown	6	4N	31E	Irrigation/Domestic	24860	120	60	100
UMAT 3854	NW/SE	28	5N	30E	Irrigation/Domestic	23548	844	70	155
UMAT 3860	Unknown	30	5N	31E	Irrigation/Domestic	22687	0	60	22
UMAT 58217	NE/SW	15	5N	30E	Irrigation/Test Well	41172	1379	0	0
UMAT 55719	NW/SE	3	4N	30E	Livestock	38834	871	250	248
UMAT 57043	SW/NW	7	5N	31E	Livestock	41018	990	3000	572
UMAT 57711	NW/NW	33	5N	31E	Livestock	42683	102	300	23
UMAT 58595	NE/SW	15	5N	30E	Livestock	44333	270	90	156
UMAT 3856	Unknown	31	5N	30E	Test Well	23797	1008	200	300
UMAT 54332	Unknown	9	4N	31E	Unknown	0	0	0	0