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A Geochemical Assessment of Potential Groundwater Storage Locations within the Yakima River Basin

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A GEOCHEMICAL ASSESSMENT OF POTENTIAL GROUNDWATER STORAGE LOCATIONS WITHIN THE YAKIMA RIVER BASIN

WASHINGTON, USA

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by

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ABSTRACT

A GEOCHEMICAL ASSESSMENT OF POTENTIAL GROUNDWATER STORAGE LOCATIONS WITHIN THE YAKIMA RIVER BASIN

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Currently in the Yakima River Basin more people possess surface water rights than there is available surface water. As a result, the local community devised the Yakima River Basin Integrated Water Management Plan, with the goal of creating a sustainable source of water for the foreseeable future. One of seven elements outlined in this plan is groundwater storage. The idea is to take available water during high spring flows and store it in the subsurface. The water will then be used to increase stream flows and decrease stream water temperatures during the summer months. A main challenge associated with groundwater storage is determining the fate of the recharged water. In this project we analyzed major ions and stable isotopes of surface waters and groundwaters within three regions (Roslyn, Kittitas Valley and Moxee Valley) to determine water–rock interactions, relative residence times, recharge regimes and groundwater surface-water interactions. We found that irrigation water generally had heavier isotopic values ($\delta D > -115‰$) and higher nitrogen levels when compared to natural groundwater. This allowed us to identify which aquifers were dominantly recharged by irrigation water versus aquifers that are recharged naturally (typically by snowmelt). Using our geochemical data, combined with known hydrogeologic units and structures we created conceptual models of groundwater relationships at each site. Additionally, we identified potential shallow aquifer recharge sites that

have deep surficial aquifers overlain by large vadose zones. These conceptual models and identified locations can be used to inform future management decisions regarding groundwater storage.

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CHAPTER I

INTRODUCTION

Significance

Located on the east side of the Cascade Mountain Range, the Yakima River Basin (Figure 1) is the main water source for agriculture, and the dominant economic driver within the central Washington region, with approximately 95% of the surface water usage for irrigation. With a drainage area of 6200 mi^2, the Yakima River Basin is currently over allocated in its surface water rights, meaning that more people possess surface water rights than there is available surface water during drier years. This water deficit is compounded by the region's sub–arid climate and recent increases in population, farm land and temperature (Frankson et al., 2017). Estimates of groundwater pumpage (Figure 2) illustrates this increase in water use in the municipal, domestic and agriculture sectors since 1960. The deficit is also due to the fact that most of the water infrastructure within the region (Bumping Dam, Kachess Dam, Clear Creek Dam, Keechelus Dam, Tieton Dam, and Cle Elum Dam) was built prior to 1940 when the regional population was much smaller (Vaccaro et al., 2009). Thus, the current water storage infrastructure was never designed to be able to accommodate for the needs of the present demands. Consequently, during drier years, when water withdrawals exceed water availability, the community's junior water users (e.g. Kittitas Reclamation District and Roza Irrigation District) are prorated to a fraction of their water right (Vaccaro et al, 2009). These dry years greatly diminish the farming production of Kittitas County and Yakima County which is currently estimated to be a $1.78 billion market (United States, Department of Agriculture, 2012).

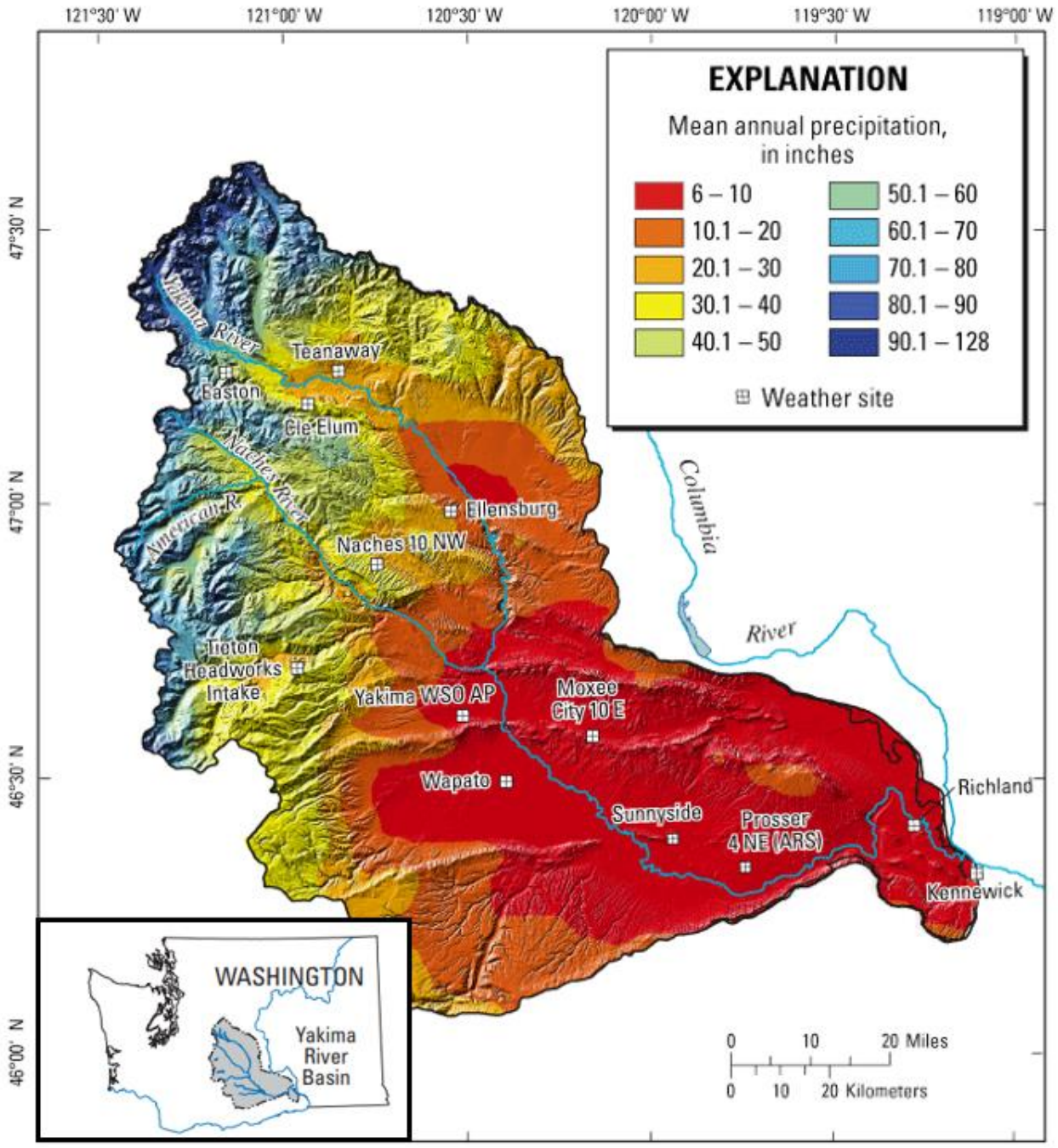


Figure 1. Map of the Yakima River Basin that is color coded based on mean annual precipitation. This precipitation trend is due to the rain shadow effect caused by the Cascade Mountains. Figure source: Vaccaro and Olsen (2007).

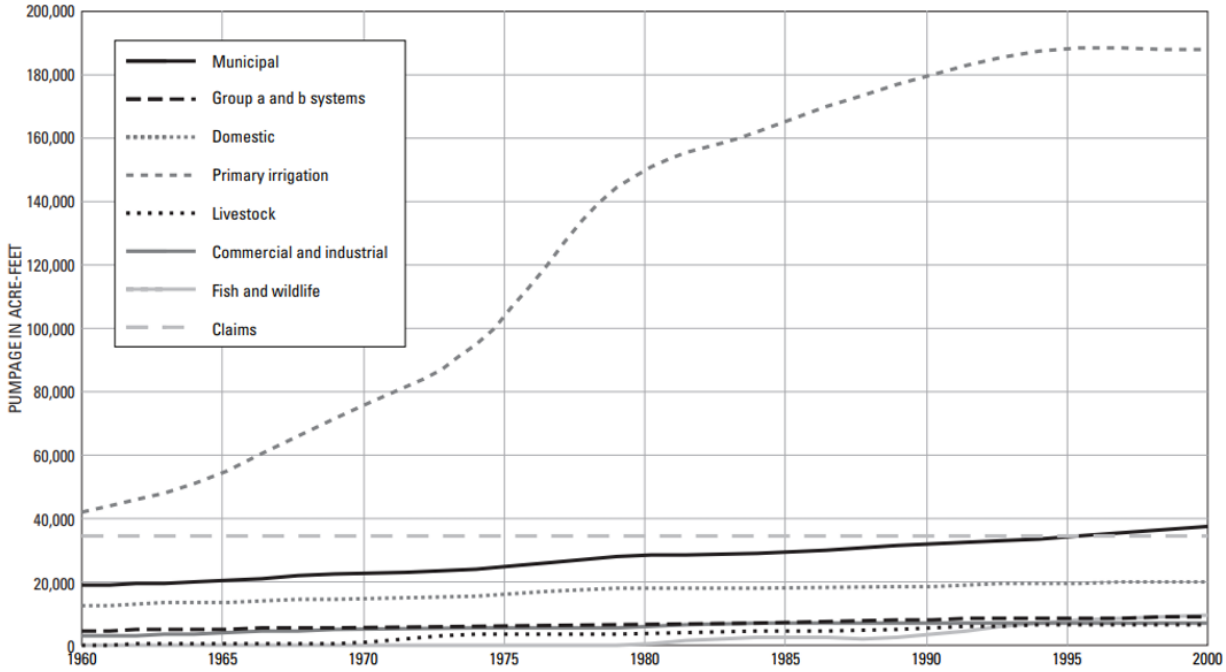


Figure 2. Estimated annual groundwater pumpage for the Yakima River Basin. Figure source: Vaccaro and Sumioka (2006).

In addition to the already strained water resources of the region, climate change predictions bring grave implications for the future. Pacific Northwest climate models predict that increased temperatures will decrease snowpack as precipitation shifts from snow to rain, causing earlier spring melt and prolonging the dry season (Frankson et al., 2017). A longer dry season means that more water will be lost to evaporation, the chance of forest fires will increase, and the amount of available water for rivers and farms will decrease.

The Yakima River Basin Integrated Water Management Plan

The combination of the regions aging water infrastructure and the recent increases in population, agriculture, water usage, and temperature has caused the Yakima Basin community to plan new water resource solutions, leading to the Yakima River Basin Integrated Water Management Plan (YRBIP, summarized in Figure 3). The 30 year YRBIP was passed through

the legislature and funded in 2013 with the goal of finding sustainable water solutions for the region. Currently the plan is in its "initial development phase' and has hundreds of millions of dollars entirely dedicated to water resource projects throughout the Yakima River Basin. One of the YRBIP's seven main goals is to increase groundwater storage within the basin. Groundwater storage refers to two methods of storage: aquifer storage and recovery, and shallow aquifer recharge (SAR). The difference between these two groundwater storage techniques is how the water enters the subsurface. In aquifer storage and recovery, the water is pumped down into the sub–surface while in SAR, water is diverted from streams onto an infiltration zone where the water naturally infiltrates into the shallow aquifer (Figure 4). Groundwater storage is beneficial when compared to surface water storage (i.e. dams and reservoirs) because it limits water–loss via evaporation (e.g., Lake Kachess loses ~9,610 acre–ft of water annually to evaporation (WRCC 2020)), is more cost effective (Dillon, 2002; Vose et al., 2017), is less environmentally destructive, and requires less land area than dams/reservoirs. The ideal SAR system takes excess water from the spring melt (snow melt) and stores it underground (via infiltration). The water is then recovered during the dry season when the farms and river ecosystems need it most (Figure 3). This strategic re-distribution of water is intended to decrease summertime stream temperatures and increase flows keeping the Yakima River a suitable habitat for fish species that are listed under the Federal Endangered Species Act (e.g., bull trout & steelhead trout). It also is a way of fulfilling the water needs of the Yakama Nation Indian Tribes, environmental organizations and the agriculture industry within the basin.

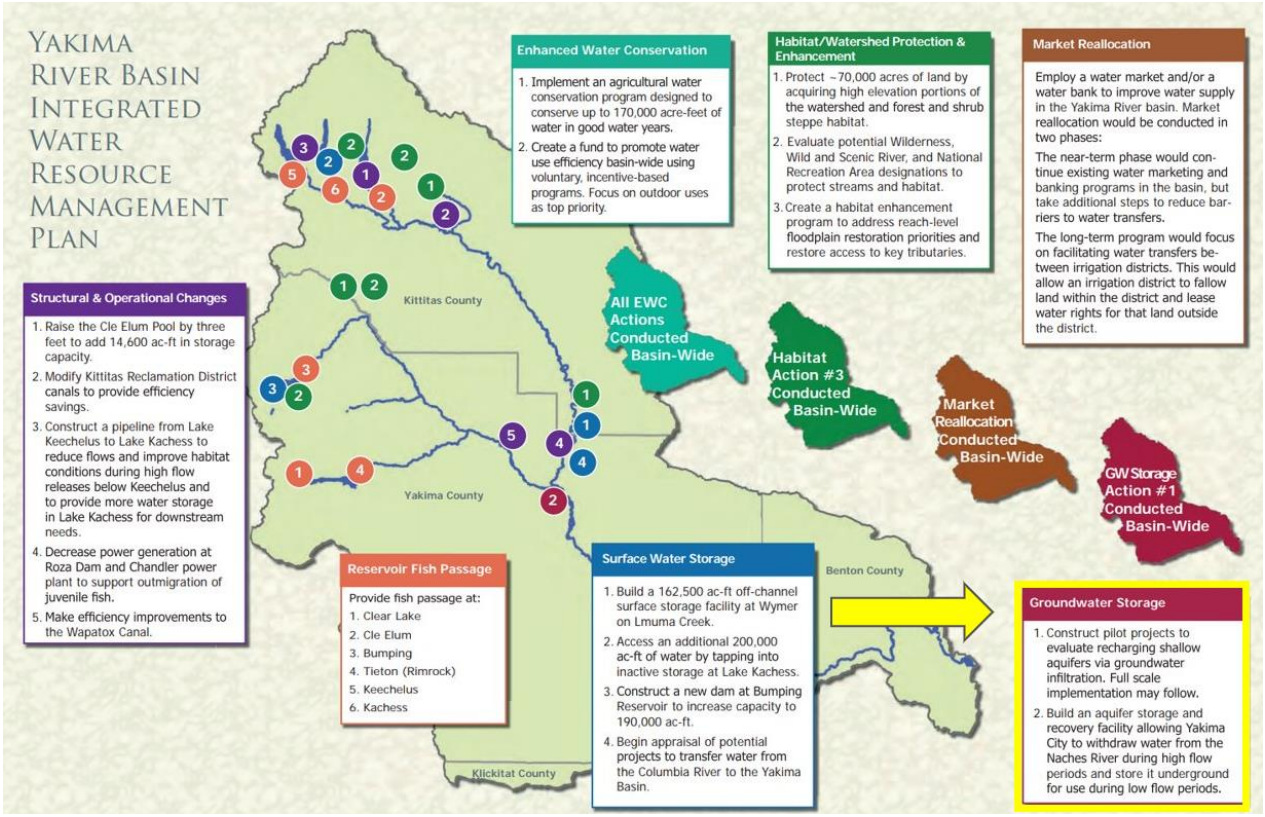


Figure 3. The Yakima Integrated Plan's seven goals. Groundwater storage is outlined as one of the seven main goals. Figure from Sandisen et al. (2012)

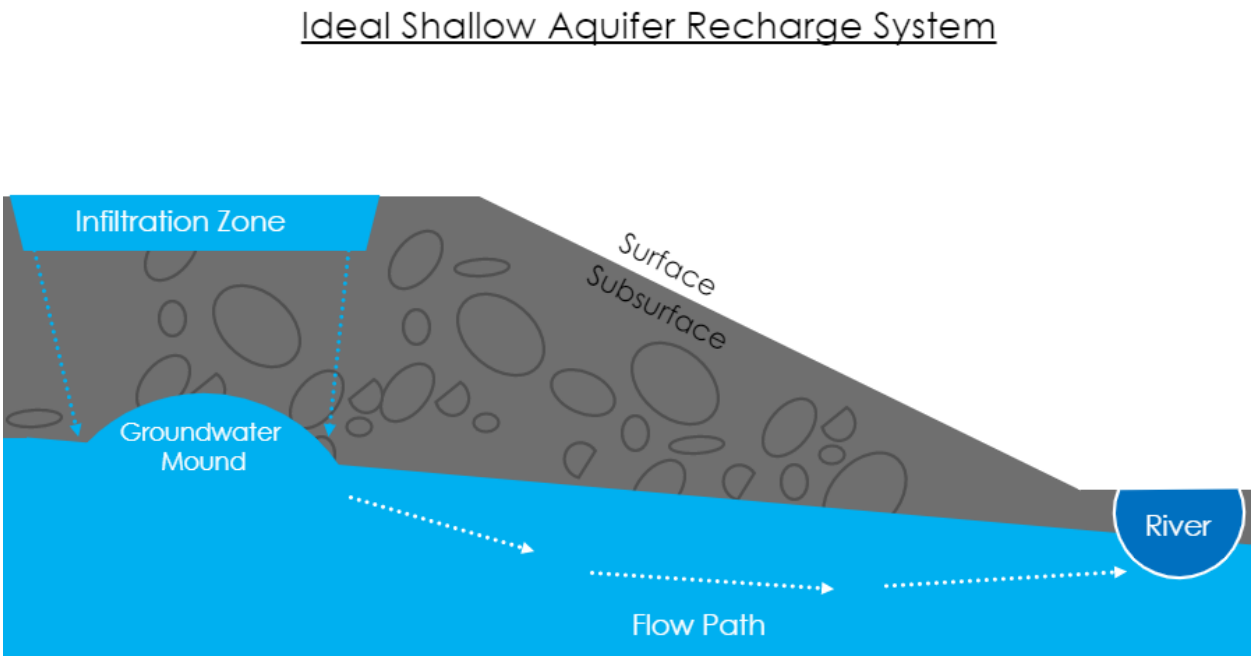


Figure 4. A conceptual model of a shallow aquifer recharge (SAR) system.

Currently in the Yakima Basin there are two managed aquifer recharge projects in motion. The first aquifer recharge project began in 2014, when the City of Yakima constructed an aquifer storage and recovery facility. The facility, which began operation in 2015, takes water from the Naches River during high flows, treats the water to drinking water standards and then injects it into underground storage for use in the municipal water supply. This aquifer recharge provides the City of Yakima a buffer for droughts/water shortages. The main disadvantage of injecting water into the ground is the high costs that go into treating water to drinking water standards and pumping water. The cost is so high that the volume of recharged water is suitable for municipal use but cannot positively influence the summer stream temperatures or flows. On a tributary or smaller river, the stream temperatures may be affected by aquifer storage and recovery but on a river the size of the Yakima, a groundwater storage system that involves pumping water is too expensive to make a significant contribution to stream flow or temperature. The second managed aquifer recharge project currently happening in the Yakima Basin is a shallow aquifer recharge (SAR) project. This project diverts water (~2,500 ac–ft in 2016) onto an alluvial fan in the Toppenish Basin in order to raise the water table and restore natural vegetation. Because SAR can handle much larger volumes of water with lower annual costs compared to aquifer storage and recovery, it is the preferred method when the overall goal is to increase summer stream flows and decrease stream temperatures for a river the size of the Yakima.

Using Geochemistry as a Tool

A main challenge of SAR is correctly predicting the fate of the artificially recharged water. The speed and direction of the recharged water is controlled by subsurface barriers to flow and preferential flow paths which are currently poorly understood. To get at this question of

groundwater movement, major ion and stable isotope ($\delta^{18}O$ and δD) analyses are tools consistently used within the scientific community to determine groundwater/surface water and groundwater/groundwater interactions, relative groundwater ages, and flow patterns (e.g., Yaun et al 2011; Blasch and Bryson 2007; Criss and Davisson 1996; Taylor and Gazis 2014). Stable isotope analyses ($\delta^{18}O$ and δD) are especially useful for determining groundwater/surface water interactions, while major ion analyses are useful for highlighting groundwater - rock interactions as well as some anthropogenic influences (e.g., high nitrate indicate agriculture influence).

In this project, groundwater and surface water samples were taken from three regions within the Yakima Basin (Figure 4) to determine the SAR suitability. The sampled waters were analyzed for major ion compositions and stable isotope ratios ($^{18}O/^{16}O$ and D/H). These geochemical results were then analyzed to determine the extent of groundwater-surface water interaction and geochemical fingerprints of each separate waterbody. Combined with previous knowledge of the subsurface, (e.g., hydrogeologic unit lithologies and thicknesses, structural geology, etc.) the geochemical data are interpreted to create conceptual models of groundwater relationships at each site. These models can be used by the YRBIP to inform future water management decisions.

Hydrogeologic Setting

A surficial geology map of the Yakima Basin is shown in Figure 5. The geology of the Yakima Basin is dominated by the Columbia River Basalt Group, which are voluminous lava flows that covered the region between ~17 and ~6 Ma rock resetting the landscape to negligible relief (Cheney & Hayman, 2009). Since then, GPS measurements and paleomagnetic declination anomalies suggest that a gradual clockwise rotation of northern Oregon and southern Washington State has been occurring over the last 15–10 Ma (McCaffery et al., 2013). This

clockwise rotation caused shortening and compression within the crust creating the anticlinal ridges and synclinal valleys known as the Yakima fold belt.

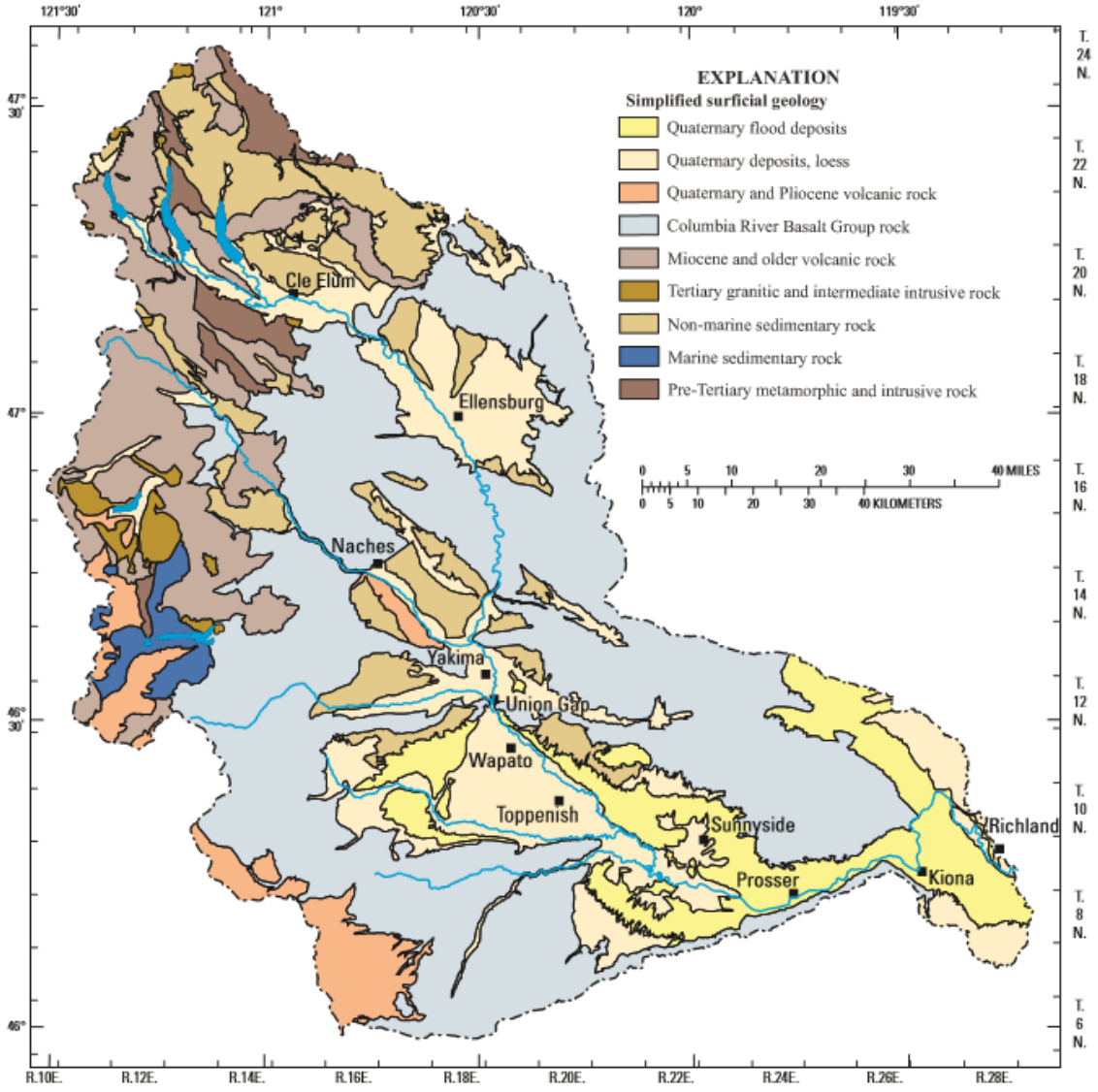


Figure 5. Simplified surficial geology of the Yakima Basin. Figure from Vaccaro et al. (2009).

The Yakima fold belt comprises 14 anticlines developed in pre–Miocene basement rocks and Columbia River Basalts (Reidel et al., 2013). These anticlines are important because they compartmentalize much of the surface water and groundwater flow within the basin. Due to their structure and depth, the basalt anticlines force water into single corridors, which hydraulically

connect the sequential synclinal basins (Packard et al, 1996). As a consequence, the river switches from an erosional regime as it passes through the narrow/compartmentalized anticline valleys to a depositional regime within the wide synclinal basins. This pattern of erosion and deposition dominates the geologic makeup of these synclinal valleys, which is primarily composed of basalt bedrock overlain by thick sedimentary deposits that reach depths up to 240 m (Vacarro et al., 2009). Because of the large depth of these deposits, Vacarro et al. (2009) separated them into three distinct basin fill units (Table 1). Two out of our three study areas (Kittitas and Moxee Valley), are located within these synclinal valleys enclosed by basalt mountain ridges.

Structural basin name	Mapped area (mi^2)	Unit	Lithology	Thickness (ft)		
				Range	Average	Median
Roslyn basin	70	1	Alluvial, lacustrine, and glacial deposits	0 to 360	80	80
		2	Fine-grained lacustrine clay and silt deposits	0 to 530	180	170
		3	Coarse-grained sand and gravel deposits	0 to 240	60	50
		Total basin thickness	All deposits	0 to 700	150	110
Kittitas basin	270	1 (alluvial)	Floodplain alluvial deposits	0 to 100	30	10
		2 (unconsolidated)	Loess, alluvial fan, glacial terrace, and Thorp gravel deposits	0 to 790	180	150
		3 (consolidated)	Ellensburg Formation and undefined continental sedimentary deposits	0 to 2,040	600	350
		Total basin thickness	All deposits	0 to 2,120	500	270
Yakima basin	230	1 (alluvial)	Floodplain alluvial deposits	0 to 120	20	20
		2 (unconsolidated)	Loess, alluvial fan, glacial terrace, and Thorp gravel deposits	0 to 350	90	80
		3 (consolidated)	Ellensburg Formation and undefined continental sedimentary deposits	0 to 1,840	510	450
		Total basin thickness	All deposits	0 to 1,840	530	410

Table 1. Table categorizing the basin fill units within the Yakima River Basin. Table modified from Vaccaro et al., 2009.

Geologic Setting of the Headwaters and Roslyn Mines

The headwaters of the Yakima River Basin lie on the eastern side of the Cascade Range. The Cascade Range is comprised of a complex assortment of sedimentary rocks, metamorphic

rocks, and intrusive and extrusive igneous rocks. The Roslyn study area (our third study area) is located in this head water region between Lake Cle Elum and the city of Cle Elum. The surficial geology of the Roslyn study area is primarily composed of unconsolidated glacial and non-glacial deposits (Gendaszek et al., 2014). Beneath the surficial geology lies a thick sedimentary unit known as the Roslyn Formation. The Roslyn Formation is made up interbedded layers of sandstone, shale and coal (Saunders 1914). Within the Roslyn Formation three coal seams were extensively mined (known as coal seams 1, 5, and 6). Due to the extensive mining of these three shafts their combined pore and void space is estimated to be ~20,000 acre–feet (Packard, 1981). The abundant pore space created by these abandoned coal mines provide a unique opportunity for managed aquifer recharge.

A common public concern when mixing water and coal mines is the reaction that occurs when sulfide–bearing (S^{2-}) minerals are exposed to water (H_2O) and oxygen (O_2), forming sulfuric acid (H_2SO_4). This reaction causes acidification of the water, which allows further dissolution of other heavy metals (e.g. Cu, Pb, Hg, Mn). The common term for this type of water is acid mine drainage; and it is the cause of severe environmental problems worldwide. Acid mine drainage has been linked to contaminated drinking water, corroded pipes/infrastructure, and the destruction of aquatic ecosystems (e.g., Wright et al., 2018).

The degree to which mine–water becomes acidic is based primarily on the concentration of sulfur within the mines. Generally, the higher the sulfur content, the more acidic the water (Jacobs & Testa 2014). Because mines with low sulfur content are not as toxic, there are documented cases of overlying communities using mine water for their public water supplies (e.g., Ferrell, 1992). Whereas average coal in the United Statas has between 0.8-5 % sulfur content (University of Wisconsin, 2017), Beikman et al., (1961) reported that the sulfur content

of the Roslyn coal mines was about 0.4% on average; thus, the Roslyn Coal Mines are considered to have very low sulfur concentrations. In a 1981 study (Packard, 1981), every water sample collected from the Roslyn coal mines was in the alkaline range (pH>7), supporting the idea that sulfur concentration for the Roslyn coal is low and that the mines did not produce acidic waters. This in turn suggests that heavy metals are not dissolved in the waters that interact with the mine rocks. To confirm this, a separate objective of this research for the Roslyn study area was to measure trace elements/ heavy metals in wells that interact with the coal mines to determine if the mines can be used to safely store water.

Stable Isotope Fundamentals

Stable isotope ratios ($^{18}O/^{16}O$ and D/H) are used commonly in the scientific community to categorize and separate waterbodies. Aside from the most common isotopes of oxygen (^{16}O) and hydrogen (^{1}H), ^{18}O and ^{2}H (δD) are the second most abundant stable isotopes with two more neutrons than ^{16}O and one more neutron than ^{1}H. Evaporation and precipitation cause isotopic ratios of water masses to change (known as fractionation). As a result, isotope ratios vary substantially with geographic location. This allows researchers to determine recharge regimes for different water bodies (e.g., Atkison et al. 2014; Blasch and Bryson 2007; Yaun et al 2011). For example, Atkison et al. (2014) used stable isotope data to show that within one flood plain there were two separate hydrological regimes interacting; one primarily recharged by the adjoining river and the other recharged from distant highlands. Stable isotope ratios are also very useful for determining the extent surface water/groundwater interactions. Because oxygen and hydrogen are major constituents in water, isotope ratios change linearly relative to mixing ratios. For example, a mixture of one liter of water with a δD value of –120‰ and one liter of water with a δD value of –110‰ will have a δD value of –115‰, while other mixtures will have values along a mixing

line between the two end members (Figure 6). This allows scientists to not only identify isotopically distinct water bodies but identify zones of mixing.

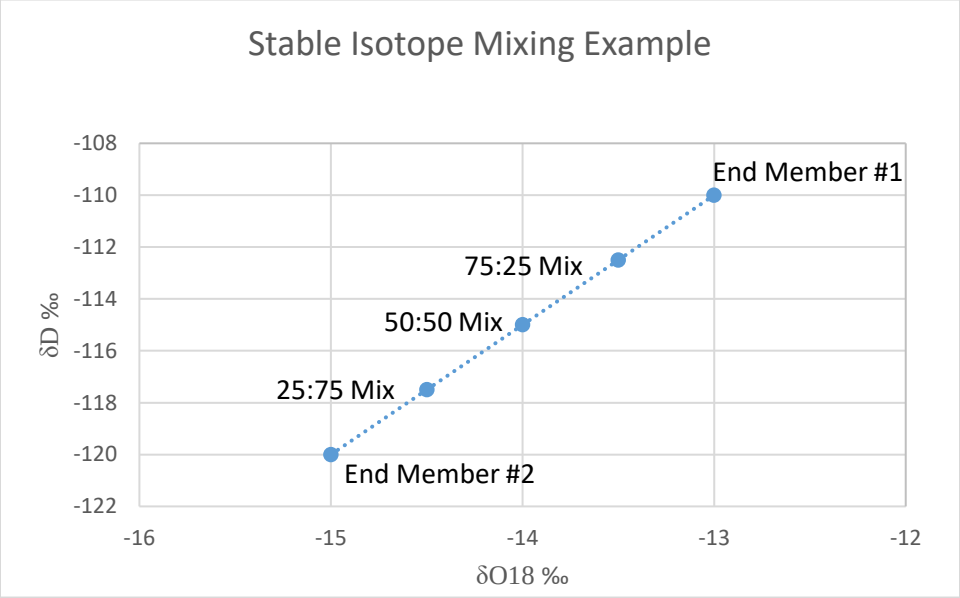


Figure 6. A stable isotope mixing example.

Because a mixture of waters produces an intermediate stable isotope ratio, these signatures can then be used to identify barriers to flow. For example, if two nearby wells penetrating down to similar depths have different isotopic compositions we can assume that these wells are drawing water from two separate water bodies, thus indicating the presence of a barrier to flow.

Irrigation and spring snowmelt events are the two main processes that recharge groundwater in Kittitas and Moxee Valley. Because the reservoirs that supply the irrigation water are located in the headwaters of the Cascade Mountains, the recharge regimes represent different geographic regions and their isotopic ratios differ significantly. Thus, Yakima River water and irrigation water drawn from the Yakima River are generally heavier when compared to the other surface water types (i.e., inland tributaries) in the region. The difference is so distinct that by using stable isotopes we can differentiate between the two surface water types (Vacarro et al., 2009). In

addition, surface water is generally heavier than groundwater in the Yakima River Basin (Figure 7) which allows us to further classify water types based on their isotopic value.

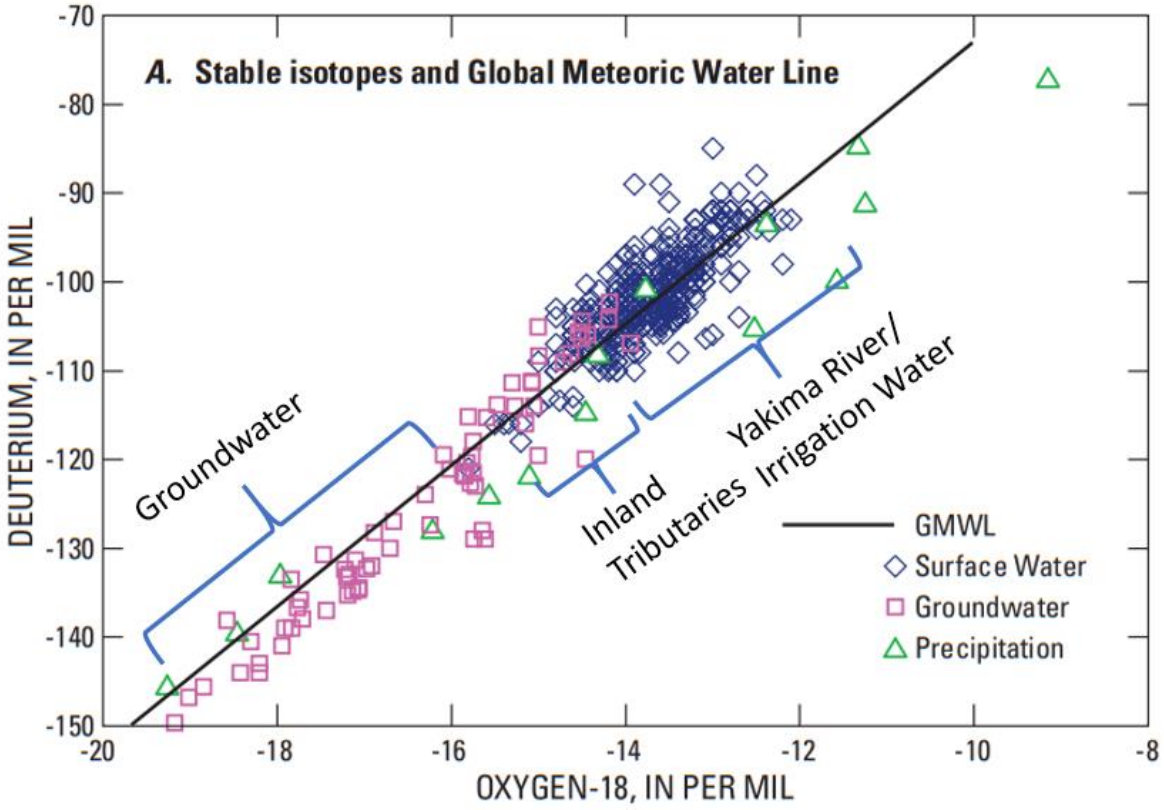


Figure 7. A $\delta^{18}O$ vs δD plot of groundwater, surface water and precipitation in the Yakima River Basin. Surface water is significantly lighter and therefore can be used to determine which aquifers are recharged via surface water. Figure modified from Vaccaro et al. 2009.

Major Ions Explained

In addition to stable isotope ratios, a second line of geochemical information comes from major ion concentrations: calcium (Ca^{2+}), magnesium (Mg^{2+}), potassium (K^{+}), sodium (Na^{+}), ammonium (NH_4^{+}), chloride (Cl^{-}), sulfate (SO_4^{-}), nitrate (NO_3^{-}), phosphate (PO_4^{-}) and bicarbonate(HCO_3^{-}). Major ions are important to measure because they record interactions

between water and rock, length of water rock interaction and possible anthropogenic influence (e.g., nitrate from agriculture). When water falls as precipitation the major ion concentrations are extremely low due to the distillation process in evaporation; but as the water travels through different environments, chemical reactions (e.g., dissolution and chemical weathering of minerals, formation of precipitates, ion exchange, acid–base reactions, oxidation–reduction reactions) contribute to the waters' major ion geochemistry. For groundwater, dissolution and chemical weathering of subsurface minerals causes the water to chemically evolve and become more concentrated in major ions over time. Figure 8 demonstrates the many different origins of major ions in groundwater.

Aqueous Species	Origin
Na^+	NaCl dissolution (some pollution) Plagioclase weathering Rainwater addition
K^+	Biotite weathering K–feldspar weathering
Mg^{2+}	Amphibole and pyroxene weathering Biotite (and chlorite) weathering Dolomite weathering Olivine weathering Rainwater addition
Ca^{2+}	Calcite weathering Plagioclase weathering Dolomite weathering
HCO_3^-	Calcite and dolomite weathering Silicate weathering
SO_4^{2-}	Pyrite weathering (some pollution) $CaSO_4$ dissolution Rainwater addition
Cl^-	NaCl dissolution (some pollution) Rainwater addition

Figure 8. The origin of major aqueous species in groundwater. Figure modified from Berner and Berner (1996).

CHAPTER II

METHODS

Sample Collection

A total of 116 water samples were collected throughout the Yakima Basin (Figure 9 and 10) during this study, including 99 groundwater samples from wells and 17 surface water samples (Table 1, 2, and 3). Groundwater sites were chosen based on the location, quality of well logs and well geology. When identifying wells, we wanted wells in the same area that penetrate into different lithologic units at different depths. Online resources were used to find and correlate well logs with addresses (Kittitas County Property Search, 2020; Washington State Well Report Viewer, 2020). However, the groundwater sampling success rate was only ~30% (3/10 houses visited resulted in sample collection), so many of the wells sampled were based off of well accessibility and well logs were not always available. Sampling occurred between August 2019 and November 2019. When possible the sample was collected from the closest water source to the well, usually from an outdoor spigot or garden hose. Sampling from outside the house also proved to be a beneficial way to bypass the filtration and/or softener systems. If the water passed through a softener system, it was noted and excluded from the piper diagrams. Prior to sample collection, pH, electrical conductivity (EC), temperature and dissolved oxygen (DO) were constantly monitored until the readings stabilized (usually 3-5 minutes) to ensure that the delivery system was sufficiently purged and the water samples collected were representative of the aquifer's water. Once the readings stabilized, the water sample was collected and the final values of pH, EC, temperature and DO recorded (Tables 2, 3, and, 4).

At each sample location two water samples were collected: (1) for major ion and stable isotopes analyses. Samples were filtered with a 0.45–μm filter and stored in new 60–ml

polyethylene bottles, and sealed with tape to prevent evaporation; (2) for alkalinity titrations, unfiltered samples were collected in a 300–ml polyethylene bottle. For the Roslyn study area, the sample collected for major ions and stable isotope analyses would also be used to measure trace elements, and thus acid washed 60–ml polyethylene bottles were used. Prior to any sample collection, bottles were rinsed three times with the filtered sample water.

Geochemical Analysis

All geochemical analyses were performed in the Central Washington University laboratories of either the Geological Sciences or Chemistry Departments. Major anion and cation analyses were measured by both the Dionex ICS–5000 Ion Chromatograph (located in the Murdock Lab in the Geological Sciences Department) and the Dionex DX 500 Ion Chromatograph (located in the Chemistry Department). Samples were measured by both ion chromatographs in order to check the accuracy of the results (Appendix B). Uncertainty for major ions was 10% based on the QC results. Detection limits for the Dionex DX 500 Ion Chromatograph were determined by Holt (2012) and are 0.092, 0.085, 0.043, 0.17, 0.107, 0.088, 0.142, 0.087, and 0.181 ppm for F^-, Cl^-, NO_3^-, SO_4^-, Na^+, NH_4^+, K^+, Mg^+, and Ca^+, respectively.

Alkalinity was determined by titration in the laboratory within 3 days of sample collection. Alkalinity titrations were conducted by adding 0.01 M HCl to 100 ml of sample until the acid converted all of the sample's bicarbonate ions (HCO_3^-) to carbonic acid (H_2CO_3). A Gran plot is then used to determine the equivalence point which was then used to calculate the bicarbonate (HCO_3^-) concentration of each sample. This calculation assumes that the alkalinity is dominated by bicarbonate, based on the intermediate pH values of the samples.

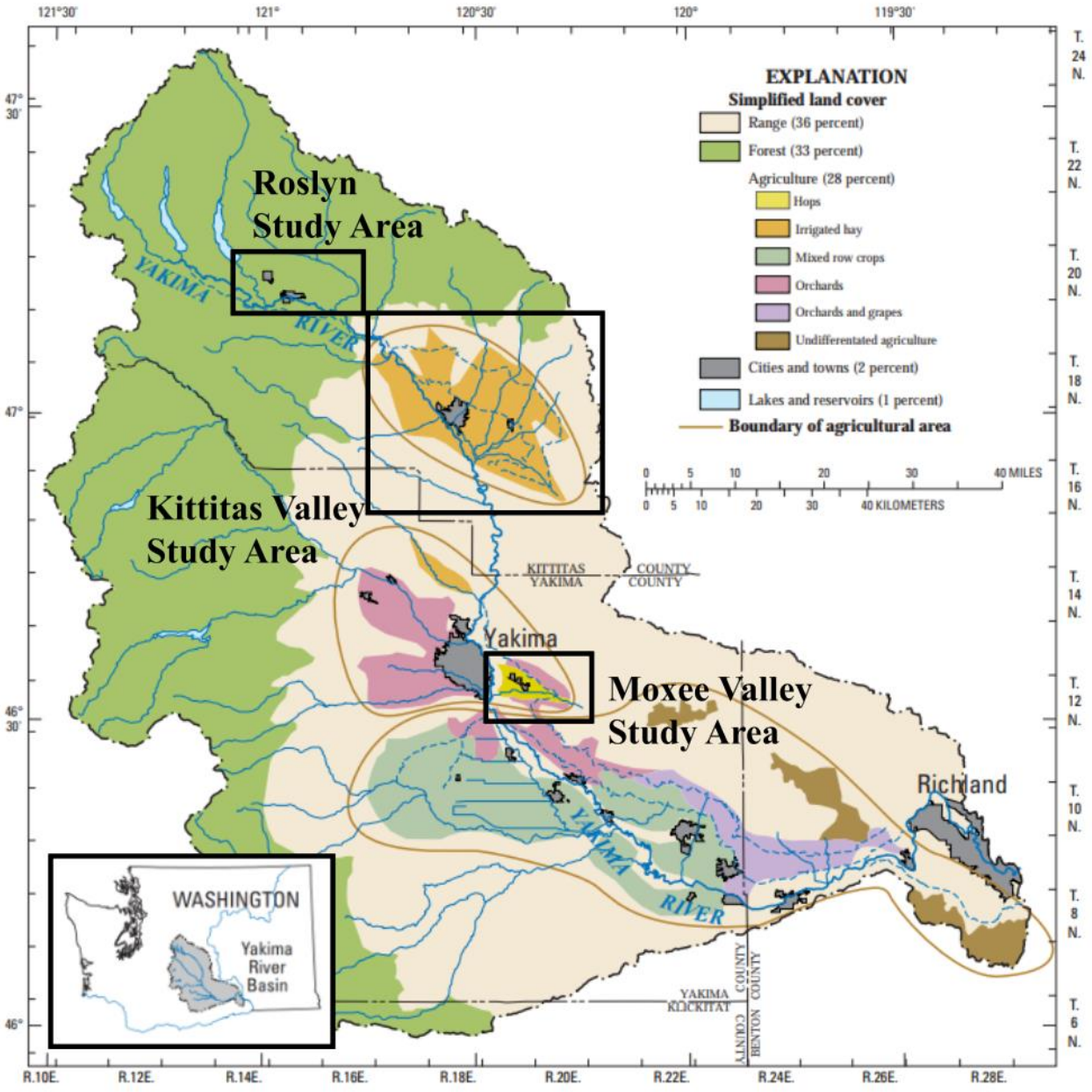


Figure 9. Map of study regions, modified from Vaccaro et al. (2009). Boxes outline study areas: Roslyn, Kittitas Valley, and Moxee Valley.

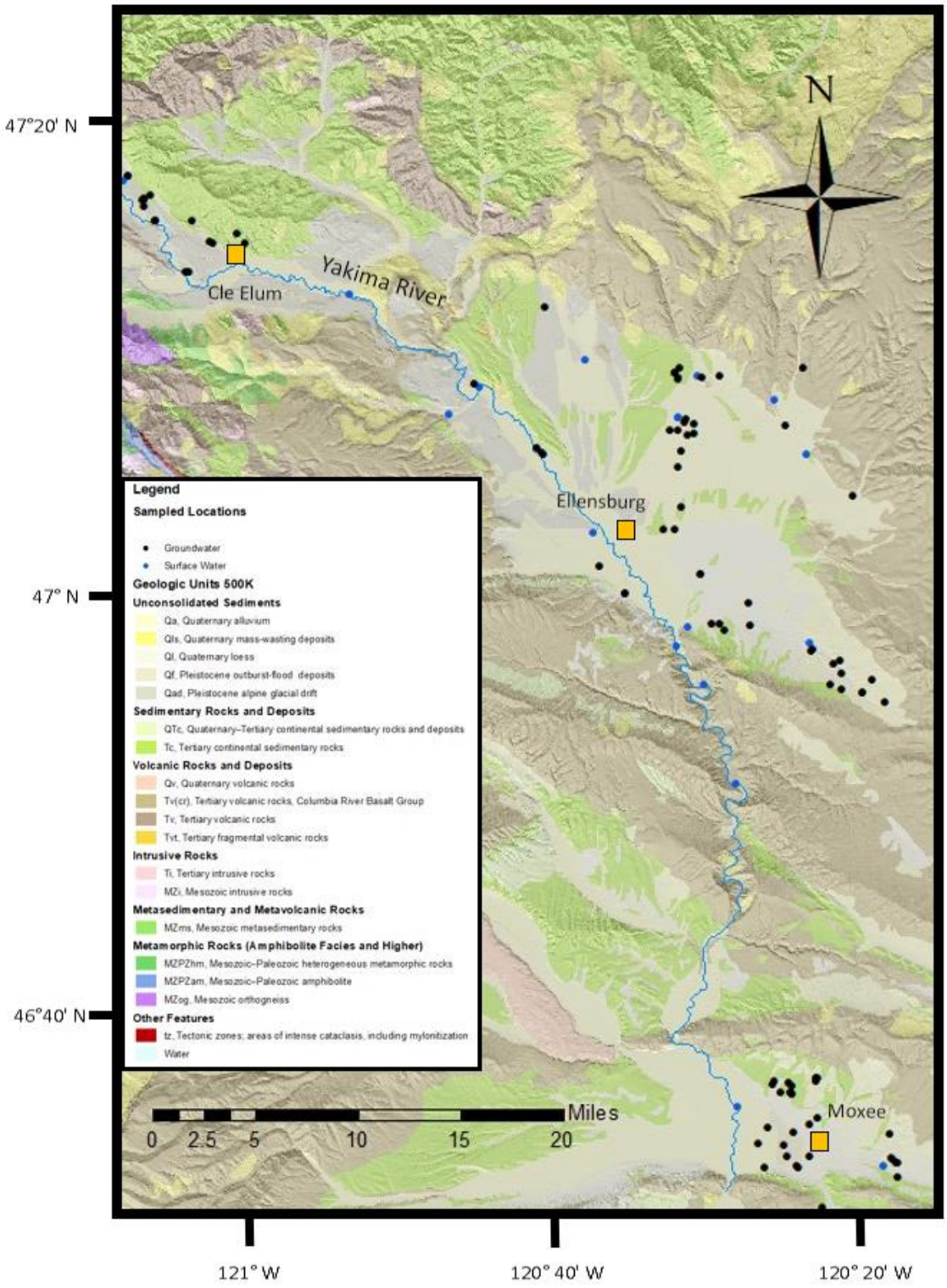


Figure 10. Sampled locations on top of a surficial geology map. Blue dots represent surface water samples while black dots represent groundwater samples (LIDAR from Washington DNR).

Table 2. General description of sampling locations in Roslyn

Well Name	General Description	Date Sampled	Well Depth (ft)	Surface Elevation (ft)	Latitude	Longitude
Borders Reservoir						
Guzzi60	On the southern bank of Lake Cle Elum	10.20.19	127	2229	47.238	–121.044
Guzzi30	On the southern bank of Lake Cle Elum	10.20.19	124	2229	47.240	–121.044
Salmon14030	~0.5 miles east of Lake Cle Elum	11.03.19	–	2329	47.234	–121.044
Coal interaction likely						
Fan (11/12)	0.01 miles east of the Cle Elum River, overflow point for the Roslyn Mines	11.12.19	705	2074	47.238	–121.044
Vinegar390	Between Lake Cle Elum and the fan house	10.20.19	99	2219	47.223	–120.994
Vinegar481	Between Lake Cle Elum and the fan house	10.20.19	171	2230	47.239	–121.045
Vinegar420	Between Lake Cle Elum and the fan house	10.26.19	120	2225	47.187	–121.002
Shaft421	Located between Roslyn and Cle Elum	10.26.19	325	2125	47.187	–121.000
Shaft181	Located between Roslyn and Cle Elum	11.03.19	300	2117	47.206	–120.940
Ridgeview	On hillside north of Cle Elum	11.05.19	250	2252	47.224	–121.033
Ridge360	On hillside north of Cle Elum	11.12.19	250	2601	47.240	–121.044
Tamarack101	Between Lake Cle Elum and the fan house	11.03.19	–	2182	47.207	–120.974
Coal interaction not expected						
RoslynRidge	New housing development on hillside north of Ronald	11.03.19	–	2426	47.168	–120.834
W–WA103	Inside the town of Roslyn	10.20.19	40	2264	47.208	–120.977
Easton	East of Easton	11.05.19	–	2172	47.242	–121.171
Borders Cle Elum R.						
Woodduck1161	~0.3 miles east of the Cle Elum River downstream from fan house	10.26.19	46	1969	47.403	–121.097
Woodduck1281	~0.3 miles east of the Cle Elum River downstream from fan house	10.26.19	43	1975	47.272	–121.072
Surface Water						
Salmon La Sac R.	Salmon La Sac River which is a main tributary to Cle Elum Lake	11.03.19	n.a	2400	47.253	–121.066
Cle Elum Lake	Reservoir, located up gradient of all wells except Salmon14030	11.03.19	n.a	2223	47.243	–121.038
Teanaway R.	River south of Cle Elum on Highway 10	11.03.19	n.a	1810	47.242	–121.171

n.a. = not applicable

Table 3. General descriptions of sampling locations in Kittitas Valley

North of Irrigation		**Date Sampled**				
Grn18	Above irrigation canals, amidst natural vegetation	08.21.19	840	2705	47.156	–120.632
W122	N end of transect, above influence of irrigation	09.05.19	420	2336	47.106	–120.500
Clk64	Perched on basalt hills E of Cooke Canyon	09.09.19	566	3000	47.106	–120.368
Chr90	N end of transect, above irrigation canals	10.02.19	409	2303	47.103	–120.496
W117	N end of transect, above irrigation canals	10.02.19	235	2284	47.101	–120.497
W268	N end of transect, above irrigation canals	10.02.19	345	2382	47.110	–120.495
Chr20	E of Naneum Creek, above irrigation canals	10.03.19	185	2288	47.102	–120.471
Chr33	E of Naneum Creek, above irrigation canals	10.03.19	180	2340	47.103	–120.454
Prk	Group home located at the mouth of Parke Creek Canyon	09.03.19	360	2112	47.015	–120.321
Ck23	Between Coleman Creek and Cooke Creek, above irrigation canals	09.09.19	–	2215	47.067	–120.387
North Valley						
Af20	N end of transect, amidst hay fields	08.20.19	280	1992	47.065	–120.498
Af86	N end of transect, amidst hay fields	08.20.19	385	1967	47.066	–120.507
W64	N end of transect, amidst hay fields	08.20.19	200	1905	47.051	–120.496
W45	N end of transect, amidst hay fields	08.20.19	170	1829	47.040	–120.500
L97	N end of transect, amidst hay fields	08.21.19	220	2047	47.070	–120.483
L45	N end of transect, amidst hay fields	08.21.19	200	1999	47.063	–120.482
Bar90	N end of transect, amidst hay fields	08.27.19	120	2060	47.073	–120.491
W70	N end of transect, amidst hay fields	08.27.19	–	1987	47.062	–120.489
Bar94	N end of transect, amidst hay fields	08.28.19	163	2044	47.071	–120.492
Center Valley						
3rd26	Middle of transect located near Ellensburg High School	10.14.19	125	1596	46.995	–120.506
Pf20	Middle of transect located near Ellensburg High School	10.14.19	172	1579	46.996	–120.518
Tj39	S half of transect located E of the I–90 & I–82 junction, amidst hay fields	10.14.19	30	1509	46.964	–120.481
Tj39(b)	S half of transect located E of the I–90 & I–82 junction, amidst hay fields	10.14.19	125	1509	46.964	–120.481
W127	Middle of transect, amidst hay fields	10.27.19	–	1679	47.011	–120.498
Sor17	Between Ellensburg and Badger Pocket, amidst hay fields	10.27.19	–	1523	46.942	–120.432
South Valley						
Trl60	S end of the transect, ~2 miles N of Manastash Ridge	10.22.19	183	1618	46.926	–120.431
Trl32	S end of the transect, ~1.5 miles N of Manastash Ridge	10.22.19	137	1549	46.928	–120.462
Or51	S end of the transect, ~1.5 miles N of Manastash Ridge	10.23.19	125	1554	46.923	–120.457
Trl30	S end of the transect, ~1.5 miles N of Manastash Ridge	10.23.19	138	1495	46.928	–120.471

Table 3. General descriptions of sampling locations in Kittitas Valley. – Continued

Well Name	General Description	Date Sampled	Well Depth (ft)	Surface Elevation (ft)	Latitude	Longitude
West Valley						
RB20	SW section of Kittitas Valley, amidst hay fields	08.27.19	140	1533	46.951	–120.559
Mn10	SW section of Kittitas Valley, amidst hay fields	08.28.19	110	1600	46.971	–120.584
Badger Pocket						
Boh501	In Badger Pocket, on local terrace above Badger Creek, amidst hay fields	08.27.19	145	1963	46.876	–120.318
UpB91	In Badger Pocket on W floodplain of Badger Creek	09.11.19	–	1835	46.890	–120.339
Mor	Abandoned well in Badger Pocket located on E floodplain of Badger Creek	09.11.19	–	1766	46.897	–120.346
Cm14	In Badger Pocket on terrace E of Badger Creek	09.11.19	550	1833	46.899	–120.339
Km100	In Badger Pocket located at the base of a terrace to the W of Badger Creek	09.11.19	–	1702	46.907	–120.368
By61	In Badger Pocket, ~100ft south of the pump ditch Irrigation canal	10.03.19	188	2104	46.885	–120.307
UpB17	In Badger Pocket, ~400yrds south of the pump ditch Irrigation canal	10.03.19	182	2083	46.869	–120.295
WPA51	In Badger Pocket, on terrace W of Badger Creek, amidst hay fields	10.03.19	290	2003	46.882	–120.351
Bor	In Badger Pocket, on terrace W of Badger Creek, amidst hay fields	10.03.19	163	2012	46.878	–120.340
Km89	In Badger Pocket located at the base of a terrace to the W of Badger Creek	10.03.19	–	1758	46.906	–120.369
North West Valley						
Man22	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	11.11.19	365	1602	47.052	–120.640
Man20	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	11.12.19	60	1598	47.051	–120.638
Hwy10	On terrace E of the Yakima R. and W of the Kittitas Valley Anticline	11.14.19	385	1797	47.103	–120.708
Man60	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	11.14.19	37	1608	47.056	–120.645
Surface Water						
Yakima R. (TRP)	Yakima R. at N entrance to Kittitas Valley	09.03.19	n.a.	1676	47.101	–120.702
Yakima R. (BV)	Inside the Yakima Canyon, all Kittitas Valley water flows to this point	09.03.19	n.a.	1371	46.885	–120.480
North Branch Canal	An irrigation canal at the N end of the transect	08.28.19	n.a.	2077	47.075	–120.498
Naneum Cr.	Tributary N of Yakima R. near mouth of Naneum Canyon	09.03.19	n.a.	2288	47.103	–120.476
Badger Cr.	Tributary to the Yakima R. Located in badger pocket	09.03.19	n.a.	1681	46.912	–120.370
Wilson Cr.	Tributary N of the Yakima R., directly E of Yakima R. Canyon	09.03.19	n.a.	1410	46.913	–120.508
Cherry Cr.	Tributary N of the Yakima R., mainly fed via irrigation ditches	09.03.19	n.a.	1429	46.926	–120.496
Manastash Cr.	Tributary S of Yakima R.	09.03.19	n.a.	1592	46.995	–120.591
Taneum Cr.	Tributary S of Yakima R.	09.03.19	n.a.	1855	47.082	–120.736
Reecer Cr.	Tributary N of Yakima R. Above influence of irrigation	09.03.19	n.a.	2171	47.117	–120.593
Coleman Cr.	At mouth of Coleman Canyon	09.30.19	n.a.	2396	47.085	–120.399
Caribou Cr.	~1.2mi S of the mouth of Caribou Canyon	09.30.19	n.a.	2030	47.046	–120.367

n.a. = not applicable

Table 4. General descriptions of sampling locations in Moxee Valley

Well Name	General Description	Date Sampled	Well Depth (ft)	Surface Elevation (ft)	Latitude	Longitude
North of Agriculture						
Cla18	At S base of Yakima Ridge Anticline, above influence of irrigation	10.05.19	840	1589	46.604	–120.378
Cla23	At S base of Yakima Ridge Anticline, above influence of irrigation	10.05.19	545	1550	46.601	–120.378
Cla15	At S base of Yakima Ridge Anticline, above influence of irrigation	10.05.19	768	1612	46.604	–120.376
North Valley						
Ter70	N end of transect, below irrigation canal, amidst agriculture	10.04.19	243	1185	46.594	–120.416
Bit50	N end of transect, just above (N) of irrigation canal	10.04.19	445	1266	46.598	–120.404
Bit71	N end of transect, just above (N) of irrigation canal	10.04.19	245	1199	46.594	–120.404
Bit81	N end of transect, just above (N) of irrigation canal	10.04.19	180	1186	46.592	–120.404
Bit80	N end of transect, just above (N) of irrigation canal	10.04.19	180	1189	46.593	–120.404
Loc40	N end of transect, below irrigation canal, amidst agriculture	10.05.19	245	1183	46.600	–120.423
Ter59	N end of transect, just above (N) of irrigation canal	10.05.19	268	1215	46.603	–120.420
Bit09	N end of transect, just above (N) of irrigation canal	10.05.19	360	1276	46.601	–120.407
Middle Valley						
Bea23	~0.5mi S of East Valley High School	10.29.19	140	1030	46.566	–120.403
Cay22	In middle valley, ~1.5mi E of Yakima R.	10.29.19	113	988	46.569	–120.429
Mie9	Middle of Moxee Valley, on a local high point, amidst agriculture	10.05.19	290	1221	46.575	–120.379
Duf86	Middle of Moxee Valley, amidst agriculture	10.05.19	105	1108	46.570	–120.386
Bel65	Middle of valley, E of Moxee	10.29.20	60	1009	46.557	–120.414
Bir22	In middle of the valley, ~1 mile E of Yakima R.	10.27.19	80	974	46.559	–120.440
East Valley						
Des38	SE end of Moxee Valley, amidst agriculture	10.05.19	150	1219	46.531	–120.298
WA–24	SE end of Moxee Valley, on a local high point, amidst agriculture	10.05.19	220	1286	46.541	–120.299
Hof35	S end of Moxee Valley, on a local high point, amidst agriculture	10.05.19	170	1301	46.542	–120.298
Hof34	S end of Moxee Valley, on a local high point, amidst agriculture	10.05.19	195	1300	46.544	–120.302
Hof25	S end of Moxee Valley, on a local high point, amidst agriculture	10.05.19	316	1269	46.545	–120.304
Pos12	NE end of Moxee Valley, amidst agriculture	10.05.19	425	1361	46.562	–120.304
South Valley						
Gam02	S end of transect, amidst agriculture	10.06.19	110	1071	46.541	–120.400
Gam76	S end of transect, amidst agriculture	10.06.19	65–90	1073	46.541	–120.400
Gam5	S end of transect, amidst agriculture	10.06.19	60	979	46.542	–120.434
Bea85	Middle of transect, directly south of Moxee	10.29.19	94	1051	46.549	–120.388
Bea68	S end of transect, amidst agriculture	10.06.19	122	1024	46.549	–120.410

Table 3. General descriptions of sampling locations in Moxee Valley. –Continued

Konnowac Pass						
Kon14	S end of transect, above agriculture on the west side of Konnowac pass	10.06.19	685	1275	46.512	–120.375
Surface Water						
Yakima R. (LU)	Yakima R. at Luma Cr. recreation site	10.29.19	n.a	1292	46.813	–120.450
Moxee Cr.	S end of Moxee Valley, at Beane Rd Bridge	10.29.19	n.a	1163	46.540	–120.313
YR@Moxee (MX)	Yakima R. at the end of W Birchfield Rd	10.29.19	n.a	1000	46.585	–120.459

n.a. = not applicable

Charge balance errors were calculated using Equation 1. 95.5% of samples had charge balance errors less than 10%, and with the exception of one sample the remaining 4.5% of samples all had charge balance errors under 15%. Charge balance errors greater than 10% are highlighted in yellow in the results section; these major ion concentrations are not used in this report. This overall low charge balance error indicates that there is not systematic error in either the titration or the ion chromatography measurements and that the measured major ions constitute the majority of the ionic charge in these samples.

$$CBE = \frac{\sum cations - |\sum anions|}{\sum cations + |\sum anions|} \times 100$$

Equation 1. The charge balance error (CBE) equation that is used to check accuracy of major ion results. Cations (Na^+, NH_4^+, K^+, Mg^{2+}, and Ca^{2+}) and anions (F^-, Cl^-, NO_3^-, SO_4^-, and HCO_3^-) are in calculated in millequivalents. If the sum of the cation and anion charges are equal, then the CBE is 0.

For the Roslyn study area samples and a subset of the Kittitas Valley samples, an Agilent 8900 Triple Quad Inductively Coupled Mass Spectrometer (ICPMS) was used to determine the concentrations of the following elements: Be, Na, Mg, Al, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Mo, Ag, Cd, Sb, Ba, Ti, Th, U and Pb. Multi–element standard solutions of concentrations 1 ppb, 10 ppb, 50 ppb, 100 ppb, 250 ppb, 500 ppb, 750 ppb, 1000 ppb, 15000 ppb, 2000 ppb, 2500 ppb, 3000 ppb, 4000 ppb and 5000 ppb were used to establish calibration curves. Quality control (QC) samples, replicates, and blanks were run throughout the process to ensure accuracy and precision. Based on the QC samples, uncertainty is less than 10%. Detection limits for trace elements were determined by multiplying the standard deviation of the replicate QC samples by three (EPA, 2016). Because the samples run were diluted by a factor of five the

calculated detection limits were multiplied by five, giving the detection limits presented in Table 5 for 5x diluted samples. All samples were under the detection limit for the following elements: Be, Co, Se, Ag, Cd, Sb, Ti, and Th.

Table 5. Trace element detection limits in ppb for 5x diluted samples. Detection limits were determined as per stated in EPA (2016).

Be	Al	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	U
0.37	0.34	0.14	0.21	0.11	15.58	0.21	0.33	0.27	0.50	0.08
As	Se	Mo	Ag	Cd	Sb	Ba	Ti	Pb	Th	
0.31	0.96	0.10	0.16	0.27	0.24	0.38	0.17	0.15	0.44	

For quality assurance 27 samples were analyzed for Cl, NO_3, SO_4, Na, Mg, K, and Ca on both the Dionex ICS–5000 Ion Chromatograph and Dionex DX 500 Ion Chromatograph; these analyses are plotted against each other in Appendix B. In addition, 21 samples were analyzed for Ca, Mg, K, and Na on the Dionex ICS–5000 Ion Chromatograph, the Dionex DX 500 Ion Chromatograph and the Agilent 8900 Triple Quad Inductively Coupled Mass Spectrometer. The results from the three instruments were then plotted against each other (Appendix B). The graphs presented in Appendix B show that the measurements made by the three instruments agree except for NO_3^-, which is discussed further in the Appendix. The Dionex ICS–5000 Ion Chromatograph was the instrument that we used to measure all major ion data, which is presented in Table 6, 7, and 8.

Oxygen and hydrogen isotope ratios were determined using the Picarro L2130–I Isotopic H_2O Analyzer. The Picarro L2130–I Isotopic H_2O Analyzer uses Cavity Ring–Down Spectroscopy technology to determine relative abundances of water molecules with ^{18}O,^{17}O, ^{16}O, D and H. The instrument's operating system then uses the measurements to calculate the oxygen and hydrogen isotope ratios, reported in the standard δ–notation in per mil units (Equation 2). Absolute isotope ratios were calibrated using three IAEA standards (VSMOW, GISP, SLAP) and five internal laboratory standards. Calibration verification was accomplished by comparison with

internal water standards obtained from Dartmouth College Stable Isotope Geochemistry Laboratory. Uncertainty based on replicate measurements of the internal lab standards and of unknown samples is < 0.04‰ for $\delta^{18}O$ and < 0.2‰ for δD.

$$\delta^{18}O = \left(\frac{\frac{^{18}O}{^{16}O_{smp}} - \frac{^{18}O}{^{16}O_{SMOW}}}{\frac{^{18}O}{^{16}O_{SMOW}}} \right) * 1000 \quad \delta D = \left(\frac{\frac{D}{H_{smp}} - \frac{D}{H_{SMOW}}}{\frac{D}{H_{SMOW}}} \right) * 1000$$

Equation 2. The two equations used to obtain the standard δ–notation in per mil units. Where smp = sample and SMOW = standard mean ocean water.

CHAPTER III

RESULTS

Major Ions

Major ion data, pH and electrical conductivity values for all water sampled collected are located in Tables 6, 7, and 8. Major ion data that had charge balance errors >10% are marked with an asterisk and are not used in this study. Sample location details are located in Tables 2, 3 and 4. The major ion data is also presented on a Piper Plot (Figure 11). Piper diagrams are graphical representations of the major ion percentages for each sample (as opposed to concentrations). HCO_3 is the dominant anion in all samples while within the cation triangle there is a larger distribution of chemistries. Thus, different groupings (neutral, Ca^{2+} dominated and Na^{+} dominated) can be identified. With the exception of one sample, every surface water collected has >70% Ca^{2+} content. Standard deviations and ranges for major ions are presented in Table 9.

Trace Elements

Trace element data for select water samples are presented in parts per billion (ppb) in Tables 11 and 12. At the bottom of Table 11 and 12, the national drinking water limits defined by the EPA are included for reference.

Stable Isotopes

All stable isotope values can be found in table 6, 7, and 8. Stable isotope values are also plotted on a δD vs $\delta^{18}O$ plot in Figure 12. Groundwater samples are color coded based on the study area and the surface waters are all blue. Local meteoric water lines (LMWL) represent the isotope values of precipitation collected at a specific location. In Figure 12 the LMWL for Cle

Elum and Snoqualmie are included. The maximum, minimum and average stable isotope values for each study area can be found in Table 10.

Table 6. Geochemical data for Roslyn

Well Name	EC (µS/cm)	pH	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	HCO_3 (mg/L)	Charge Balance Error (%)	δD (‰)	$\delta^{18}O$ (‰)
Borders Reservoir													
Guz60	12.44	6.9	29.4	25.9	9.9	1.5	27.81	n.r	5.0	248	0	–100	–13.6
Guz30	10.73	7	25.5	23.4	7.9	1.1	12.95	n.r	4.0	216	0	–100	–13.7
Salmon	10	7.8	29.5	12.9	20.7	1.1	3.76	n.r	6.5	214	0	–100	–13.3
Near Coal Shafts													
Fan	–	7.8	22.5	17.4	43.0	1.5	12.05	n.r	12.4	324	9	–99	–13.5
Vin390	12	7.4	45.0	10.0	71.8	2.3	14.22	n.r	11.8	406	3	–100	–13.6
Vin481	–	–	42.9	9.5	82.2	2.4	14.78	n.r	13.0	408	1	–101	–13.6
Vin420	13	7.8	19.7	3.9	123.2	4.1	17.83	n.r	8.7	435	3	–101	–13.6
Shaft42	7.6	8.8	4.4	0.1	78.3	0.7	2.25	n.r	4.9	232	2	–114	–15.2
Shaft18	–	–	5.2	0.2	75.0	0.8	2.60	n.r	6.1	223	1	–116	–15.5
Ridge	–	–	32.7	4.7	91.0	0.7	0.07	n.r	7.9	359	1	–112	–15.0
Ridge360	5	6.9	6.9	0.3	67.8	0.7	0.52	n.r	5.5	210	2	–113	–15.4
Tam101	–	–	18.9	2.0	55.1	1.3	6.78	n.r	2.0	227	3	–102	–13.9
Away From Coal Shafts													
RoslynRidge	9	7.7	18.9	2.0	55.6	1.4	7.08	n.r	2.2	232	3	–103	–14.0
WA103	2.3	7.9	14.9	1.7	2.9	0.7	2.01	n.r	1.9	52	9	–94	–13.2
Easton	–	–	12.6	2.3	3.7	0.8	1.21	n.r	2.1	0	–	–94	–13.0
Borders Cle Elum R.													
Wood16	10	7.3	14.7	20.3	3.3	1.4	4.89	n.r	2.1	154	1	–103	–13.8
Wood12	10	7.2	15.0	15.1	3.9	1.0	3.14	n.r	1.8	127	2	–106	–14.3
Surface Waters													
Salmon R.	7.3	6.7	6.6	3.6	1.2	1.8	1.83	n.r	1.4	39	7	–95	–13.1
Cle Elum Lake	1	8.1	8.0	3.4	1.3	0.8	0.92	n.r	1.5	40	8	–97	–13.1
Teanaway R.	–	–	16.2	6.1	2.5	0.7	1.33	n.r	2.7	84	2	–102	–14.0
Detection Limit			0.1	0.1	0.1	0.1	0.1	0.1	0.1	10			

bdl., below detection limit; –, not measured

n.r., not reported. For this study area NO_3 is excluded because the samples were collected in acid washed bottles which may increase the background concentrations of NO_3.

Table 7. Geochemical data for Kittitas Valley

Well Name	EC (µS/cm)	pH	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	HCO_3 (mg/L)	Charge Balance Error (%)	δD (‰)	$\delta^{18}O$ (‰)
North of Irrigation													
Grn18	208	7.6	19	9.4	11.5	3.8	1.8	1.2	3.5	133	3	–120	–15.5
W122	86	7.8	24.4	10.5	16.2	3.8	6.9	3.9	6.2	172	1	–121	–15.8
Clk64	58	6.7	18	10.9	9.5	2.2	2	0.9	2.5	134	2	–118	–15.0
Chr90	16	7.9	28.6	15	21.1	3.9	11.6	6.9	10.1	227	1	–120	–15.4
W117	13	7.7	25.7	13.5	17.8	4.7	5.7	4.5	5.6	192	2	–120	–15.5
W268	10	7.9	23.3	11.3	12.5	3.9	4.5	2.2	8	160	2	–119	–15.3
Chr20	20	7.6	30.4	11.5	28.5	6.3	6.1	4.1	6.4	232	1	–120	–15.6
Chr33	15	7.5	25.1	13.4	9.8	1.9	3	2.2	2.9	162	3	–122	–15.9
Prk	80	67.7	19.6	7.6	15.7	3.8	2.8	3.5	4.8	137	3	–121	–15.9
Ck23	30	7.3	22.8	10.8	12.4	4.7	7.1	21.6	7.2	129	12*	–120	–15.5
North Valley													
Af20	77	7.33	20.59	10.1	6.33	2.4	1	0.9	0.9	130	1	–118	–15.8
Af86	77	8	20	6.2	10.7	2.8	0.9	1.0	2	119	2	–121	–16.2
W64	62	7.2	18.4	8.7	5.9	2.5	0.9	bdl.	1.5	115	2	–119	–16.0
W45	85	7	20.4	9.6	6.8	2.1	1.3	bdl.	1.3	133	0	–116	–15.6
L97	106	7.3	20.8	9.5	8.2	2.5	1.1	0.9	1.6	343	2	–121	–16.0
L45	185	7.1	19.9	9.9	7.4	39.5	36.4	bdl.	1.9	189	1	–119	–15.8
Bar90	53	7.4	2.4	0.2	35.9	0.5	0.6	bdl.	1	100	2	–118	–15.8
W70	61	7.9	23.9	8.4	8.6	2.9	0.9	1.0	1.5	143	0	–121	–16.1
Bar94	46	7.1	17.6	8.4	4.8	2.3	1.9	bdl.	1.8	110	1	–119	–16.1
Center Valley													
3rd26	12	6.8	41.5	17.2	11.7	2.7	3.3	1.2	3.9	254	1	–103	–13.8
Pf20	7	7	30.1	13.9	8.6	2.6	3.1	2.3	4	186	1	–99	–13.4
Tj39	10	6.9	43.5	19.6	15.5	5.8	15.2	12.2	18.1	269	2	–103	–13.9
Tj39(b)	6	7.3	22.2	10.4	13.5	1.9	1.4	1.2	2.2	157	1	–117	–15.6
W127	108	6.9	42.2	18.6	13.1	2.6	6.2	1.1	3.8	258	0	–97	–13.0
Sor17	92	7.8	25.2	11.2	22.8	3.6	3.7	1.1	6.1	200	0	–123	–15.8
South Valley													
Trl60	N/A	7.7	63.1	22.7	28.1	6.2	14.9	18.7	37.3	379	2	–120	–15.7
Trl32	N/A	N/A	74.6	28.4	32.1	6.2	10	12.8	20.3	463	0	–96	–13.0
Or51	15	7.7	67.6	26	32.5	5.5	15	23.1	24.7	419	1	–100	–13.5
Trl30	15	7.7	54.3	21.1	46.3	5.9	9.5	18.8	18	394	1	–94	–12.8

Table 7. Geochemical data for Kittitas Valley. –Continued

Well Name	EC (µS/cm)	pH	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	HCO_3 (mg/L)	Charge Balance Error (%)	δD (‰)	$\delta^{18}O$ (‰)
West Valley													
RB20	67	6.8	21.6	10.9	9.3	4.7	4.3	2.8	6.8	144	3	–118	–15.6
Mn10	62	7.4	14	5.7	4.2	2	1.3	8.2	2.1	108	12*	–99	–13.4
Badger Pocket													
Boh501	304	7.8	83.4	38	96.6	7	26.2	26.6	110.6	716	0	–109	–14.2
UpB91	23	7.4	44.3	19.1	27.3	4.6	14	9.7	27.8	310	0	–113	–14.9
Mor	15	7.1	31.4	13	10	4.5	13	7.3	20.2	187	2	–128	–16.6
Cm14	21	7.6	31.9	14	23	3.8	8.3	5.8	15.3	231	1	–122	–15.6
Km100	19	7.4	29.3	12.8	16	6.9	11.6	5.9	14.7	202	1	–123	–16.0
By61	28	7.8	21.5	9.4	18.9	3.1	7.7	9.4	3.7	154	4	–91	–12.5
UpB17	23	7.7	50.5	23.1	42.8	3.5	4.2	1.6	4.3	393	1	–91	–12.4
WPA51	14	7.9	20.6	9.6	19.5	4	5.7	2.5	14.8	154	5	–126	–16.4
Bor	32	7.6	53	25.3	36.6	4.3	7.7	10.9	20.7	382	1	–97	–13.2
Km89	24	7.7	39.6	16.8	23.4	4.4	11.5	6.1	21.3	263	2	–113	–14.9
North West Valley													
Man22	13	8	15.5	4.2	15.4	2.1	2.3	0.4	4.8	110	1	–131	–17.1
Man20	N/A	N/A	14.5	5.2	5.5	1.1	3	0.6	2.2	83	2	–99	–13.3
Hwy10	10	7.6	45.1	25.5	19.4	4.1	6.3	10.7	7.2	316	1	–108	–14.4
Man60	30	7.2	13.1	5	4.5	1.8	3.6	0.4	1.6	75	3	–96	–13.1
Surface Water													
Yakima R. (TRP)	76	7.7	9.8	bdl.	2.1	0.7	1.9	0.8	1.2	40	5	–94	–12.7
Yakima R. (BV)	70	7.9	13.4	4.8	4	1.2	2.7	1.0	2.3	65	9	–95	–12.9
North Branch Canal	33	7.6	8.4	0.9	2.2	0.7	1.8	0.9	1.3	27	9	–90	–12.3
Naneum Cr.	82	8	12.4	4.5	3.7	1.8	0.7	bdl.	1	51	18*	–113	–15.3
Badger Cr.	128	7.7	13.8	3.7	5.2	0.8	2.3	1.2	2.9	63	9	–91	–12.3
Wilson Cr.	132	7.9	22.1	8.2	8.5	8.1	9.9	1.9	5.3	134	4	–93	–12.6
Cherry Cr.	100	7.9	20.1	6.7	8.5	1.7	3.4	1.8	5.1	110	4	–92	–12.5
Manastash Cr.	95	7.6	9	bdl.	2.6	1	1.4	bdl.	1.5	42	9	–95	–12.7
Taneum Cr.	20	7.8	8	bdl.	2	0.5	1.6	0.8	1.4	33	3	–90	–12.0
Reecer Cr.	131	8.3	12.6	5.1	4.1	2.4	bdl.	bdl.	bdl.	63	11*	–108	–14.5
Coleman Cr.	N/A	N/A	16.4	7.2	6.1	2.8	1.2	bdl.	4.6	105	1	–115	–15.2
CaribouCr.	9	7.4	27.6	12.5	11.5	5.9	4.2	1.1	4.6	186	0	–114	–14.9
Detection Limit			0.1	0.1	0.1	0.1	0.1	0.1	0.1	10			

Table 8. Geochemical data for Moxee Valley.

Well Name	EC (µS/cm)	pH	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	HCO_3 (mg/L)	Charge Balance Error (%)	δD (‰)	$\delta^{18}O$ (‰)
North of Agriculture													
Cla18	12	7.7	13.1	3.7	48.4	7.03	6.6	0.0	1.8	204	1	–139	–17.3
Cla23	15	7.5	36.0	17.3	19.3	4.16	8.3	5.0	17.5	249	1	–123	–15.1
Cla15	17	7.8	33.9	15.7	33.1	5.77	8.9	3.6	18.7	281	0	–125	–15.3
North Valley													
Ter70	1	8.0	2.3	0.2	59.4	1.19	5.0	1.9	12.6	164	1	–100	–13.5
Bit50	11	7.9	25.1	7.2	18.2	3.48	7.6	2.9	17.4	160	2	–134	–16.7
Bit71	11	7.2	28.5	9.1	19.3	3	6.5	2.7	8.1	189	0	–98	–13.3
Bit81	9	7.8	21.8	7.2	15.3	2.74	4.0	5.3	3.8	137	4	–99	–13.4
Bit80	10	7.1	24.9	8.3	16.8	2.85	4.5	6.1	5.1	153	4	–98	–13.4
Loc40	6.26	7.3	17.4	6.4	6.4	2.01	3.7	1.6	4.5	97	4	–94	–12.6
Ter59	15	7.4	35.4	12.9	25.9	2.34	15.2	21.2	13.7	220	6	–107	–12.9
Bit09	19	7.5	42.9	13.2	35.9	5.2	20.1	12.9	33.0	286	2	–122	–15.2
Middle Valley													
Bea23	–	–	2.3	0.2	85.4	0.68	19.0	0.4	2.5	244	2	–134	–16.8
Cay22	5	8.1	24.3	8.6	25.4	5.96	6.0	0.4	12.2	198	1	–129	–16.0
Mie9	24	7.5	2.3	0.2	128.8	1.89	16.4	0.4	36.9	359	1	–122	–15.5
Duf86	23	8	2.35	0.2	134.5	0.73	14.7	10.5	34.5	359	1	–101	–13.6
Bel65	–	–	36.2	13.5	623.7	5.4	36.6	19.7	74.0	688	46*	–113	–14.7
Bir22	7.3	8	21.2	7.5	24.8	5.28	5.2	0.4	9.1	178	1	–128	–16.0
East Valley													
Des38	19	7.7	36.3	13.9	49.1	5.95	9.3	0.4	49.6	328	1	–132	–16.7
WA–24	19.5	7.9	2.5	0.3	109.8	4.56	26.7	0.4	22.9	319	2	–129	–16.3
Hof35	17	8.1	29.6	13.1	45.6	6.39	31.9	0.4	24.8	294	1	–126	–15.6
Hof34	23	7.8	52.2	21.5	36.7	5.62	56.1	0.5	58.9	381	1	–121	–14.9
Hof25	15	8.4	2.4	0.7	91.4	1.17	22.6	0.4	15.1	261	1	–135	–17.0
Pos12	12.9	7.7	24.5	11.7	26.5	6.62	8.0	0.4	1.4	223	2	–126	–15.5
South Valley													
Gam02	30	7.9	70.2	34.9	90.1	3.21	49.4	42.8	50.4	611	2	–101	–13.5
Gam76	27	7.7	76.7	30.8	65.0	4.15	31.5	69.2	52.5	502	6	–102	–13.7
Gam5	23.6	7.9	59.9	23.0	69.6	4.8	23.7	24.4	57.5	475	1	–109	–14.4
Bea85	17	7.4	48.7	18.7	108.2	6.08	29.9	24.7	59.1	534	0	–115	–15.0
Bea68	56.3	7.7	101.5	46.8	115.9	6.42	31.8	77.4	108.1	845	1	–101	–13.5

Table 8. Geochemical data for Moxee Valley. – Continued

Well Name	EC (µS/cm)	pH	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	NO_3 (mg/L)	SO_4 (mg/L)	HCO_3 (mg/L)	Charge Balance Error (%)	δD (‰)	$\delta^{18}O$ (‰)
Konnowac Pass													
Kon14	12	8.6	12.8	2.5	54.4	13.83	17.6	0.4	1.2	224	2	–143	–17.1
Surface Waters													
Yakima R. (LU)	7	7.8	26.6	13.7	14.4	5.08	8.0	1.5	8.8	188	2	–98	–13.2
Yakima R. (MX)	–	7.9	15.4	5.0	6.3	1.88	4.2	10.7	4.0	86	3	–105	–13.7
Moxee Cr.	–	–	59.8	21.6	110.8	8.96	27.3	2.9	76.5	610	1	–100	–13.2
Detection Limit			0.1	0.1	0.1	0.1	0.1	0.1	0.1	10			

bdl., below detection limit; –, not measured; *, charge balance error > 10%

Table 9. Standard Deviations and Ranges for Major Ions

Study Area	F (mg/L)	Cl (mg/L)	NO_2 (mg/L)	SO_4 (mg/L)	NO_3 (mg/L)	HCO_3 (mg/L)	Na (mg/L)	K (mg/L)	Mg (mg/L)	Ca (mg/L)
Roslyn										
Standard Deviation	0.06	7.4	2.4	3.8	5.1	122	38.6	0.8	8.1	11.8
Range	0.2	27.7	7.9	11.6	24.1	395	122	3.4	25.8	40.6
Max	0.2	27.8	8.6	13	24.1	434	132	4.1	25.9	45.0
Min	0	0.1	7.9	1.4	0	38.5	1.5	0.7	0.1	4.4
Medium	0	3.5	5.3	4.5	1.4	223	31.8	1.1	4.3	17.5
Kittitas										
Standard Deviation	0.3	0.9	2.4	22.3	6.1	145	18.4	5.0	8.4	18.6
Range	1.1	35.8	9.91	133	23.3	730	99	39	42.2	88.8
Max	1.13	36.4	9.91	134	24.6	757	100	39.5	42.2	91.2
Min	0	0.6	0	0.9	1.3	27.5	1.8	0.5	0	2.4
Medium	0.1	3.7	3.5	4.4	3.0	154	99	3.5	10.6	22
Moxee										
Standard Deviation	0.4	13.7	2.0	27.0	17.0	183	108	2.7	10.8	23.9
Range	2.5	52.5	8.6	107	69.5	758	617	13.5	46.7	99.2
Max	2.5	56.2	10.9	108	69.5	845	624	13.8	46.8	102
Min	0	3.7	2.3	1.2	0	86	6.3	0.7	0.1	2.3
Medium	0.5	15.0	5.4	17.4	3.0	255	47	4.7	10.4	25.9
All Study Areas										
Standard Deviation	0.3	7.3	2.3	17.7	9.4	164.0	55.0	2.8	9.1	18.1
Range	1.3	38.7	8.8	83.9	39.0	627	279	18.6	38.2	76.2
Max	1.3	40.1	9.8	85.0	39.4	678	285	19.1	38.3	79.4
Min	0	1.5	3.4	1.2	0.4	50	3.2	0.6	0.1	3.0
Medium	0.2	7.4	4.7	8.8	2.5	210	59.3	3.1	8.4	21.8

Table 10. Maximum, minimum and average values for stable isotope samples.

Study Area	δD (‰)	$\delta^{18}O$ (‰)	Number of Samples
Roslyn Groundwater			
Max	–94	–13	17
Min	–114	–15.4	
Average	–104	–14	
Roslyn Surface Water			3
Max	–94	–13.1	
Min	–102	–14	
Average	–98	–13	
Kittitas Groundwater			48
Max	–91	–17.1	
Min	–131	–12.3	
Average	–115	–15.2	
Kittitas Surface Water			13
Max	–89	–12.1	
Min	–115	–15.3	
Average	–98	–13.3	
Moxee Groundwater			29
Max	–93	–12.9	
Min	–142	–17.8	
Average	–117	–15	
Moxee Surface Water			3
Max	–98	–13.2	
Min	–106	–13.7	
Average	–101	–13.4	

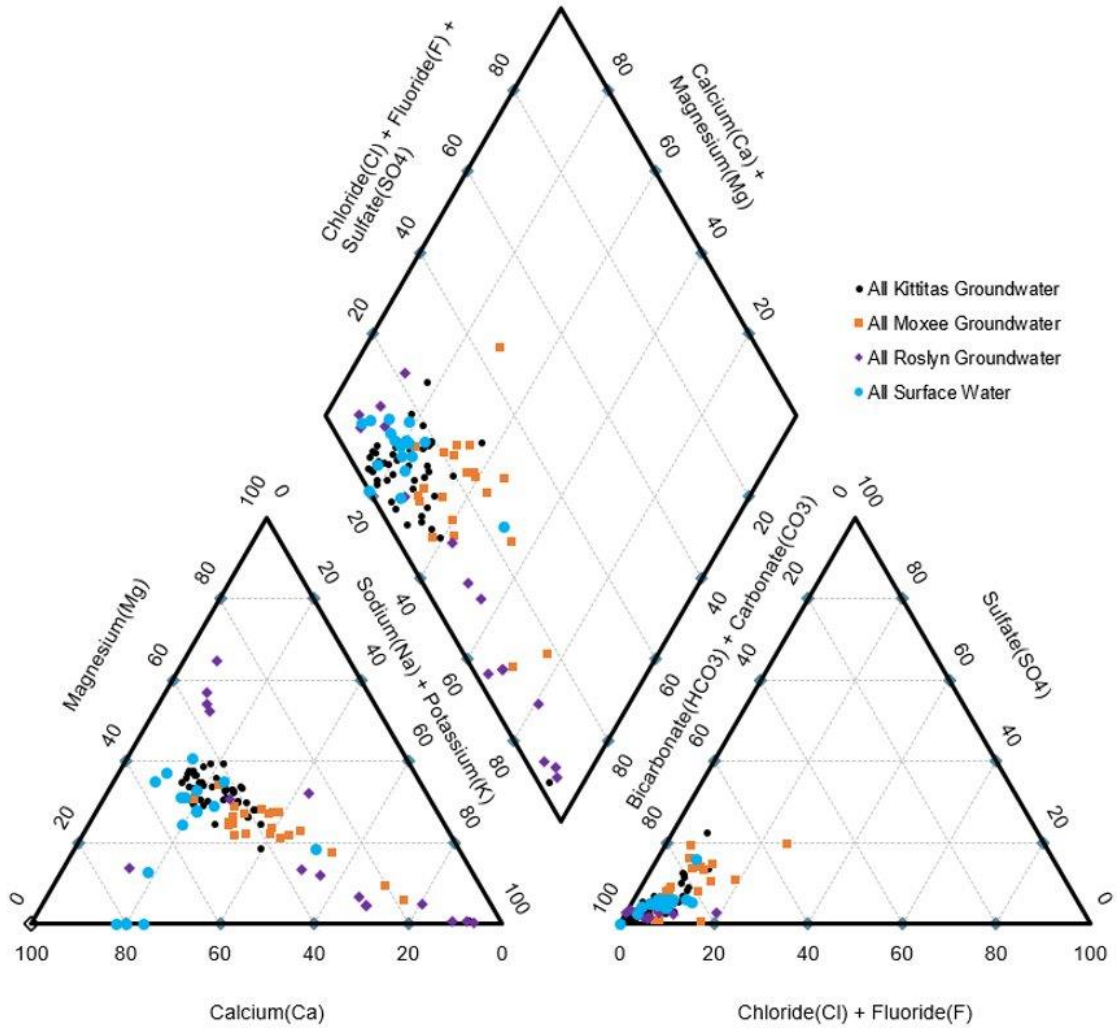


Figure 11. A Piper Diagram of all collected water samples.

Table 11. Trace element data for Roslyn

Well Name	Al (ppb)	V (ppb)	Cr (ppb)	Mn (ppb)	Fe (ppb)	Ni (ppb)	Cu (ppb)	Zn (ppb)	As (ppb)	Mo (ppb)	Ba (ppb)	Pb (ppb)	U (ppb)
Borders Reservoir													
Guzzi60	bdl.	bdl.	bdl.	19.5	bdl.	8.1	bdl.	719.7	0.0	bdl.	5.0	bdl.	bdl.
Guzzi30	bdl.	1.4	1.9	4.9	bdl.	7.3	1.2	558.9	bdl.	0.1	4.1	bdl.	bdl.
Salmon14030	2.0	1.5	1.7	0.5	bdl.	1.9	9.3	66.7	2.2	1.0	32.0	0.2	0.1
Near Coal Shafts													
Fan (11/12)	3.1	2.1	1.1	0.2	16.6	4.2	0.7	0.9	0.8	0.8	83.1	bdl.	bdl.
Vinegar390	bdl.	bdl.	bdl.	29.0	bdl.	bdl.	bdl.	2.0	0.7	0.3	280.5	bdl.	bdl.
Vinegar481	0.8	bdl.	bdl.	8.7	bdl.	0.5	29.4	110.2	bdl.	0.2	304.4	0.2	bdl.
Vinegar420	0.5	bdl.	bdl.	10.0	33.2	bdl.	bdl.	3.0	bdl.	0.3	236.6	bdl.	bdl.
Shaft421	1.4	bdl.	bdl.	0.3	bdl.	bdl.	bdl.	1.1	bdl.	bdl.	1.6	bdl.	bdl.
Shaft181	1.1	bdl.	bdl.	0.7	bdl.	bdl.	0.4	47.7	bdl.	bdl.	3.4	bdl.	bdl.
Ridgeview	bdl.	bdl.	bdl.	25.9	bdl.	bdl.	0.4	3.1	bdl.	0.2	28.0	bdl.	bdl.
Ridge360	0.5	bdl.	bdl.	0.9	bdl.	bdl.	3.7	24.6	bdl.	0.2	5.5	bdl.	bdl.
Tamarack101	0.8	bdl.	bdl.	0.2	bdl.	bdl.	3.5	21.2	bdl.	0.3	97.5	bdl.	bdl.
Away from Coal Shafts													
RoslynRidge	0.4	bdl.	bdl.	0.2	bdl.	bdl.	2.3	7.9	bdl.	0.3	98.8	bdl.	bdl.
W–WA103	2.2	0.7	0.0	bdl.	bdl.	bdl.	9.2	9.4	bdl.	bdl.	2.1	bdl.	bdl.
Borders Cle Elum R.													
Woodduck1161	0.9	1.6	4.8	0.9	bdl.	0.9	13.5	4.0	1.3	bdl.	2.8	bdl.	bdl.
Woodduck1281	1.3	1.6	4.5	8.4	29.7	0.4	0.4	1.4	1.3	bdl.	2.0	bdl.	bdl.
Surface Water													
Salmon La Sac R.	9.7	0.2	0.7	0.7	bdl.	2.2	bdl.	0.3	0.7	0.1	3.1	bdl.	bdl.
Cle Elum Lake	3.6	0.2	0.4	4.8	bdl.	2.2	bdl.	0.4	0.5	0.1	3.1	bdl.	bdl.
Teanaway R.	2.7	0.3	0.6	2.9	bdl.	1.1	0.5	0.5	bdl.	bdl.	6.9	bdl.	bdl.
Legal Limit	50	n.a.	100	50	300	100	1000	5000	10	n.a.	2000	15	30
Detection Limit	0.34	.014	0.21	0.11	15.58	0.33	0.27	0.50	0.31	0.10	0.38	0.15	0.08

bdl., below detection limit; –, not measured; n.a., not applicable

Table 12. Trace element data for Kittitas Valley

Well Name	Al (ppb)	V (ppb)	Cr (ppb)	Mn (ppb)	Fe (ppb)	Ni (ppb)	Cu (ppb)	Zn (ppb)	As (ppb)	Mo (ppb)	Ba (ppb)	Pb (ppb)
North of Irrigation												
W122	0.6	31.3	0.5	bdl.	bdl.	bdl.	bdl.	178.1	0.5	0.5	3.2	bdl.
Clk64	bdl.	bdl.	bdl.	93.0	19.8	bdl.	bdl.	14.2	0.3	0.3	4.5	bdl.
Chr90	0.5	30.2	0.3	0.6	bdl.	bdl.	1.4	95.5	0.4	0.8	3.8	bdl.
W117	0.5	28.0	0.3	bdl.	bdl.	bdl.	0.5	255.9	0.4	1.0	2.0	bdl.
W268	0.7	29.3	0.4	bdl.	bdl.	bdl.	3.1	18.1	0.4	0.5	4.4	bdl.
Chr20	0.6	10.0	0.2	0.2	bdl.	bdl.	9.6	4.7	bdl.	0.4	6.1	bdl.
Chr33	0.5	45.8	0.3	0.7	bdl.	bdl.	bdl.	16.9	0.5	0.2	9.9	bdl.
Ck23	0.8	21.6	bdl.	0.2	bdl.	bdl.	0.3	8.1	0.4	0.5	3.3	bdl.
South Valley												
Trl60	bdl.	3.6	bdl.	bdl.	bdl.	bdl.	0.4	0.8	bdl.	0.0	18.5	bdl.
Trl32	bdl.	6.0	bdl.	bdl.	bdl.	bdl.	0.4	0.8	bdl.	0.0	27.0	bdl.
Or51	0.4	6.5	bdl.	bdl.	bdl.	bdl.	bdl.	bdl.	bdl.	0.1	24.4	bdl.
Badger Pocket												
Boh501	bdl.	9.9	bdl.	0.9	bdl.	bdl.	0.4	27.7	0.3	0.6	11.7	bdl.
UpB91	0.9	20.2	0.4	0.3	bdl.	bdl.	11.8	8.4	0.5	0.8	49.0	bdl.
Mor	0.7	14.2	0.9	bdl.	bdl.	bdl.	0.3	0.5	0.4	0.2	51.3	bdl.
Cm14	0.5	37.6	0.4	0.1	bdl.	bdl.	bdl.	9.1	1.0	1.0	38.5	bdl.
Km100	0.5	25.9	0.9	0.3	bdl.	bdl.	1.3	9.6	0.7	0.4	38.5	bdl.
By61	0.5	48.7	bdl.	0.1	bdl.	bdl.	0.7	101.6	1.9	0.8	6.5	0.3
UpB17	0.7	46.0	bdl.	bdl.	bdl.	bdl.	32.7	14.2	2.1	1.4	6.6	0.2
WPA51	0.6	32.7	0.7	0.5	bdl.	bdl.	0.4	48.9	1.2	1.4	20.2	bdl.
Bor	0.6	27.7	0.1	0.5	bdl.	bdl.	1.8	29.6	1.2	0.7	58.9	bdl.
Km89	0.6	23.5	bdl.	2.8	bdl.	bdl.	5.0	96.2	0.7	0.5	41.9	0.1
Legal Limit	50	n.a.	100	50	300	100	1000	5000	10	n.a.	2000	15
Detection Limit	0.34	.014	0.21	0.11	15.58	0.33	0.27	0.50	0.31	0.10	0.38	0.15

bdl., below detection limit; –, not measured; n.a., not applicable

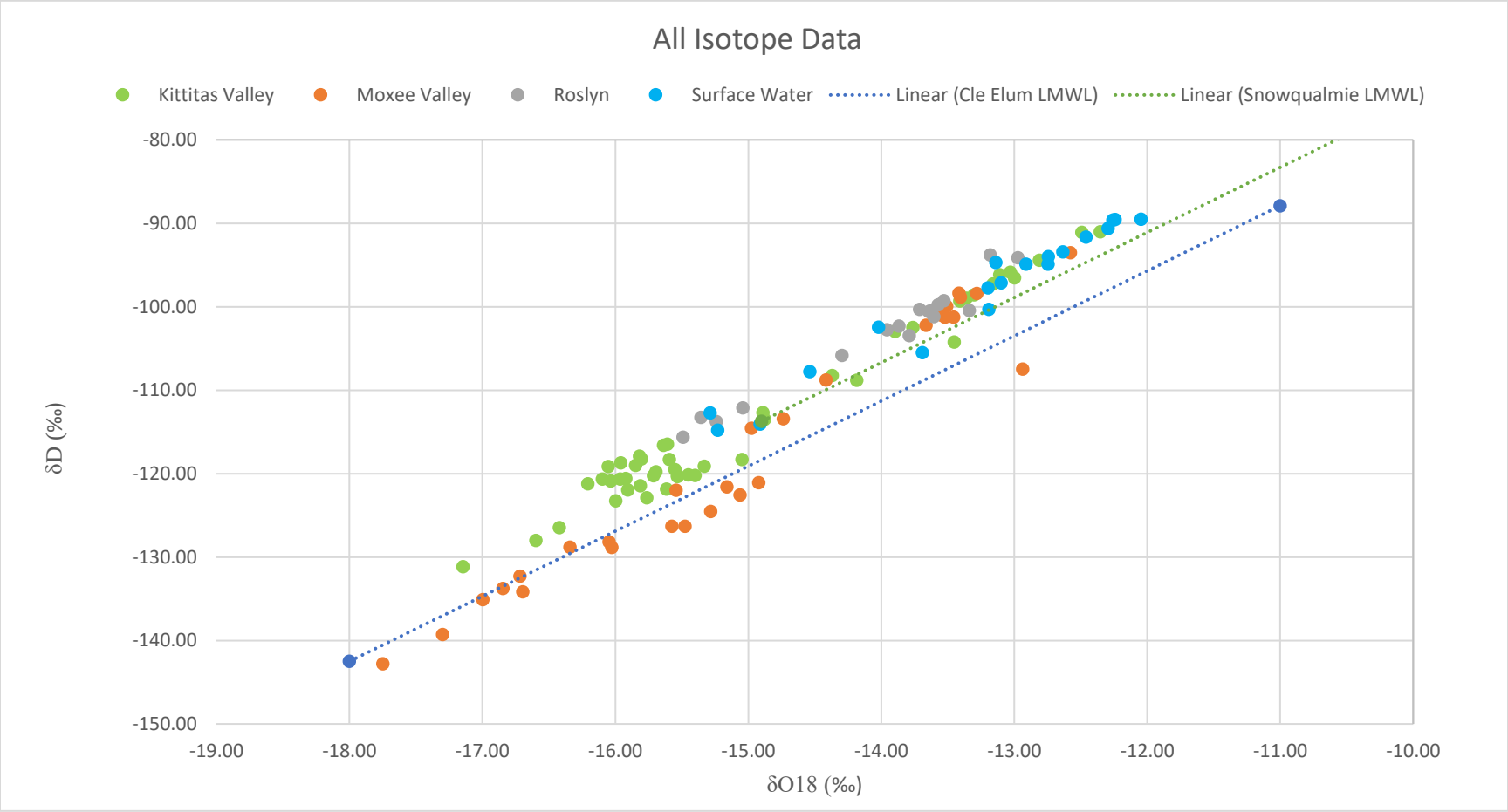


Figure 12. $\delta^{18}O$ vs δD plot of all collected water samples. Uncertainty based on replicate measurements of the internal lab standards and of unknown samples is < 0.04‰ for $\delta^{18}O$ and < 0.2‰ for δD. Local meteoric water lines (LMWL) from Snoqualmie Pass and Cle Elum are shown.

CHAPTER IV

DISCUSSION

Isotopic Composition of Yakima River Water and Irrigation Water: Signature of Artificial Recharge.

The isotopic composition of the Yakima River varies both seasonally and with location (Figure 13) along the river (United States, Geological Survey, 2020), but it tends to fall within a relatively narrow range (–107‰ to –93‰ for δD); Yakima River water is isotopically heavier than water from tributaries whose water originates as snowmelt from further inland (Figure 14). During the irrigation season, the Yakima River serves as a conduit from the reservoirs to the major irrigation districts within the basin, whose networks are supplied from different diversion points along the Yakima River. As a result, the Yakima River and irrigation water are nearly identical isotopically, with deuterium isotope values between –89‰ and –106‰. Because of slower movement through canal systems and increased evaporation, measured irrigation water tends to be slightly heavier isotopically, falling toward the top of that range (Figure 14).

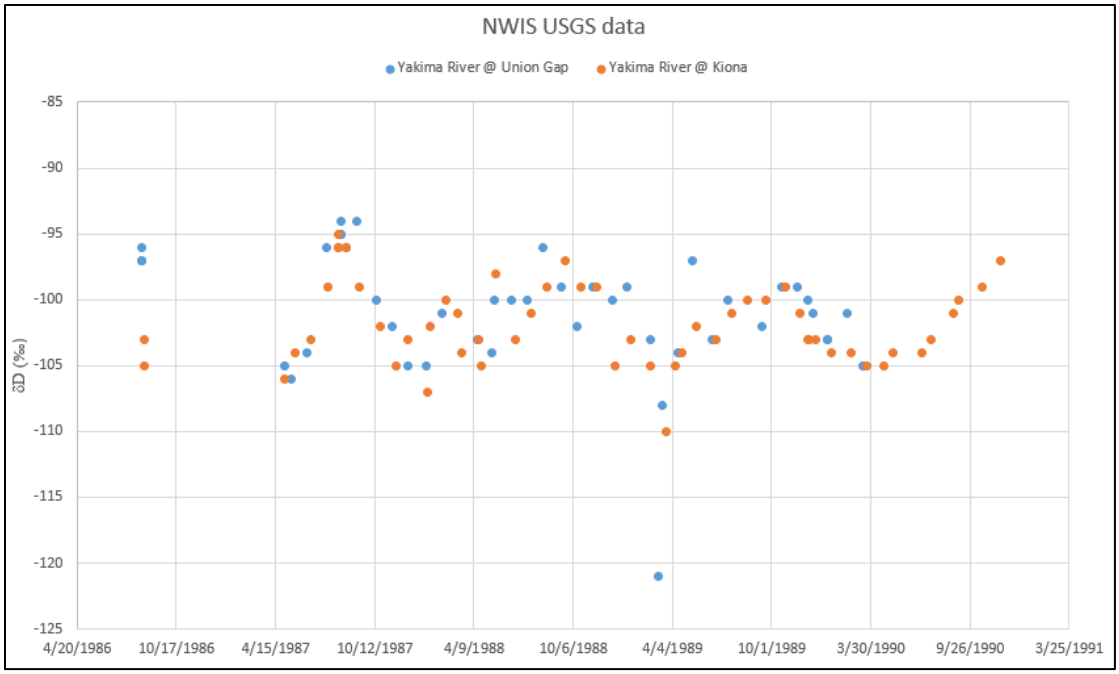


Figure 13. USGS data demonstrating the temporal changes in isotopic composition for Yakima River water. Data is from the USGS National Water Information System (NWIS) sites 12500405 and 12510500.

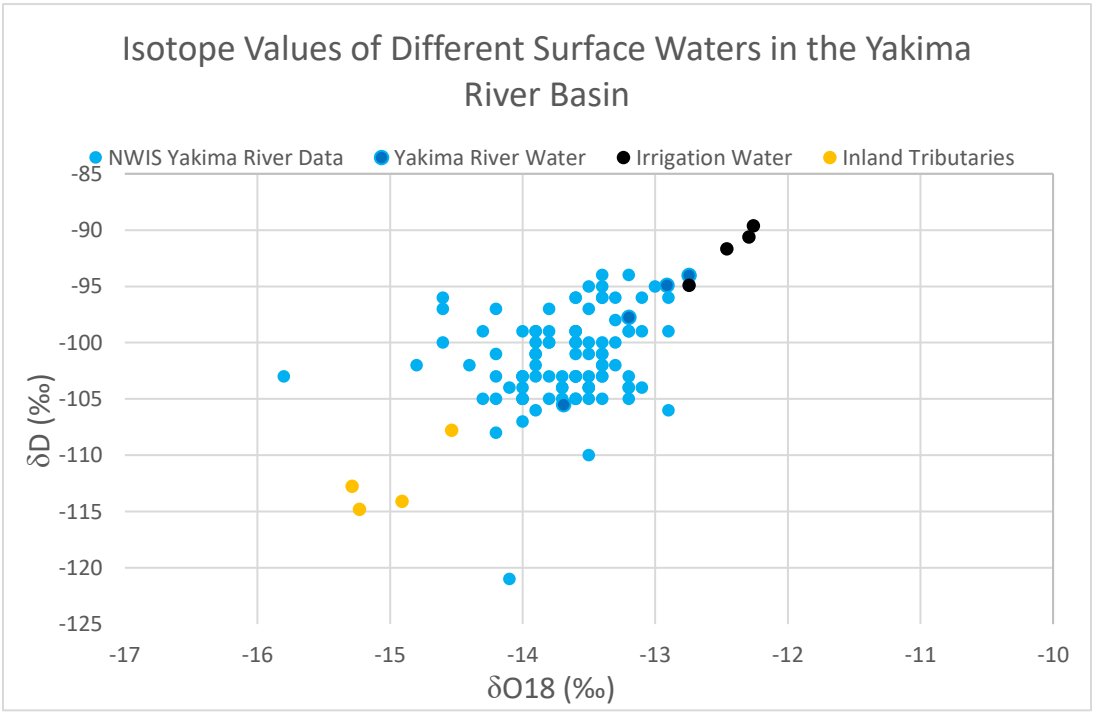


Figure 14. Difference in isotope values from different types of surface waters in the Yakima River Basin. The NWIS Yakima River data was collected at USGS sites 12500405 and 12510500. All other data was collected in this study.

One way that we can examine the relationship between isotopes and recharge regimes is by comparing between the isotopic composition of groundwater from nearby wells of different depth. In local scenarios, groundwater collected from deeper wells are almost always lighter isotopically. This trend is illustrated in various locations in both Kittitas Valley (Figure 15) and Moxee Valley (Figure 16). We interpret this trend to reflect surficial aquifers that are significantly influenced by irrigation or Yakima River water (the heavier isotopic signature, green in the figures) and deeper aquifers with groundwater that has been recharged naturally, either recently or in the past (the lighter isotopic signatures, yellow or red in the figures). Past isotopic studies in the region (Vlassopoulos et al., 2009) indicate that the deeper basalt aquifers within the Columbia River basalts tend to have lighter isotopic signatures, with δD values that are typically below –130‰.

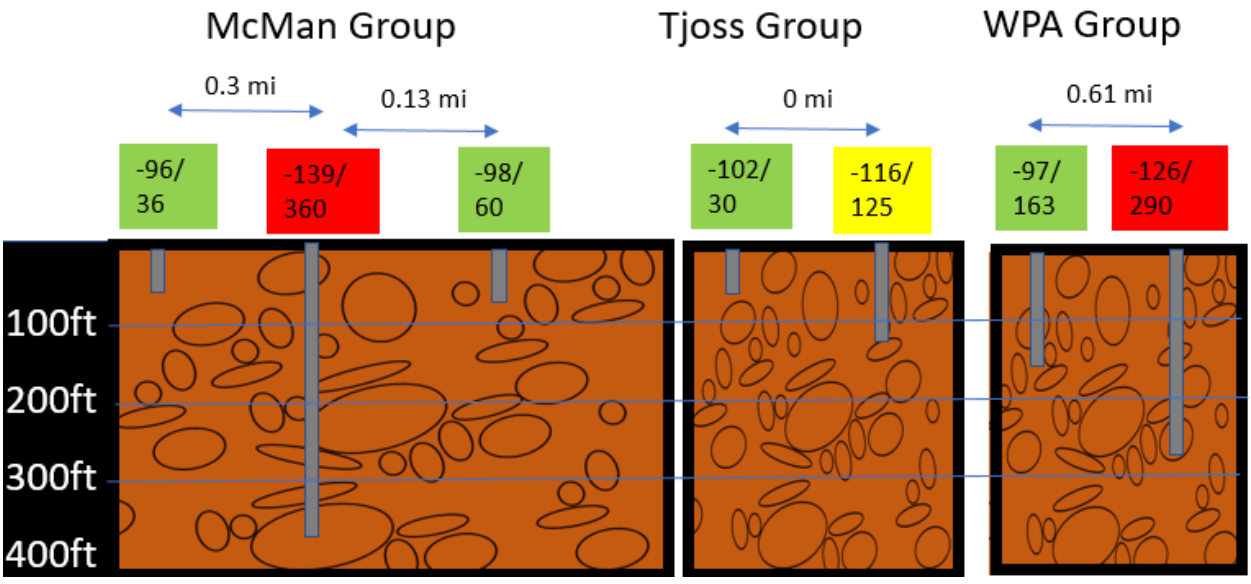


Figure 15. Three local groups in Kittitas Valley that demonstrate the relationship between isotopes and depth. The top number is the δD value (‰) and the bottom number is the depth of the well (ft). Groups are color coded based off δD values; green: >–108‰, yellow: –108‰ <–121‰, red: <–122‰.

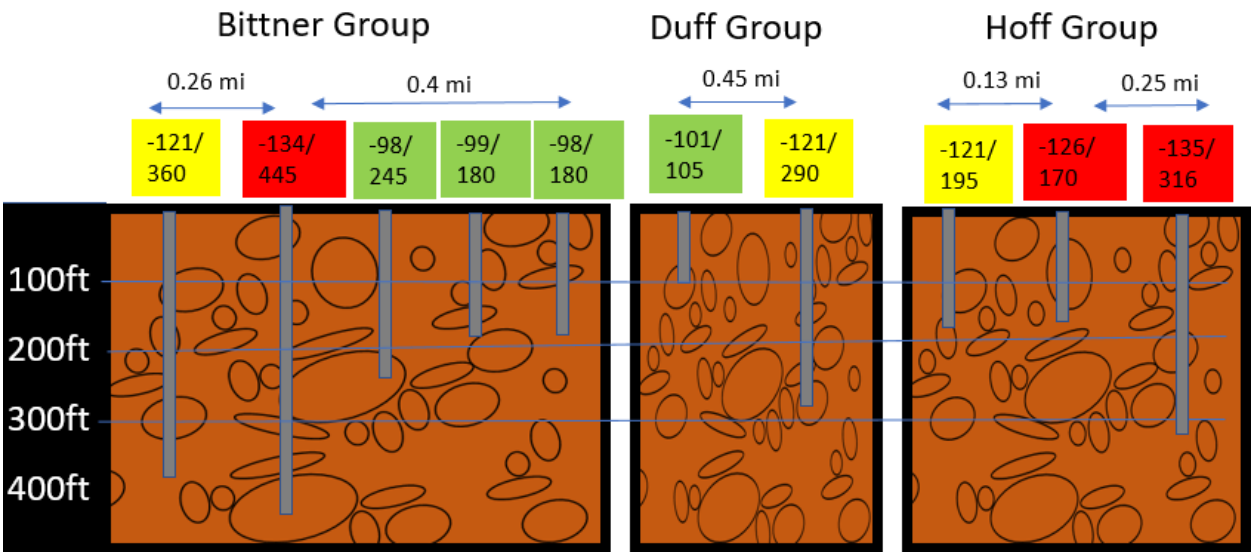


Figure 16. Three local groups in Moxee Valley that demonstrate the relationship between isotopes and depth. The top number is the δD value (‰) and the bottom number is the depth of the well (ft). Groups are color coded based off isotopic values; green: >–108‰, yellow: –108‰ <–121‰, red: <–122‰.

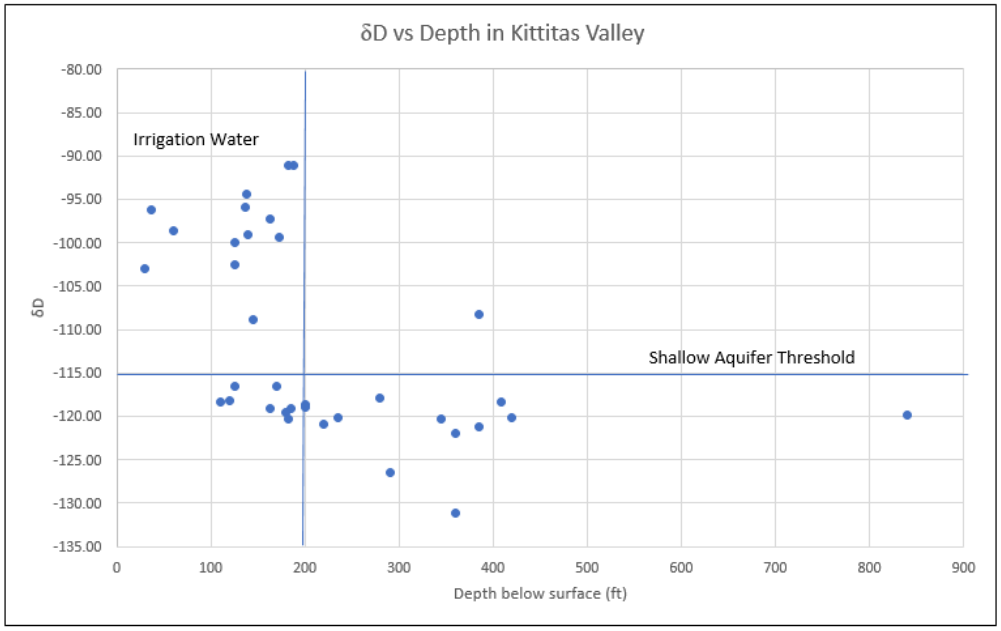
Extent of Irrigation Water Influence

When plotting isotopes versus depth for Kittitas and Moxee Valleys there are clear thresholds for the depth of irrigation-water dominance in aquifers (Figure 17). In Moxee Valley, heavy isotopes (δD>–115‰) are not found at depths greater than 270 ft, indicating that 270 ft is the maximum depth of that region's surficial aquifer. With the exception of one point, in Kittitas Valley, heavy isotopic signatures are not found deeper than 200 ft (Figure 17). The one deeper occurrence of this Yakima-River signature in Kittitas Valley was groundwater collected from a well located on an irrigated terrace approximately 200 ft above the Yakima River and 0.27 mi from the river. Thus, the well in question extends ≤200 ft below the river's surface and has two potential sources for isotopically heavy water (the river and irrigation).

In addition to these depth constraints, stable isotope signatures can be used to constrain the extent of Yakima River/ irrigation waters geographically as well. As expected in Kittitas and

Moxee Valley, irrigation water was not found in wells located up-gradient of widespread agriculture. However, within the boundaries of widespread agriculture the type of water collected (irrigation vs natural) often depended on the depth of the individual well and not the location.

a



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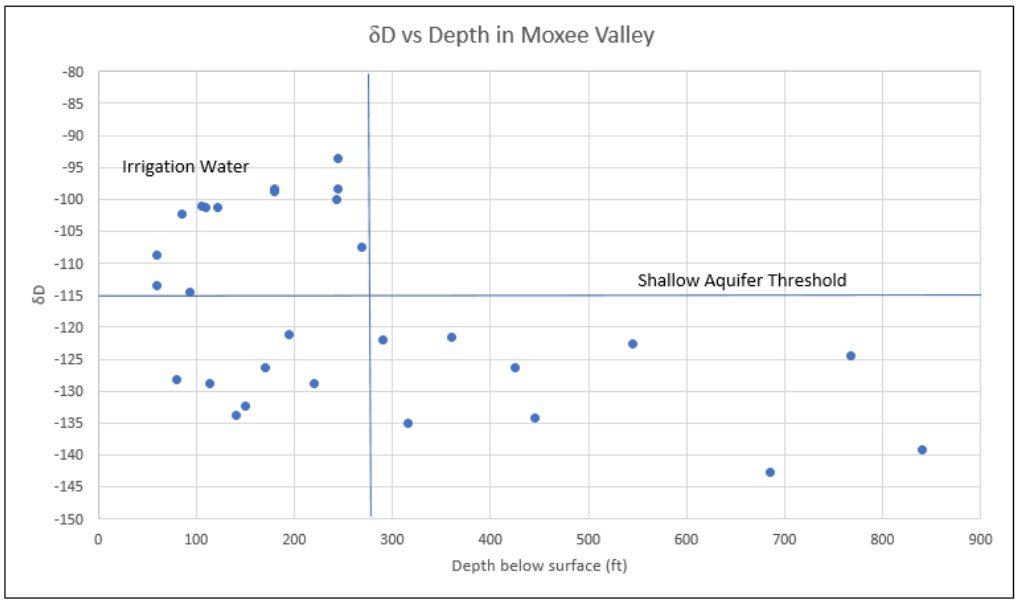

Figure 17. The relationship between δD (‰) and depth (ft) for groundwaters collected in a) Kittitas and b) Moxee Valleys. The vertical line represents the depth at which irrigation water is no longer observed. The horizontal line represents the isotopic value at which irrigation water is no longer detected; we consider this our shallow aquifer threshold.

In addition to influencing the groundwater, irrigation water can influence tributaries during the growing season. For example, up-gradient of the irrigation canals in Kittitas Valley the tributaries, Manastash and Taneum Creek collected in 2005 and 2006 had δD values of –110‰ and –107‰ (Taylor and Gazis 2014), respectively, while δD values of samples from the same tributaries collected below the irrigation canals in this study were –89‰ and –95‰ (Figure 18). This data informs us that within the borders of the canal systems, streams may be heavily influenced by the application of irrigation water.

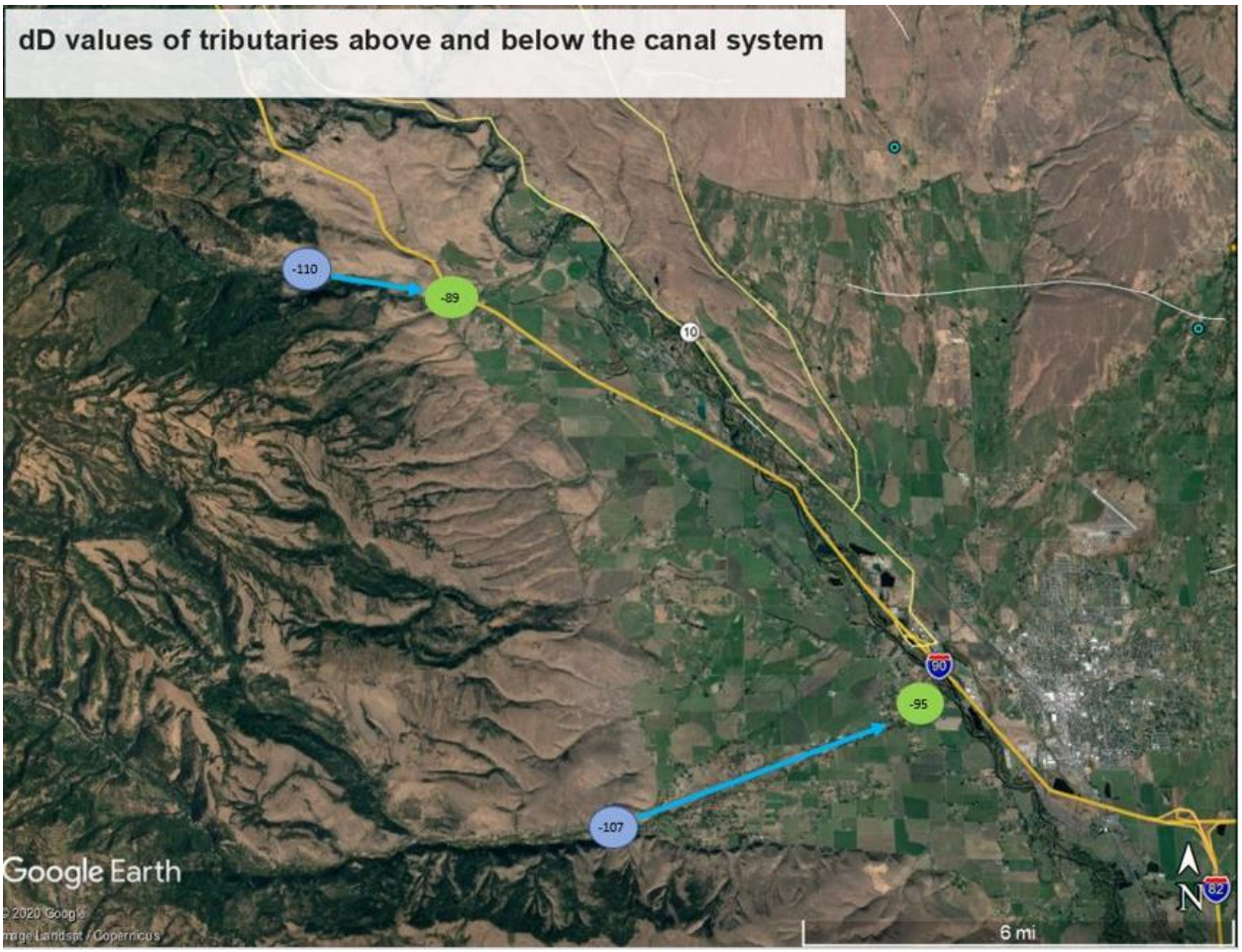

Figure 18. A map presenting the δD values (‰) of tributaries above and below the irrigation canals located on the west side of Kittitas Valley. Light blue numbers represent samples taken above the canal while green numbers are taken below the canal.

Surface water consistently has lower nitrogen values than groundwater (Table 6, 7, and 8). The highest total N (nitrate-N) concentrations recorded in surface waters within Moxee Valley is 0.65 ppm which was collected at Moxee Creek. The high nitrogen concentration of Moxee Creek is likely because the creek is largely fed by irrigation runoff. The highest total N concentration recorded in Kittitas Valley was at Wilson Creek (0.4 ppm) where it enters the Yakima River; at this location, Wilson Creek is dominated by irrigation run off. Because surface waters have low concentrations of total nitrogen we assume that increases in nitrogen are the result of agriculture or possibly leaky septic systems.

Total Nitrogen Concentrations and Isotope Values

In both Kittitas Valley and Moxee Valley, total nitrogen concentrations (nitrate-N) were used to identify irrigation waters and confirm that the heavy Yakima-River isotopic signature is in fact irrigation water in most cases. The link between total nitrogen and heavy isotopic signatures is seen in multiple local scenarios when wells penetrate down to different depths. Based on Figure 16, the lowest δD value of groundwater that is substantially influenced by Yakima-River derived water is –115‰. This defines the shallow aquifer. Figure 19 plots of plotting δD vs total nitrogen and uses this δD value to define the shallow aquifer threshold. The majority of the total nitrogen concentrations above 2 ppm are waters with this heavier isotopic signature. This nitrogen is most likely derived from agricultural fertilizers transported to the groundwater by irrigation water. Thus, this relationship further supports the idea that we can use isotopes to delineate the extent of the surficial aquifer.

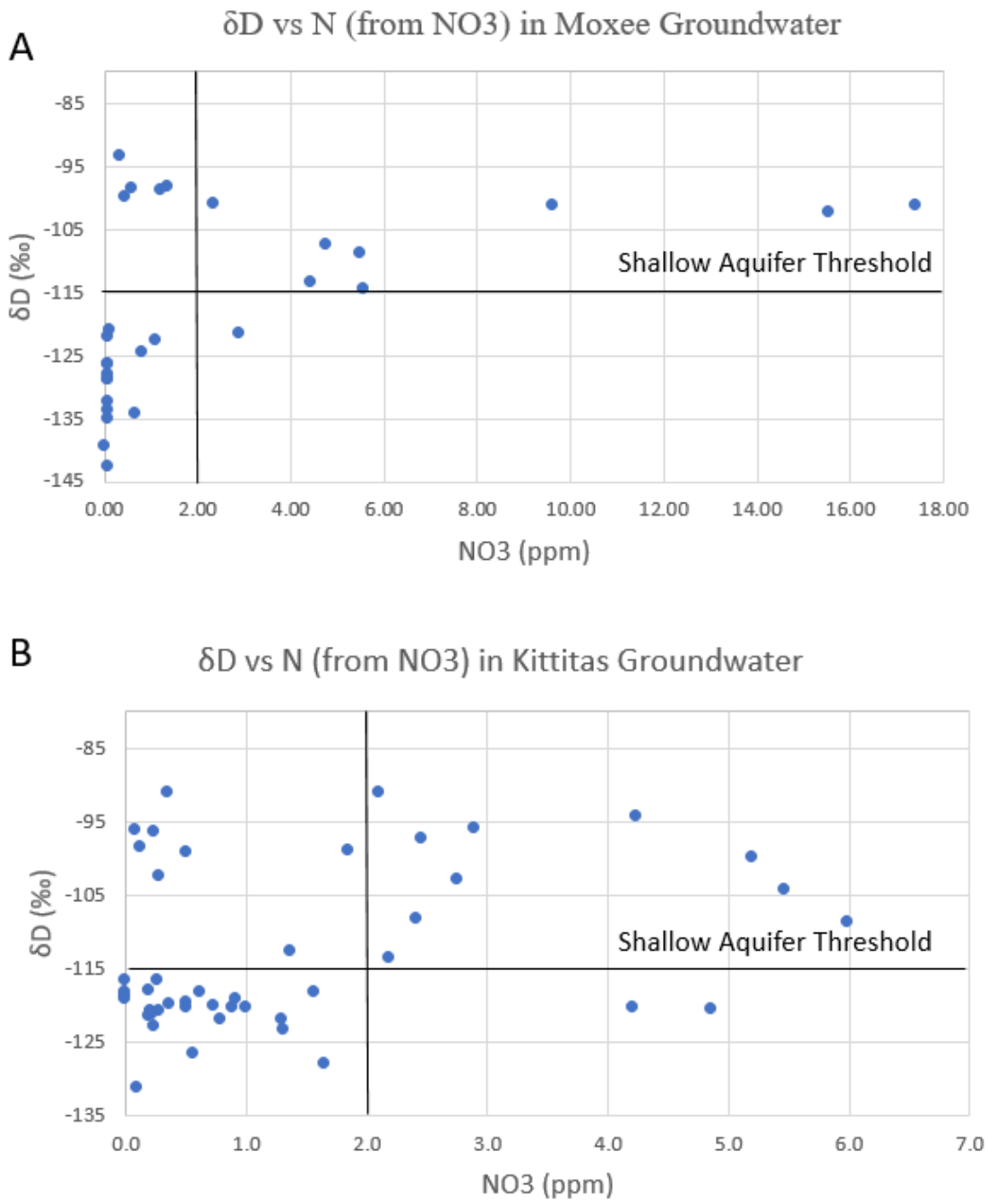

Figure 19: The relationship between δD (‰) and total N (nitrate-N) in groundwaters collected in Kittitas and Moxee Valleys. The vertical dotted line represents the nitrogen threshold for shallow aquifers (2 ppm). The horizontal lines represent the δD threshold for shallow aquifers (–115‰).

Out of all the water samples collected only three groundwater samples were over the drinking water limit for nitrogen. These three wells were all shallow (<125 ft), surrounded by agriculture, and had groundwater with isotopic values representative of irrigation water.

Overall surface water has low concentrations of N and heavier isotopes when compared to groundwater. Using these chemical components together we are able to differentiate between two different surface water recharge regimes; recharge with agriculture interaction, and recharge without agriculture interaction.

In a few cases, groundwater is isotopically similar to irrigation water but the nitrogen concentrations are low. Interestingly, the five wells in Moxee Valley that fell into this category were all less than 0.15 mi from the same irrigation canal (Figure 20). We expect that the isotopic and chemical composition of water in the irrigation canal near the five wells is similar to the Yakima River near Moxee. Comparison of a variety of chemical constituents indicate that the wells and the Yakima River water at Moxee are chemically similar, with only slightly higher concentrations of bicarbonate and total N (Figure 21) in the wells. Past studies have also concluded that artificial recharge in the Yakima Basin is divided between irrigation water applied on fields and irrigation water leaking out of canals (Vaccaro and Olsen, 2007a).

Figure 20. A Google Earth image showing the locations of the wells relative to the irrigation canal. The numbers inside of the green boxes are the δD isotopic values. The blue box represents the δD value taken from the Yakima River at Moxee.

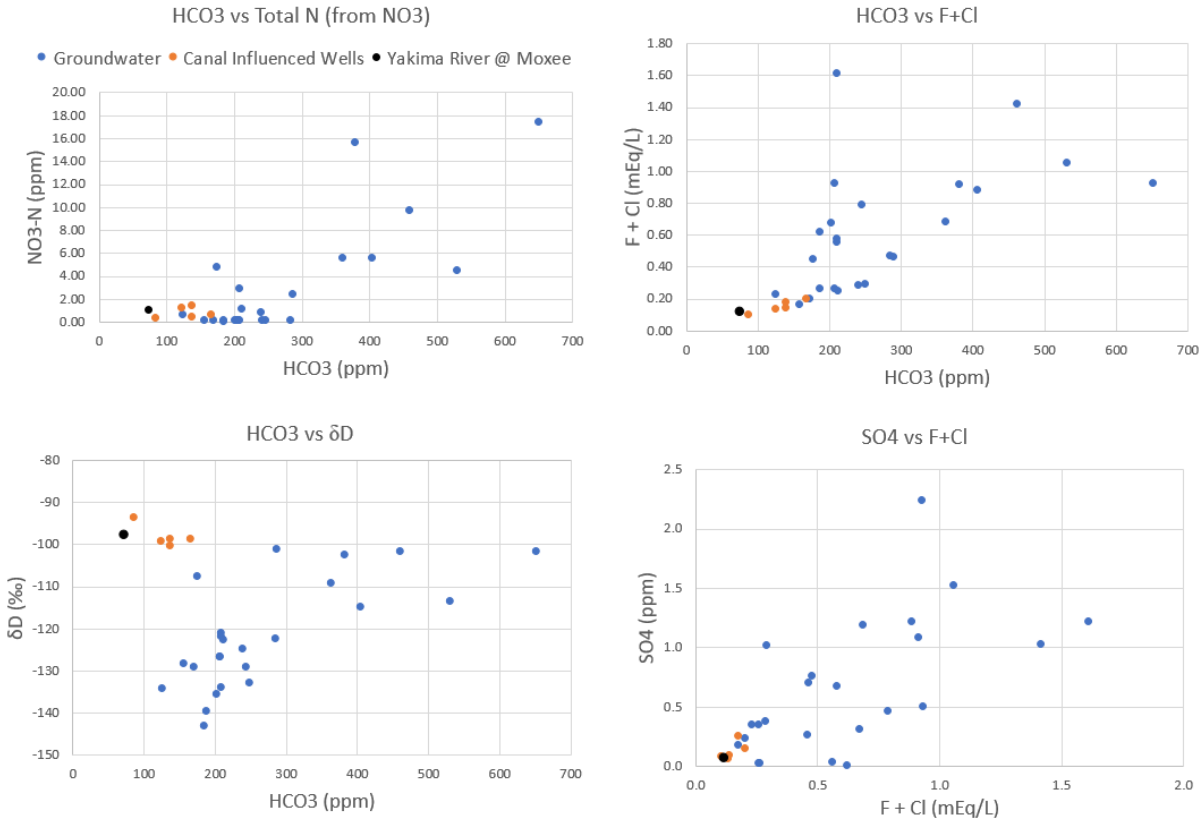

Figure 21. Four Graphs Showing Geochemical Clusters in Moxee. The canal influenced wells are shown on Figure 20 and are orange in this figure.

Kittitas Valley

Nine out of the thirteen surface water samples taken in Kittitas Valley had δD values heavier than –95.0‰ (Figure 22). The other four surface waters were sampled from the easternmost tributaries of the Yakima River (Reecer Creek, Naneum Creek, Coleman Creek and Caribou Creek) and are thus, expected to have lighter isotopic values. These four tributaries were also sampled at low discharge (post-dry season and pre-wet season). Therefore, the isotopic similarity between these four streams and groundwater (Figure 22) could be because the streams are either recharged by resident groundwater, winter precipitation or a combination of the two.

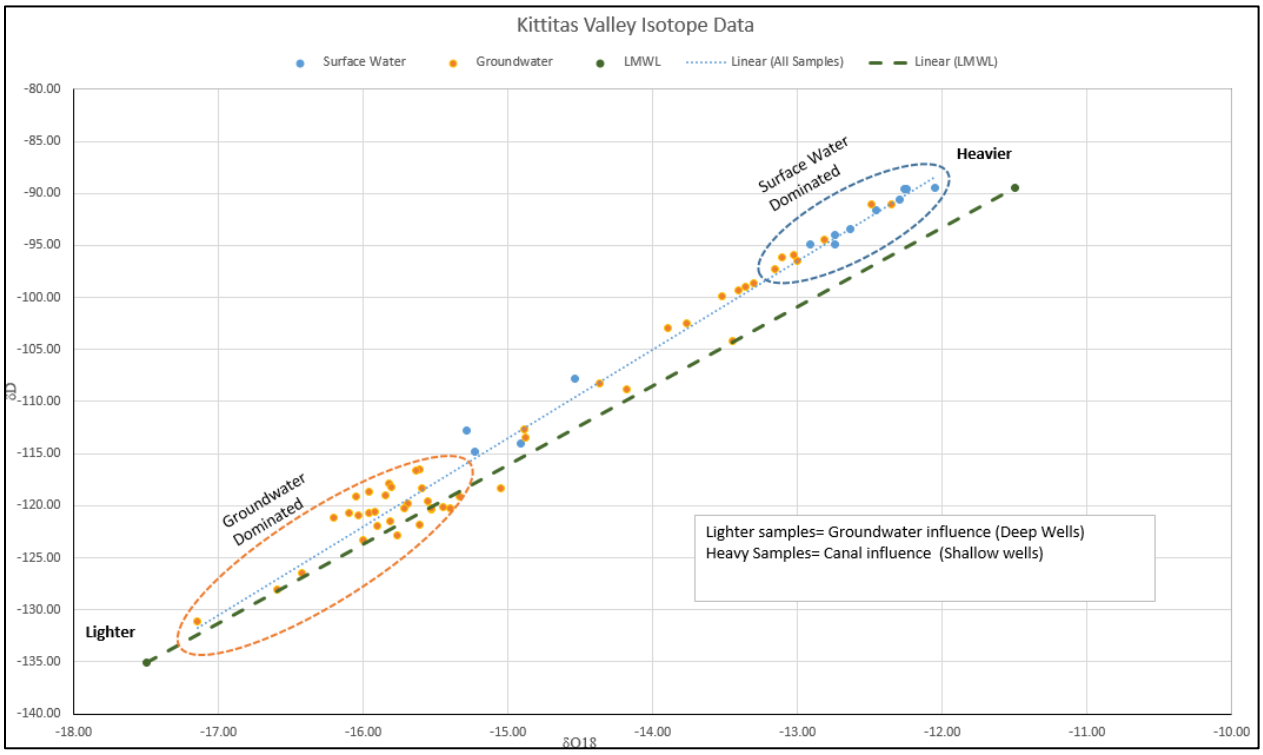

Figure 22. $\delta^{18}O$ vs δD plot, demonstrating the isotopic difference between surface water and groundwater in Kittitas Valley. The green line represents the local meteoric water line of Cle Elum, WA.

Kittitas Valley Transect

When looking at Kittitas Valley (Figure 23 and Figure 24), groundwater both above and below the North Branch canal have similar isotopic values. The canal acts as a border separating a natural shrub-steppe ecosystem and widespread irrigated agriculture; thus, one might expect that isotope signatures of groundwater below the canal would become heavier due to irrigation infiltration. However, influence of irrigation water was not detected in sampled wells until five miles south of the North Branch Canal. Furthermore, many of the wells up-gradient from the canal terminate in basalt aquifers which are sometimes observed to have older, isotopically lighter water (Taylor and Gazis 2014). The observed relatively constant, intermediate isotopic values indicate that the groundwater is not connected to the surficial aquifer; thus, the shallow aquifer in this region is likely above a depth 120 ft (the shallowest well depth sampled in the area).

Although the isotopic compositions don't change above and below the canal the major ion concentrations do. The six wells that were sampled both above the canal and the Naneum Creek floodplain generally have much higher major ion concentrations (specifically Na^+) than the nine wells below (Figure 25). This similar isotopic composition suggests that the precipitation/surface water that recharges both areas are the same. However, the increased major ion concentrations may indicate that the water below the flood plain is more dilute due to either: 1) loss of exchangeable cations due to continued leaching through irrigation, or 2) shorter residence times when compared with the wells above the floodplain (Figure 25). The Piper diagram (Figure 26) shows that major ions above the canal have a higher percentage of Na^+ and a lower percentage of HCO3 which may suggest influence from the Kittitas Valley basalt groundwater identified in Taylor and Gazis (2014).

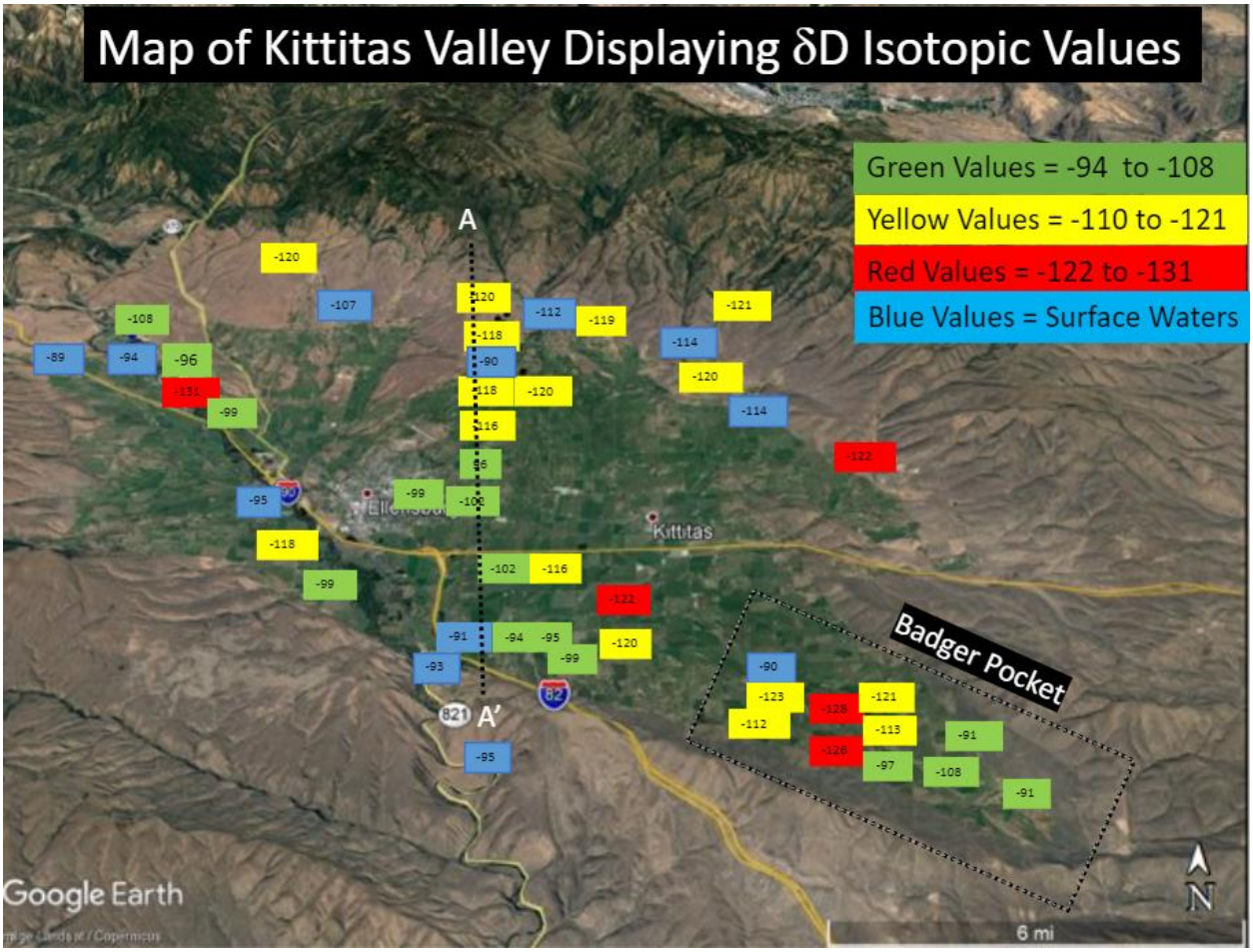

Figure 23. A map of Kittitas Valley displaying δD isotopic values (‰) of water samples. Samples are color coded based on the δD value (‰). Blue samples represent surface water.

Cross-section of Kittitas Valley based on lithologic depths from Vaccaro et al. (2006) and δD values.

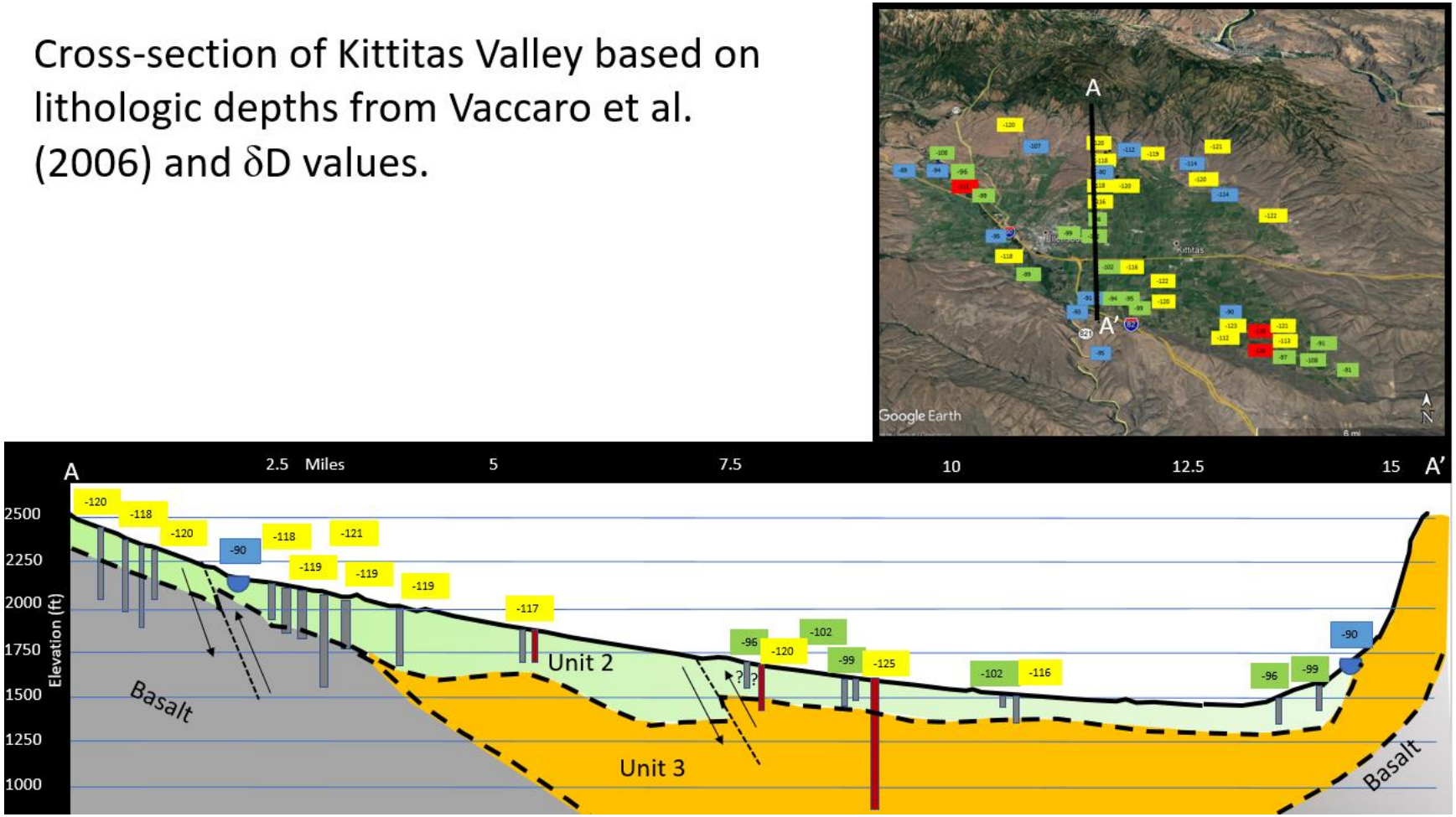

Figure 24. A N-S cross-section of Kittitas Valley showing δD values (‰) of water samples. Blue boxes represent surface water, green boxes are groundwaters with significant irrigation-water influence, yellow boxes are groundwaters with little surface-water influence. (maroon wells are wells recorded by Taylor and Gazis (2014). We do not know the depth of the well at the 7.5-mile mark which is why it is surrounded with question marks.

Approximately 7.5 to 8-miles from the north end of the transect, three wells tested at depths of 125ft, 172ft, and unknown, are isotopically similar to irrigation water implying that the surficial aquifer in this area is relatively deep (Figure 24). This region may be a good candidate for SAR if other criteria are met (i.e., a deep vadose zone, medium to high storativity and transmissivity, land availability, etc.). Interestingly, the isotopic change recorded in our data coincides with a reverse fault identified recently by WA Department of Natural Resources (personal communication, Andrew Sandowski, 2020). Thus, it may be possible that this fault marks an offset of hydrogeologic units and serves as either a barrier to flow or a conduit for surface water to the shallow aquifer downgradient.

Further south in the Kittitas Valley transect, we can infer from the isotope values near mile 11 of the transect that the shallow aquifer influenced by irrigation water is between 30 ft and 130 ft below the surface. At mile-13 two wells indicate that the shallow aquifer is at least 137 ft deep. The static water level recorded in the logs for these well (appendix C, D, and E) are 45 ft and 20 ft below land surface. The 45 ft water level was recorded in April while the 20-ft below was recorded in August. This could represent a seasonal fluctuation in water level that represents a significant influx of irrigation water. Alternatively, these different static water levels represent heterogeneities in confining layers that create a locally perched aquifer. Nevertheless, the southern part of this Kittitas Valley transect is the best suited location for a SAR system due to the depth of its surficial aquifers, its sufficiently deep vadose zone, and its close proximity to the Yakima River main stem (which is the ideal end point for the recharged water).

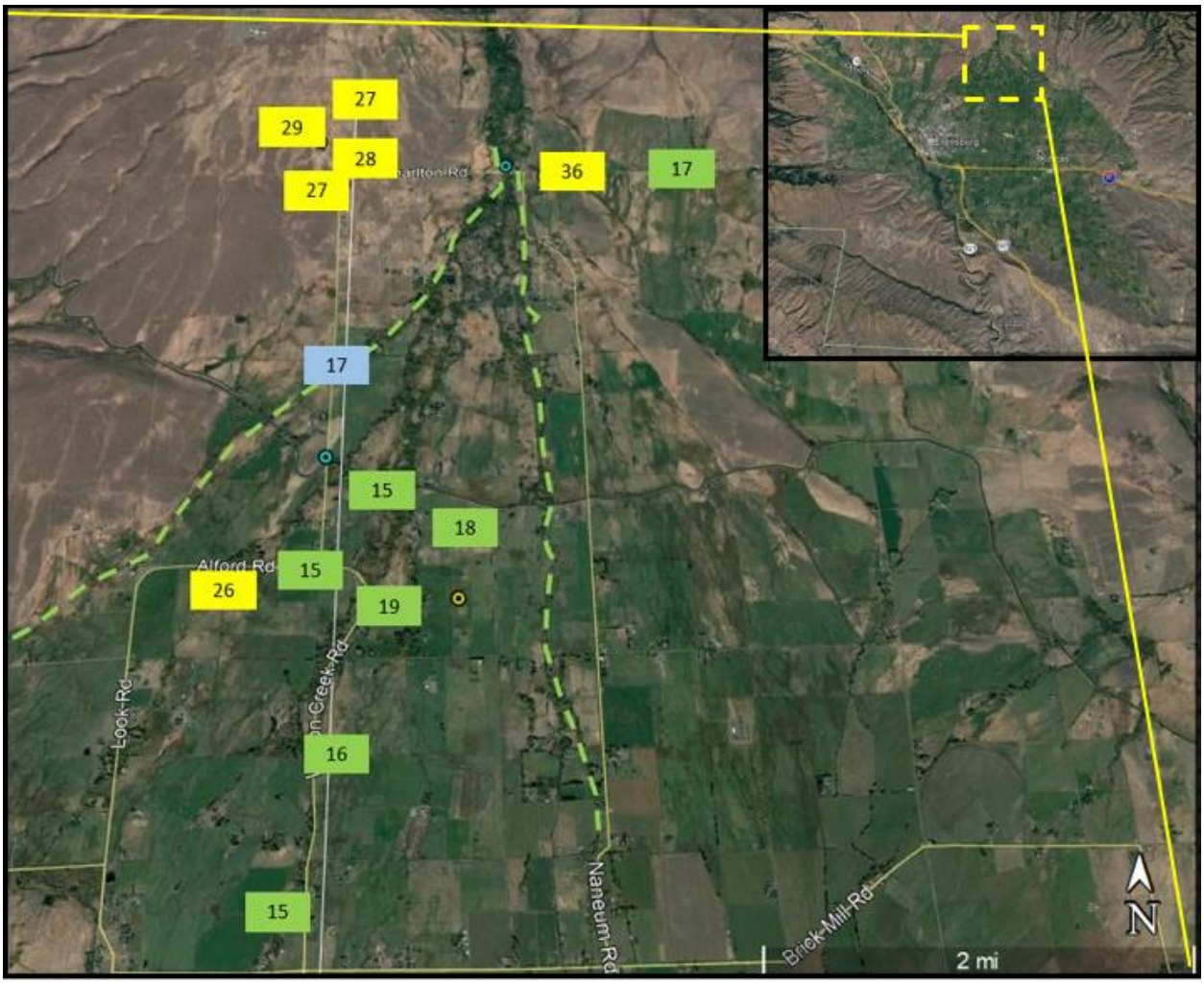

Figure 25. A satellite image showing Na^+ percentages from wells in the northern most section of the Kittitas Valley cross section. The Na^+ values are colorcoded (green < 20 %, yellow >20 %). The dotted green lines represent the Naneum Creek floodplain.The blue box represents Naneum Creek's Na^+ %.

Kittitas Valley Major Ion Data

Major ion data samples from Kittitas Valley and Badger Pocket were plotted on a Piper diagram (Figure 26). We looked to find relationships between major ion geochemistry and many other factors (e.g., depth, isotopic composition, location and geologic unit) and were unable to find any consistent relationship. These three surface water samples collected from Taneum Creek, Manastash Creek and the Yakima River at Thorp were outliers without any measurable Mg. We are unsure why these samples have such low Mg but each sample had less than 10% of a charge

balance error indicating that these samples were measured correctly. Also one sample (well Bar90) has a high relative abundance of Na^+ Although similar Na^+ concentrations are seen in groundwater throughout the valley (wells Trl32, Trl30, Or51, and Bor) they also have higher concentrations of Mg^{2+}, and Ca^{2+} placing them in the neutral zone in the cation triangle. In the anion triangle wells Mor and Boh501 are significantly less dominated by bicarbonate and carbonate. Well Mor has one of the lowest concentrations of bicarbonate recorded in Badger Pocket (187 mg/L) while Boh501 has the highest major ion concentrations recorded in all of Kittitas Valley.

This Piper diagram has similar clusters in both the cation and anion triangles when compared to the groundwater geochemistry data of Taylor and Gazis (2014), also from Kittitas Valley. The anion chemistry is dominated by bicarbonate and carbonate while the major cation cluster falls within the ranges of Mg = 40-60% Ca = 40-60% and Na+K = 15-30%. The largest differences seen between the two major ion data sets are not in the clusters but in the outliers. Three main differences in major ion chemistries between the Taylor and Gazis (2014) data set and our own; 1) the absence of Mg in some surface waters in our data; and 2) Taylor and Gazis (2014) observed high Na values in groundwaters from basalt aquifers on the southwest side of the valley; 3) Taylor and Gazis (2014) groundwater data was not so tightly clustered near the carbonate corner of the anion triangle on the Piper diagram.

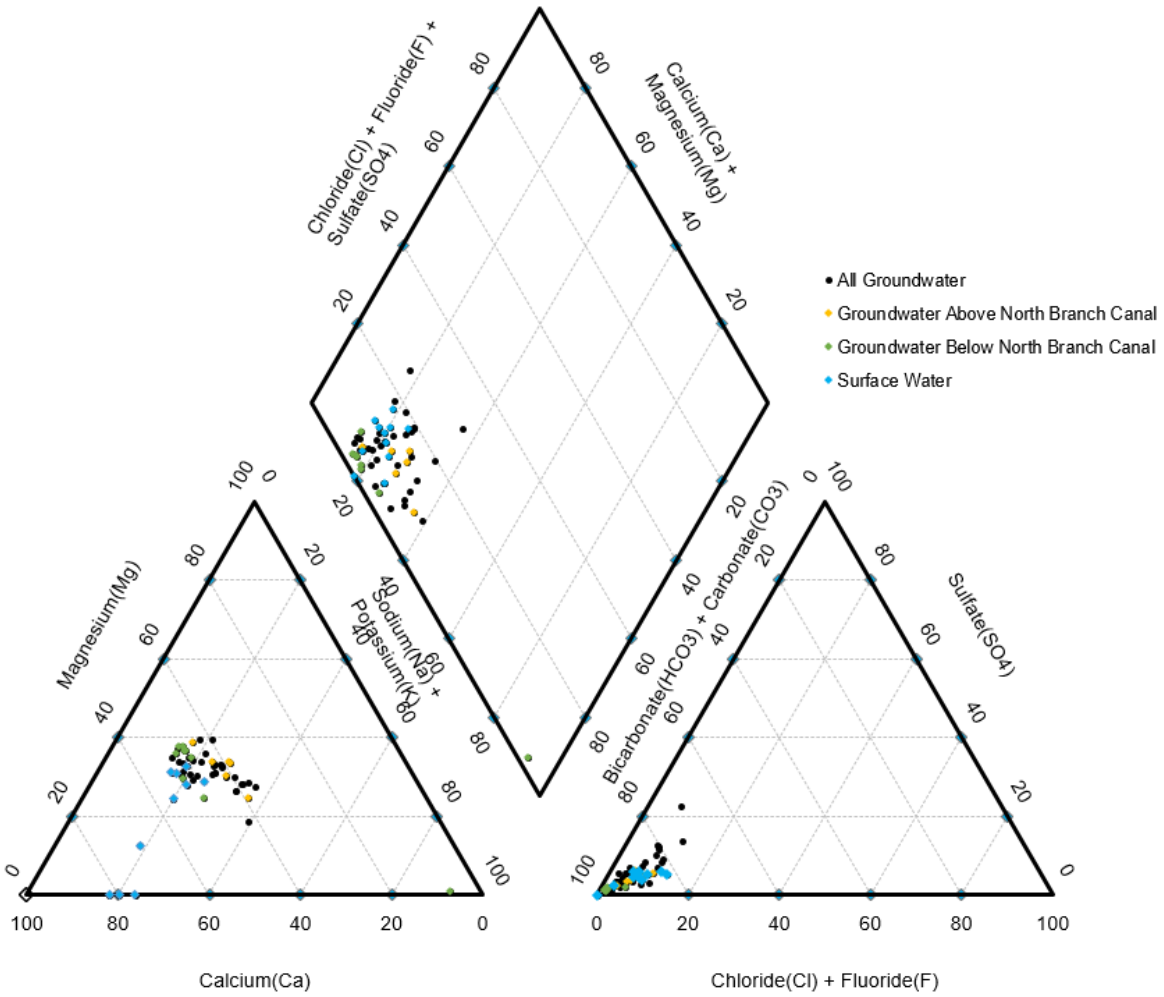

Figure 26. Piper diagram of samples taken in Kittitas Valley and Badger Pocket. Blue dots represent surface water while black dots represent groundwater.

Results Compared to Gibson and Campana (2018)

Gibson and Campana (2018) created and utilized a model to identify potential groundwater recharge locations in the Yakima Basin. In Kittitas Valley they identified five suitable locations for aquifer recharge (Figure 27). The first location Gibson and Campana (2018) identified is located in northern Kittitas Valley, between the Yakima River and the Kittitas Valley Anticline. One reason Gibson and Campana (2018) justified this location is because the water level is estimated to be 50 ft below the surface in the winter. However, we sampled a 37-ft well in this

region that is used for domestic purposes year round, implying that the water table must not drop below 37 ft. Therefore, the Gibson and Campana's (2018) estimated water table height of 50 ft may be an overestimate and should be examined more carefully if this region is to be explored for SAR. Locations 2 and 3 identified by Gibson and Campana (2018) are located near the intersection of Brickmill Rd and Wilson Creek Rd. We sampled a 170 ft deep well (AKW860) 0.25 mi NW of this intersection. The isotopic signature of groundwater from that well does not show any irrigation-water influence, indicating that it is not connected to the surficial aquifer. Although we believe that the surficial aquifer is above 170 ft depth, it is possible that the surficial aquifer at this location extends to a depth that is sufficient for shallow aquifer recharge. Sites 4 and 5 are near (~0.5 mi) Manastash Creek and are deemed suitable by Gibson and Campana because the depth to static water level is ~100 ft. However, USGS water level measurements of 13 wells in the area (Figure 28) show that the average depth to the water table is 47.5 ft and the max depth measured is 82.4 ft (Table 13). Thus, sites 4 and 5 are still a viable option for SAR but the water level estimates from Gibson and Campana (2018) are not supported by the areas recorded water level measurements. In addition, we did not collect and geochemical data from this area so we are unsure of the true depth of the surficial aquifer.

Figure 27. Suitable locations for groundwater storage in Kittitas Valley identified by Gibson and Campana (2018). The yellow star represents a SAR location identified in this study. Figure modified from Gibson and Campana (2018).

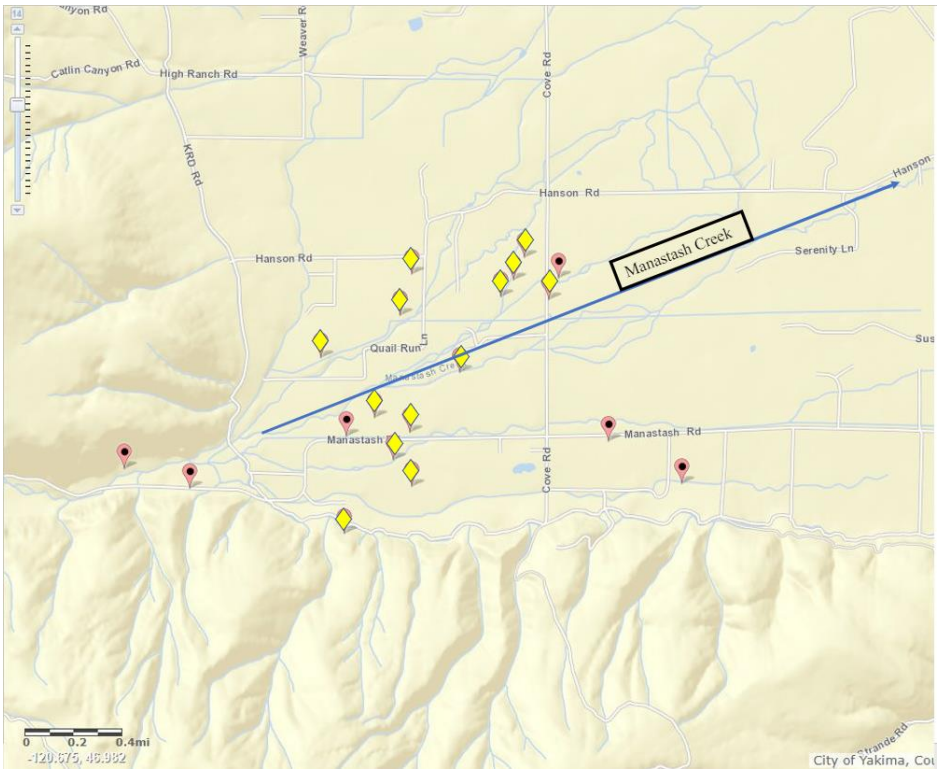

Figure 28. A map showing USGS wells in the same area as Gibson and Campana's sites 4 and 5. The yellow diamonds represent wells with recorded water level measurements, which are presented below in Table 13.

Table 13. USGS water level measurements near Gibson and Campana's (2018) sites 4 and 5. Data from United States, Geological Survey NWIS (2020).

Well #	USGS Site Number	Date measured	Depth to water table (feet) (USGS)
1	475835120395001	1997-07-14	21
2	465844120392501	1975-04-25	60
3	465831120390601	1987-08-03	73
3	465831120390601	2000-03-09	82.42
3	465831120390601	2001-03-09	78.20
3	465831120390601	2001-08-21	81.35
4	465822120393301	1979-03-07	15
4	465822120393301	1979-03-07	25
5	465847120383801	1991-10-18	54
5	465847120383801	2000-08-30	49.45
6	465813120392901	1973-12-09	12
7	465819120392201	1976-01-23	10
8	465848120385301	1992-11-10	65
8	465848120385301	2000-09-14	57.62
9	465852120392101	1991-05-20	19
9	465852120392101	2000-08-30	56.90
10	465852120384901	1990-07-24	70
10	465852120384901	2000-09-14	52.38
10	465852120384901	2001-03-28	46.48
10	465852120384901	2001-08-21	55.87
10	465852120384901	2002-03-27	47.94
11	465856120384601	2000-09-14	35.98
12	465813120392701	1973-12-12	30
13	465757120394201	1994-12-02	29
13	465757120394201	2000-08-31	60.60

Badger Pocket

Badger Pocket, an elevated region on the southeast side of the Kittitas Valley, is primarily used for agriculture (Figure 24). It is considered a pocket due to the basalt hills that surround it on three sides with only one main road connecting it to the rest of Kittitas Valley. The loess deposits that have accumulated in Badger Pocket are intensively farmed, particularly for hay. Ten groundwater samples were collected from Badger Pocket but only five of those samples had known depths. Badger Pocket has a wide range of isotopic values (–91‰ < –128‰ for δD) that may be due in part to the fact that Badger Pocket is the eastern most location sampled in Kittitas Valley; precipitation becomes isotopically lighter the further east you are from the Cascade crest. Thus,

the isotopic difference between natural recharge and irrigation recharge is even more distinct within Badger Pocket. Alternatively, this range of isotopic values could indicate a wide range in well depth and thus a combination of Yakima-River influenced water and older groundwaters that likely reside in basalt aquifers.

While sampling in Badger Pocket the owner of well UpB17 mentioned he had two wells, one well drilled to 83 ft and the other to 182 ft. The 182 ft well on this property was isotopically the same as irrigation water while his shallower well was dry. This suggests that there is a >80 ft deep unsaturated zone overlying a >182 ft deep surficial aquifer. This single set of observations suggests a location that is ideal for SAR, a notably deep vadose zone with an even deeper surficial aquifer beneath it. Considering that this farm encompasses 58 acres, has an 80 ft deep vadose zone and a porosity of 23.6 to 46.6 (estimated in Manger, 1963) the storage potential of this single farm is between ~1135 acre-ft and ~2242 acre-ft.

Further NW in Badger Pocket (WPA and Bor), two wells are located at the same elevation, approximately 0.6 mi apart. The WPA well is 290 ft deep while the Bor well is 163 ft deep. Groundwater from the shallower well is isotopically identical to irrigation water and has higher nitrogen concentrations than the deep well. The deep well (WPA) had one of the lightest isotopic values collected in Kittitas Valley which may be representative of resident groundwater in Badger Pocket. In addition, the reported water level for the well (Bor) is 104 ft below surface which indicates a 163 ft deep shallow aquifer with a 104 ft deep unsaturated zone. Thus, this area may also be suitable for managed groundwater recharge.

Moxee Valley

Similar to Kittitas Valley, Moxee Valley is located in the rain shadow of the Cascade Mountains causing a large isotopic difference between natural recharge from local precipitation

and artificial recharge from Yakima River irrigation water. In contrast to Kittitas Valley, it does not have as many moderate-sized tributaries bringing water from the local highlands into the valley. Isotope values for Moxee samples are shown in map view in Figure 29. As in previous figures, isotope signatures are color coded based on their δD values, Green = > –109‰ Yellow= –109‰ to –122‰ Red = < –122‰. The green category is representative of irrigation water while the red is representative of groundwater that shows no signs of influence from irrigation water and is likely deeper and older. All deuterium values that are < –122‰ have below average nitrogen concentrations which indicates that these waters do not have significant irrigation water inputs (Figure 19). The yellow category may be either be a separate, intermediate natural groundwater or a mix between the two end members (irrigation and deeper, isotopically lighter water). Yellow groundwaters that have nitrogen concentrations above the shallow aquifer threshold determined previously (2 ppm) are likely the latter.

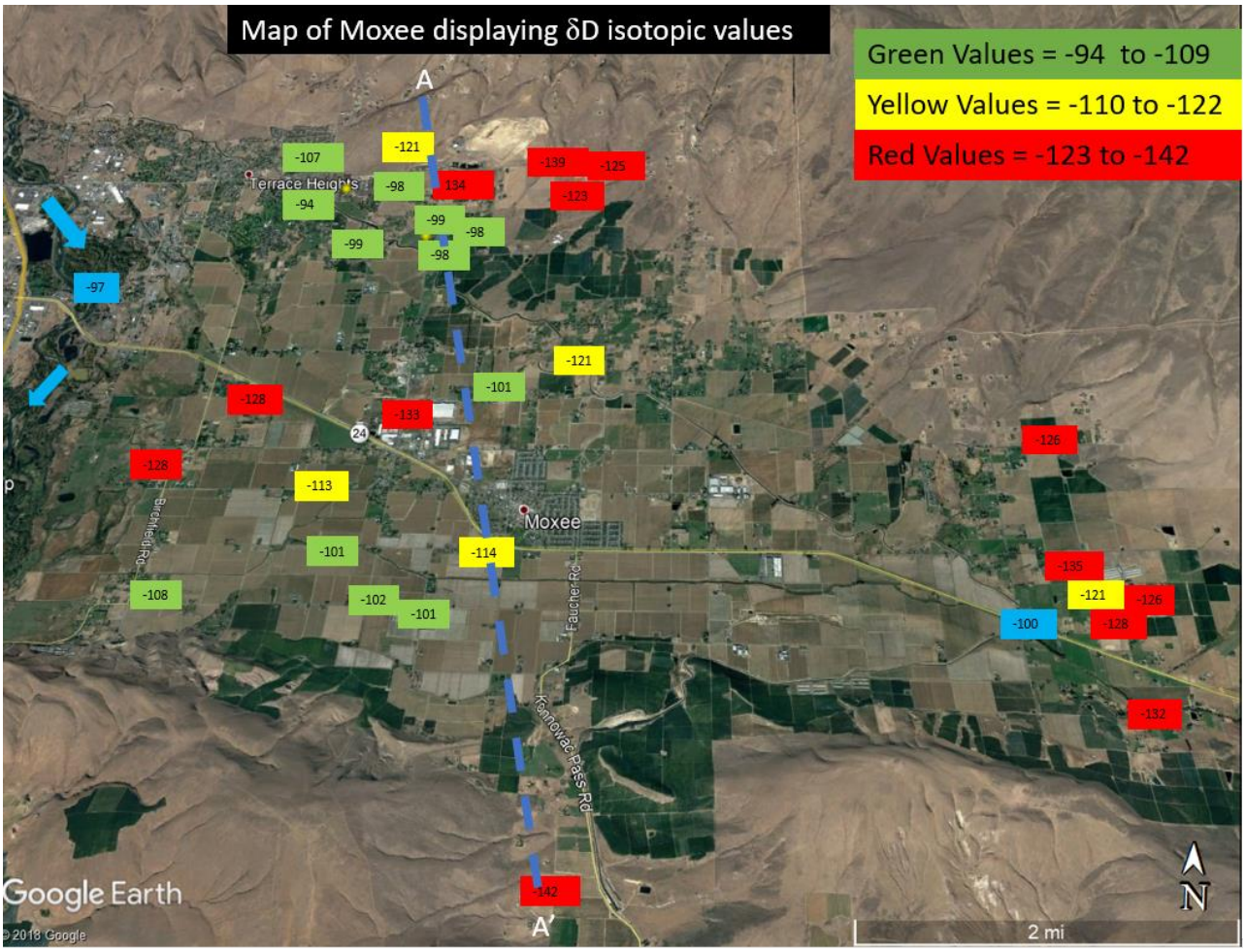

Figure 29. Map of Moxee Valley displaying δD values. Values are color coded based off their δD values (‰).

In the north-south cross-section (Figure 30), the northern third of the transect has irrigation water signatures in three wells reaching depths of 180 and 245 ft below ground surface. Irrigation water found at such depths is a promising sign for potential SAR because it means that the surficial aquifer may be as deep as 245 ft. Furthermore, the static water levels recorded in the three wells were all deeper than 100 ft. Hence, this location may be well suited for SAR because it is close to a canal, is connected to the surficial aquifer, and has a large vadose zone.

In the south central part of the Moxee Valley, four wells (Gam02, Gam76, Gam5 and Bea68) are isotopically similar to irrigation water (Figure 30). The depth to water reported in logs for three of those wells, which were drilled at different times, are 40 ft in January (ACL563) and 11 ft (130920) and 25 ft (APT908) in May. These higher water levels during irrigation season are consistent with the isotopic evidence that the wells are recharged by irrigation water. Therefore, it is possible that this portion of Moxee Valley may also be suitable for SAR if recharged during the winter months.

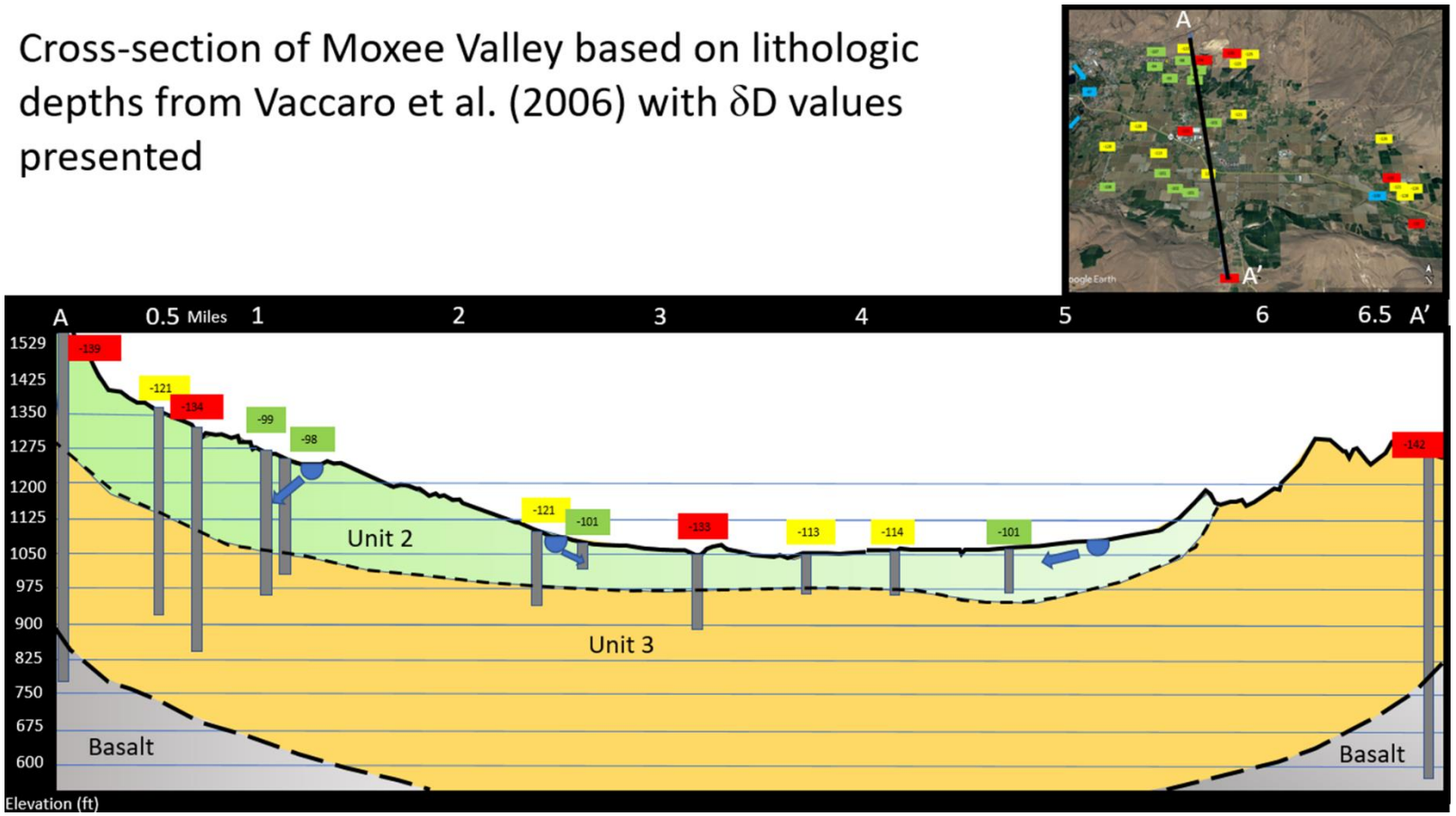

Figure 30. A N-S cross-section of Moxee Valley showing δD values of water samples. Blue boxes represent surface water, green boxes are groundwater with significant irrigation-water influence, yellow boxes are groundwaters with little surface-water influence. Descriptions of lithologic units 2 and 3 are covered in Table 1.

Comparing Data to 2007 DOE Report

Out of the 31 groundwater samples collected in Moxee Valley two wells (AHT021 and AHT031) were also part of a 2007 DOE study, in which they measured water levels in June and January as well as temperature, pH, conductivity, DO, fecal coliform, total N, total P, organic carbon and other water chemical parameters. Table 14 shows combined data from both studies. The depth to groundwater for both wells are <15ft yet their isotopic values indicate that they are not dominated by irrigation water. Well AHT021 has light isotopic values ($\delta D = -132$) suggesting that it taps a confined aquifer and the water level measurement in the DOE report represents its potentiometric surface. This idea is supported by the low nitrogen concentrations recorded in the water sampled in both studies. Well AHT031 is located in the center of Moxee Valley and has a depth to groundwater of 14ft. This well has an intermediate isotopic value ($\delta D = -113$). because of the relatively high nitrogen concentrations recorded in both studies (Table 14), this water appears to be a mixture of irrigation and natural groundwater. Thus, the surficial aquifer and deep aquifer waters are mixing either in the well or in the subsurface. The well log for this well indicates a 20 ft seal at the top. Thus, if the water is indeed mixing in the well then the shallow aquifer must be deeper than 20ft.

Table 14. Comparison between this study and 2007 DOE study for wells AHT021 and AHT031.

Well ID	Date Sampled	Study	Well Depth (ft)	Depth to Groundwater (ft)	TotalN (mg/L)	Chloride (mg/L)	δD
AHT021	01/10/2006	DOE	150	12.5	0.01	7.29	
Desmarias	06/14/2006	DOE		14.5	0.01	9.43	
	08/29/2019	CWU			0.09	9.34	–132
AHT031	06/15/2006	DOE	60	14	4.27	28.5	
Bell	08/05/2019	CWU			4.44	35.6	–113

The 2007 DOE study also sampled a well (AHT025) that is immediately adjacent to a well that we sampled (Well report ID 952392). Table 15 shows the comparisons between these two wells. The most significant differences between the two wells are the well depths (37ft and 140ft) and nitrogen content. Therefore, it is likely that the 37ft well is drawing water from the shallow aquifer while the 140ft well is drawing water from a deeper aquifer that is disconnected from irrigation water. This inference is supported by the isotopic composition of water from the deeper well. In addition, the depth to groundwater reported by the driller and the DOE ranged from 3.5 to 5.1ft, indicating that the water table is very close to the surface at this location. Moreover, the shallow well terminates at 37.5 ft and the deep well log reports that a "cemented gravel layer" is present from 39-58 ft which may be the confining layer beneath the surficial aquifer. This information provides us with constraints on the both the shallow aquifer and deep aquifer at this exact location (Figure 31).

Table 15. Comparing neighboring wells from this study and the 2007 DOE study

Address	Unique Well ID/ Report ID	Date Sampled	Study	Well Depth	Depth to Groundwater (ft)	Nitrite + Nitrate as N (mg/L)	Chloride (mg/L)	δD
Beaudry Rd 2326	AHT025	01/12/2006	DOE	37.5	4.4	6.32	11.7	
		06/15/2006	DOE		5.1	10.9	20.1	
		02/05/1975	Well Log		3.5			
Beaudry Rd 2327	952392	08/29/2019	CWU	140		2.1	19	-133
		12/17/1990	Well Log		16			

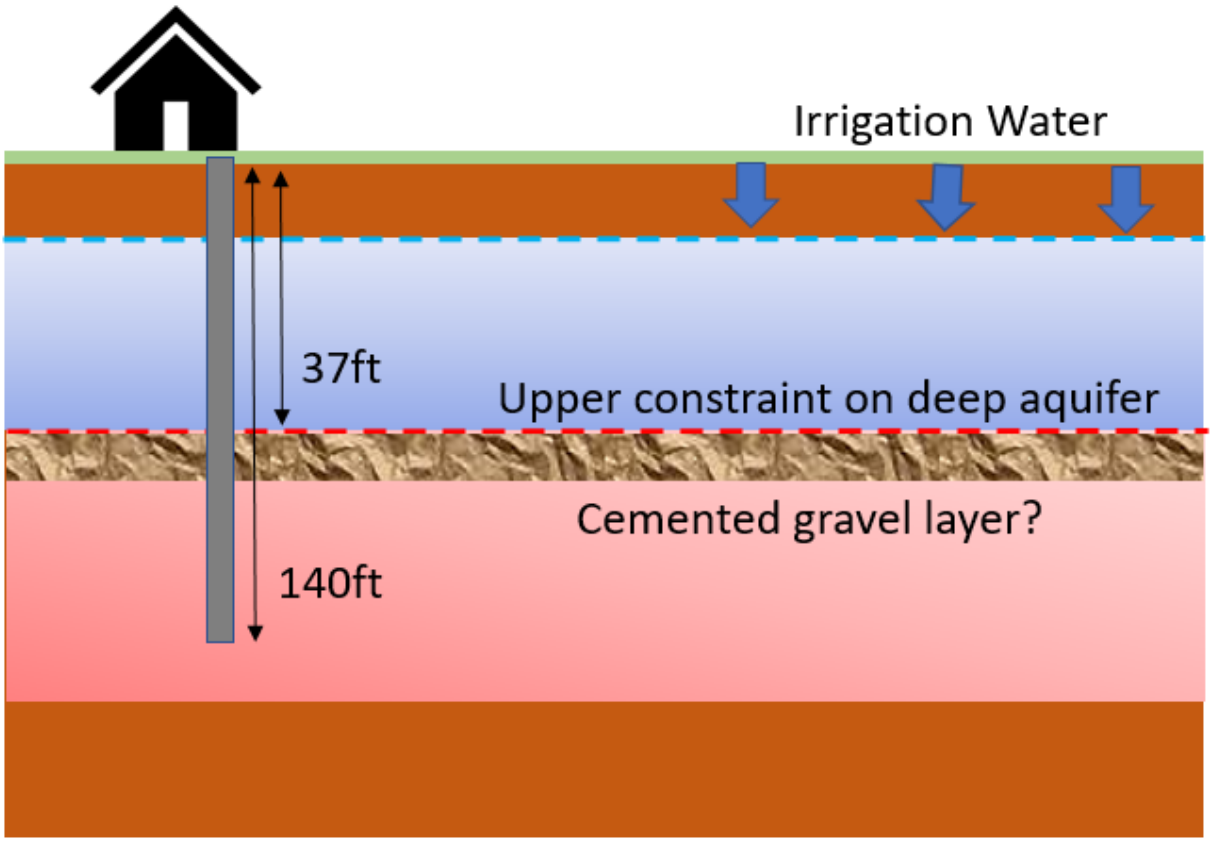

Figure 31. Constraints on the deep aquifer at location Beaudry Rd 2327 and Beaudry Rd 2326 Moxee, WA

The major ion data from the Moxee Valley samples are plotted on a Piper diagram in Figure 32. Major ion geochemical signatures do not appear to be correlated with depth, location, or stable isotope ratio. However, the two water samples with elevated Na^+ concentrations were similar are both deep (840 and 685ft), penetrate into the basalt, have very light isotopic values (–140 and –143 for δD), and are located up gradient of agriculture. This unique geochemical signature is similar to basalt waters from the southwest side of Kittitas Valley analyzed in Taylor and Gazis (2014) and elsewhere in the Columbia Basin (Holt, 2012). The higher Na and low δD are characteristic of older, more evolved groundwaters. The surface water with high Na on the Piper plot is from Moxee Creek, which serves as a drainage system for agriculture east of the Roza Canal

system. Thus, the agricultural water that drains into Moxee Creek comes from the ground. Thus, the high Na^+ recorded may be due to the difference in water source, land use or water quantity when compared to the other surface water samples.

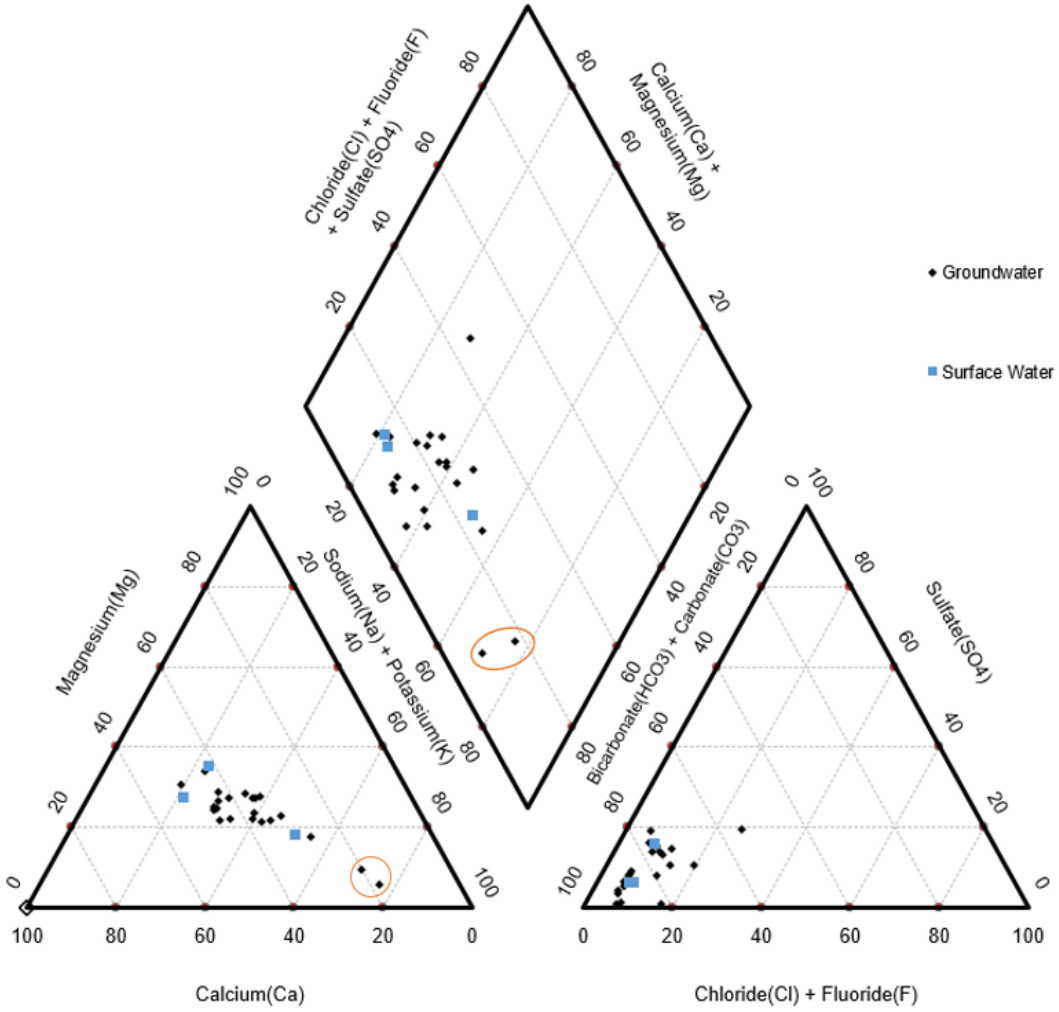

Figure 32. Piper diagram for Moxee Valley. Black dots represent groundwater while blue dots represent surface water. The orange circle encompasses two wells that are believed to be withdrawing very deep and old groundwater from the basalts.

Storage Estimates

With our data we constrained the shallow aquifer depths in both Kittitas and Moxee Valley which allow us to make very general estimates of the irrigation water currently stored in each region. By multiplying our shallow aquifer thresholds, estimated porosity and recorded water depths we are able to estimate the total amount of stored irrigation water (Table 16). The thickness used in these estimates are based on the shallow aquifer thresholds and the water levels reported by the DOE, USGS or in the well logs. Porosity values are estimated in Manger (1963). Google Earth is used to determine the surface area of each study region (Figure 33 and Figure 34). The high area estimate encompasses the entire valley that is within the canal borders while the low area estimate generally encompasses the regions where irrigation water is found within wells.

Table 16. A table presenting the high and low estimates of currently stored irrigation water in Kittitas and Moxee Valley.

Study Region	Area (acres)	Porosity	Saturated Thickness (ft)	Estimate of Stored Water (acre-ft)
Kittitas Valley				
High Estimate	155,000	46.6	50	3,610,000
Low Estimate	54,000	23.6	20	254,000
Moxee Valley				
High Estimate	25,000	46.6	90	1,050,000
Low Estimate	14,000	23.6	30	99,100

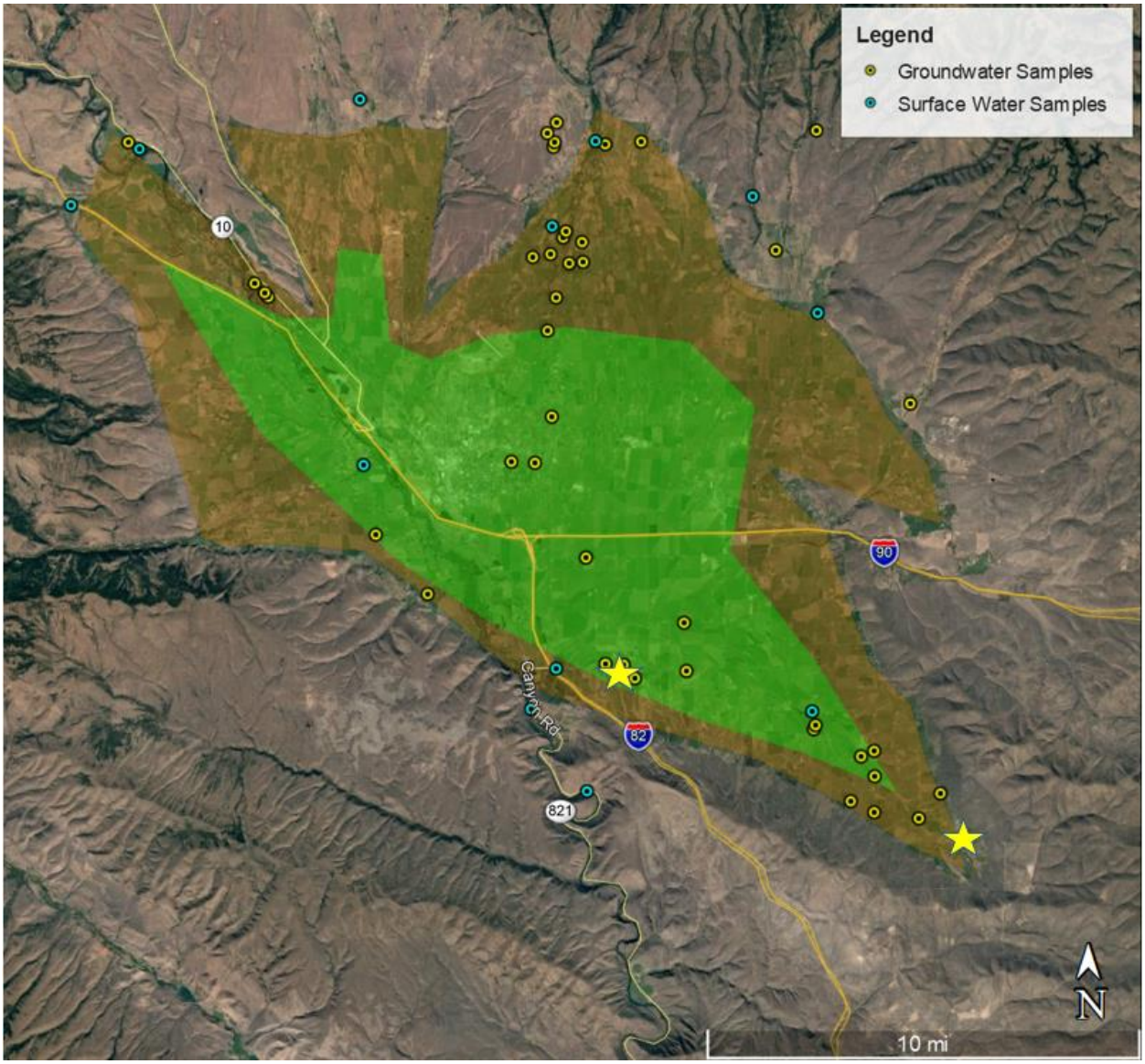

Figure 33. A Map of Kittitas Valley showing the high and low area's used for the storage estimates. Area estimates used in Table 15 are colored in green (low) and brown (high). Yellow stars represent our identified SAR location.

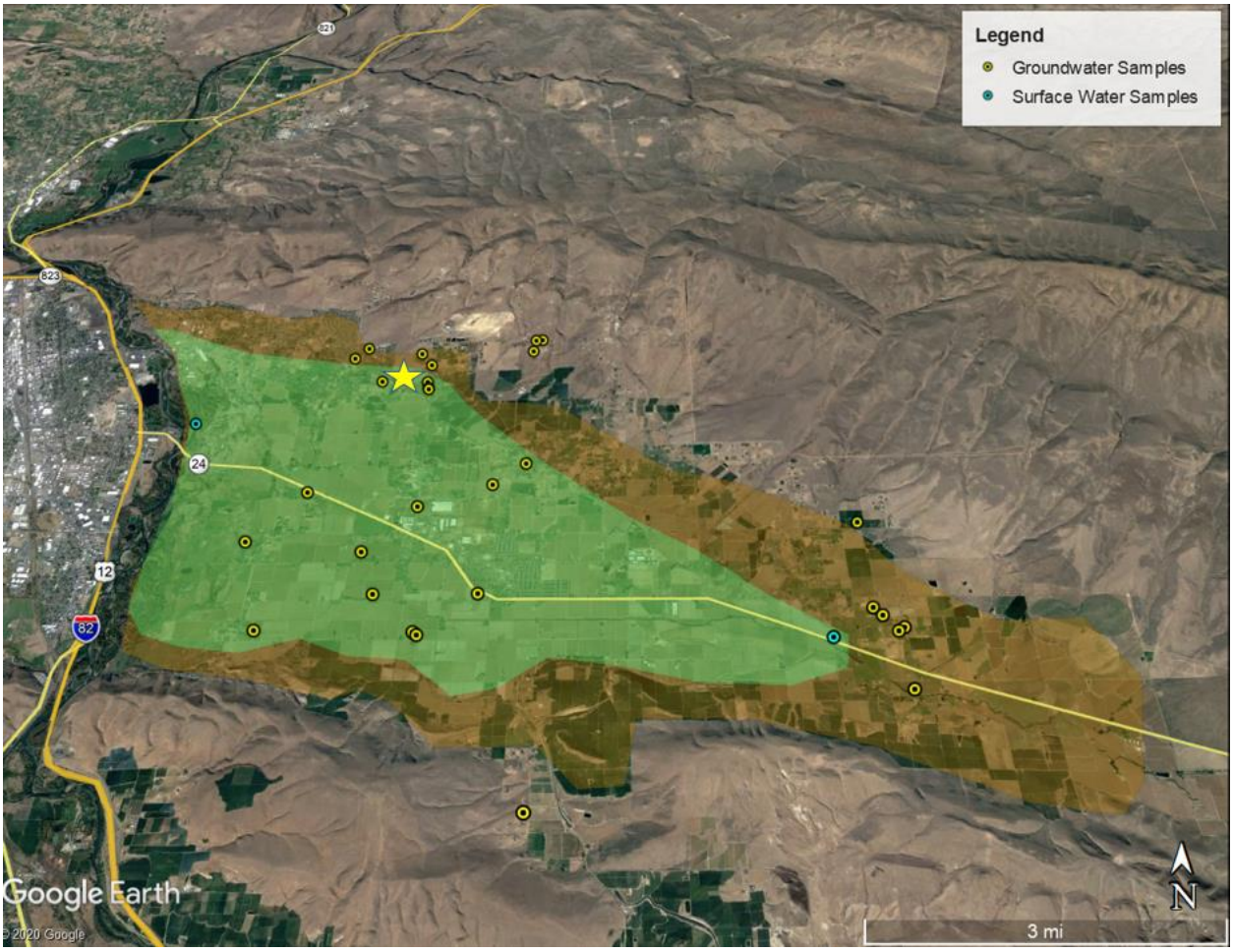

Figure 34. A Map of Moxee Valley showing the high and low area's used for the storage estimates. Area estimates used in Table 15 are colored in green (low) and brown (high). Yellow stars represent our identified SAR location.

In addition to estimating the amount of irrigation water currently stored within Kittitas and Moxee Valley, by multiplying the area, porosity and depth of the unsaturated zone we can also estimate the amount of storage space for our identified SAR sites (Table 17). Area estimates are based off of the distribution of irrigation influenced wells, shown in Figures 35, 36 and 37, range from 1,200 to 88,000 acre-ft. To put these storage values in context, the Cle Elum Reservoir has a storage capacity of ~437,000 acre-ft (United States, Bureau of Reclamation, 2020).

Table 17. A table presenting the high and low storage space estimates at identified SAR locations.

SAR Location	Area (acres)	Porosity (%)	Unsaturated Thickness (ft)	Estimate of Stored Water (acre-ft)
Kittitas Valley				
High Estimate	680	46.6	45	14,000
Low Estimate	260	23.6	20	1,200
Badger Pocket				
High Estimate	2,100	46.6	90	88,000
Low Estimate	1,100	23.6	50	13,000
Moxee Valley				
High Estimate	450	46.6	120	25,000
Low Estimate	195	23.6	80	3,700

Figure 35. A Map of our first identified SAR site in Kittitas Valley. Boxes next to the wells show the δD value over the well depth. Area estimates used in Table 16 are colored in green (low) and brown (high).

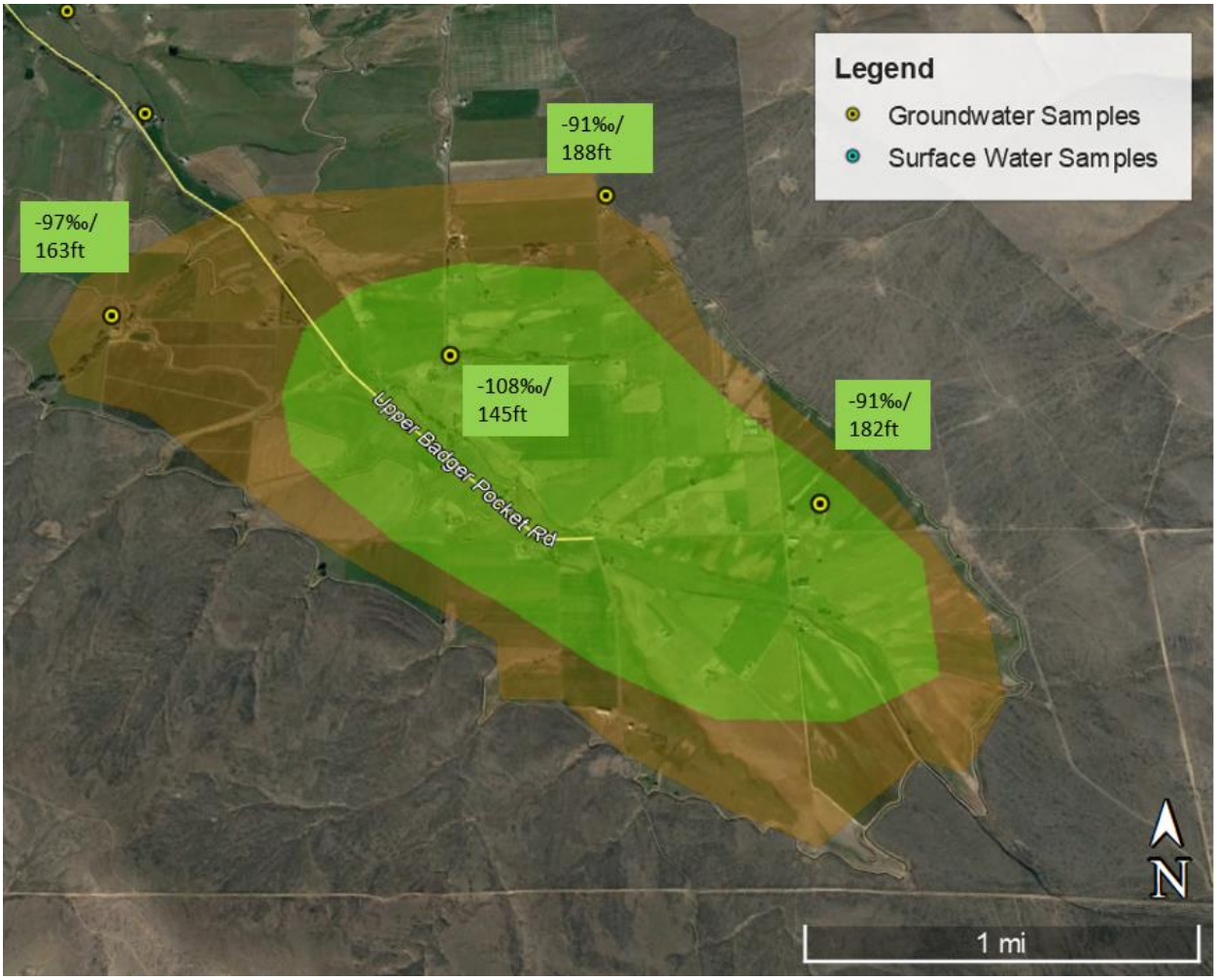

Figure 36. A Map of our second identified SAR site in Badger Pocket. Boxes next to the wells show the δD value over the well depth. Area estimates used in Table 16 are colored in green (low) and brown (high).

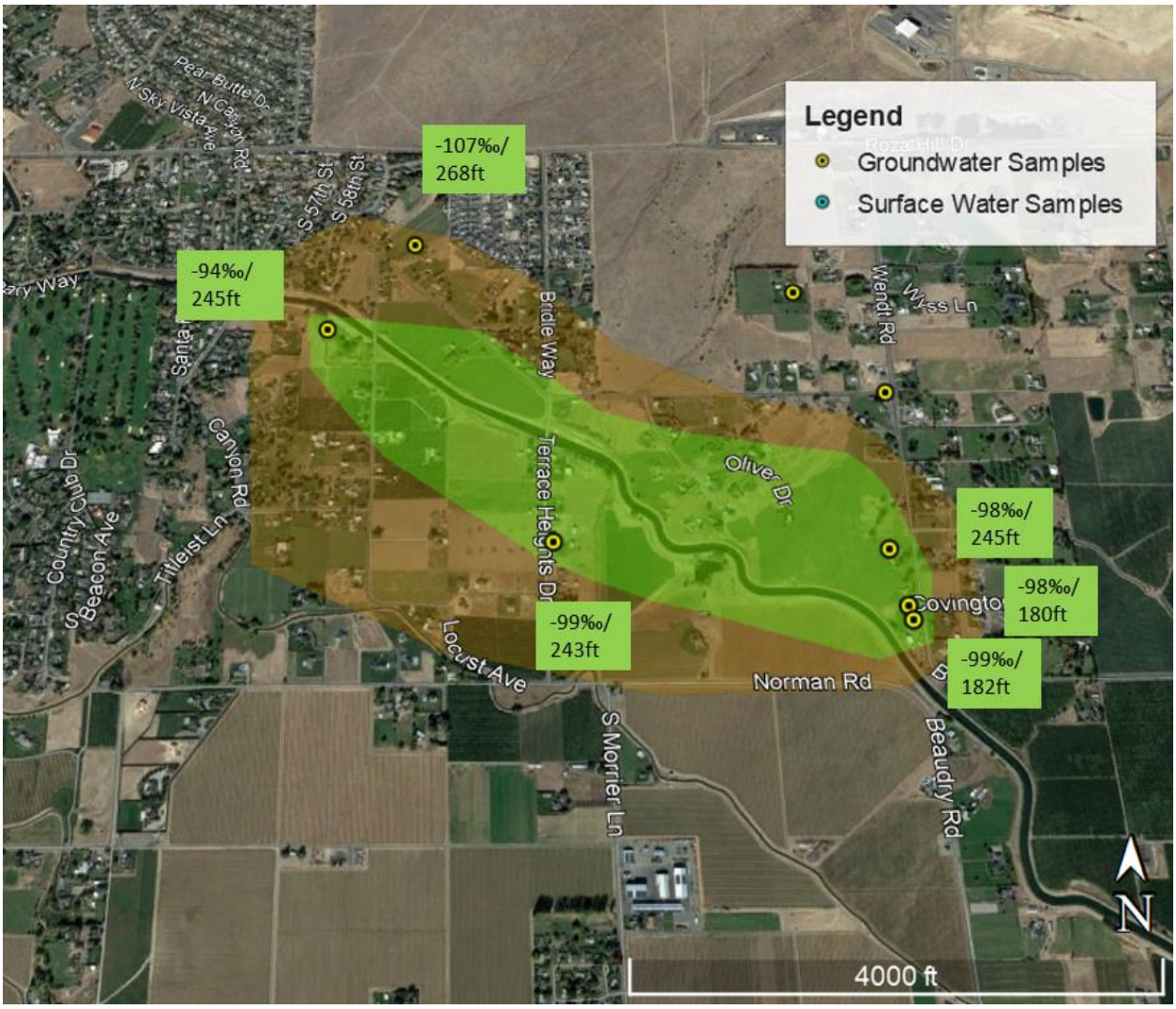

Figure 37. A Map of our third identified SAR site in Moxee Valley. Boxes next to the wells show the δD value over the well depth. Area estimates used in Table 16 are colored in green (low) and brown (high).

Roslyn Study Area

The Roslyn study area differs from the other two because at this location our primary objective is to assess the quality of the water that interacts with the Roslyn Mines whereas the other two study locations (Kittitas and Moxee Valley) our research focuses more on groundwater movement and recharge regimes.

In order to sample water from the Roslyn Mines we accessed a well-known mine overflow point commonly called "fanhouse". When the mines were operational, the fanhouse used overflowing water to turn a large fan which provided fresh air for the miners in the coal shafts. Although the fanhouse is no longer used mine water continues to seep out of the fanhouse which has created a swamp around the house (Figure 38). The fanhouse water is a good representation of the mine water because of the extended path the water must travel to reach the fan house (Figure 39).

Figure 38. A picture of the fanhouse. The fanhouse is a groundwater overflow point for the Roslyn Mines located on the Suncadia property directly east of the Cle Elum River.

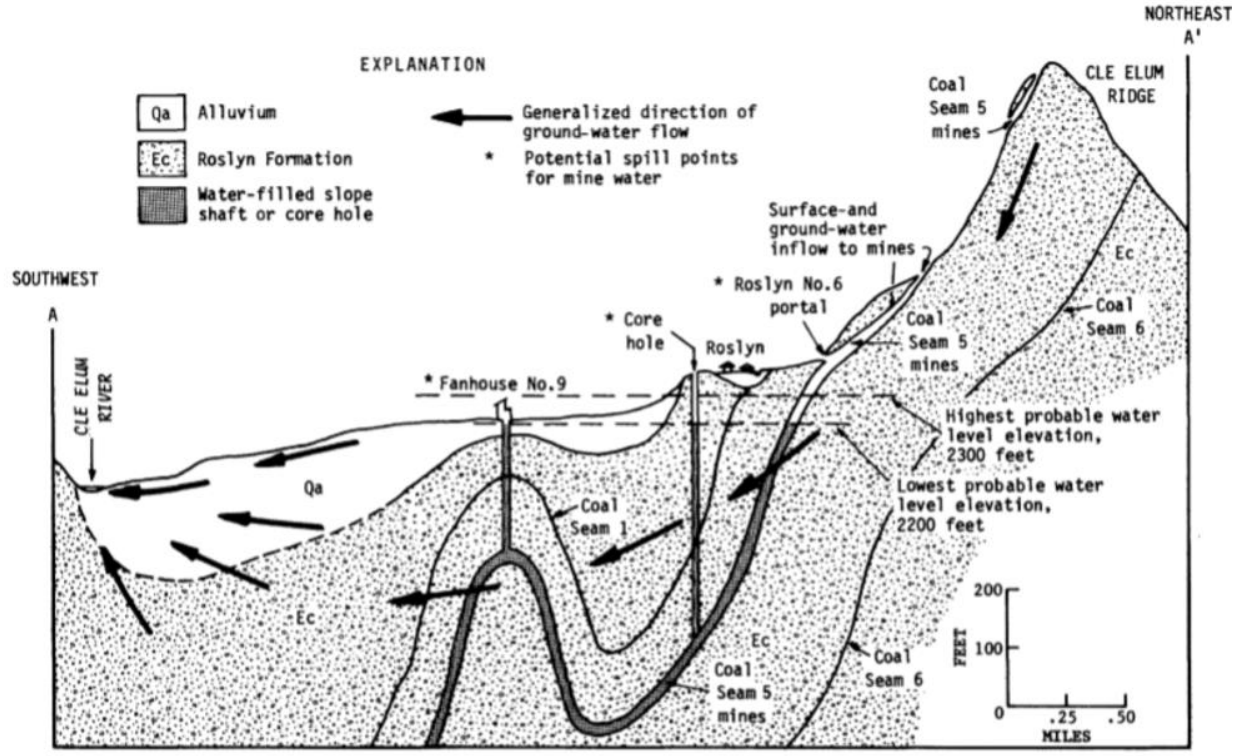

Figure 39. A cross section of the Roslyn Mine shafts. Note that the fanhouse is the "spill point" for the mine water. Figure from Packard (1981).

For the trace and major elements measured, every Roslyn groundwater sample was below the federal drinking water limit set by the EPA (Table 11). Although the mine overflow point (Figure 38 and 39) did have elevated values of aluminum and iron, (which are common elements found in acid mine drainage) higher values of aluminum were found in upstream surface waters and higher concentrations of iron were found in two residential wells. Furthermore, the dissolution of heavy metals can only occur at low pH values and every pH value recorded in this study area was >6.8 (Table 2). In addition, the bicarbonate values recorded in and around the mines indicate that the groundwater has a sufficient capability to neutralize acid. Therefore, based on the chemistry, it is not likely that the flooded Roslyn mines will turn acidic or form acid mine drainage (Singer and Stumm 1970, Förstner and Prosi 1979).

When compared to the region's groundwater, surface water had relatively high values of aluminum and nickel. Out of these surface water samples the sample with the highest aluminum, nickel concentrations were collected in a small tributary far above anthropogenic influence. Thus, these levels of Al and Ni are likely byproducts of natural weathering in this region. Though arsenic concentrations were well below the legal limit, the highest recorded samples were collected from three wells, two of which were located next to the Cle Elum River (Wood16, and Wood12) the other was located adjacent to Lake Cle Elum (Salmon). The same three wells had high concentrations in V and Cr relative to the rest of the sample pool.

The water in Lake Cle Elum (which lies up gradient from the mines) is isotopically indistinguishable from the water flowing out of the old mine shafts (Figure 40). Therefore, it is likely that either the reservoir is recharging the shallow aquifer which in turn recharges the mine shafts or that isotopically similar precipitation is recharging both the lake and the mines.

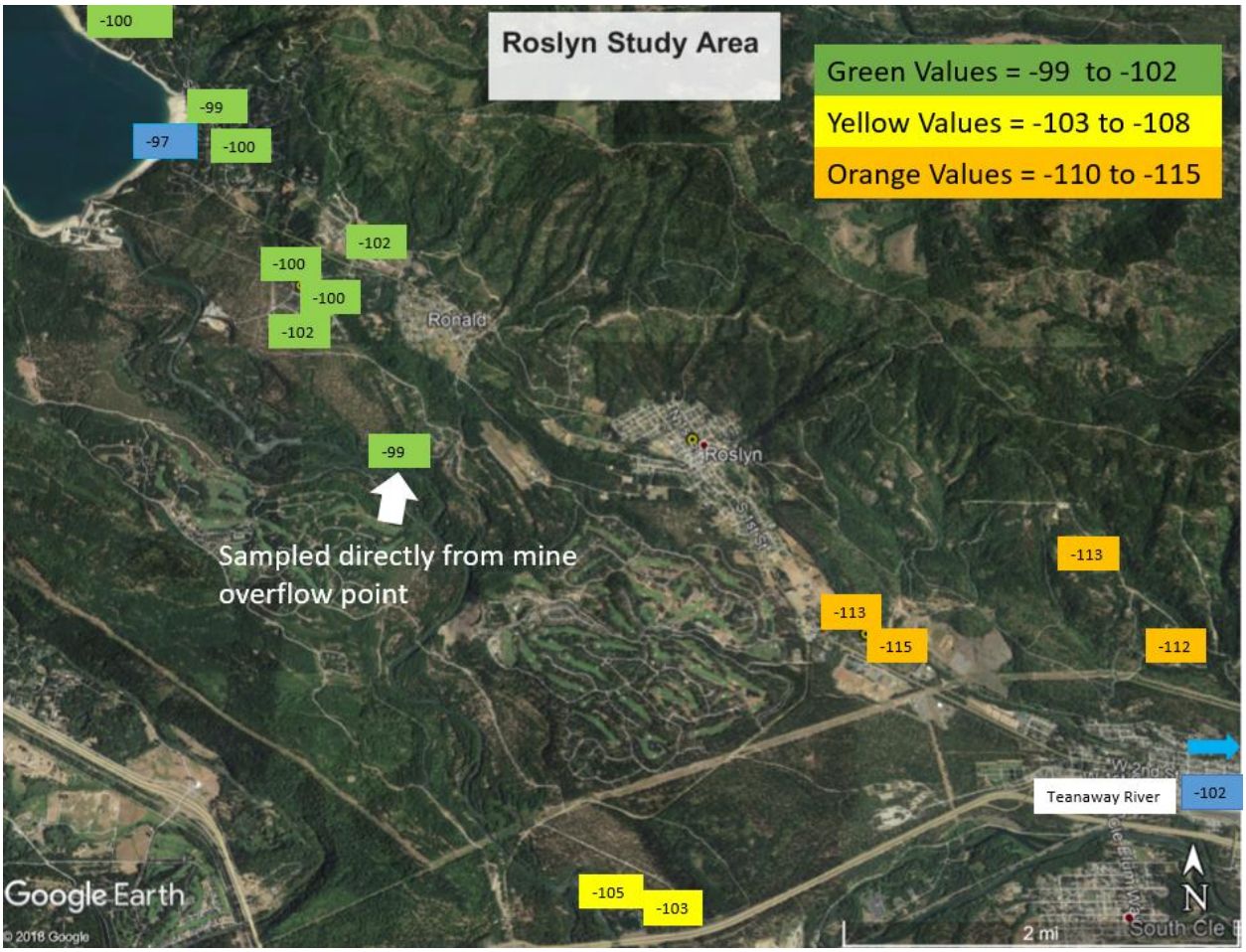

Figure 40. δD A Map of δD Isotopic Values Collected in the Roslyn Study Area. Blue boxes represent surface water. (note the color coding is different in this study area because of the isotopic difference in natural precipitation).

The Piper diagram for the Roslyn study area (Figure 41) shows a large variation in major cation chemistry within the water samples collected. Within the variations, three groupings, often referred to as hydrochemical facies, were identified. Facies P1 is outlined in blue and is classified based on its low proportions of sodium and potassium. Facies P1 includes all surface waters collected in this study region as well as wells that border the Lake Cle Elum reservoir (Guz60 and Guz30) and wells that border the Cle Elum River (Wood16 and Wood12). This indicates that surface water in this area can be characterized by low amounts of low sodium and potassium.

Facies P2 contains the sample taken directly from the mine's overflow shaft as well as one well adjacent to Lake Cle Elum, and two wells between Lake Cle Elum and the mine overflow point. These wells in turn are isotopically indistinguishable from the reservoir. These similarities in water chemistry suggest that these waters are all freely interacting and mixing and thus support the idea that the reservoir is recharging the shallowest aquifer which in turn is recharging the mine shafts. Facies P3 is categorized by its high concentrations of sodium and potassium which is thought to represent a more chemically evolved water (Holt, 2012). Furthermore, the wells that make up P3 are thought to be drawing water from the underlying Roslyn Formation while P1 is likely drawing less-evolved water from the overlying unconsolidated sediment. P2 is a mixture between the P1 and P3 based on the positions in the cation triangle. This mixture may be due to the fact that the extensive mine system is likely recharged with water from both the surficial aquifers and deep sedimentary aquifers in the region.

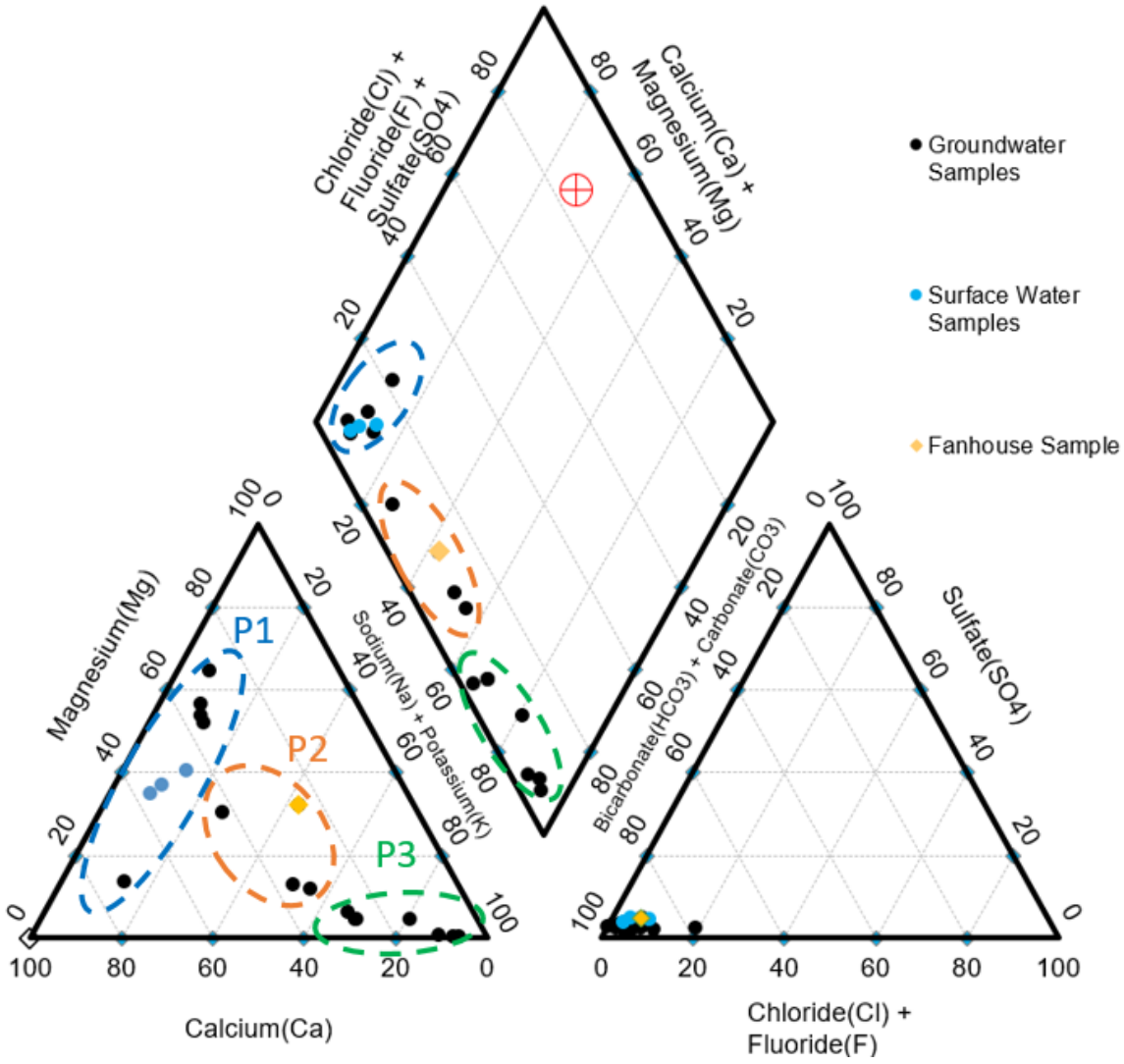

Figure 41. Piper diagram of Roslyn study region. The piper diagram shows 3 major geochemical facies (P1) Ca^{2+} type, (P2) Intermediate cation type, (P3) Na^{+}-K^{+} type.

CHAPTER V

CONCLUSION/SUMMARY

In this study, 99 groundwater samples and 17 surface water samples were collected from three study areas in the Yakima River Basin and analyzed for stable isotope ratios and major ion concentrations. In Moxee and Kittitas Valleys relationships between stable isotopes, well depths and nitrogen concentrations were used to identify aquifers that are dominantly recharged by irrigation water vs aquifers that are recharged naturally (i.e., snowmelt). Geochemical fingerprinting of irrigation water allowed us to determine the extent of the surficial aquifers in Kittitas and Moxee Valleys and estimate the amount of irrigation-derived water that is stored in these valleys through current and past farming practices. These estimates range from x to y, depending on the assumed area, porosity, and saturated thickness. This information about the extent of irrigation water and the surficial aquifer is useful for assessing suitability for shallow aquifer recharge (SAR) because a working SAR system must have a shallow aquifer that is deep enough to accommodate the recharged water. Furthermore, we were able to geochemically classify other water types as well which allowed us to locate leaky sections of canals. By combining our geochemical data with past literature we made conceptual models for Kittitas and Moxee Valleys that demonstrate groundwater relationships. These conceptual models delineate the different water types found in Kittitas and Moxee Valleys and can be used in the future to make water management decisions.

In our third study area (Roslyn), we focused our study on the groundwater quality of water in and around the old coal mines by including trace element concentrations to the geochemical data. Studies have assessed the storage capacity within the abandoned mine shafts to be ~20,000 acre-ft (Packard, 1981), but this is the first comprehensive geochemical study to

look at the groundwater quality in and around the mines. From the 15 groundwater samples collected in and around the mines we found no evidence for groundwater acidification or increased trace metal concentrations. This result is consistent with the low sulfur content (0.01%) of the coal in the Roslyn mines. Furthermore, groundwaters from domestic wells that penetrate into coal layers (according to the well logs) are geochemically similar to the water flowing out of the mines. Thus, people are already using the mine water as a drinking supply.

Possible Shallow Aquifer Recharge Sites in Kittitas Valley

In Kittitas Valley many of the samples collected were along a north-south transect of the valley; this transect was used to create a conceptual model demonstrating groundwater relationships (Figure 24). Our results suggest that the most suitable place for SAR along this transect is in the southern end near Thrall Rd. In this area (mile 14), three wells of depths of 125 to 138 ft were dominated by irrigation water indicating that the surficial aquifer consistently extends to depths greater than 125 ft. The logs for these three wells record depths to water of 45 ft (in April), 20 ft (in July), and 3 ft (in September). This seasonal variation supports the model of a shallow aquifer recharged by irrigation waters during the irrigation season, developing a recharge mound throughout the season. If the water table prior to irrigation is ~45 ft below the surface, this is a sufficient depth for SAR. In addition, this location is only ~2 mi from the Yakima River which is the targeted endpoint for the stored groundwater. By multiplying the porosity for unconsolidated materials by the area of the properties and by the unsaturated thickness this potential SAR location may be able to store between to ~1,200 to 13,000 acre-ft (Table 16).

Possible Shallow Aquifer Recharge Sites in Badger Pocket

Badger Pocket, an elevated region on the southeast side of the Kittitas Valley, is primarily used for agriculture. One farm within Badger Pocket has a dry well 80 ft deep and a 180 ft deep well whose water is significantly influenced by irrigation water. This information indicates that, at least locally, there is an 80 ft deep vadose zone and a surficial aquifer that extends to a depth of 180 ft or more. By multiplying the porosity for unconsolidated materials by the area of the properties and by the unsaturated thickness this potential SAR location may be able to store between to ~13,000 to 88,000 acre-ft (Table 16).

Possible Shallow Aquifer Recharge Sites in Moxee Valley

In Moxee Valley, there is a cluster of wells in the northern part of the transect that penetrate to between 180 and 245 ft and are all dominated by irrigation water (Figure 65). This well cluster is unique (Mile 1.2), because although they are isotopically similar to irrigation water, they have below-average nitrate concentrations. It appears that they are geochemically identical to canal water before it is applied to fields, indicating that this area is being recharged via leaks in the existing canal. This location is also suitable for SAR because irrigation water is found at great depths (180-245 ft) and all of the well logs report a static water level deeper than 100 ft. Therefore, the data suggests that there is a ~100 ft vadose zone above a surficial aquifer that extends down to 180-245 ft below the surface. By multiplying the porosity for unconsolidated materials by the area of the properties and by the unsaturated thickness this potential SAR location may be able to store between to 3,700 to 25,000 acre-ft (Table 16). Two other wells in this area extend to deeper depths (360 and 445 ft) and are isotopically representative of naturally recharged groundwater. Thus, there is a boundary between the two water types (irrigation water and natural water) at ~250-350 ft below the surface. Moving

forward, this information can be used to develop a plan of shallow aquifer storage in the area that may include reducing canal leakage and managed recharge.

Lessons Learned/ Future Recommendations

For future groundwater research in this region, stable isotope analysis, a relatively inexpensive technique that can be used to fingerprint different water types, has proven to be helpful when deciphering aquifer boundaries and recharge regimes. In the Yakima River basin, the Cascade rain shadow has created stable isotope variations that enhance our ability to delineate different water types. The relationship between stable isotopes and depth is particularly valuable in that it can constrain the depth to which groundwaters are influenced by irrigation recharge. Future researchers in Kittitas Valley should investigate groundwater flow across the "Craig's Hill" fault. In addition, eastern tributaries (Reecer Creek, Naneum Creek, Coleman Creek, and Caribou Creek) should be sampled in the winter and spring to determine if the isotope values match that of the nearby groundwater ($-121 < \delta D < -116‰$). This would partially test the hypothesis that the groundwater in the northern part of the valley is primarily recharged from the Naneum anticline. Age dating methods (^{3}H, ^{14}C, CFCs, and SF_6) applied to groundwaters with these intermediate isotopic compositions and the isotopically lightest ($\delta D < -128‰$) would further constrain the extent to which these intermediate values represent modern versus prehistoric recharge.

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Legend

Sampled Locations

- Groundwater
- Surface Water

Geologic Units 500K

Unconsolidated Sediments

- Qa, Quaternary alluvium
- Qls, Quaternary mass-wasting deposits
- Ql, Quaternary loess
- Qf, Pleistocene outburst-flood deposits
- Qad, Pleistocene alpine glacial drift

Sedimentary Rocks and Deposits

- QTc, Quaternary–Tertiary continental sedimentary rocks and deposits
- Tc, Tertiary continental sedimentary rocks

Volcanic Rocks and Deposits

- Qv, Quaternary volcanic rocks
- Tv(cr), Tertiary volcanic rocks, Columbia River Basalt Group
- Tv, Tertiary volcanic rocks
- Tvt, Tertiary fragmental volcanic rocks

Intrusive Rocks

- Ti, Tertiary intrusive rocks
- MZi, Mesozoic intrusive rocks

Metasedimentary and Metavolcanic Rocks

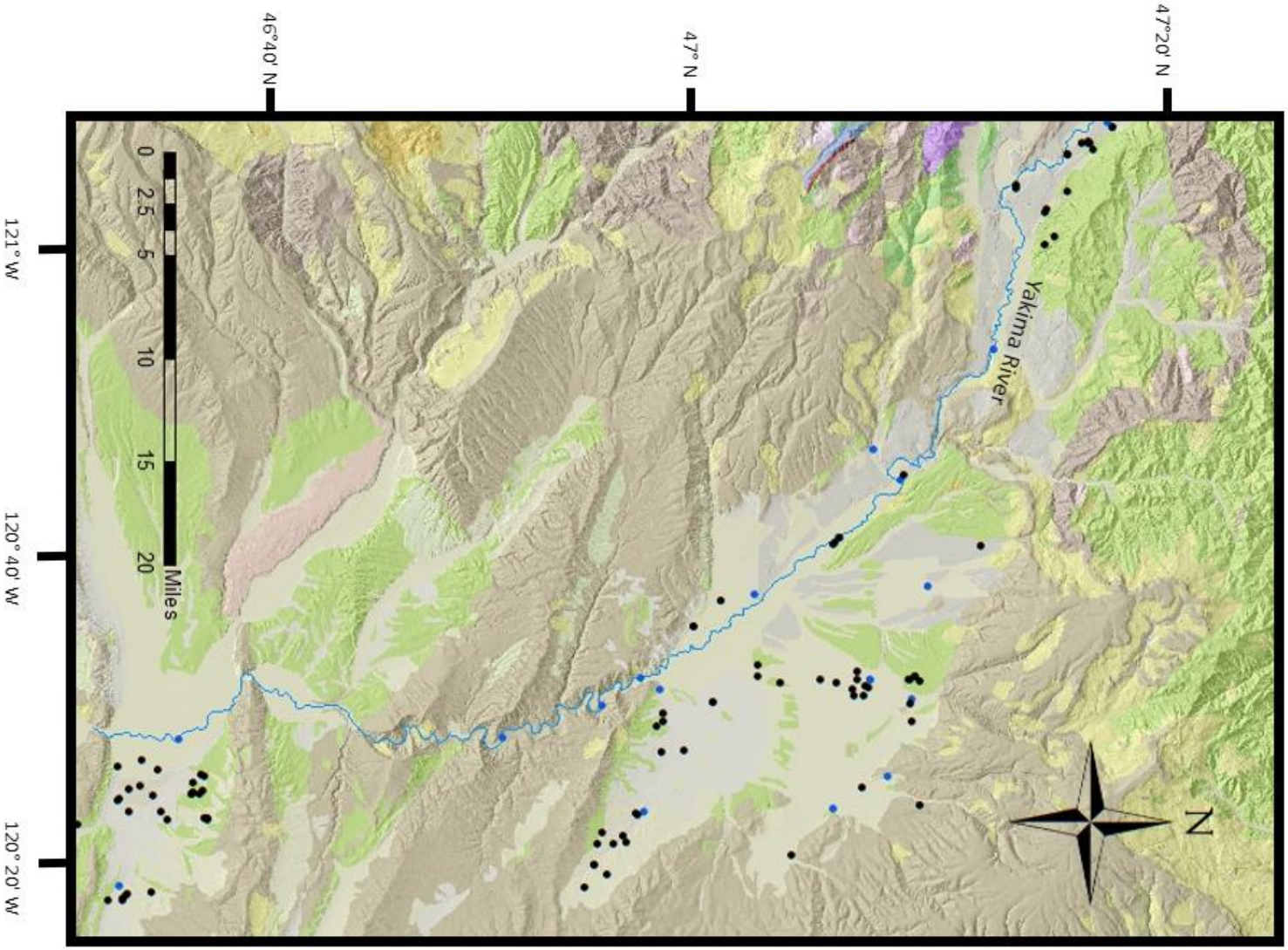
- MZms, Mesozoic metasedimentary rocks

Metamorphic Rocks (Amphibolite Facies and Higher)

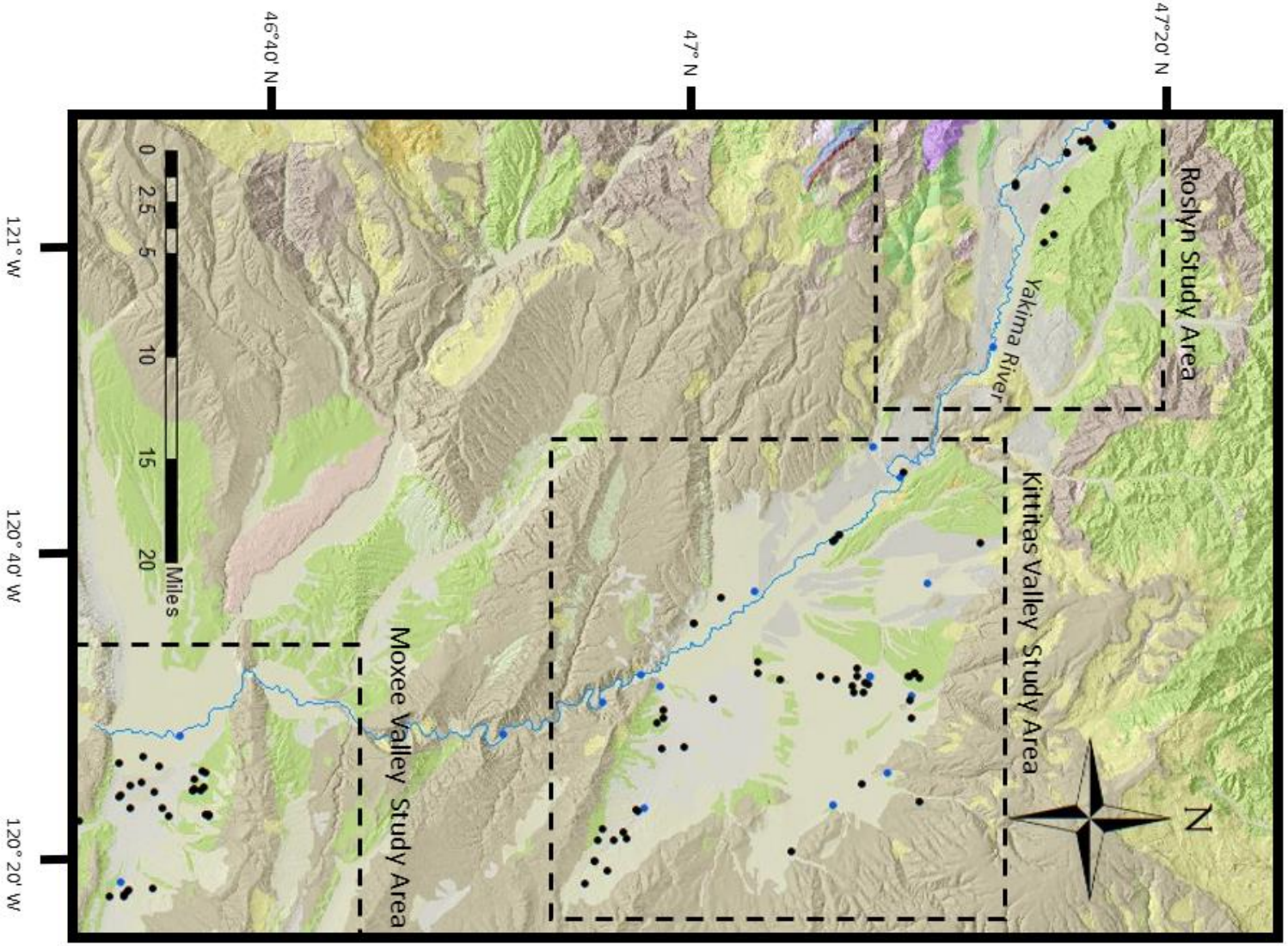
- MZPZhm, Mesozoic–Paleozoic heterogeneous metamorphic rocks
- MZPZam, Mesozoic–Paleozoic amphibolite
- MZog, Mesozoic orthogneiss

Other Features

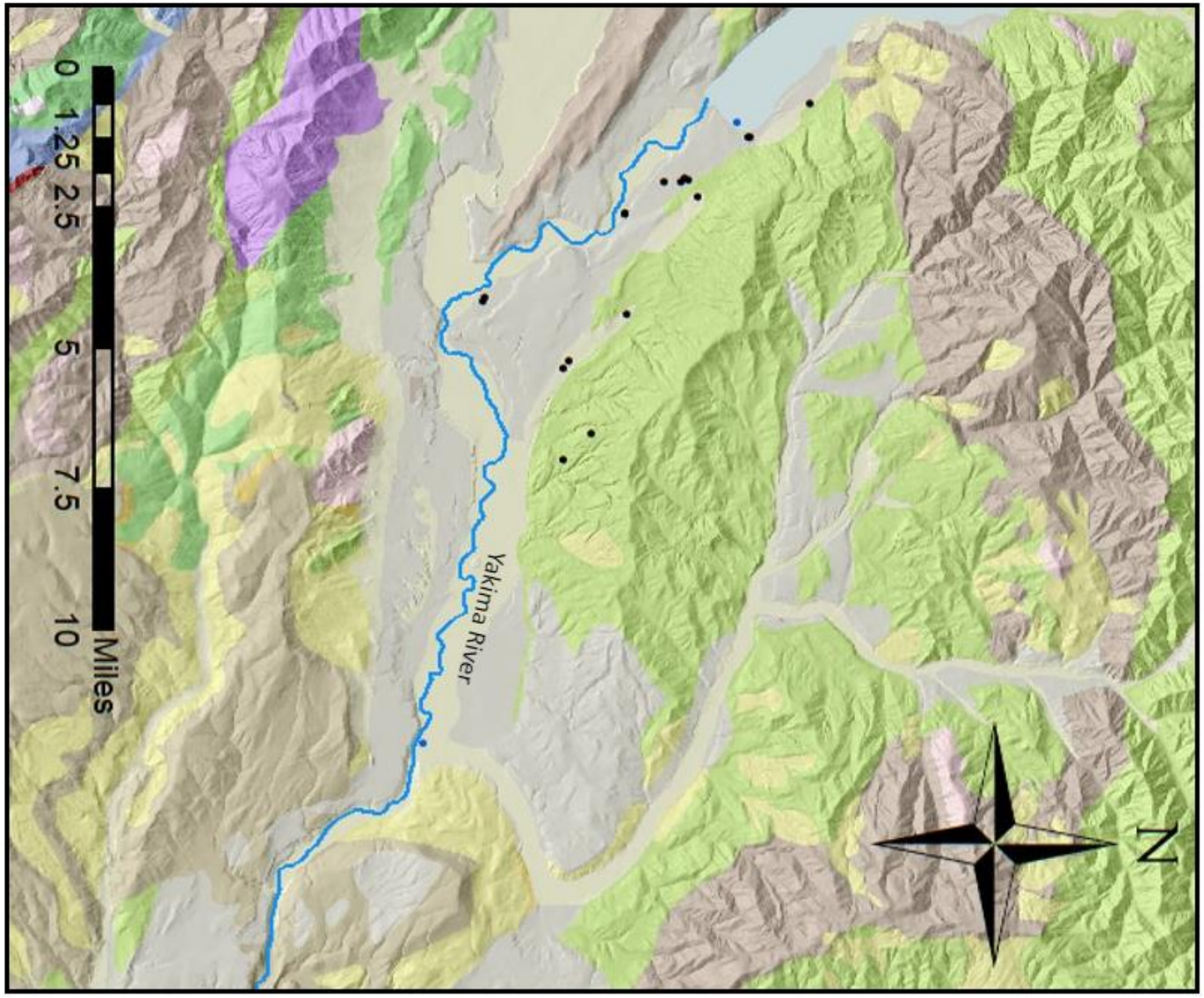
- tz, Tectonic zones; areas of intense cataclasis, including mylonitization
- Water



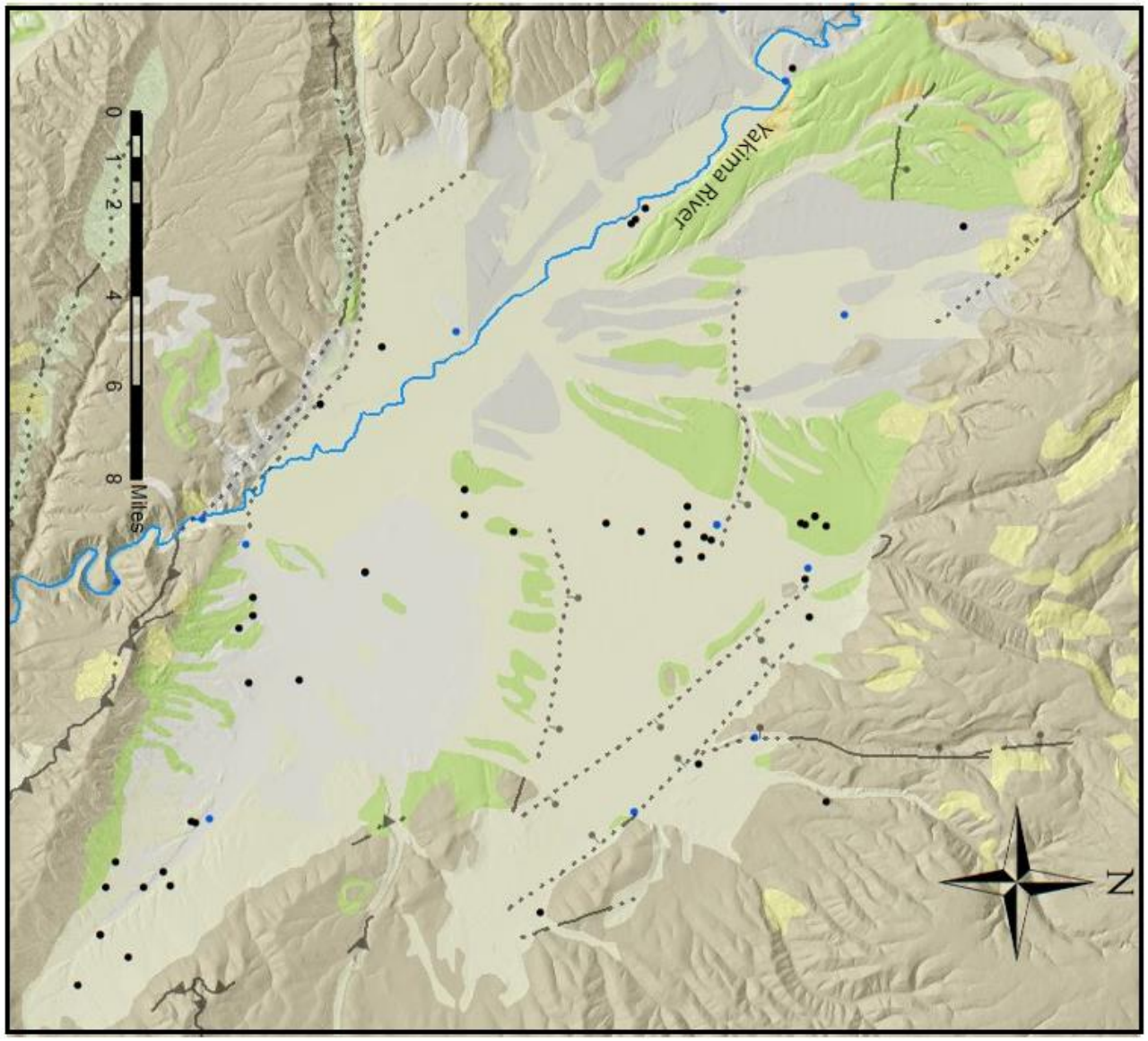
Map A1. Sampled locations overlain on a surficial geology map



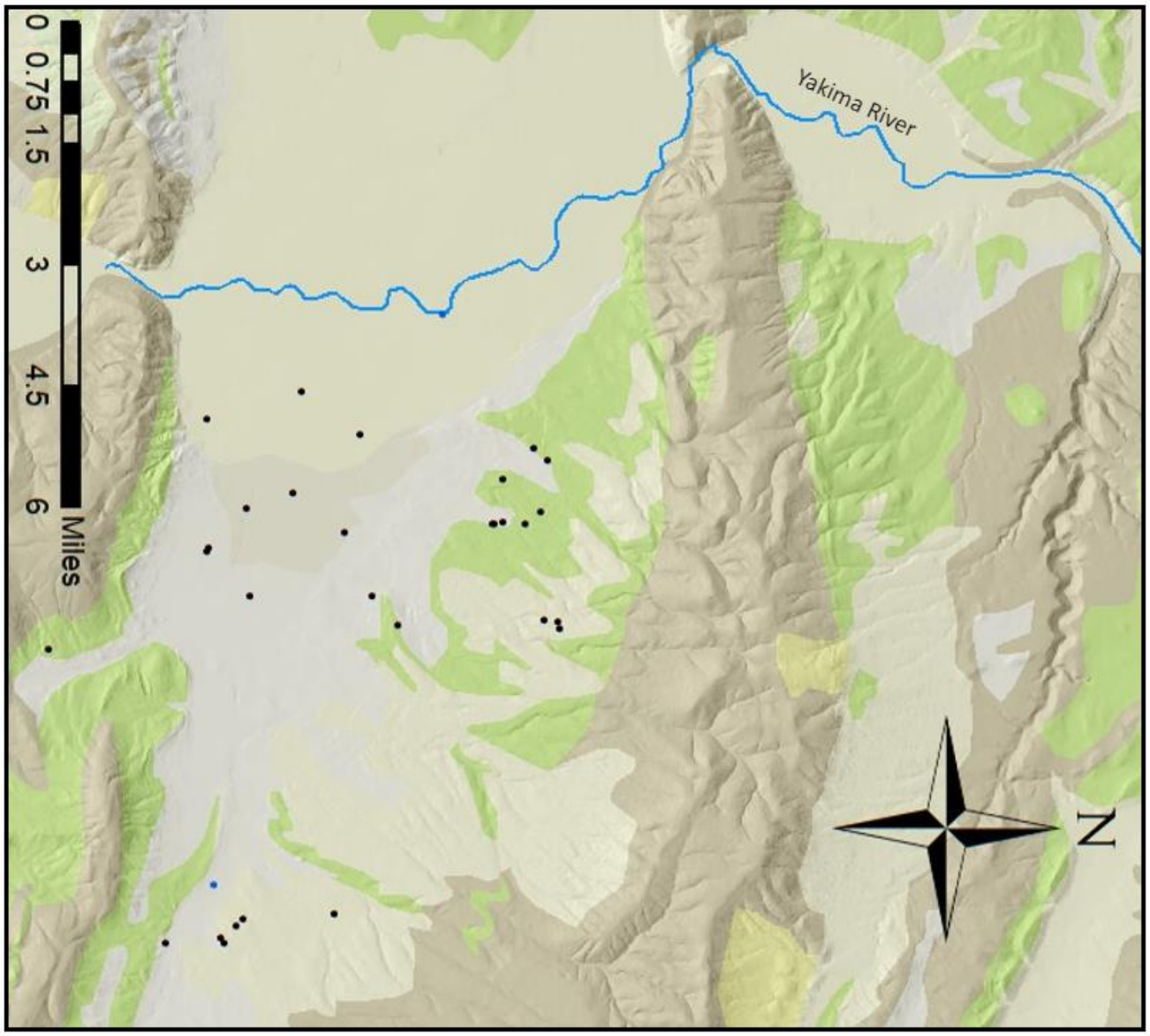
Map A2. The borders of the three study areas



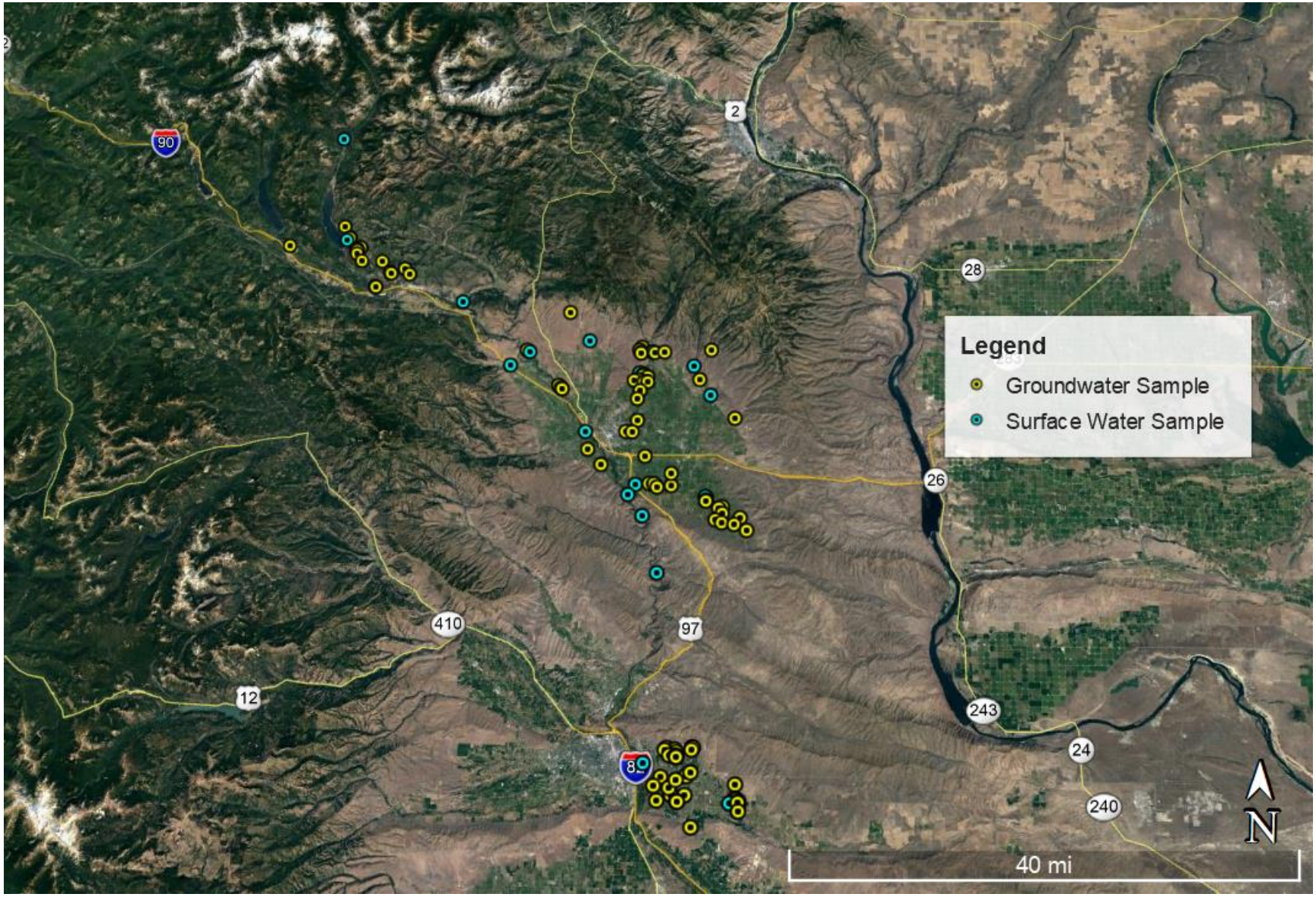
Map A3. Sampled Locations in the Roslyn area



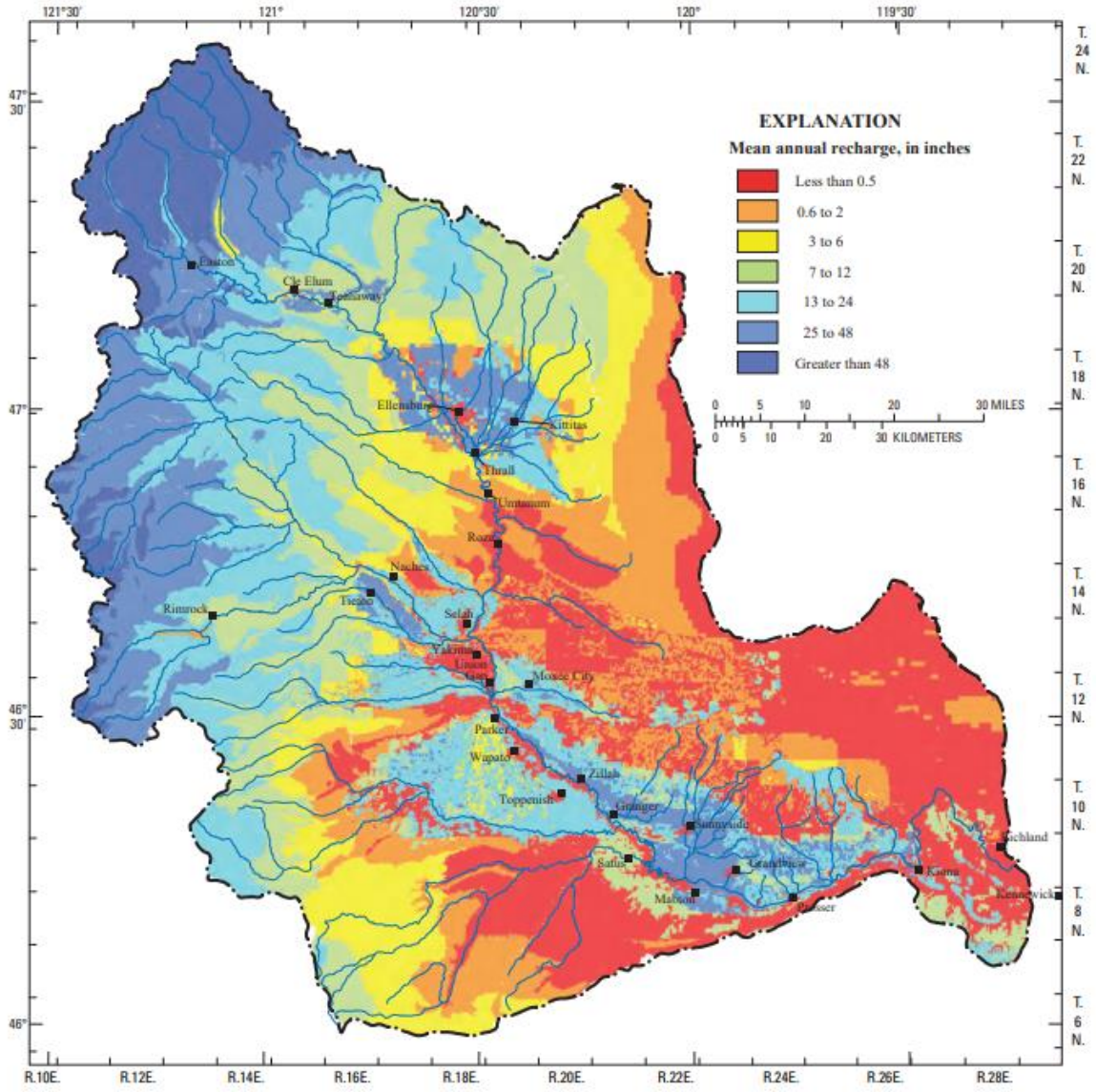
Map A4. Sampled locations in Kittitas Valley



Map A5. Sampled locations in Moxee Valley



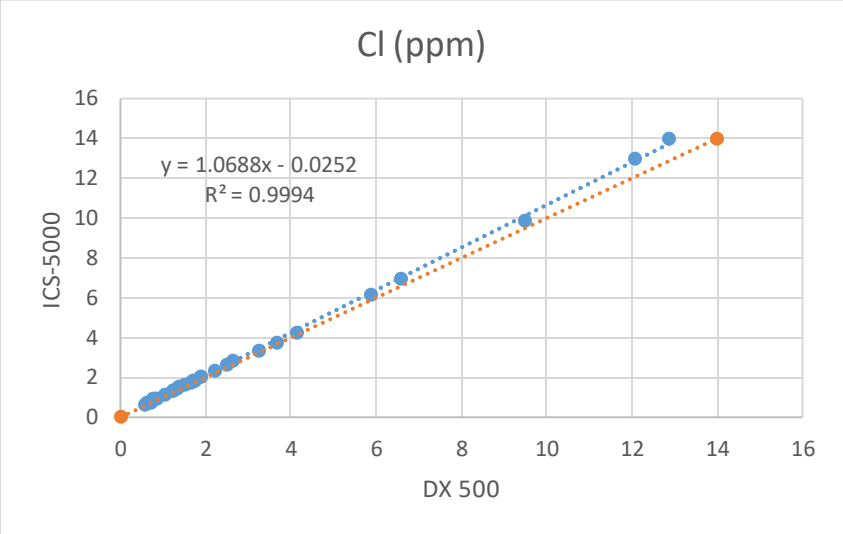
Map A6. A satellite image of all sampled locations.

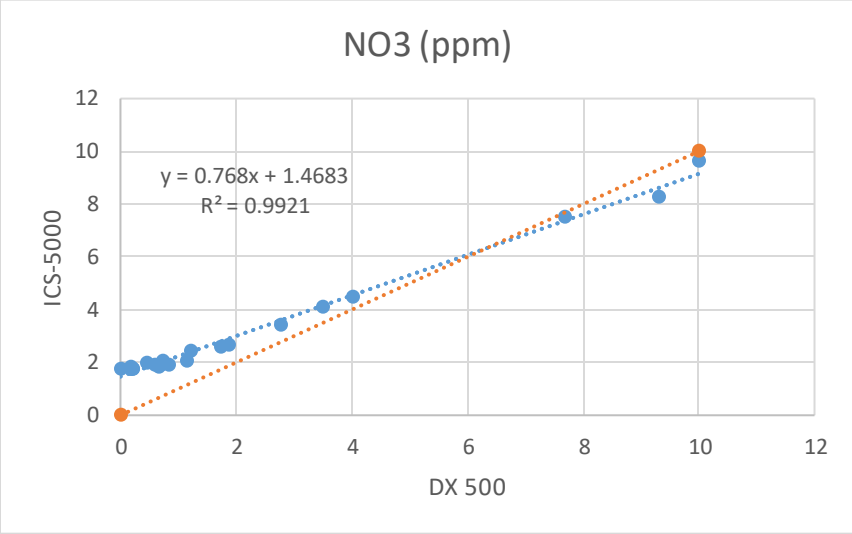


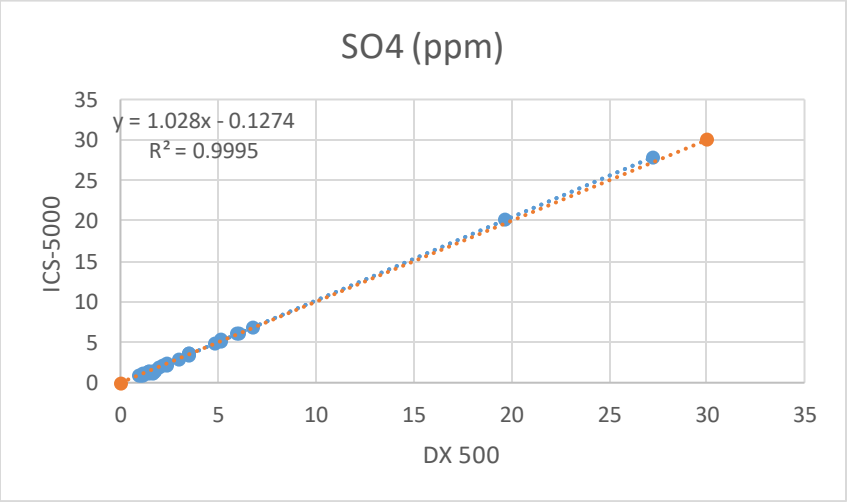
Map A7. A map showing the mean annual recharge for current conditions, 1960-2001. Map from Vaccaro et al., 2009

APPENDIX B- INSTRUMENT COMPATIBILITY

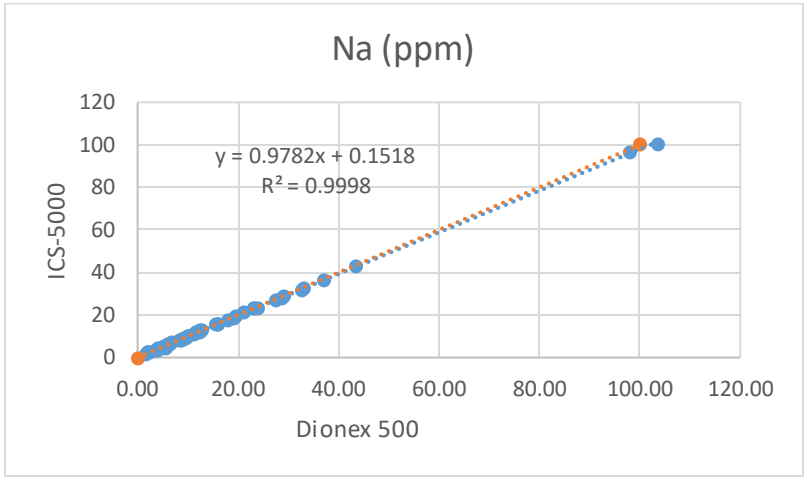
Anion concentrations measured by Dionex ICS-5000 Ion Chromatograph (Geological Sciences Department) vs the Dionex DX 500 Ion Chromatograph (Chemistry Department). Orange lines represent a slope of 1.

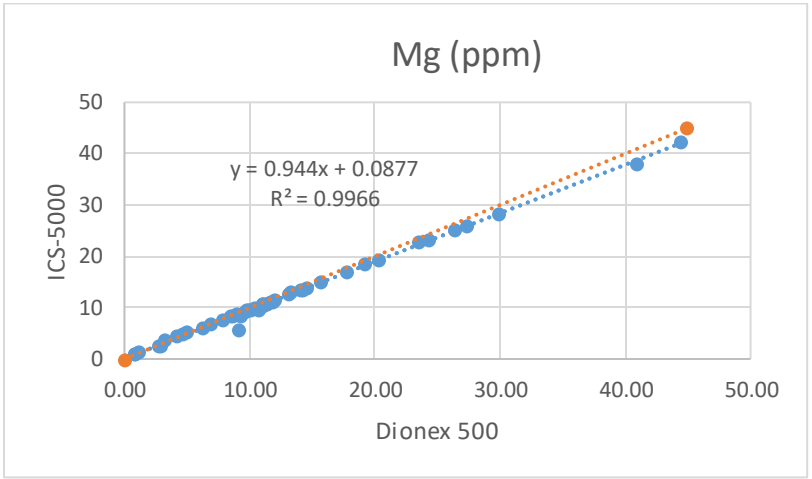


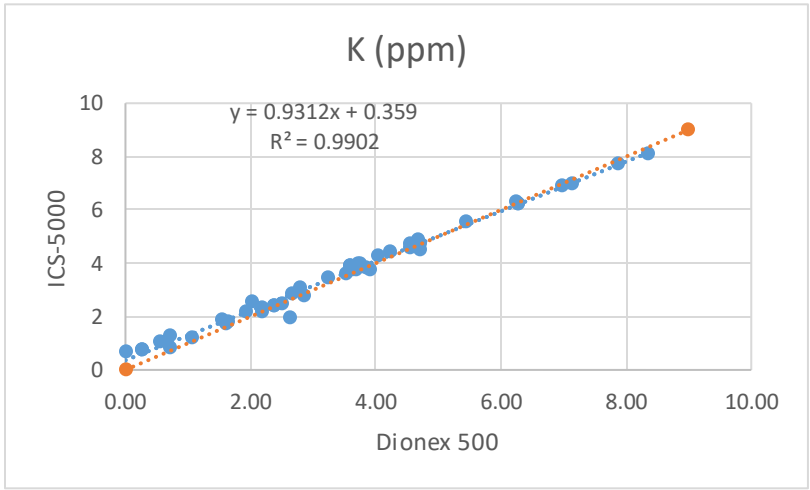


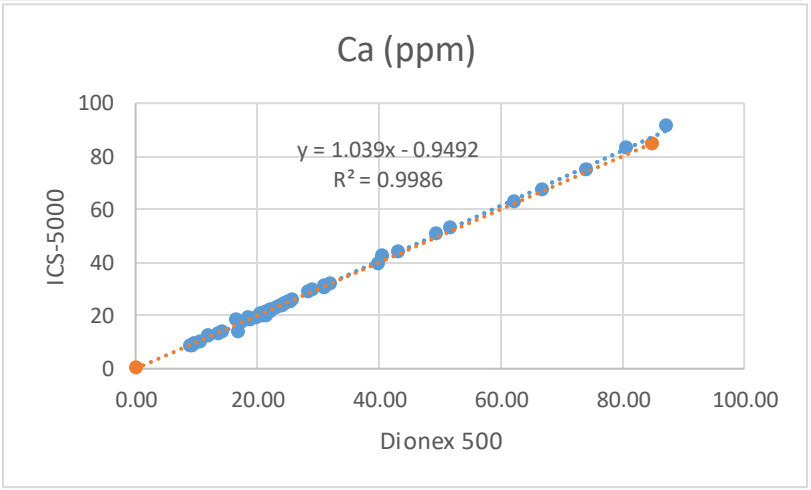


Cation concentrations measured by Dionex ICS-5000 Ion Chromatograph (located in the Geological Sciences Department) vs the Dionex DX 500 Ion Chromatograph (located in the Chemistry Department). Orange lines represent a slope of 1.

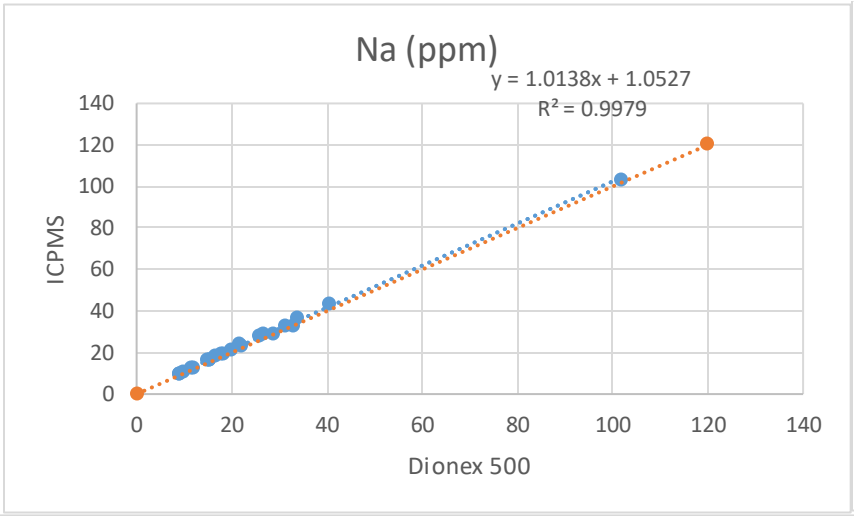


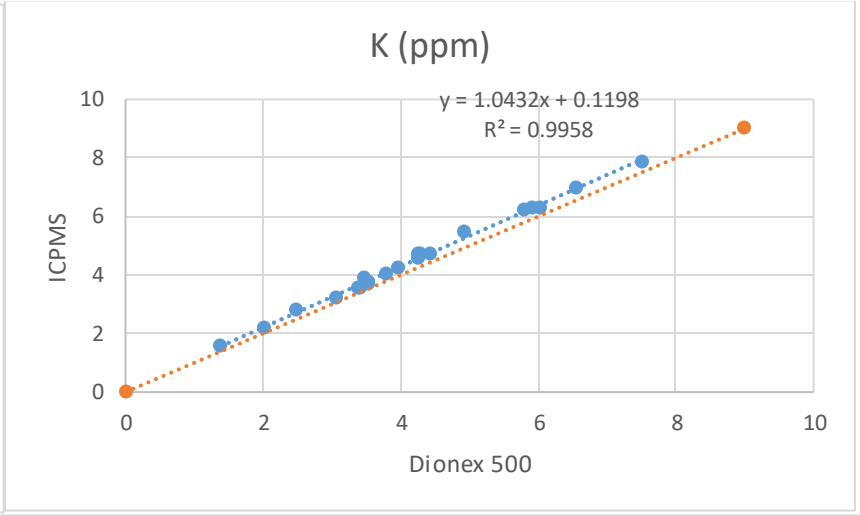


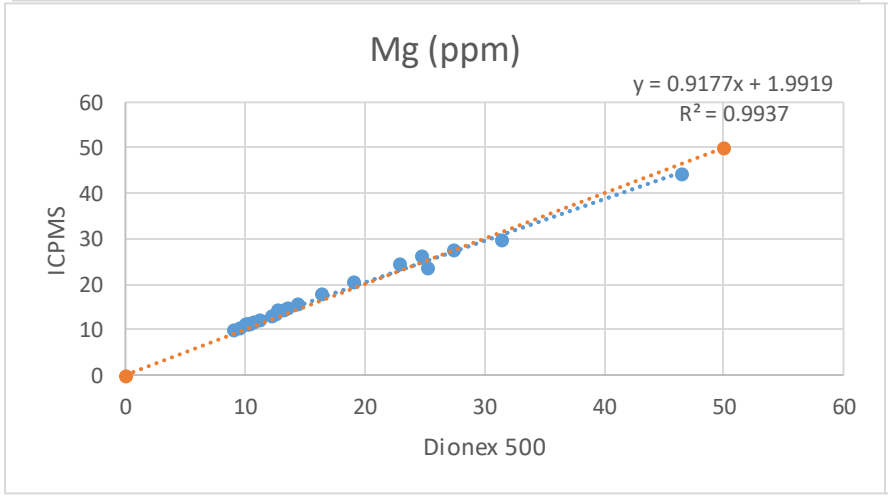


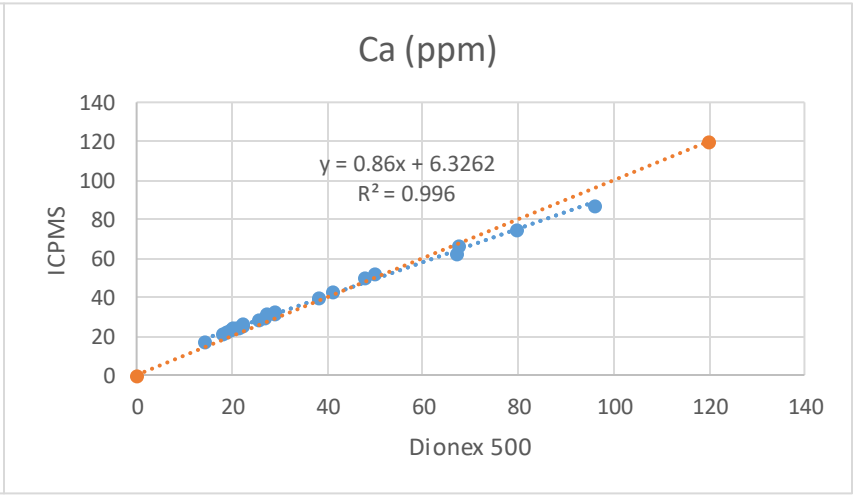


For quality assurance concentrations measured by Agilent 8900 Triple Quad Inductively Coupled Mass Spectrometer (ICPMS) (Geological Sciences Department) vs the Dionex DX 500 Ion Chromatograph (Chemistry Department). Orange lines represent a slope of 1.







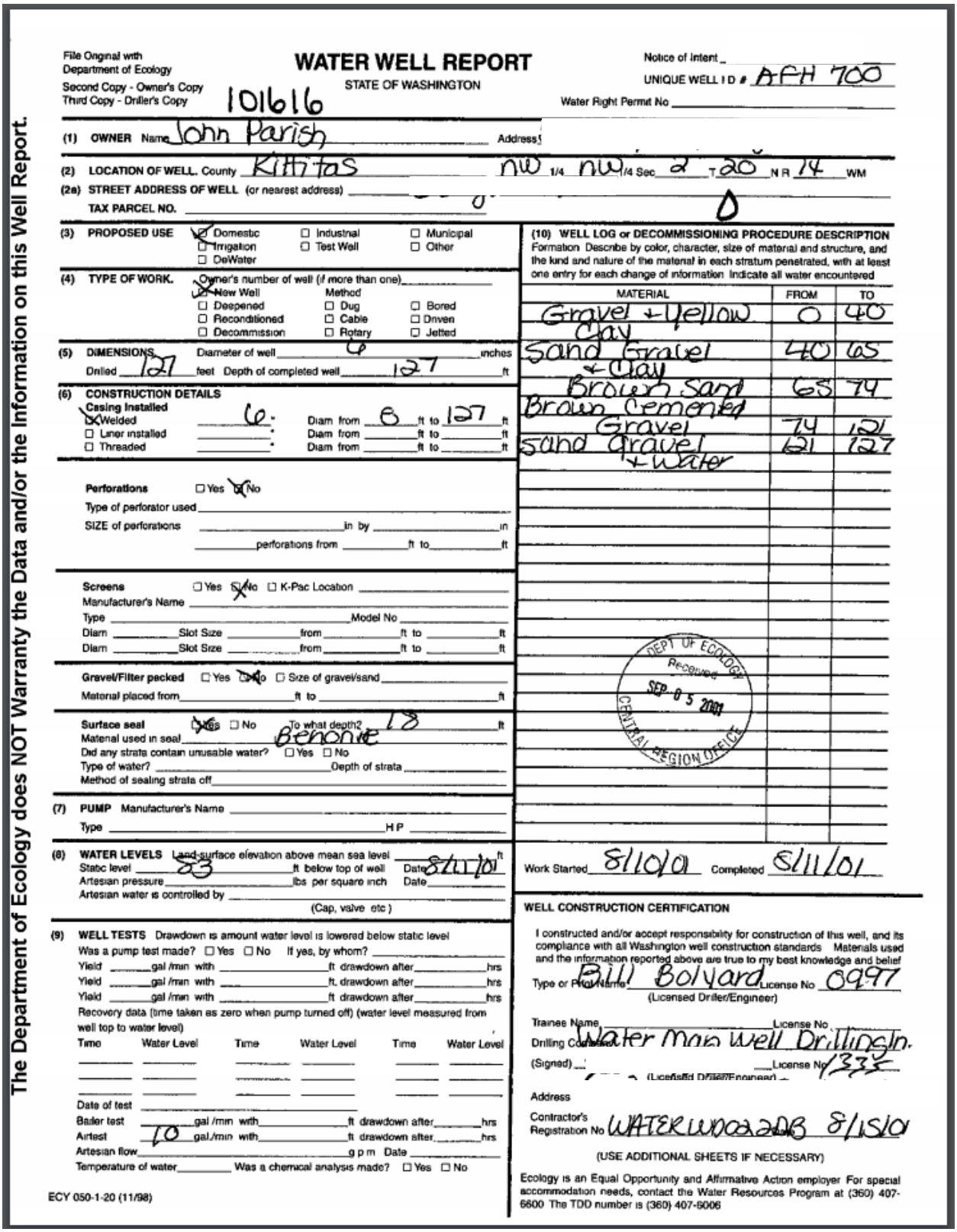


DISCUSSION

All of the graphs presented above in Appendix B show that the three instruments agree with the exception of NO_3^-. NO_3^- concentrations reported from the ICS-5000 are higher than the concentrations reported from the DX 500 for all values under 6 ppm. For NO_3^- the largest difference measured between the two instruments is 1.76 ppm while the average difference between the two instruments is 0.9 ppm. This data indicates that one of the two instruments is slightly off when measuring NO_3^- at small concentrations (<6 ppm).

APPENDIX C- ROSLYN WELL LOGS

Well Name	General Description	Unique Well ID/Report ID
Borders Reservoir		
Guzzi60	On the southern bank of Lake Cle Elum	AFH700
Guzzi30	On the southern bank of Lake Cle Elum	AGM991
Salmon14030	~0.5 miles east of Lake Cle Elum	
Coal interaction likely		
Fan (11/12)	0.01 miles east of the Cle Elum River, overflow point for the Roslyn Mines	
Vinegar390	Between Lake Cle Elum and the fan house	AKH884
Vinegar481	Between Lake Cle Elum and the fan house	ALE138
Vinegar420	Between Lake Cle Elum and the fan house	364931
Shaft421	Located between Roslyn and Cle Elum	AKW776
Shaft181	Located between Roslyn and Cle Elum	ALE962
Ridgeview	On hillside north of Cle Elum	
Ridge360	On hillside north of Cle Elum	AKW793
Tamarack101	Between Lake Cle Elum and the fan house	
Coal interaction not expected		
RoslynRidge	New housing development on hillside north of Ronald	
W-WA103	Inside the town of Roslyn	
Easton	East of Easton	
Borders Cle Elum R.		
Woodduck1161	~0.3 miles east of the Cle Elum River downstream from fan house	BAF978
Woodduck1281	~0.3 miles east of the Cle Elum River downstream from fan house	BJA238
Surface Water		
Salmon La Sac R.	Salmon La Sac River which is a main tributary to Cle Elum Lake	
Cle Elum Lake	Reservoir, located up gradient of all wells except Salmon14030	
Teanaway R.	River south of Cle Elum on Highway 10	



File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

101616

Notice of Intent _____
UNIQUE WELL I D # AFH 700
Water Right Permit No _____

(1) OWNER Name John Parish Address

(2) LOCATION OF WELL. County Kittitas NW 1/4 NW 1/4 Sec 2 T 20 N R 14 WM

(2a) STREET ADDRESS OF WELL (or nearest address) _____

TAX PARCEL NO. _____

(3) PROPOSED USE ☑ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK. Owner's number of well (if more than one) _____
☑ New Well Method ☐ Deepened ☐ Dug ☐ Bored ☐ Reconditioned ☐ Cable ☐ Driven ☐ Decommission ☐ Rotary ☐ Jetted

(5) DIMENSIONS Diameter of well 6 inches
Drilled 127 feet Depth of completed well 127 ft

(6) CONSTRUCTION DETAILS
Casing Installed ☑ Welded 6" Diam from 0 ft to 127 ft
☐ Liner installed _____" Diam from _____ ft to _____ ft
☐ Threaded _____" Diam from _____ ft to _____ ft

Perforations ☐ Yes ☑ No
Type of perforator used _____
SIZE of perforations _____ in by _____ in
_____ perforations from _____ ft to _____ ft

Screens ☐ Yes ☑ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No _____
Diam _____ Slot Size _____ from _____ ft to _____ ft
Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed ☐ Yes ☑ No ☐ Size of gravel/sand _____
Material placed from _____ ft to _____ ft

Surface seal ☑ Yes ☐ No To what depth? 18 ft
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP Manufacturer's Name _____
Type _____ H P _____

(8) WATER LEVELS Land-surface elevation above mean sea level _____ ft
Static level 53 ft below top of well Date 8/11/01
Artesian pressure _____ lbs per square inch Date _____
Artesian water is controlled by _____ (Cap, valve etc.)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____
Yield _____ gal /min with _____ ft drawdown after _____ hrs
Yield _____ gal /min with _____ ft. drawdown after _____ hrs
Yield _____ gal /min with _____ ft drawdown after _____ hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal /min with _____ ft drawdown after _____ hrs
Airtest 10 gal./min with _____ ft drawdown after _____ hrs
Artesian flow _____ g p m Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Gravel + Yellow Clay	0	40
Sand Gravel + Clay	40	65
Brown Sand	65	74
Brown Cemented Gravel	74	121
Sand Gravel + Water	121	127

DEPT OF ECOLOGY Received SEP 05 2001 CENTRAL REGION OFFICE

Work Started 8/10/01 Completed 8/11/01

WELL CONSTRUCTION CERTIFICATION
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief
Type or Print Name Bill Bolyard License No 0997
(Licensed Driller/Engineer)
Trainee Name _____ License No _____
Drilling Company Water Main Well Drilling In.
(Signed) _____ License No 1335
(Licensed Driller/Engineer)
Address
Contractor's Registration No WATERWD022DB 8/15/01

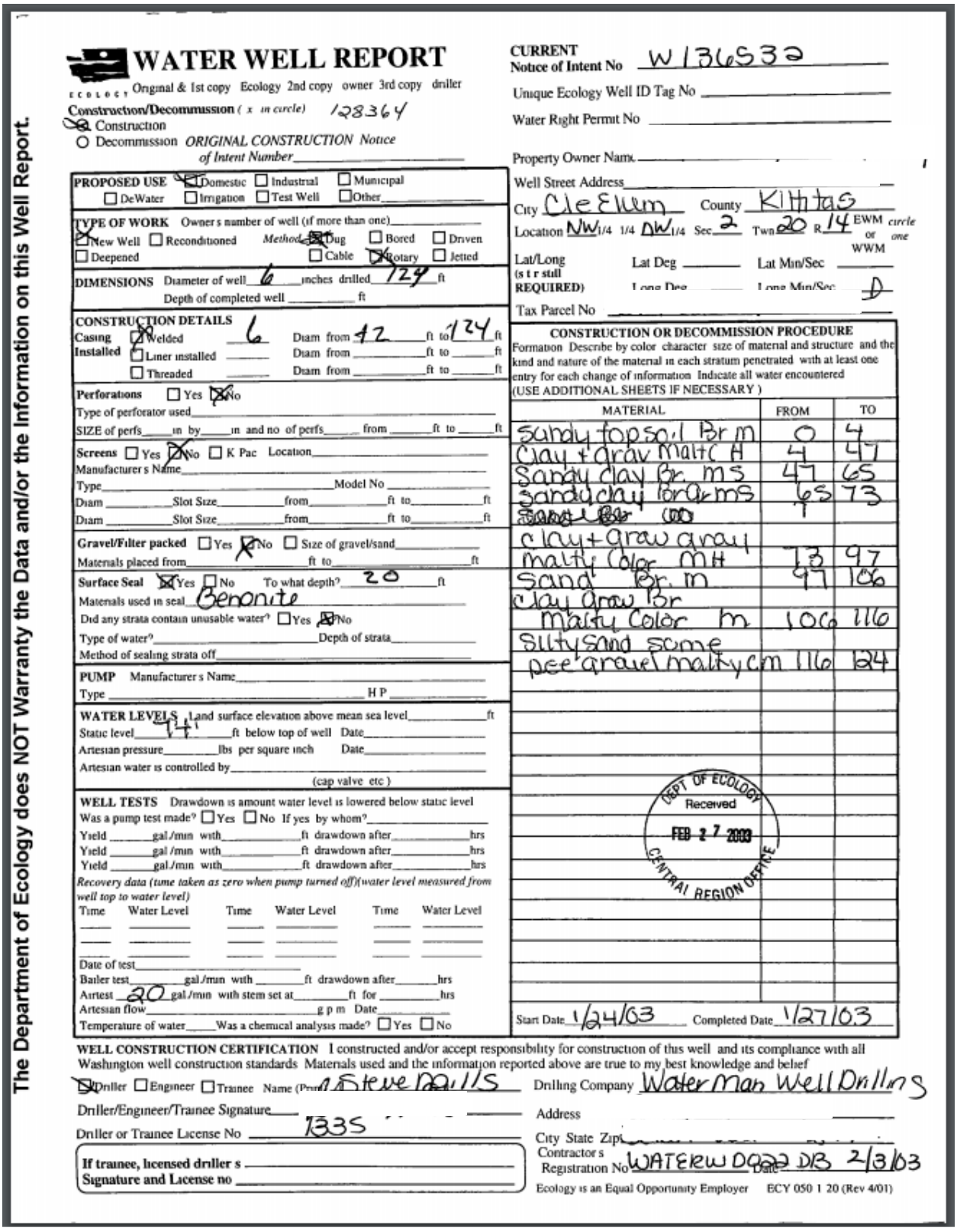
(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle) 128364

- [x] Construction
- [ ] Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT Notice of Intent No W136532

Unique Ecology Well ID Tag No

Water Right Permit No

Property Owner Name

Well Street Address

City Cle Elum County Kittitas

Location NW 1/4 1/4 SW 1/4 Sec 2 Twn 20 R 14 EWM or WWM (circle one)

Lat/Long (s t r still REQUIRED) Lat Deg Lat Min/Sec Long Deg Long Min/Sec D

Tax Parcel No

PROPOSED USE [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK Owner s number of well (if more than one)

[x] New Well [ ] Reconditioned Method [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS Diameter of well 6 inches drilled 124 ft

Depth of completed well ft

CONSTRUCTION DETAILS

Casing Installed [x] Welded 6 Diam from 42 ft to 124 ft

[ ] Liner installed Diam from ft to ft

[ ] Threaded Diam from ft to ft

Perforations [ ] Yes [x] No

Type of perforator used

SIZE of perfs in by in and no of perfs from ft to ft

Screens [ ] Yes [x] No [ ] K Pac Location

Manufacturer s Name

Type Model No

Diam Slot Size from ft to ft

Diam Slot Size from ft to ft

Gravel/Filter packed [ ] Yes [x] No [ ] Size of gravel/sand

Materials placed from ft to ft

Surface Seal [x] Yes [ ] No To what depth? 20 ft

Materials used in seal Bentonite

Did any strata contain unusable water? [ ] Yes [x] No

Type of water? Depth of strata

Method of sealing strata off

PUMP Manufacturer s Name

Type H P

WATER LEVELS Land surface elevation above mean sea level ft

Static level 94 ft below top of well Date

Artesian pressure lbs per square inch Date

Artesian water is controlled by (cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level

Was a pump test made? [ ] Yes [ ] No If yes by whom?

Yield gal./min with ft drawdown after hrs

Yield gal./min with ft drawdown after hrs

Yield gal./min with ft drawdown after hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min with ft drawdown after hrs

Artest 20 gal./min with stem set at ft for hrs

Artesian flow g p m Date

Temperature of water Was a chemical analysis made? [ ] Yes [ ] No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
sandy topsoil Br m	0	4
clay + grav Malt C H	4	47
Sandy clay Br. m s	47	65
sandy clay br gr ms	65	73
Sand Lbr (illegible)	73	97
clay + grav gray		
malty Color MH	97	106
Sand Br. m	106	116
clay grav Br		
Malty Color m	116	124
Silty Sand some		
pee gravel malty c m		

DEPT OF ECOLOGY Received FEB 27 2003 CENTRAL REGION OFFICE

Start Date 1/24/03 Completed Date 1/27/03

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Steve Mills Drilling Company Water Man Well Drillings

Driller/Engineer/Trainee Signature Address

Driller or Trainee License No 1335 City State Zip

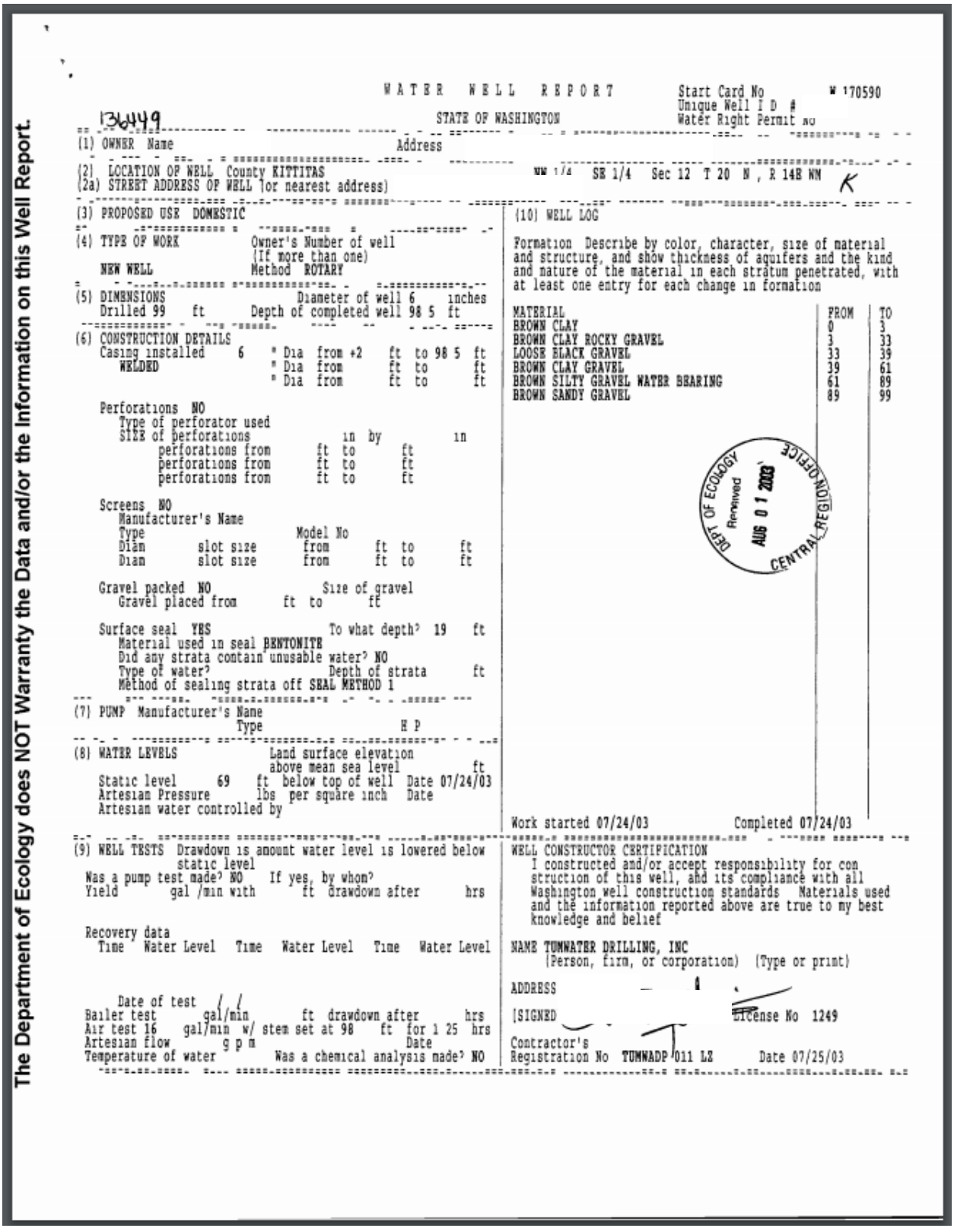
If trainee, licensed driller s Signature and License no

Contractor s Registration No WATERWD922DB Date 2/3/03

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Start Card No W 170590
Unique Well I D #
Water Right Permit no

136449

STATE OF WASHINGTON

(1) OWNER Name Address

(2) LOCATION OF WELL County KITTITAS NW 1/4 SE 1/4 Sec 12 T 20 N , R 14E WM

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE DOMESTIC

(4) TYPE OF WORK Owner's Number of well (If more than one)
NEW WELL Method ROTARY

(5) DIMENSIONS Diameter of well 6 inches
Drilled 99 ft Depth of completed well 98 5 ft

(6) CONSTRUCTION DETAILS
Casing installed 6 " Dia from +2 ft to 98 5 ft
WELDED " Dia from ft to ft
" Dia from ft to ft

Perforations NO
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft
perforations from ft to ft
perforations from ft to ft

Screens NO
Manufacturer's Name
Type Model No
Diam slot size from ft to ft
Diam slot size from ft to ft

Gravel packed NO Size of gravel
Gravel placed from ft to ft

Surface seal YES To what depth? 19 ft
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft
Method of sealing strata off SEAL METHOD 1

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 69 ft below top of well Date 07/24/03
Artesian Pressure lbs per square inch Date
Artesian water controlled by

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? NO If yes, by whom?
Yield gal /min with ft drawdown after hrs

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min ft drawdown after hrs
Air test 16 gal/min w/ stem set at 98 ft for 1 25 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

Formation Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation

MATERIAL	FROM	TO
BROWN CLAY	0	3
BROWN CLAY ROCKY GRAVEL	3	33
LOOSE BLACK GRAVEL	33	39
BROWN CLAY GRAVEL	39	61
BROWN SILTY GRAVEL WATER BEARING	61	89
BROWN SANDY GRAVEL	89	99

DEPT OF ECOLOGY Received AUG 0 1 2003 CENTRAL REGION OFFICE

Work started 07/24/03 Completed 07/24/03

WELL CONSTRUCTOR CERTIFICATION
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

NAME TUMWATER DRILLING, INC
(Person, firm, or corporation) (Type or print)

ADDRESS

[SIGNED License No 1249

Contractor's
Registration No TUMWADP011 LZ Date 07/25/03

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

W031134

File Original with Department of Ecology
Second Copy Owner's Copy
Third Copy Driller's Copy 31883

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent GAPE
UNIQUE WELL I D #
Water Right Permit No

(1) OWNER Name [redacted] Address [redacted]

(2) LOCATION OF WELL County KITTITAS NW 1/4 SW 1/4 Sec 12 T 20 N R 14 WM

(2a) STREET ADDRESS OF WELL (or nearest address)

TAX PARCEL NO

(3) PROPOSED USE ☑ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK Owner's number of well (if more than one)
☑ New Well Method ☐ Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☑ Rotary ☐ Jetted ☐ Decommission

(5) DIMENSIONS Diameter of well 6 inches
Drilled feet Depth of completed well 120 ft

(6) CONSTRUCTION DETAILS
Casing Installed
☑ Welded 6 Diam from 0 ft to 100 ft
☐ Liner installed Diam from ft to ft
☐ Threaded Diam from ft to ft

Perforations ☐ Yes ☑ No
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft

Screens ☐ Yes ☑ No ☐ K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed ☐ Yes ☑ No ☐ Size of gravel/sand
Material placed from ft to ft

Surface seal ☑ Yes ☐ No To what depth? 20 ft
Material used in seal BENTONITE
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 50 ft below top of well Date 9/5/97
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 15 gal /min with ft drawdown after hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

ECY 050 1 20 (11/98)

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
DIRT	0	5
CEMENT GRAVEL	5	95
BROKEN BASALT	95	120

AUG 27 1999
DEPARTMENT OF ECOLOGY CENTRAL REGION OFFICE

Work Started Completed 9/5/97

WELL CONSTRUCTION CERTIFICATION

I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Type or Print Name MIKE MORFORD License No 2361
(Licensed Driller/Engineer)

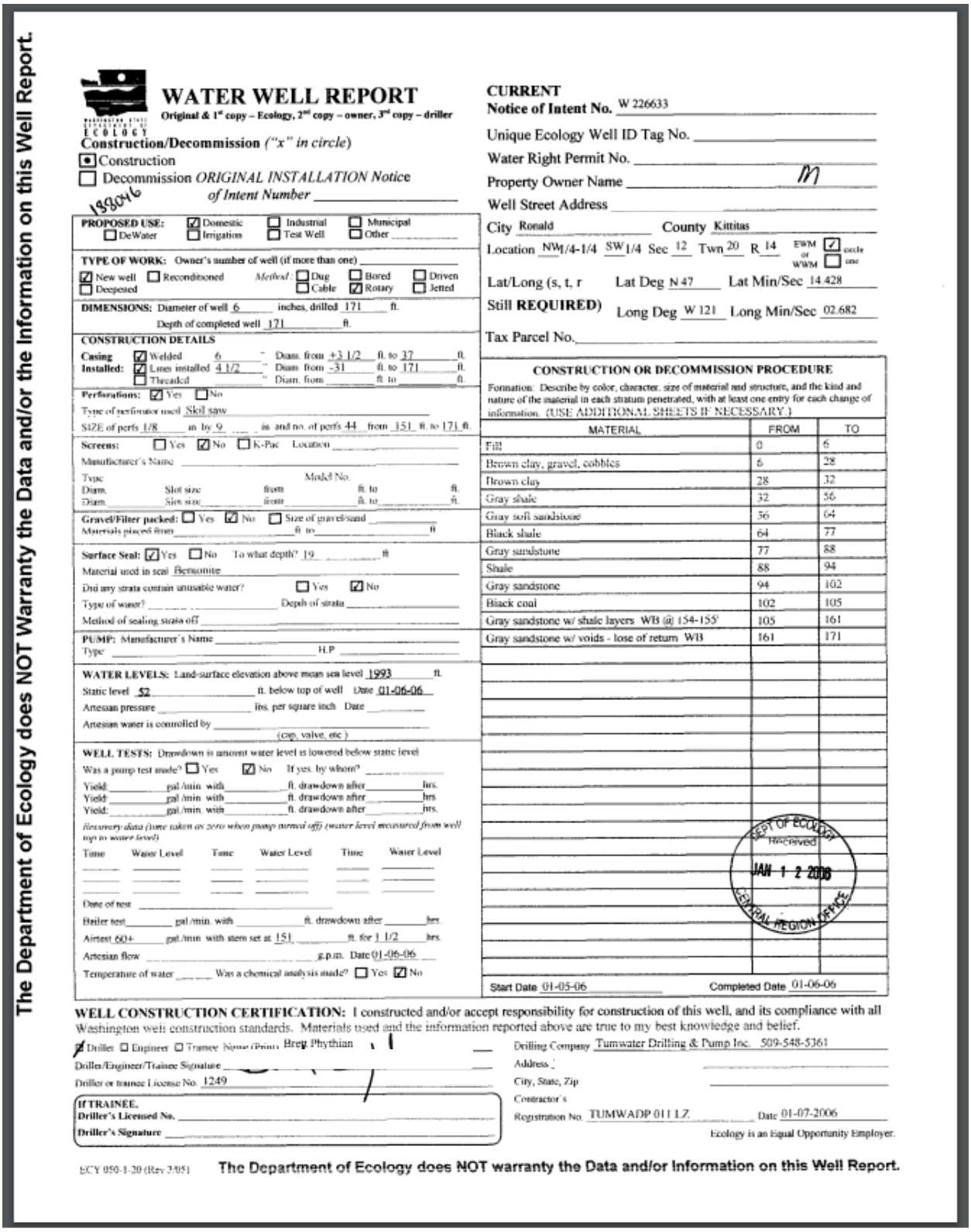
Trainee Name License No
Drilling Company BACH DRILLING CO
(Signed) License No
(Licensed Driller/Engineer)

Address
Contractor's Registration No MIKEBOX133J4 Date 9/5 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407 6600 The TDD number is (360) 407 6006

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

(•) Construction

( ) Decommission *ORIGINAL INSTALLATION Notice of Intent Number* 198046

CURRENT
Notice of Intent No. W 226633

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____ M

Well Street Address _____

City Ronald County Kittitas

Location NW 1/4-1/4 SW 1/4 Sec 12 Twn 20 R 14 E/W/M or W/M (✓) circle one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg N 47 Lat Min/Sec 14.428 Long Deg W 121 Long Min/Sec 02.682

Tax Parcel No. _____

PROPOSED USE: (✓) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other

TYPE OF WORK: Owner's number of well (if more than one) _____
(✓) New well ( ) Reconditioned ( ) Deepened
Method: ( ) Dug ( ) Bored ( ) Driven ( ) Cable (✓) Rotary ( ) Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 171 ft.
Depth of completed well 171 ft.

CONSTRUCTION DETAILS
Casing Installed: (✓) Welded 6" Diam. from +3 1/2 ft. to 37 ft.
(✓) Liner installed 4 1/2" Diam. from -31 ft. to 171 ft.
( ) Threaded " Diam. from ft. to ft.

Perforations: (✓) Yes ( ) No
Type of perforator used Skil saw
SIZE of perfs 1/8 in by 9 in and no. of perfs 44 from 151 ft. to 171 ft.

Screens: ( ) Yes (✓) No ( ) K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: ( ) Yes (✓) No ( ) Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: (✓) Yes ( ) No To what depth? 19 ft
Material used in seal Bentonite
Did any strata contain unusable water? ( ) Yes (✓) No
Type of water? Depth of strata
Method of sealing strata off

PUMP: Manufacturer's Name
Type H.P

WATER LEVELS: Land-surface elevation above mean sea level 1993 ft.
Static level 52 ft. below top of well Date 01-06-06
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ( ) Yes (✓) No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 600+ gal./min. with stem set at 151 ft. for 1 1/2 hrs.
Artesian flow g.p.m. Date 01-06-06
Temperature of water Was a chemical analysis made? ( ) Yes (✓) No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Fill	0	6
Brown clay, gravel, cobbles	6	28
Brown clay	28	32
Gray shale	32	56
Gray soft sandstone	56	64
Black shale	64	77
Gray sandstone	77	88
Shale	88	94
Gray sandstone	94	102
Black coal	102	105
Gray sandstone w/ shale layers WB @ 154-155'	105	161
Gray sandstone w/ voids - lose of return WB	161	171

DEPT OF ECOLOGY Received JAN 1 2 2006 CENTRAL REGION OFFICE

Start Date 01-05-06 Completed Date 01-06-06

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

(✓) Driller ( ) Engineer ( ) Trainee Name (Print) Brey Phythian

Driller/Engineer/Trainee Signature

Driller or trainee License No. 1249

Drilling Company Tumwater Drilling & Pump Inc. 509-548-5361

Address

City, State, Zip

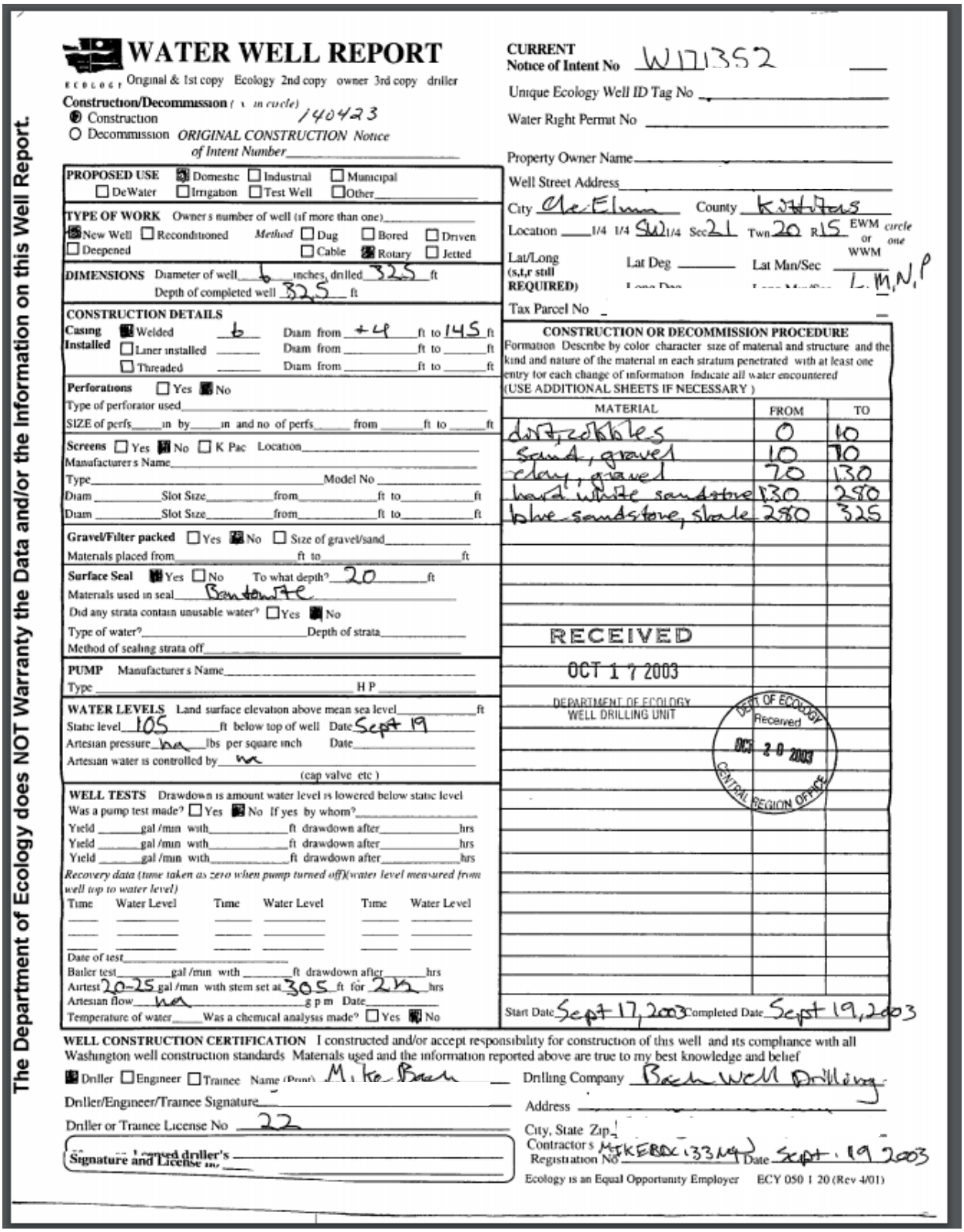
Contractor's Registration No. TUMWADP 011 LZ Date 01-07-2006

IF TRAINEE,
Driller's Licensed No.
Driller's Signature

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 2/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- (•) Construction 140423
- ( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT Notice of Intent No W171352

Unique Ecology Well ID Tag No

Water Right Permit No

Property Owner Name

Well Street Address

City McElmo County Montezuma

Location ¼ ¼ SW¼ Sec 21 Twn 20 R 15 EWM or WWM (circle one)

Lat/Long (s,t,r still REQUIRED) Lat Deg Lat Min/Sec L M N P

Tax Parcel No

PROPOSED USE (•) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other

TYPE OF WORK Owner's number of well (if more than one)
(•) New Well ( ) Reconditioned *Method* ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (•) Rotary ( ) Jetted

DIMENSIONS Diameter of well 6 inches, drilled 325 ft
Depth of completed well 325 ft

CONSTRUCTION DETAILS
Casing Installed (•) Welded 6 Diam from +4 ft to 145 ft
( ) Liner installed Diam from ft to ft
( ) Threaded Diam from ft to ft

Perforations ( ) Yes (•) No
Type of perforator used
SIZE of perfs in by in and no of perfs from ft to ft

Screens ( ) Yes (•) No ( ) K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed ( ) Yes (•) No ( ) Size of gravel/sand
Materials placed from ft to ft

Surface Seal (•) Yes ( ) No To what depth? 20 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ( ) Yes (•) No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type H P

WATER LEVELS Land surface elevation above mean sea level ft
Static level 105 ft below top of well Date Sept 19
Artesian pressure na lbs per square inch Date
Artesian water is controlled by na (cap valve etc.)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ( ) Yes (•) No If yes by whom?
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal/min with ft drawdown after hrs
Airtest 20-25 gal/min with stem set at 305 ft for 2½ hrs
Artesian flow na g p m Date
Temperature of water Was a chemical analysis made? ( ) Yes (•) No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
dirt, cobbles	0	10
sand, gravel	10	70
clay, gravel	70	130
hard white sandstone	130	280
blue sandstone, shale	280	325

RECEIVED
OCT 17 2003
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

DEPT OF ECOLOGY Received OCT 20 2003 CENTRAL REGION OFFICE

Start Date Sept 17, 2003 Completed Date Sept 19, 2003

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

(•) Driller ( ) Engineer ( ) Trainee Name (Print) Mike Beach Drilling Company Beach Well Drilling

Driller/Engineer/Trainee Signature Address

Driller or Trainee License No 22 City, State Zip

Licensed driller's Signature and License no. Contractor's Registration No MIKEBBC133MP Date Sept. 19 2003

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)
● Construction 203258
○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT Notice of Intent No. W209260
Unique Ecology Well ID Tag No.
Water Right Permit No.
Property Owner Name
Well Street Address
City DeElum County: Kittitas
Location NW 1/4- 1/4 NE 1/4 Sec 21 Twn 20N R 15 E or W WWM (circle one)
Lat/Long: (s,t,r still REQUIRED) Lat Deg Lat Min/Sec
Long Deg Long Min/Sec
Tax Parcel No. B

PROPOSED USE: ■ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)
■ New Well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ■ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 300 ft.
Depth of completed well 300 ft.

CONSTRUCTION DETAILS
Casing Installed: ■ Welded 6" Diam. from +3 ft. to 55 ft.
■ Liner installed 4" Diam. from -10 ft. to 300 ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ■ Yes ☐ No
Type of perforator used Skilsaw
SIZE of perfs 1/2 in. by 1/4 in. and no. of perfs 210 from 190 ft. to 300 ft.

Screens: ☐ Yes ■ No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ■ No ☐ Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: ■ Yes ☐ No To what depth? 20 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ■ No
Type of water? Depth of strata
Method of sealing strata off

PUMP: Manufacturer's Name
Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 132 ft. below top of well Date 5/3/06
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 15-19 gal./min. with stem set at 280 ft. for 2 1/2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ■ No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil	0	10
gravel	10	25
gravel/sand	25	150
Shale	150	153
sandstone	153	245
Shale	245	250
sandstone	250	300

DEPT. OF ECOLOGY Received MAY 2 2006 CENTRAL REGION OFFICE

Start Date 5/1/06 Completed Date 5/3/06

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

■ Driller ☐ Engineer ☐ Trainee Name (Print) Jeremy Roen Drilling Company Roen Drilling
Driller/Engineer/Trainee Signature Address
Driller or Trainee License No. 2536 City, State, Zip
If trainee, licensed driller's Signature and License no.
Contractor's Registration No. OFFICEBOX133WA Date 5/3/06

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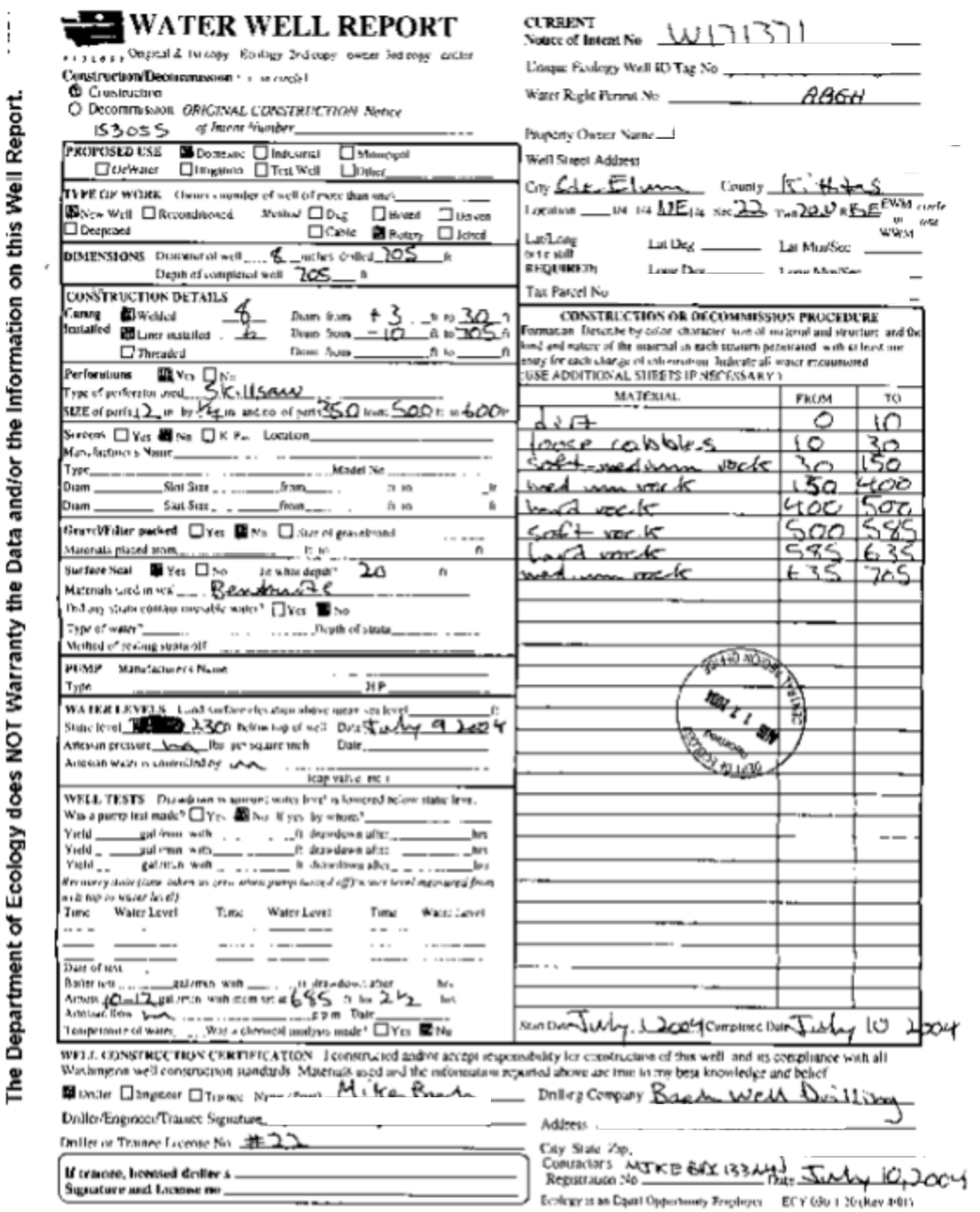
Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (mark one)
- ☒ Construction
- ○ Decommission ORIGINAL CONSTRUCTION Notice of Intent Number 153055

PROPOSED USE ☒ Domestic ☐ Industrial ☐ Municipal ☐ Dewater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK Owner's number of well (if more than one) ☒ New Well ☐ Reconditioned Method ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS Diameter of well 6 inches drilled 705 ft. Depth of completed well 705 ft.

CONSTRUCTION DETAILS
Casing ☒ Welded 6 Diam from +3 ft. to 30 ft.
Installed ☒ Liner installed 6 Diam from -10 ft. to 705 ft.
☐ Threaded Diam from ft. to ft.

Perforations ☒ Yes ☐ No
Type of perforator used SKILLSAW
SIZE of perfs 1/2 in. by 1/4 in. and no. of perfs 350 from 500 ft. to 600 ft.

Screens ☐ Yes ☒ No ☐ K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft. to ft.
Diam Slot Size from ft. to ft.

Gravel/Filter packed ☐ Yes ☒ No ☐ Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal ☒ Yes ☐ No To what depth? 20 ft.
Materials used in seal BENTONITE
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type HP

WATER LEVELS Land surface elevation above mean sea level ft.
Static level 230 ft. below top of well Date July 9 2004
Artesian pressure low lbs. per square inch Date
Artesian water is controlled by (cap valve, etc.)

WELL TESTS Drawdown is amount water level is lowered below static level.
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield gal/min with ft. drawdown after hrs.
Yield gal/min with ft. drawdown after hrs.
Yield gal/min with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal/min with ft. drawdown after hrs.
Airlift 40-50 gal/min with 6.85 ft. below 2 1/2 hrs.
Artesian flow low gpm Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

CURRENT Notice of Intent No W171371
Unique Ecology Well ID Tag No
Water Right Permit No ABGH
Property Owner Name
Well Street Address
City Edw. Elum County [redacted]
Location NW 1/4 NE 1/4 Sec 22 Twp 20 N R 5E EWM or WWM
Lat/Long (to the nearest 1/2 second) Lat Deg Lat Min/Sec
Long Deg Long Min/Sec
Tax Parcel No

CONSTRUCTION OR DECOMMISSION PROCEDURE
For each material, describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
dirt	0	10
loose cobbles	10	30
soft-med sand rock	30	150
med hard rock	150	400
hard rock	400	500
soft rock	500	595
hard rock	595	635
med hard rock	635	705

Start Date July 1 2004 Completed Date July 10 2004

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

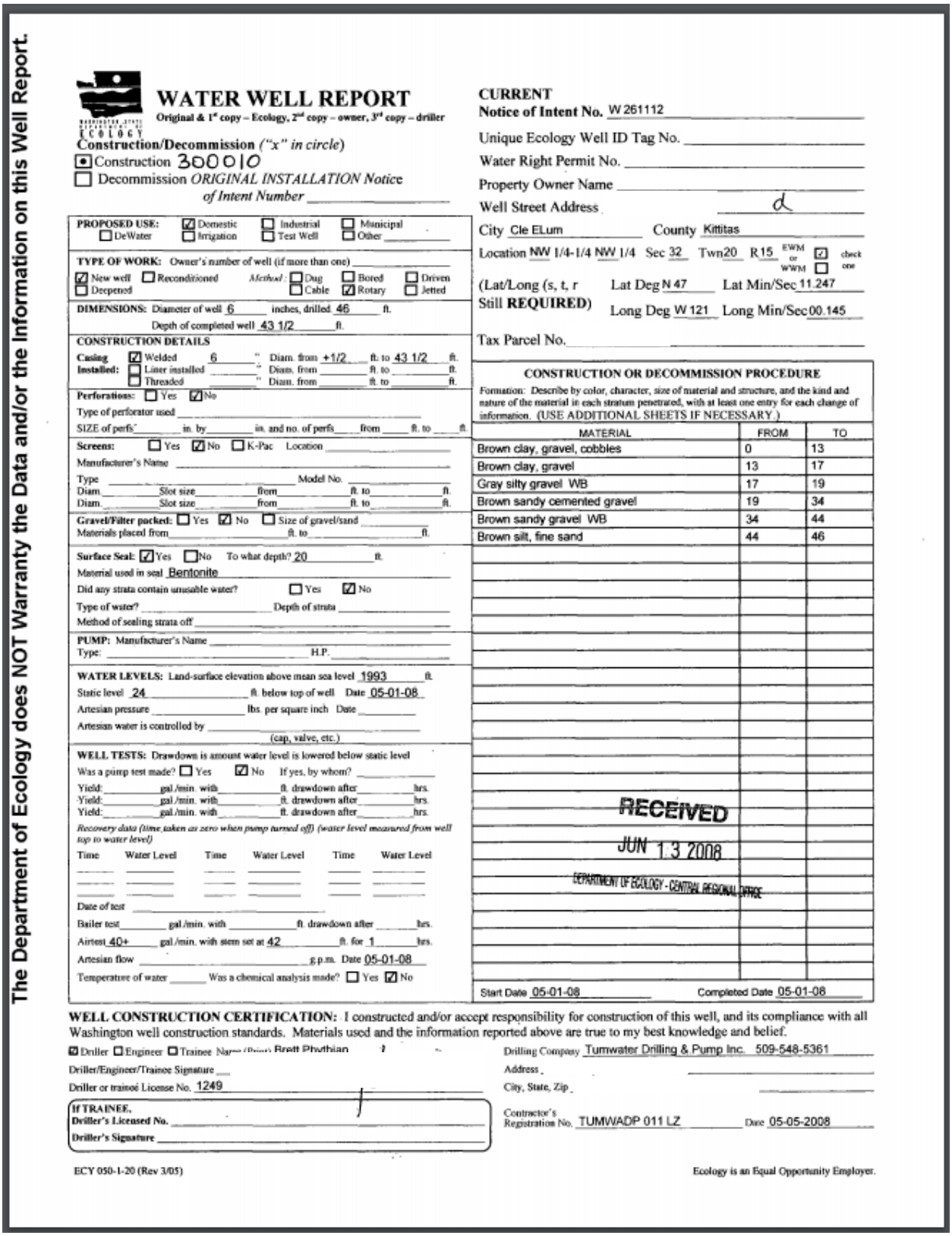
☒ Driller ☐ Engineer ☐ Trainee Name (Type or Print) Mike Brock
Driller/Engineer/Trainee Signature
Driller or Trainee License No #22
If trainee, licensed driller's Signature and License no.

Driller Company Baeth Well Drilling
Address
City State Zip
Contractor's Registration No [redacted] Date July 10, 2004

Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

ECOLOGY

Construction/Decommission *("x" in circle)*

(•) Construction 300010

( ) Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT

Notice of Intent No. W 261112

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address d

City Cle ELum County Kittitas

Location NW 1/4-1/4 NW 1/4 Sec 32 Twn 20 R 15 EWM or WWM [x] check one

(Lat/Long (s, t, r Still **REQUIRED**) Lat Deg N 47 Lat Min/Sec 11.247 Long Deg W 121 Long Min/Sec 00.145

Tax Parcel No. _____

PROPOSED USE: [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK: Owner's number of well (if more than one) _____

[x] New well [ ] Reconditioned [ ] Deepened *Method:* [ ] Dug [ ] Bored [ ] Driven [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 46 ft. Depth of completed well 43 1/2 ft.

CONSTRUCTION DETAILS

Casing Installed: [x] Welded 6 " Diam. from +1/2 ft. to 43 1/2 ft. [ ] Liner installed " Diam. from ft. to ft. [ ] Threaded " Diam. from ft. to ft.

Perforations: [ ] Yes [x] No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: [ ] Yes [x] No [ ] K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: [ ] Yes [x] No [ ] Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: [x] Yes [ ] No To what depth? 20 ft.

Material used in seal Bentonite

Did any strata contain unusable water? [ ] Yes [x] No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level 1993 ft.

Static level 24 ft. below top of well Date 05-01-08

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? [ ] Yes [x] No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 40+ gal./min. with stem set at 42 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date 05-01-08

Temperature of water _____ Was a chemical analysis made? [ ] Yes [x] No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown clay, gravel, cobbles	0	13
Brown clay, gravel	13	17
Gray silty gravel WB	17	19
Brown sandy cemented gravel	19	34
Brown sandy gravel WB	34	44
Brown silt, fine sand	44	46

RECEIVED

JUN 13 2008

DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 05-01-08 Completed Date 05-01-08

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Brett Phythian

Driller/Engineer/Trainee Signature _____

Driller or trainee License No. 1249

If TRAINEE, Driller's Licensed No. _____

Driller's Signature _____

Drilling Company Tumwater Drilling & Pump Inc. 509-548-5361

Address _____

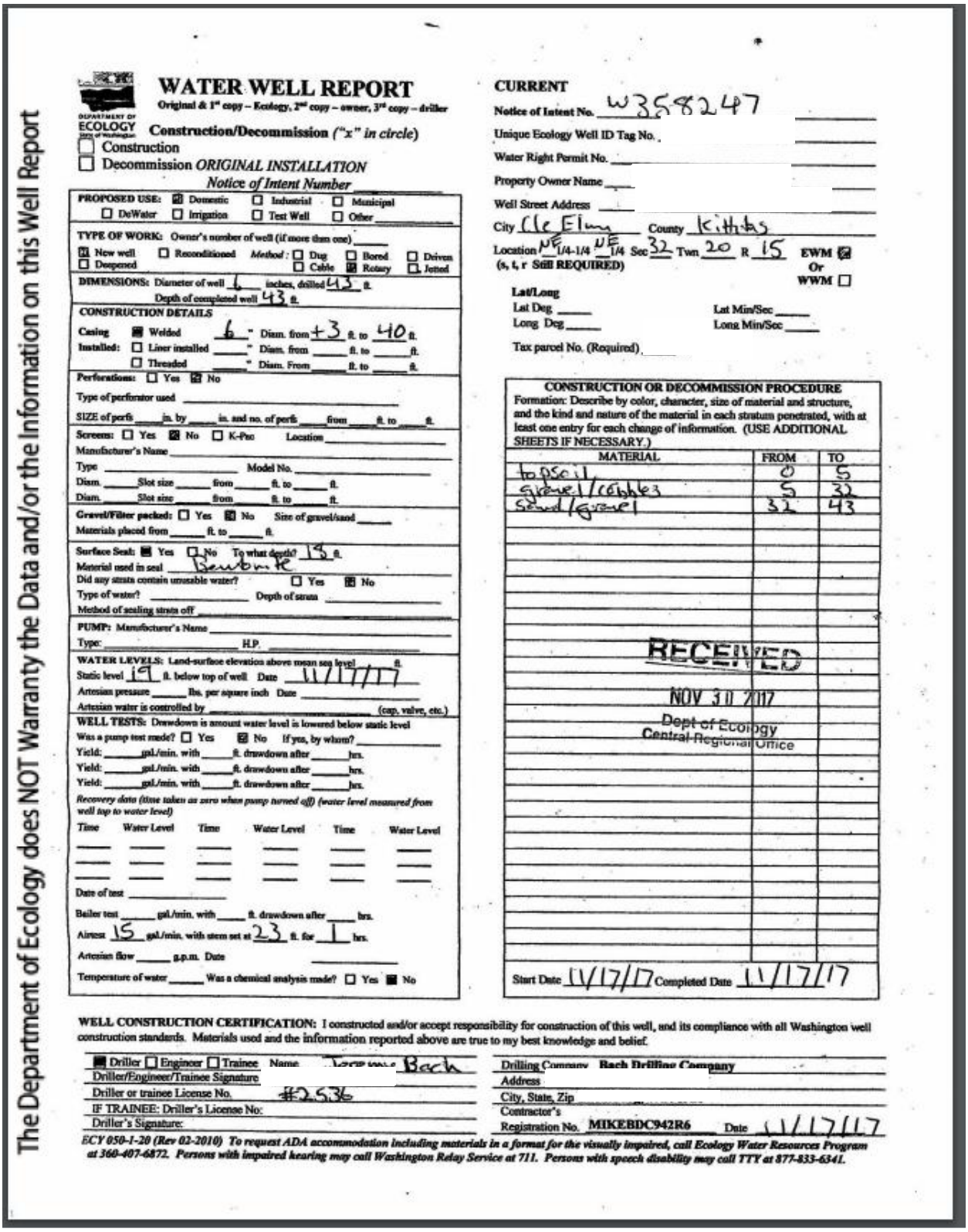
City, State, Zip _____

Contractor's Registration No. TUMWADP 011 LZ Date 05-05-2008

ECY 050-1-20 (Rev 3/05)

Ecology is an Equal Opportunity Employer.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY

Construction/Decommission *("x" in circle)*

☐ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number

CURRENT

Notice of Intent No. W3582247

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name

Well Street Address

City Cle Elum County Kittitas

Location NE 1/4-1/4 NE 1/4 Sec 32 Twn 20 R 15 EWM ☑ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long

Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax parcel No. (Required)

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)

☑ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 43 ft.

Depth of completed well 43 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 6" Diam. from +3 ft. to 40 ft.

☐ Liner installed ____" Diam. from ____ ft. to ____ ft.

☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☐ Yes ☑ No

Type of perforator used

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location

Manufacturer's Name

Type Model No.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☑ No Size of gravel/sand

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 19 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 19 ft. below top of well Date 11/17/17

Artesian pressure ____ lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☑ No If yes, by whom?

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airest 15 gal./min. with stem set at 23 ft. for 1 hrs.

Artesian flow ____ g.p.m. Date

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☑ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil	0	5
gravel/cobbles	5	32
sand/gravel	32	43

RECEIVED

NOV 30 2017

Dept of Ecology
Central Regional Office

Start Date 11/17/17 Completed Date 11/17/17

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name Jesse Bach	Drilling Company Bach Drilling Company
Driller/Engineer/Trainee Signature	Address
Driller or trainee License No. #2536	City, State, Zip
IF TRAINEE: Driller's License No:	Contractor's Registration No. MIKEBDC942R6 Date 11/17/17
Driller's Signature:	

ECY 050-1-20 (Rev 02-2010) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

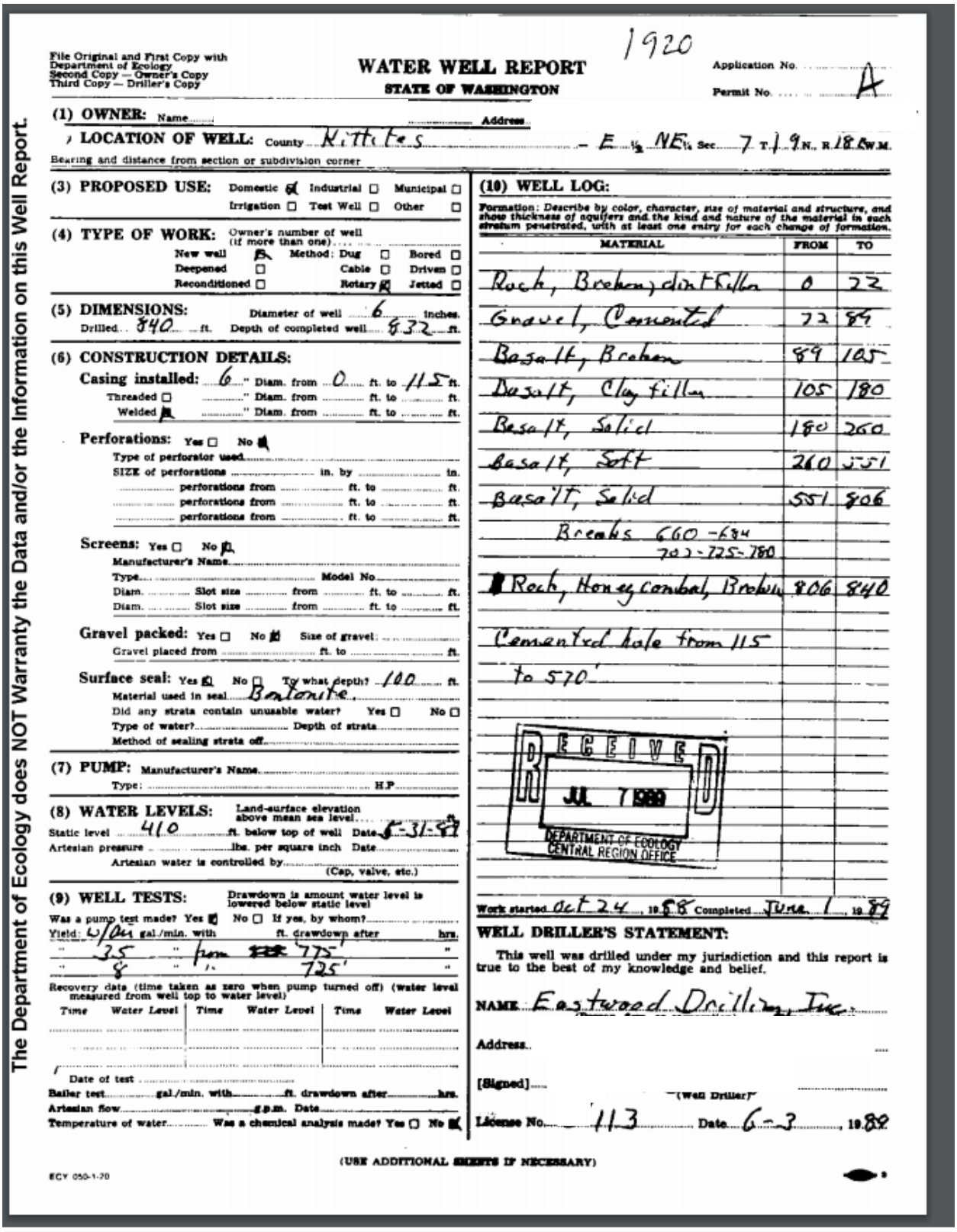
The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.

APPENDIX D- KITTITAS VALLEY WELL LOGS

Well Name	General Description	Unique Well ID/ Report ID
North of Irrigation		
Grn18	Above irrigation canals, amidst natural vegetation	114045
W122	N end of transect, above influence of irrigation	117909
Clk64	Perched on basalt hills E of Cooke Canyon	ALE717
Chr90	N end of transect, above irrigation canals	
W117	N end of transect, above irrigation canals	ACE847
W268	N end of transect, above irrigation canals	APG092
Chr20	E of Naneum Creek, above irrigation canals	BCF654
Chr33	E of Naneum Creek, above irrigation canals	AKW771
Prk	Group home located at the mouth of Parke Creek Canyon	BJA353
Ck23	Between Coleman Creek and Cooke Creek, above irrigation canals	
North Valley		
Af20	N end of transect, amidst hay fields	AKW761
Af86	N end of transect, amidst hay fields	BCF670
W64	N end of transect, amidst hay fields	BJA252
W45	N end of transect, amidst hay fields	AKW860
L97	N end of transect, amidst hay fields	
L45	N end of transect, amidst hay fields	BAP350
Bar90	N end of transect, amidst hay fields	119247
W70	N end of transect, amidst hay fields	
Bar94	N end of transect, amidst hay fields	BBJ414
Center Valley		
3rd26	Middle of transect located near Ellensburg High School	BAF788
Pf20	Middle of transect located near Ellensburg High School	BAF620
Tj39	S half of transect located E of the I-90 & I-82 junction, amidst hay fields	ALK738
Tj39(b)	S half of transect located E of the I-90 & I-82 junction, amidst hay fields	
W127	Middle of transect, amidst hay fields	
Sor17	Between Ellensburg and Badger Pocket, amidst hay fields	
South Valley		
Trl60	S end of the transect, ~2 miles N of Manastash Ridge	ALE060
Trl32	S end of the transect, ~1.5 miles N of Manastash Ridge	BAF692
Or51	S end of the transect, ~1.5 miles N of Manastash Ridge	AKL756
Trl30	S end of the transect, ~1.5 miles N of Manastash Ridge	AGL601
West Valley		
RB20	SW section of Kittitas Valley, amidst hay fields	ABX615
Mn10	SW section of Kittitas Valley, amidst hay fields	
Badger Pocket		
Boh501	In Badger Pocket, on local terrace above Badger Creek, amidst hay fields	ACX617
UpB91	In Badger Pocket on W floodplain of Badger Creek	
Mor	Abandoned well in Badger Pocket located on E floodplain of Badger Creek	
Cm14	In Badger Pocket on terrace E of Badger Creek	
Km100	In Badger Pocket located at the base of a terrace to the W of Badger Creek	
By61	In Badger Pocket, ~100ft south of the pump ditch Irrigation canal	
UpB17	In Badger Pocket, ~400yrds south of the pump ditch Irrigation canal	
WPA51	In Badger Pocket, on terrace W of Badger Creek, amidst hay fields	
Bor	In Badger Pocket, on terrace W of Badger Creek, amidst hay fields	ACX616
Km89	In Badger Pocket located at the base of a terrace to the W of Badger Creek	

North West Valley		
Man22	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	BIF315
Man20	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	
Hwy10	On terrace E of the Yakima R. and W of the Kittitas Valley Anticline	
Man60	0.25mi E Yakima R. and 0.25mi W of the Kittitas Valley Anticline	ACL650



1920

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. A

(1) OWNER: Name ..... Address .....

(2) LOCATION OF WELL: County Kittitas — E ½ NE ¼ Sec. 7 T. 19 N. R. 18 E W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 840 ft. Depth of completed well 832 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 115 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name .....
Type ..... Model No .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 100 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 410 ft. below top of well Date 5-31-89
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? .....
Yield: 5/0n gal./min. with ..... ft. drawdown after ..... hrs.
" 35 " from 775 "
" 8 " " 725'
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Rock, Broken, dirt fills	0	22
Gravel, Cemented	22	89
Basalt, Broken	89	105
Basalt, Clay fills	105	180
Basalt, Solid	180	260
Basalt, Soft	260	551
Basalt, Solid	551	806
Breaks 660-684 703-725-780		
Rock, Honeycombed, Broken	806	840
Cemented hole from 115 to 570'		

RECEIVED
JUL 7 1989
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started Oct 24 19 88 Completed June 1 19 89

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

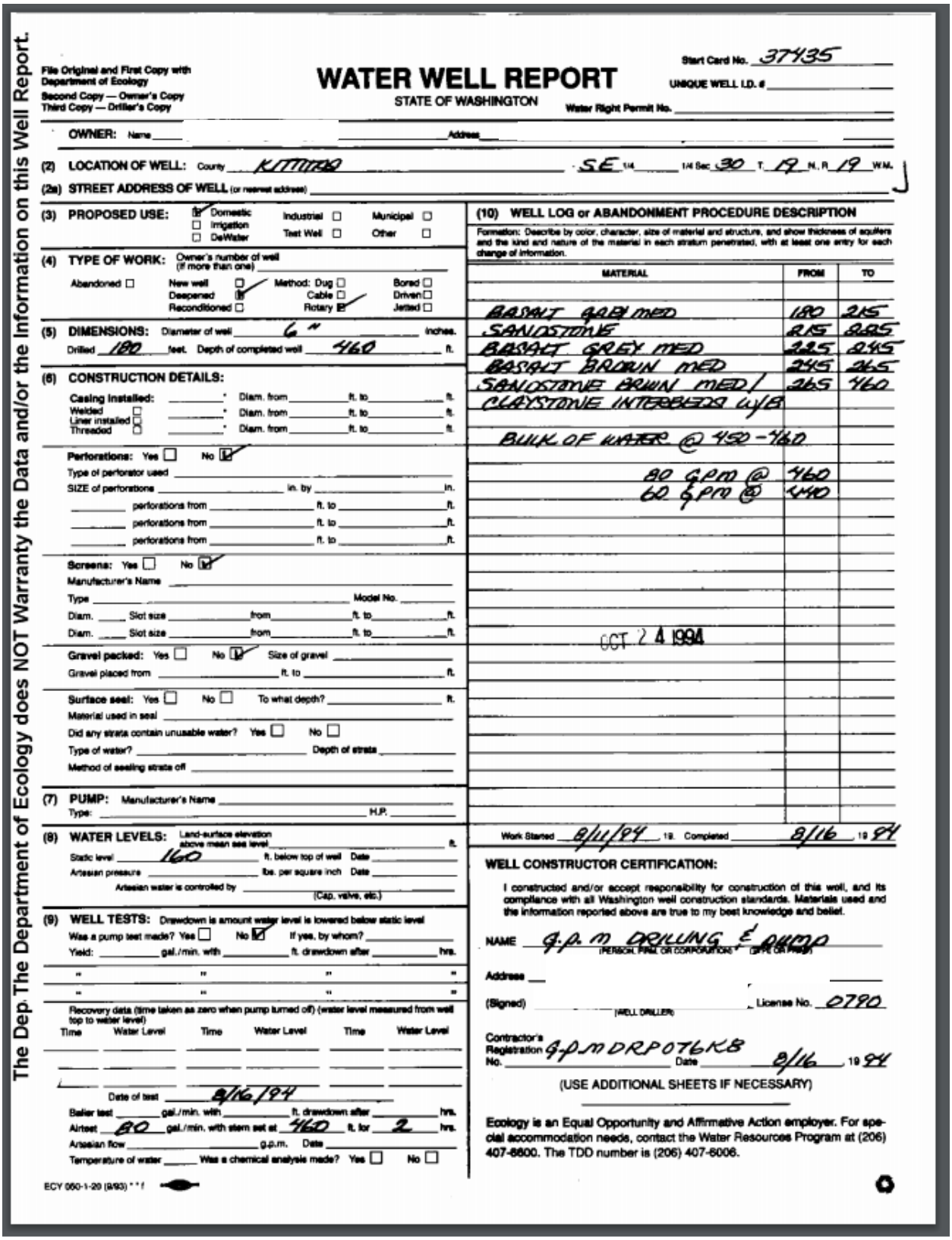
NAME Eastwood Drilling, Inc.
Address .....
[Signed] ..... (Well Driller)
License No. 113 Date 6-3 19 89

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 37435
UNIQUE WELL I.D. #
Water Right Permit No.

OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County KITTITAS SE 1/4 1/4 Sec 30 T. 19 N. R. 19 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) [redacted]

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) [redacted]
Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches.
Drilled 180 feet. Depth of completed well 460 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: ____" Diam. from ____ ft. to ____ ft.
Welded ☐ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐ Threaded ☐ ____" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used [redacted]
SIZE of perforations [redacted] in. by [redacted] in.
[redacted] perforations from [redacted] ft. to [redacted] ft.
[redacted] perforations from [redacted] ft. to [redacted] ft.
[redacted] perforations from [redacted] ft. to [redacted] ft.

Screens: Yes ☐ No ☒
Manufacturer's Name [redacted]
Type [redacted] Model No. [redacted]
Diam. [redacted] Slot size [redacted] from [redacted] ft. to [redacted] ft.
Diam. [redacted] Slot size [redacted] from [redacted] ft. to [redacted] ft.

Gravel packed: Yes ☐ No ☒ Size of gravel [redacted]
Gravel placed from [redacted] ft. to [redacted] ft.

Surface seal: Yes ☐ No ☐ To what depth? [redacted] ft.
Material used in seal [redacted]
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? [redacted] Depth of strata [redacted]
Method of sealing strata off [redacted]

(7) PUMP: Manufacturer's Name [redacted]
Type: [redacted] H.P. [redacted]

(8) WATER LEVELS: Land-surface elevation above mean sea level [redacted] ft.
Static level 160 ft. below top of well Date [redacted]
Artesian pressure [redacted] lbs. per square inch Date [redacted]
Artesian water is controlled by [redacted] (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? [redacted]
Yield: [redacted] gal./min. with [redacted] ft. drawdown after [redacted] hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 8/16/94
Bailer test [redacted] gal./min. with [redacted] ft. drawdown after [redacted] hrs.
Airtest 80 gal./min. with stem set at 460 ft. for 2 hrs.
Artesian flow [redacted] g.p.m. Date [redacted]
Temperature of water [redacted] Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
BASALT GRY MED	180	215
SANDSTONE	215	225
BASALT GREY MED	225	245
BASALT BROWN MED	245	265
SANDSTONE BRWN MED / CLAYSTONE INTERBEDS W/B	265	460
BULK OF WATER @ 450-460		
80 GPM @	460	
60 GPM @	440	

OCT 24 1994

Work Started 8/11/94 19. Completed 8/16 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME G.P.M. DRILLING & PUMP (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address [redacted]

(Signed) [redacted] (WELL DRILLER) License No. 0790

Contractor's Registration No. G.P.M.DRP076K8 Date 8/16 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6800. The TDD number is (206) 407-6006.

ECY 050-1-20 (8/93)

The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Web Report.

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W223385
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County KITTITAS - 1/4 SW 1/4 Sec 29 T. 19 N.,R 20 W.M.
(2a) STREET ADDRESS OF WELL (or nearest address)
TAX PARCEL NO. LMNP

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
[X] New Well Method: [ ] Dug [ ] Bored
[ ] Deepened [ ] Cable [ ] Driven
[ ] Reconditioned [X] Rotary [ ] Jetted
[ ] Decommission

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 566 feet. Depth of completed well 566 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 8 " Diam. from +1 1/2 ft. to 251 ft.
[X] Liner installed 6 " Diam. from 226 ft. to 556 ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [X] Yes [ ] No
Type of perforator used TORCH
SIZE of perforations 1/8 in. by 8 in.
50 perforations from 486 ft. to 526 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 220 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 397 ft. below top of well Date 11/23/2005
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 25 gal./min. with stem set at 500 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL BASALT & BOLDERS	0	5
SOIL & BROKEN BASALT	5	11
BASALT & CLAY	11	25
BASALT	25	93
BASALT & CLAY THEIF @ 96	93	126
BASALT	126	224
BASALT GREY BROWN BROKEN	224	232
BASALT GREY BROWN	232	247
BASALT DARK GREY HARD	247	276
BASALT BROKEN & CLAY	276	286
BASALT BLACK BROWN & CLAY BROWN	286	289
BASALT BLACK BROWN	289	297
BASALT DARK GREY	297	340
BASALT BROWN SOFT	340	345
BASALT BROKEN GREY BROWN & CLAY SOFT	345	418
BASALT BLACK BROWN	418	456
SHALE CLAY GREEN	456	475
BASALT DARK GREY	475	503
BASALT DARK GREY & YELLOW SHALE CLAY	503	
SOFT		507
BASALT	507	510
BASALT GREY RED & YELLOW SHALE CLAY	510	
SOFT		517
CLAY TAN	517	546
SANDSTONE SAND & SHALE CLAY LAYERS	546	
GREY		566
25 GPM @ 500		
20 GPM @ 460		
5 GPM @ 420		

DEPT. OF ECOLOGY Received DEC 27 2005 CENTRAL REGION OFFICE

Work Started 11/15/2005 , 19. Completed 11/23/2005 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name TOM MCGUIRE License No. 0357
(Licensed Driller/Engineer)
Trainee Name License No.
Drilling Company RICK ROLLIN WELL DRILLING INC.
(Signed) License No. 0357
(Licensed Driller/Engineer)
Address 1301 LANCASTER RD SELAH, WA 98942
Contractor's Registration No. RICKPWD042J2 Date 11/28/2005 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

Note: Personally Identifying Info redacted due to privacy concerns.

The Dep. The Department of Ecology does NOT Warrant the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W087481
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Kittitas NW 1/4 1/4 Sec 32 T. 19 N. R 19 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) _____
Abandoned ☐ New well ☑ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 X 6 inches. Drilled 235 feet. Depth of completed well 235 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +2 ft. to 57' ft.
Welded ☑ 4" Diam. from -2 ft. to 235 ft.
Liner installed ☑
Threaded ☐ _____ Diam. from _____ ft. to _____ ft.

Perforations: Yes ☑ No ☐
Type of perforator used Skil saw
SIZE of perforations 1/8 in. by 6 in.
220 perforations from 175 ft. to 235 ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☑
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☑ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 77 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: 11 gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" Approx Airlift 11 gpm "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

ECY 050-1-20 (9/93)

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Ok loam w/Cobbles	0	2
Cobbles - Boulders w/clay & hard clay	2	17
Cobbles - Boulders BLK VH	17	27
Cobbles - Mag. gravels Cemented	27	42
Boulders - Cobbles BLK VH	42	48
Cobbles w/Basalt BRN-BLK H	48	56
Basalt w/Tan Shale VH	56	63
Broken Basalt w/BRN Shale gravels	63	74
Broken Basalt w/gravels BLK	74	76
FRAC Basalt w/green Shale	76	94
Broken Basalt BLK/BLK BRN Sandstone	94	108
Basalt BLK w/orange Sandy Shale	108	111
Broken Basalt BLK w/BRN Shale	111	171
Broken Basalt BLK/BLK w/Rounded gravels	171	235

RECEIVED
FEB 7 1997
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work Started 1-24-97 19 Completed 1-28 97 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Water Man Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address

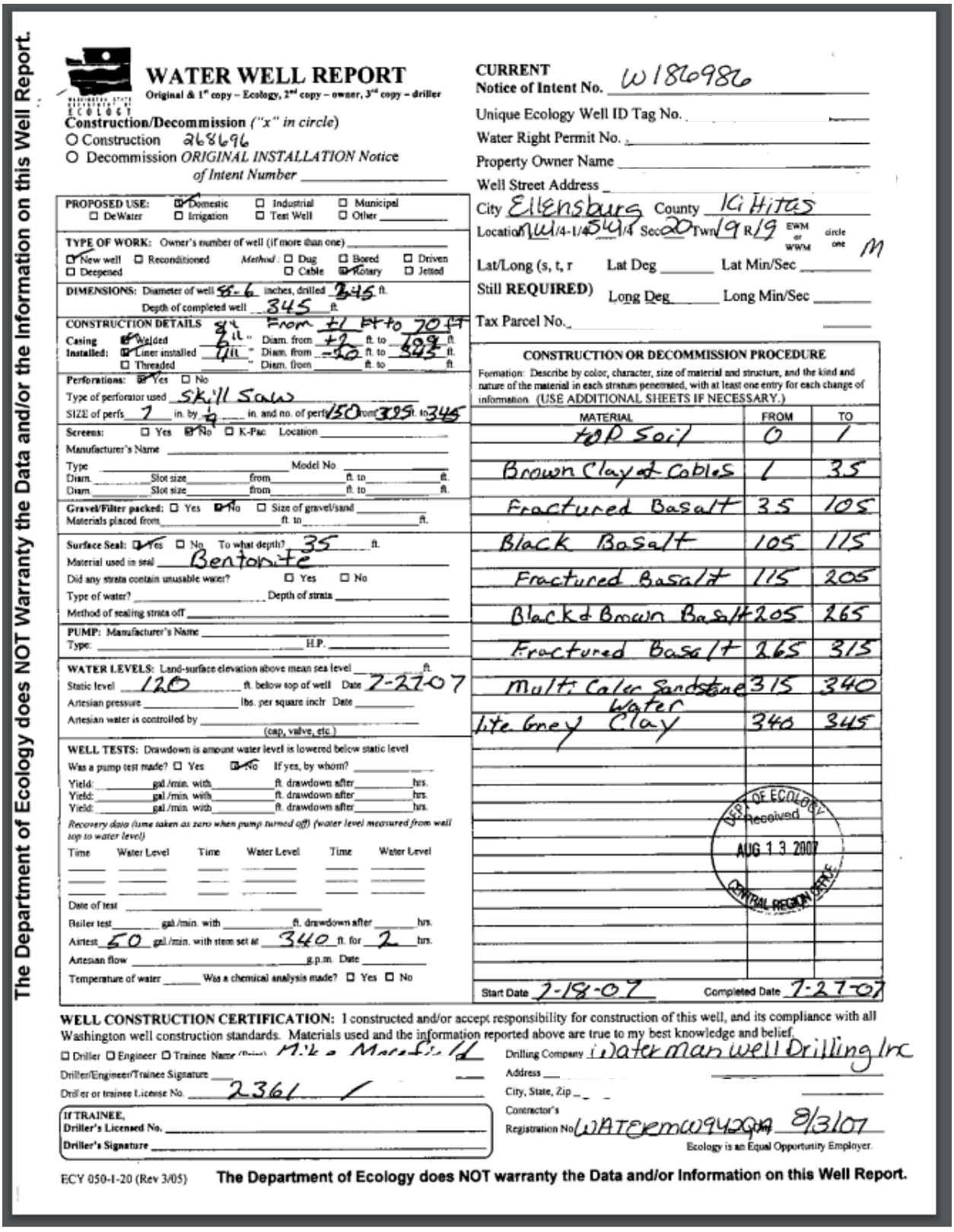
(Signed) _____ License No. RBBS 2060

Contractor's Registration No. WATERMW0064J2 1-31-97 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

○ Construction 268696

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT Notice of Intent No. W186986

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address _____

City Ellensburg County Kittitas

Location NW 1/4-1/4 34 1/4 Sec 20 Twn 19 R 19 EWM or WWM (circle one) M

Lat/Long (s, t, r Still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☑ New well ☐ Reconditioned ☐ Deepened *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 8-6 inches, drilled 345 ft. Depth of completed well 345 ft.

CONSTRUCTION DETAILS 8" From +1 ft to 70 ft

Casing ☑ Welded 6" Diam. from +2 ft. to 109 ft.

Installed: ☑ Liner installed 4" Diam. from -50 ft. to 303 ft.

☐ Threaded _____ Diam. from _____ ft. to _____ ft.

Perforations: ☑ Yes ☐ No

Type of perforator used Skil Saw

SIZE of perfs 7 in. by 1/4 in. and no. of perfs 150 from 305 ft. to 345

Screens: ☐ Yes ☑ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 35 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level 120 ft. below top of well Date 7-27-07

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☑ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 50 gal./min. with stem set at 340 ft. for 2 hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
top Soil	0	1
Brown Clay & Cobles	1	35
Fractured Basalt	35	105
Black Basalt	105	115
Fractured Basalt	115	205
Black & Brown Basalt	205	265
Fractured Basalt	265	315
Multi Color Sandstone Water	315	340
Lite Grey Clay	340	345

DEPT OF ECOLOGY Received AUG 13 2007 CENTRAL REGION OFFICE

Start Date 7-18-07 Completed Date 7-27-07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) Mike Macefield

Driller/Engineer/Trainee Signature _____

Driller or trainee License No. 2361

Drilling Company Waterman Well Drilling Inc

Address _____

City, State, Zip _____

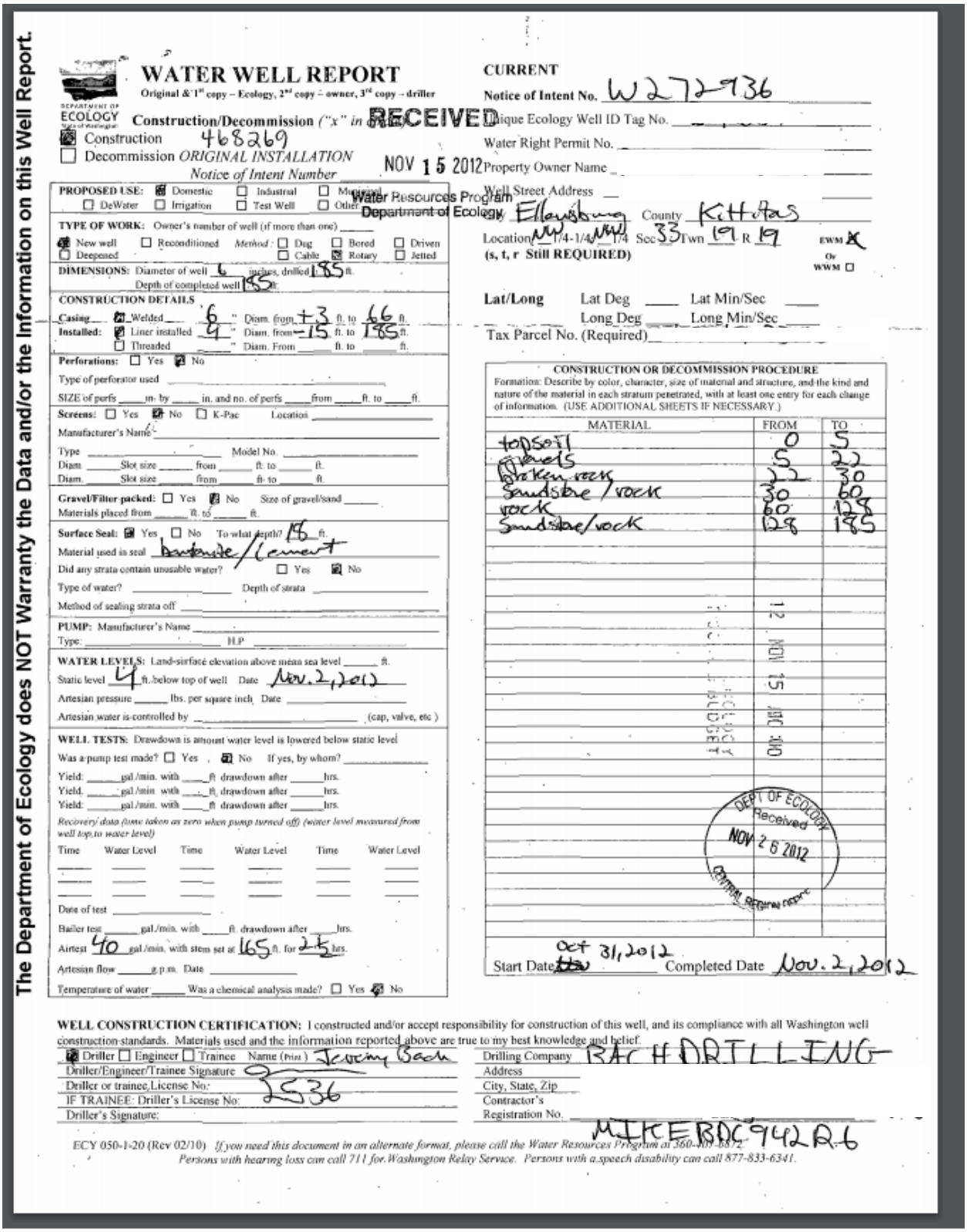
Contractor's Registration No WATERMW942QM 8/3/07

IF TRAINEE, Driller's Licensed No. _____ Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY

Construction/Decommission ("x" in box) **RECEIVED**

☒ Construction 468269

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number

NOV 15 2012

Water Resources Program
Department of Ecology

CURRENT

Notice of Intent No. W272936

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address _____

City Ellensburg County Kittitas

Location NW 1/4-1/4 NW 1/4 Sec 33 Twn 19 R 19 EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) _____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one) _____

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 185 ft. Depth of completed well 185 ft.

CONSTRUCTION DETAILS

Casing: ☒ Welded 6" Diam. from +3 ft. to 66 ft.

Installed: ☒ Liner installed 4" Diam. from -15 ft. to 185 ft.

☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____in. by _____ in. and no. of perfs _____from _____ft. to _____ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.

Material used in seal bentonite/cement

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level 4 ft. below top of well Date Nov. 2, 2012

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____gal./min. with _____ft. drawdown after _____hrs.

Yield: _____gal./min. with _____ft. drawdown after _____hrs.

Yield: _____gal./min. with _____ft. drawdown after _____hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ft. drawdown after _____hrs.

Airtest 40 gal./min. with stem set at 165 ft. for 25 hrs.

Artesian flow _____g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil	0	5
gravels	5	22
broken rock	22	30
sandstone / rock	30	60
rock	60	129
sandstone/rock	129	185

DEPT OF ECOLOGY Received NOV 26 2012 Central Regional Office

Start Date Oct 31, 2012 Completed Date Nov. 2, 2012

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Jeremy Bach

Driller/Engineer/Trainee Signature _____

Driller or trainee License No: 2536

IF TRAINEE: Driller's License No: _____

Driller's Signature: _____

Drilling Company BACHDRILLING

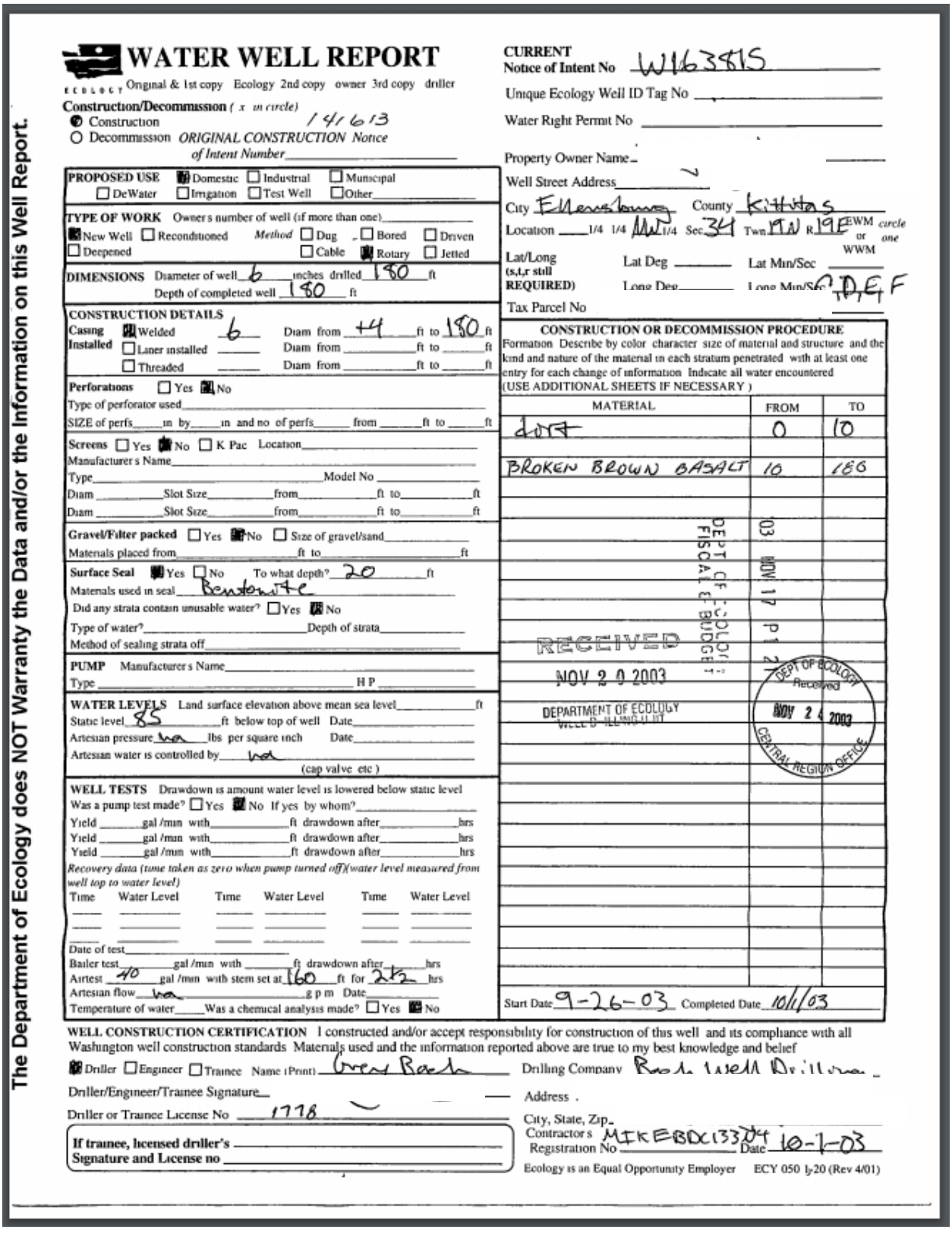
Address _____

City, State, Zip _____

Contractor's Registration No. MIKEBDC942RG

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- (●) Construction 1/16/13
- ( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT
Notice of Intent No W163815

Unique Ecology Well ID Tag No

Water Right Permit No

Property Owner Name

Well Street Address

City Ellensburg County Kittitas

Location 1/4 1/4 NW 1/4 Sec 34 Twn 19N R 19E EWM or WWM (circle one)

Lat/Long (s,t,r still REQUIRED) Lat Deg Lat Min/Sec Long Deg Long Min/Sec

Tax Parcel No

PROPOSED USE (■) Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK Owner's number of well (if more than one)
(■) New Well ☐ Reconstructed Method ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable (■) Rotary ☐ Jetted

DIMENSIONS Diameter of well 6 inches drilled 180 ft
Depth of completed well 180 ft

CONSTRUCTION DETAILS
Casing Installed (■) Welded 6 Diam from +4 ft to 180 ft
☐ Liner installed Diam from ft to ft
☐ Threaded Diam from ft to ft

Perforations ☐ Yes (■) No
Type of perforator used
SIZE of perfs in by in and no of perfs from ft to ft

Screens ☐ Yes (■) No ☐ K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed ☐ Yes (■) No ☐ Size of gravel/sand
Materials placed from ft to ft

Surface Seal (■) Yes ☐ No To what depth? 20 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ☐ Yes (■) No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type H P

WATER LEVELS Land surface elevation above mean sea level ft
Static level 85 ft below top of well Date
Artesian pressure n/a lbs per square inch Date
Artesian water is controlled by n/a (cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes (■) No If yes by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 40 gal /min with stem set at 160 ft for 2½ hrs
Artesian flow n/a g p m Date
Temperature of water Was a chemical analysis made? ☐ Yes (■) No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
dirt	0	10
BROKEN BROWN BASALT	10	180

DEPT OF ECOLOGY FISCAL & BUDGET 03 NOV 17 P 12

RECEIVED NOV 20 2003 DEPARTMENT OF ECOLOGY

DEPT OF ECOLOGY Received NOV 24 2003 CENTRAL REGION OFFICE

Start Date 9-26-03 Completed Date 10/1/03

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

(■) Driller ☐ Engineer ☐ Trainee Name (Print) Brad Bach Drilling Company Bach Well Drilling

Driller/Engineer/Trainee Signature Address

Driller or Trainee License No 1778 City, State, Zip

If trainee, licensed driller's Signature and License no

Contractor's Registration No MIKEBDC133704 Date 10-7-03

Ecology is an Equal Opportunity Employer ECY 050 1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

WATER WELL REPORT

STATE OF WASHINGTON

9367 Start Card No. 08680

UNIQUE WELL I.D. # D

Water Right Permit No.

Name [redacted] Address

(2) LOCATION OF WELL: County Kittitas NW¼ NW¼ Sec. 34 T. 18 N., R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) 2

Abandoned ☐ New well ☑ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well ____ inches. Drilled ____ feet. Depth of completed well ____ ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from 0 ft. to 20 ft.
Welded ☑ 6" Diam. from +2 ft. to 298 ft.
Liner installed ☐
Threaded ☐ " Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type ____ Model No.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☑ Size of gravel
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☑ No ☐ To what depth? 25 ft.
Material used in seal CEMENT
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ____ Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: ____ H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 260 ft. below top of well Date
Artesian pressure ____ lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest 15 gal./min. with stem set at 360 ft. for 1 hrs.
Artesian flow ____ g.p.m. Date
Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Dirt - clay	0	10
Medium Black Basalt	10	140
SANDSTONE	140	180
MEDIUM BASALT	180	340
Fractured Basalt	340	360

RECEIVED
AUG 27 1993
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 6-28 19 Completed 7-12 19 93

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Bach Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address

(Signed) (WELL DRILLER) License No. 22

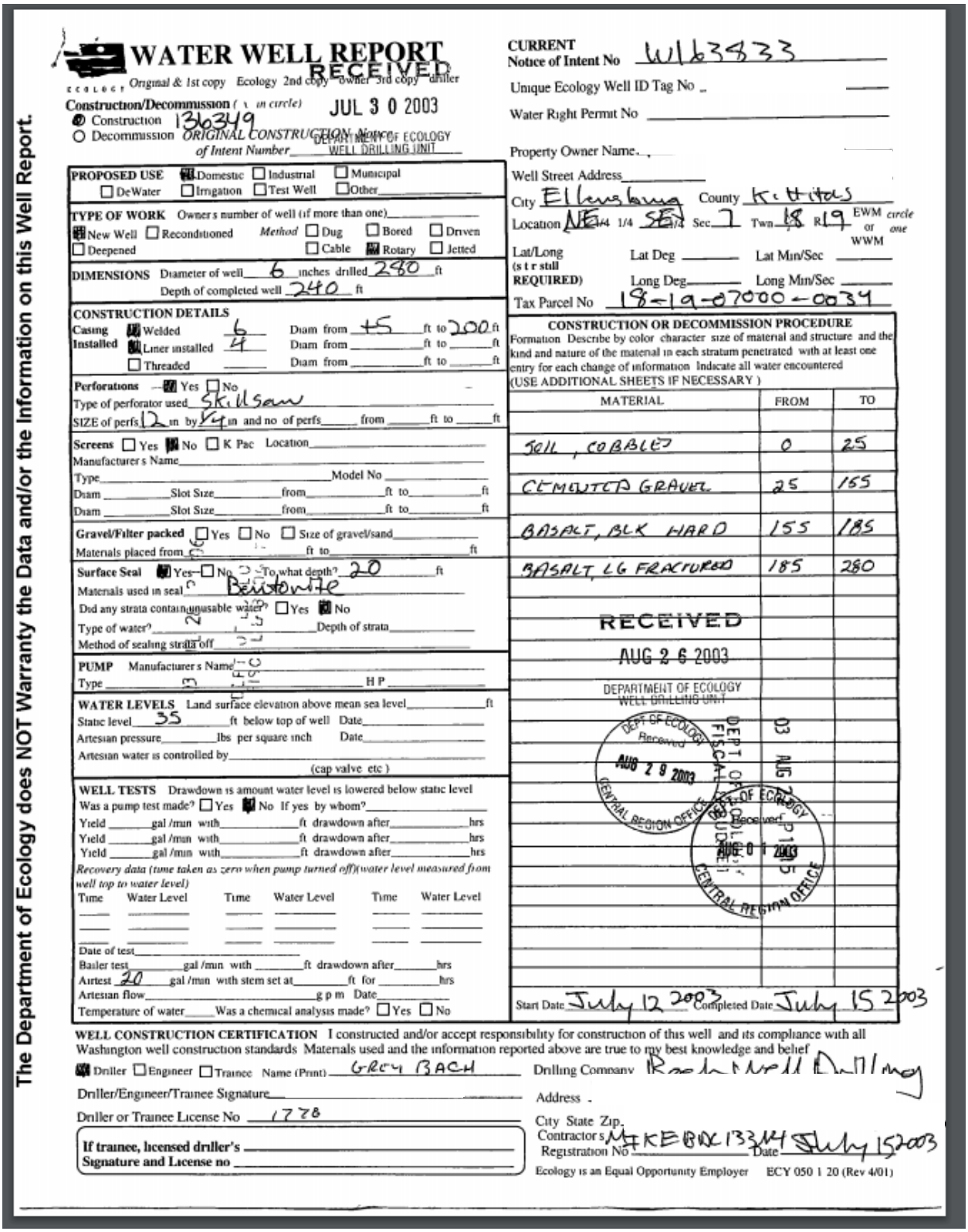
Contractor's Registration No. MIKEBOC133NJ4 Date 7-15 19 93

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

RECEIVED

JUL 30 2003

DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (circle)
- Construction 136349
- Decommission ORIGINAL CONSTRUCTION Notice of Intent Number

CURRENT Notice of Intent No WI63833

Unique Ecology Well ID Tag No

Water Right Permit No

Property Owner Name

Well Street Address

City Ellensburg County Kittitas

Location NE 1/4 1/4 SE 1/4 Sec 7 Twn 18 R 19 EWM or WWM (circle one)

Lat/Long (s t r still REQUIRED) Lat Deg Lat Min/Sec Long Deg Long Min/Sec

Tax Parcel No 18-19-07000-0034

PROPOSED USE Domestic Industrial Municipal DeWater Irrigation Test Well Other

TYPE OF WORK Owner's number of well (if more than one)
New Well Reconstructed Method: Dug Bored Driven Deepened Cable Rotary Jetted

DIMENSIONS Diameter of well 6 inches drilled 280 ft
Depth of completed well 240 ft

CONSTRUCTION DETAILS
Casing Installed: Welded 6 Diam from +5 ft to 200 ft
Liner installed 4 Diam from ft to ft
Threaded Diam from ft to ft

Perforations Yes No
Type of perforator used Skil Saw
SIZE of perfs 12 in by 1/4 in and no of perfs from ft to ft

Screens Yes No K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed Yes No Size of gravel/sand
Materials placed from ft to ft

Surface Seal Yes No To what depth? 20 ft
Materials used in seal Bentonite
Did any strata contain unusable water? Yes No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type HP

WATER LEVELS Land surface elevation above mean sea level ft
Static level 35 ft below top of well Date
Artesian pressure lbs per square inch Date
Artesian water is controlled by (cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes by whom?
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal/min with ft drawdown after hrs
Airtest 20 gal/min with stem set at ft for hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? Yes No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
SOIL, COBBLES	0	25
CEMENTED GRAVEL	25	155
BASALT, BLK HARD	155	185
BASALT, LG FRACTURED	185	280

RECEIVED
AUG 26 2003
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

DEPT OF ECOLOGY Received AUG 29 2003 CENTRAL REGION OFFICE

DEPT OF ECOLOGY Received AUG 01 2003 CENTRAL REGION OFFICE

Start Date July 12 2003 Completed Date July 15 2003

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) GREG BACH

Drilling Company Rodmell Drilling

Driller/Engineer/Trainee Signature

Address

Driller or Trainee License No 1778

City State Zip

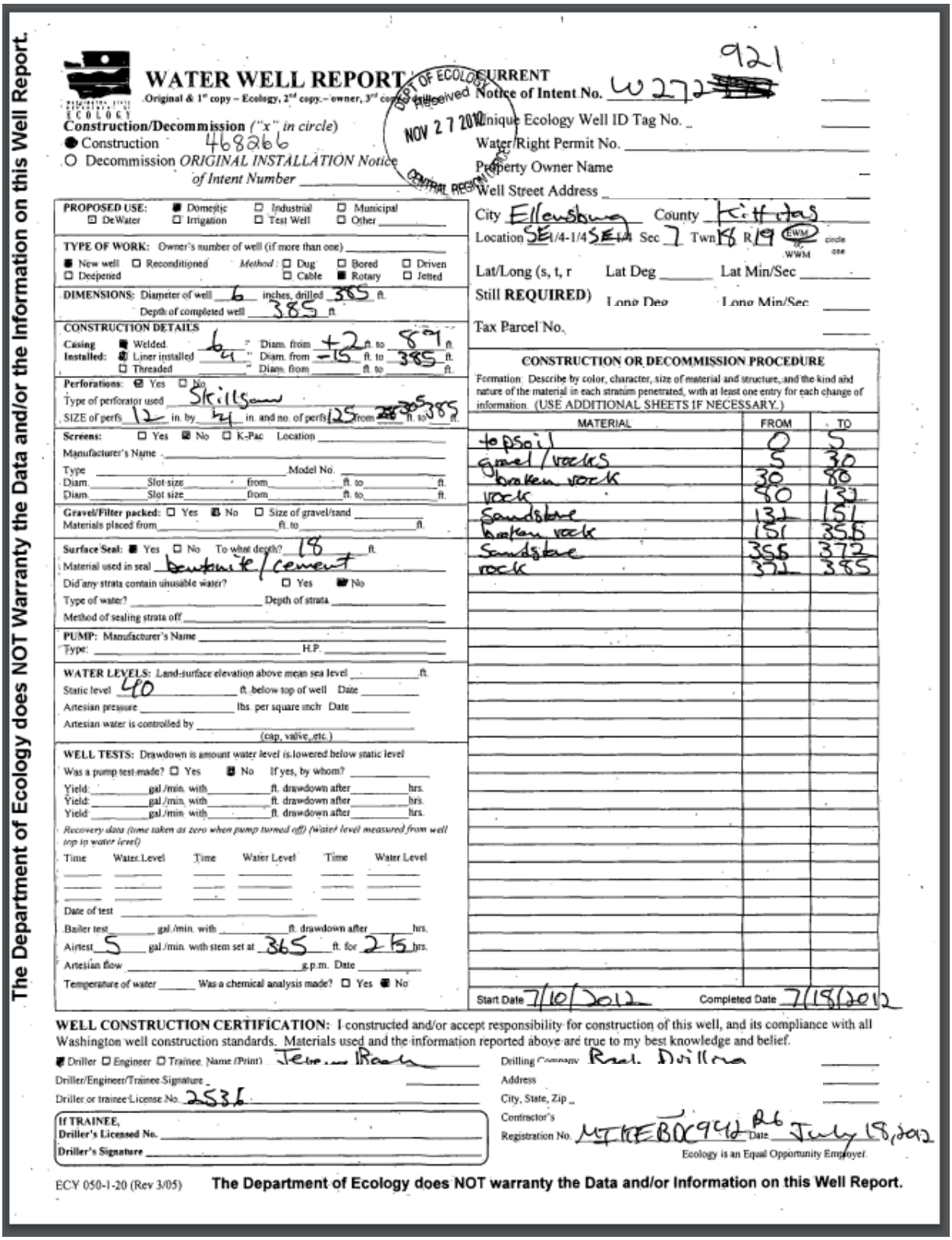
If trainee, licensed driller's Signature and License no

Contractor's Registration No MKEBRX133LL4 Date July 15 2003

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

CURRENT Notice of Intent No. W 272 921

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address _____

City Ellensburg County Kittitas

Location SE 1/4-1/4 SE 1/4 Sec 7 Twn 18 R 19 E/W/WWM (circle one)

Lat/Long (s, t, r Still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

Construction/Decommission ("x" in circle)
● Construction 46826
○ Decommission ORIGINAL INSTALLATION Notice of Intent Number _____

RECEIVED DEPT OF ECOLOGY NOV 27 2012 CENTRAL REGIONAL OFFICE

PROPOSED USE: ■ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
■ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ■ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 385 ft. Depth of completed well 385 ft.

CONSTRUCTION DETAILS
Casing Installed: ■ Welded 6" Diam. from +2 ft. to 89 ft. ■ Liner installed 4" Diam. from -15 ft. to 385 ft. ☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ■ Yes ☐ No
Type of perforator used Skillsaw
SIZE of perfs 1/2 in. by 1/4 in. and no. of perfs 125 from 260 305 ft. to 385 ft.

Screens: ☐ Yes ■ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ■ No ☐ Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: ■ Yes ☐ No To what depth? 18 ft.
Material used in seal bentonite/cement
Did any strata contain unusable water? ☐ Yes ■ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 40 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ■ No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 5 gal./min. with stem set at 365 ft. for 2 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ■ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil	0	5
gravel/rocks	5	30
broken rock	30	80
rock	80	132
Sandstone	132	151
broken rock	151	355
Sandstone	355	372
rock	372	385

Start Date 7/10/2012 Completed Date 7/18/2012

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

■ Driller ☐ Engineer ☐ Trainee Name (Print) Jeremy Roach
Driller/Engineer/Trainee Signature _____
Driller or trainee License No. 2536

Drilling Company Roach Drilling
Address _____
City, State, Zip _____
Contractor's Registration No. MTKEBOC946 R6 Date July 19, 2012

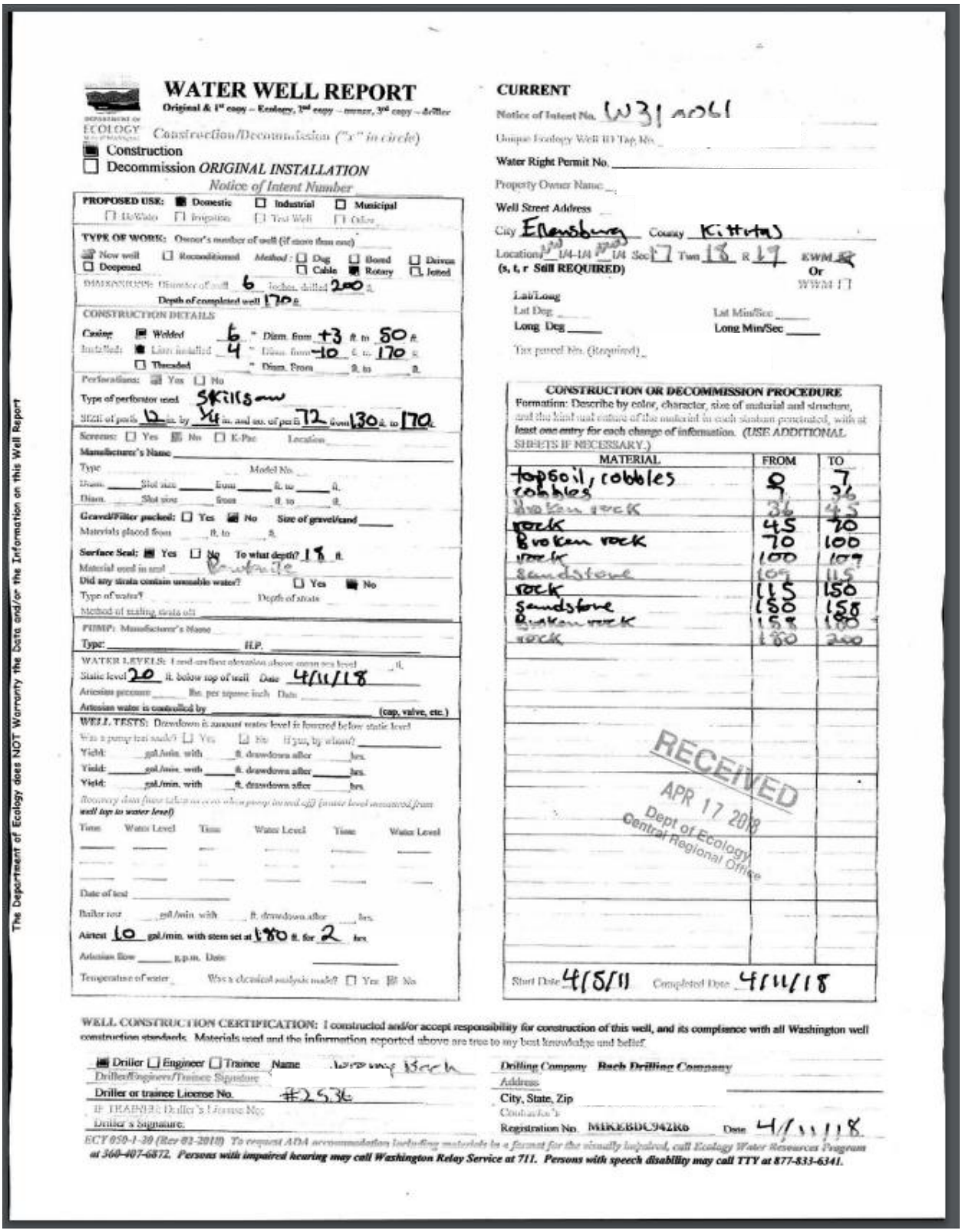
If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY

Construction/Decommission ("x" in circle)

Construction

Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number

PROPOSED USE: Domestic ☐ Industrial ☐ Municipal
☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven
☐ Deepened ☐ Cable Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 200 ft.
Depth of completed well 170 ft.

CONSTRUCTION DETAILS

Casing: Welded 6 " Diam. from +3 ft. to 50 ft.
Installed: Liner installed 4 " Diam. from 40 ft. to 170 ft.
☐ Threaded " Diam. From ft. to ft.

Perforations: Yes ☐ No
Type of perforator used Skil saw
SIZE of perfs 12 in. by 1/4 in. and no. of perfs 72 from 130 ft. to 170 ft.

Screens: ☐ Yes No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: ☐ Yes No Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: Yes ☐ No To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes No
Type of water? Depth of strata
Method of sealing strata off

PUMP: Manufacturer's Name
Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date 4/11/18
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 10 gal./min. with stem set at 180 ft. for 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes No

CURRENT

Notice of Intent No. W31 [illegible]
Unique Ecology Well ID Tag No.
Water Right Permit No.
Property Owner Name
Well Street Address
City Ellensburg County Kittitas
Location NW 1/4-1/4 NW 1/4 Sec 7 Twn 18 R 19 EWM
(s, t, r Still REQUIRED) Or WWM
Lat/Long
Lat Deg. Lat Min/Sec
Long Deg. Long Min/Sec
Tax parcel No. (Required)

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil, cobbles	0	7
cobbles	7	36
broken rock	36	45
rock	45	70
Broken rock	70	100
rock	100	109
Sandstone	109	115
rock	115	150
sandstone	150	158
Broken rock	158	180
rock	180	200

RECEIVED
APR 17 2018
Dept of Ecology
Central Regional Office

Start Date 4/5/11 Completed Date 4/11/18

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

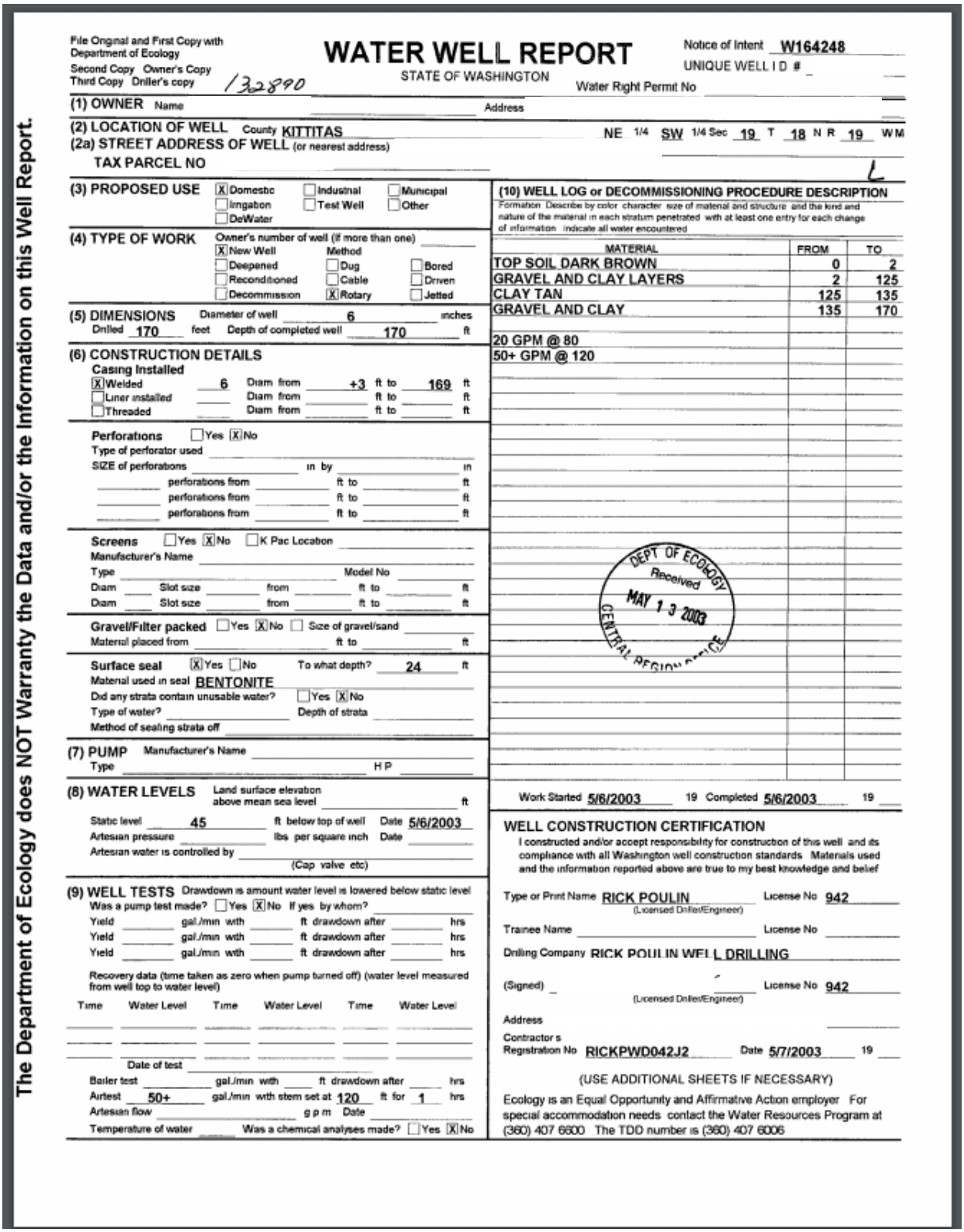
Driller ☐ Engineer ☐ Trainee Name [illegible] Bach
Driller/Engineer/Trainee Signature
Driller or trainee License No. #2536
IF TRAINEE: Driller's License No.
Driller's Signature

Drilling Company Bach Drilling Company
Address
City, State, Zip
Contractor's Registration No. MIKEBDC942K6 Date 4/11/18

ECY 050-1-20 (Rev 02-2010) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

STATE OF WASHINGTON

File Original and First Copy with Department of Ecology
Second Copy Owner's Copy
Third Copy Driller's copy 132890

Notice of Intent W164248
UNIQUE WELL I D #
Water Right Permit No

(1) OWNER Name Address

(2) LOCATION OF WELL County KITTITAS NE 1/4 SW 1/4 Sec 19 T 18 N R 19 WM
(2a) STREET ADDRESS OF WELL (or nearest address)
TAX PARCEL NO

(3) PROPOSED USE [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK Owner's number of well (if more than one)
[X] New Well Method [ ] Deepened [ ] Dug [ ] Bored [ ] Reconditioned [ ] Cable [ ] Driven [ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS Diameter of well 6 inches
Drilled 170 feet Depth of completed well 170 ft

(6) CONSTRUCTION DETAILS
Casing Installed
[X] Welded 6 Diam from +3 ft to 169 ft
[ ] Liner installed Diam from ft to ft
[ ] Threaded Diam from ft to ft

Perforations [ ] Yes [X] No
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft
perforations from ft to ft
perforations from ft to ft

Screens [ ] Yes [X] No [ ] K Pac Location
Manufacturer's Name
Type Model No
Diam Slot size from ft to ft
Diam Slot size from ft to ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft to ft

Surface seal [X] Yes [ ] No To what depth? 24 ft
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 45 ft below top of well Date 5/6/2003
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes by whom?
Yield gal./min with ft drawdown after hrs
Yield gal./min with ft drawdown after hrs
Yield gal./min with ft drawdown after hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min with ft drawdown after hrs
Airtest 50+ gal./min with stem set at 120 ft for 1 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
TOP SOIL DARK BROWN	0	2
GRAVEL AND CLAY LAYERS	2	125
CLAY TAN	125	135
GRAVEL AND CLAY	135	170
20 GPM @ 80		
50+ GPM @ 120		

DEPT OF ECOLOGY Received MAY 13 2003 CENTRAL REGIONAL OFFICE

Work Started 5/6/2003 19 Completed 5/6/2003 19

WELL CONSTRUCTION CERTIFICATION
I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

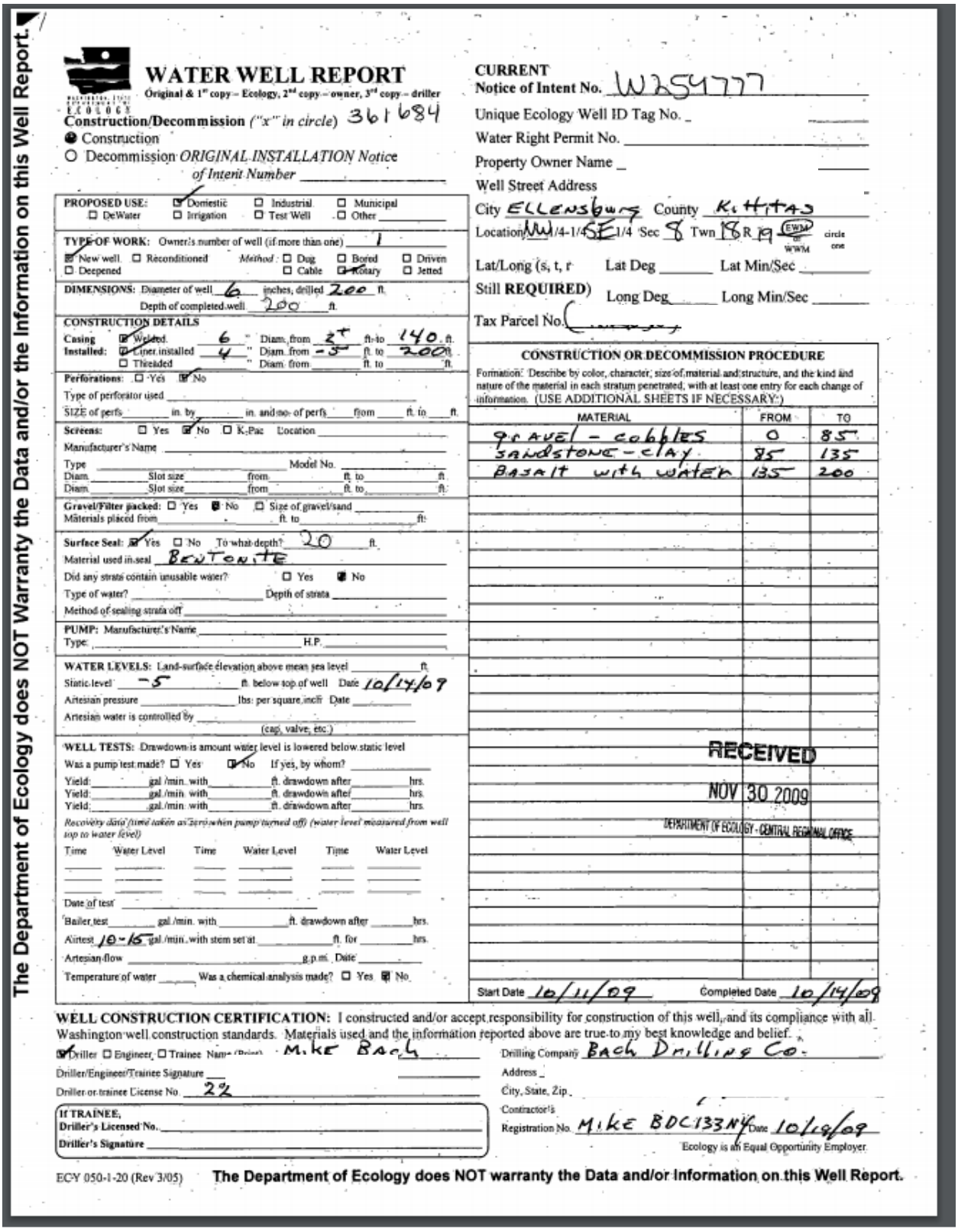
Type or Print Name RICK POULIN (Licensed Driller/Engineer) License No 942
Trainee Name License No
Drilling Company RICK POULIN WELL DRILLING
(Signed) (Licensed Driller/Engineer) License No 942
Address
Contractor s Registration No RICKPWD042J2 Date 5/7/2003 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407 6600 The TDD number is (360) 407 6006

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)* 361684

● Construction

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. W254777

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address

City ELLENSBURG County KITTITAS

Location NW 1/4-1/4 SE 1/4 Sec 8 Twn 18 R 19 EWM WWM (circle one)

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. [illegible]

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) 1

☑ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 200 ft. Depth of completed well 200 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 6" Diam. from 2' ft. to 140 ft. ☑ Liner installed 4" Diam. from -5 ft. to 200 ft. ☐ Threaded " Diam. from ____ ft. to ____ ft.

Perforations: ☐ Yes ☑ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 20 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level -5 ft. below top of well Date 10/14/09

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☑ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 10-15 gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☑ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
gravel - cobbles	0	85
sandstone - clay	85	135
BASALT with water	135	200

RECEIVED
NOV 30 2009
DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 10/11/09 Completed Date 10/14/09

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE BACH

Driller/Engineer/Trainee Signature _____

Driller or trainee License No. 2%

Drilling Company BACH DRILLING CO.

Address _____

City, State, Zip _____

Contractor's Registration No. MIKE BDC133NY Date 10/19/09

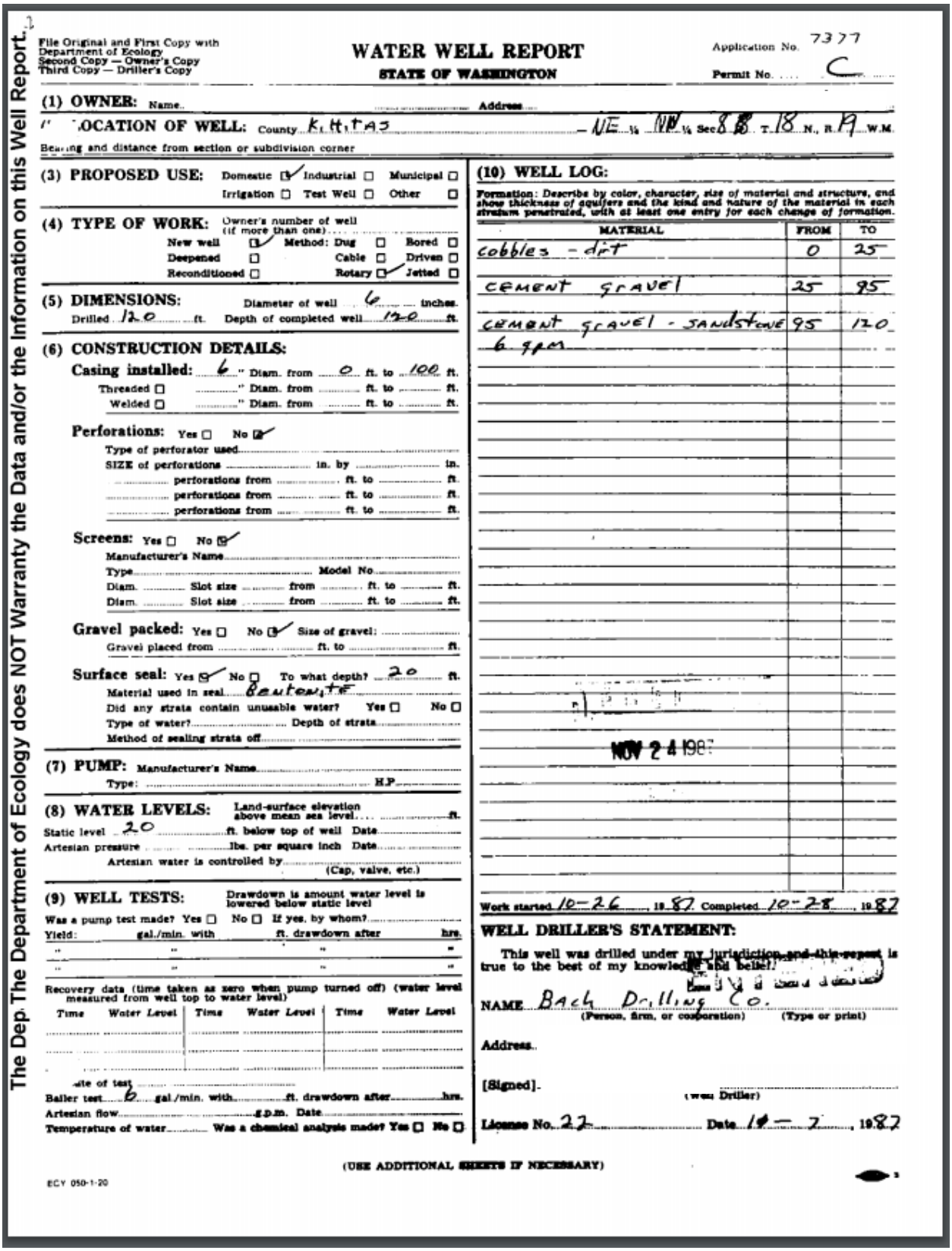
If TRAINEE, Driller's Licensed No. _____

Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 7377
Permit No. C

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County KITTAS NE ¼ NW ¼ Sec 8 T. 18 N., R. 19 W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 120 ft. Depth of completed well 120 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 100 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 6 gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
cobbles - dirt	0	25
CEMENT gravel	25	95
CEMENT gravel - SANDSTONE	95	120
6 gpm		

NOV 24 198[illegible]

Work started 10-26 19 87 Completed 10-28 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Bach Drilling Co.
(Person, firm, or corporation) (Type or print)

Address [redacted]

[Signed] [redacted]
(well Driller)

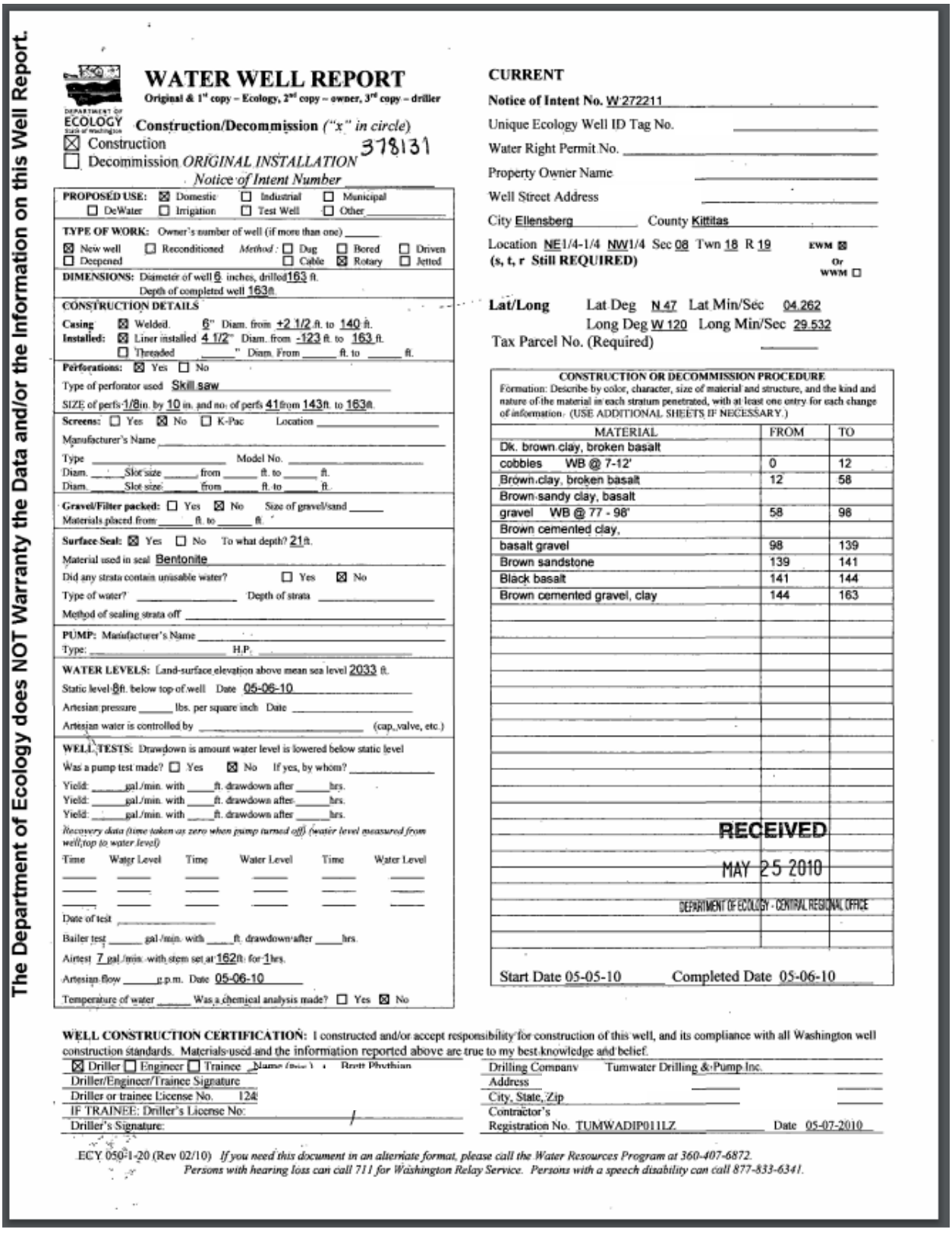
License No. 22 Date 11-7 19 87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION* 378131

Notice of Intent Number _____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 163 ft. Depth of completed well 163 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded. 6" Diam. from +2 1/2 ft. to 140 ft. ☒ Liner installed 4 1/2" Diam. from -123 ft. to 163 ft. ☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used Skil saw

SIZE of perfs 1/8 in. by 10 in. and no. of perfs 41 from 143 ft. to 163 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 21 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level 2033 ft.

Static level 8 ft. below top of well Date 05-06-10

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 7 gal./min. with stem set at 162 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date 05-06-10

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. W 272211

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address _____

City Ellensberg County Kittitas

Location NE 1/4-1/4 NW 1/4 Sec 08 Twn 18 R 19 EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg N 47 Lat Min/Sec 04.262 Long Deg W 120 Long Min/Sec 29.532

Tax Parcel No. (Required) _____

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Dk. brown clay, broken basalt		
cobbles WB @ 7-12'	0	12
Brown clay, broken basalt	12	58
Brown sandy clay, basalt		
gravel WB @ 77 - 98'	58	98
Brown cemented clay,		
basalt gravel	98	139
Brown sandstone	139	141
Black basalt	141	144
Brown cemented gravel, clay	144	163

RECEIVED

MAY 25 2010

DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 05-05-10 Completed Date 05-06-10

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (type) Brett Phythian

Driller/Engineer/Trainee Signature

Driller or trainee License No. 124

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company Tumwater Drilling & Pump Inc.

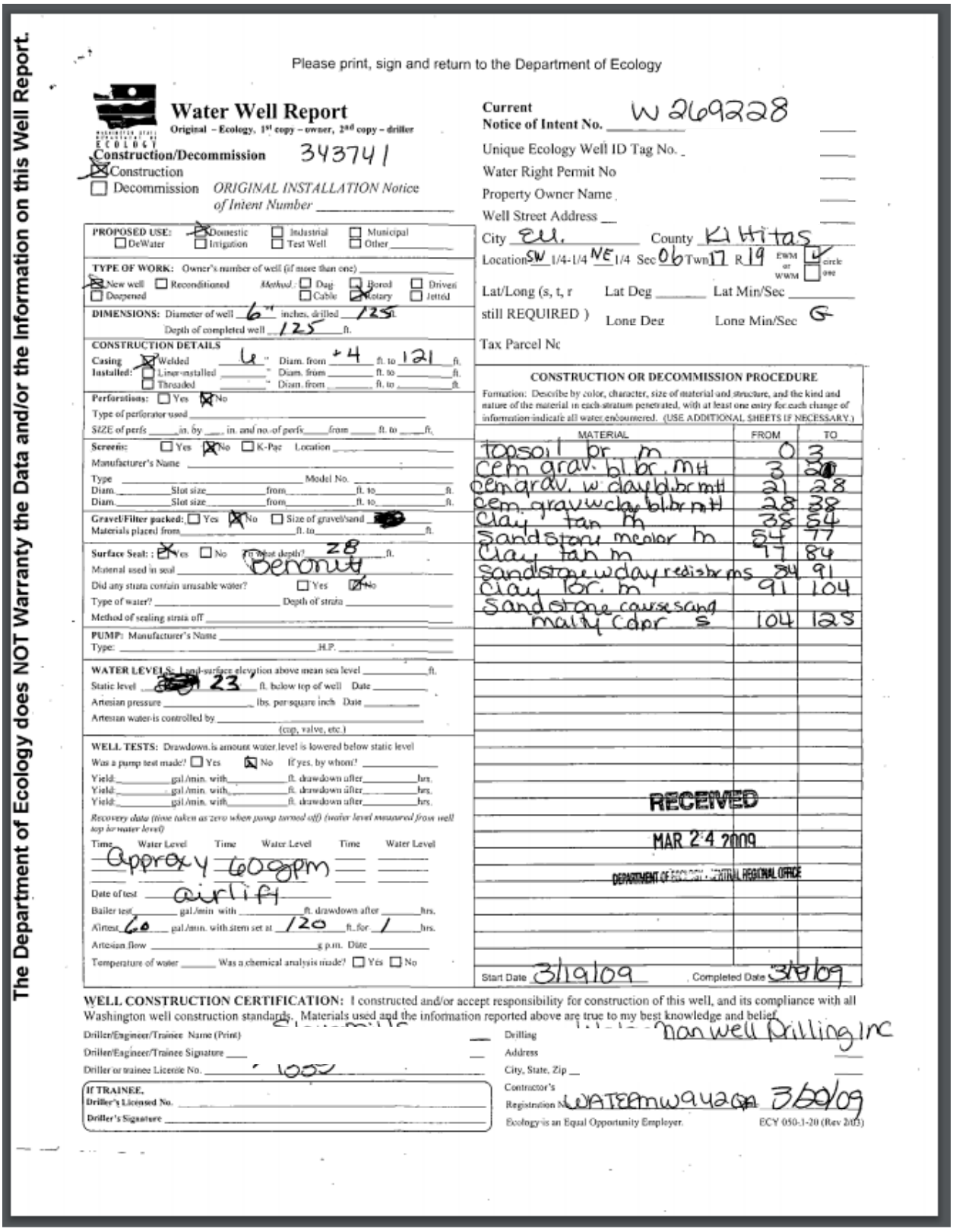
Address

City, State, Zip

Contractor's Registration No. TUMWADIP011LZ Date 05-07-2010

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission 343741

☒ Construction

☐ Decommission ORIGINAL INSTALLATION Notice of Intent Number _____

Current Notice of Intent No. W 269228

Unique Ecology Well ID Tag No. _____

Water Right Permit No _____

Property Owner Name _____

Well Street Address _____

City Ell. County Kittitas

Location SW 1/4-1/4 NE 1/4 Sec 06 Twn 17 R 19 EWM ☑ or WWM ☐ circle one

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec G

Tax Parcel No _____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☒ New well ☐ Reconditioned ☐ Deepened Method: ☐ Dug ☐ Bored ☐ Driven ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6" inches, drilled 125 ft. Depth of completed well 125 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam. from +4 ft. to 121 ft. ☐ Liner-installed _____" Diam. from _____ ft. to _____ ft. ☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 28 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level [redacted] 23 ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
Approx	600gpm				

Date of test airlift

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 60 gal./min. with stem set at 120 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil br m	0	3
Cem grav. bl br. mH	3	20
Cem grav. w clay bl br mH	21	28
Cem. grav w clay bl br mH	28	38
Clay tan m	38	54
Sandstone medior m	54	77
Clay tan m	77	84
Sandstone w clay redish brms	84	91
Clay br. m	91	104
Sandstone course sand mally clear s	104	125

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MAR 24 2009

DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 3/19/09 Completed Date 3/19/09

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller/Engineer/Trainee Name (Print) [redacted]

Driller/Engineer/Trainee Signature _____

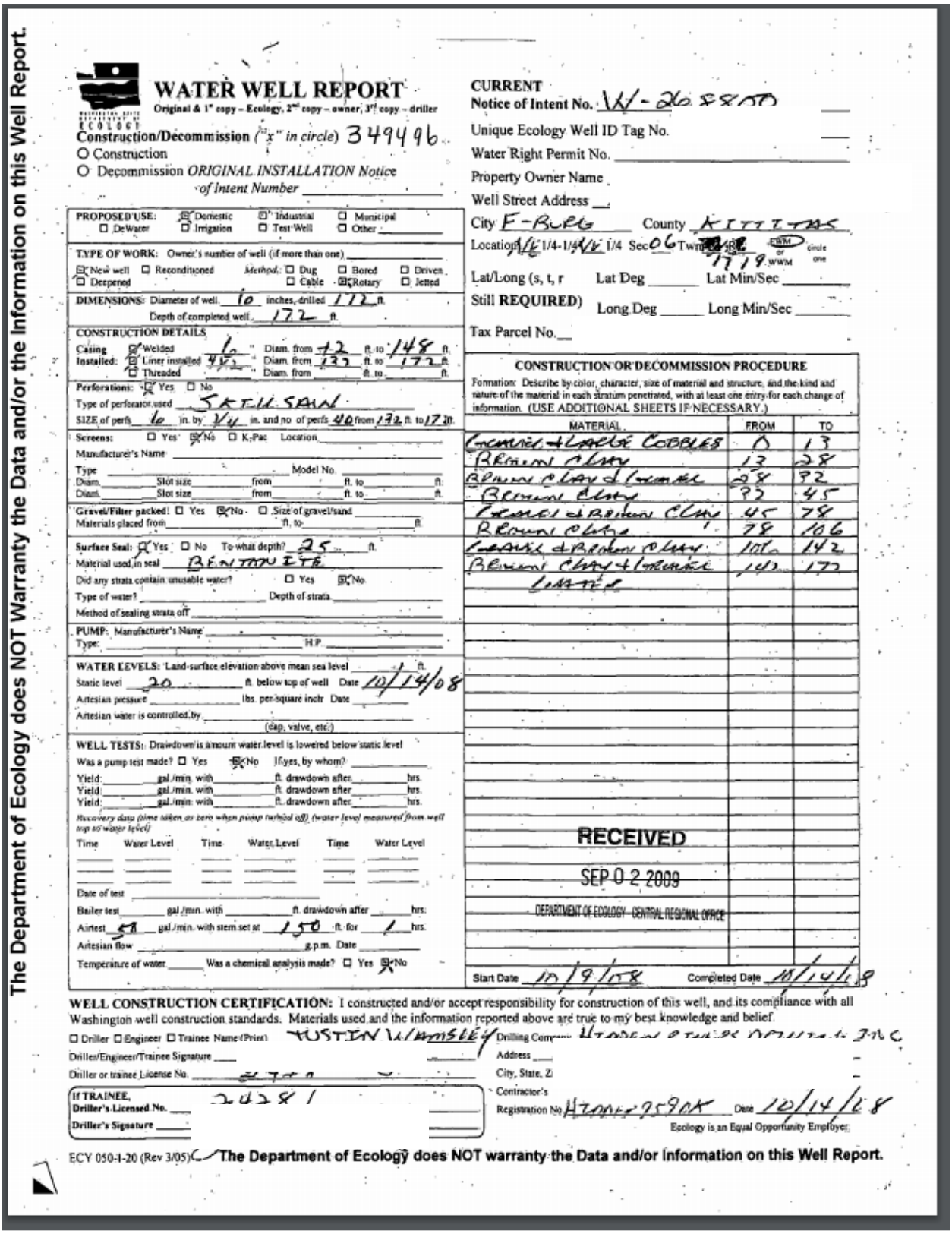
Driller or trainee License No. 1005

If TRAINEE, Driller's Licensed No. _____ Driller's Signature _____

Drilling Address _____ City, State, Zip _____ Contractor's Registration No. [redacted] WATERMW942QA 3/20/09

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Construction/Decommission ("x" in circle) 349496

- O Construction
- O Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. WW-26 58 50
Unique Ecology Well ID Tag No. ____
Water Right Permit No. _____
Property Owner Name _____
Well Street Address ____
City E-BURG County KITTITAS
Location 1/4 1/4-1/4 1/4 Sec 06 Twn 17N R 19 E/W WM (circle one)
Lat/Long (s, t, r Lat Deg _____ Lat Min/Sec _____
Still REQUIRED) Long Deg _____ Long Min/Sec _____
Tax Parcel No. ____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
☒ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 10 inches, drilled 172 ft. Depth of completed well 172 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6" Diam. from 42 ft. to 148 ft. ☒ Liner installed 4½" Diam. from 137 ft. to 172 ft. ☐ Threaded ____" Diam. from ____ ft. to ____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used SKIL SAW
SIZE of perfs 10 in. by ¼ in. and no. of perfs 40 from 172 ft. to 171 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____
Materials placed from ____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 25 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 20 ft. below top of well Date 10/14/08
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest 50 gal./min. with stem set at 150 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water ____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
GRAVEL & LARGE COBBLES	0	13
BROWN CLAY	13	28
BROWN CLAY & GRAVEL	28	92
BROWN CLAY	92	45
GRAVEL & BROWN CLAY	45	78
BROWN CLAY	78	106
GRAVEL & BROWN CLAY	106	142
BROWN CLAY & GRAVEL	142	172
CAVED		

RECEIVED
SEP 0 2 2009
DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

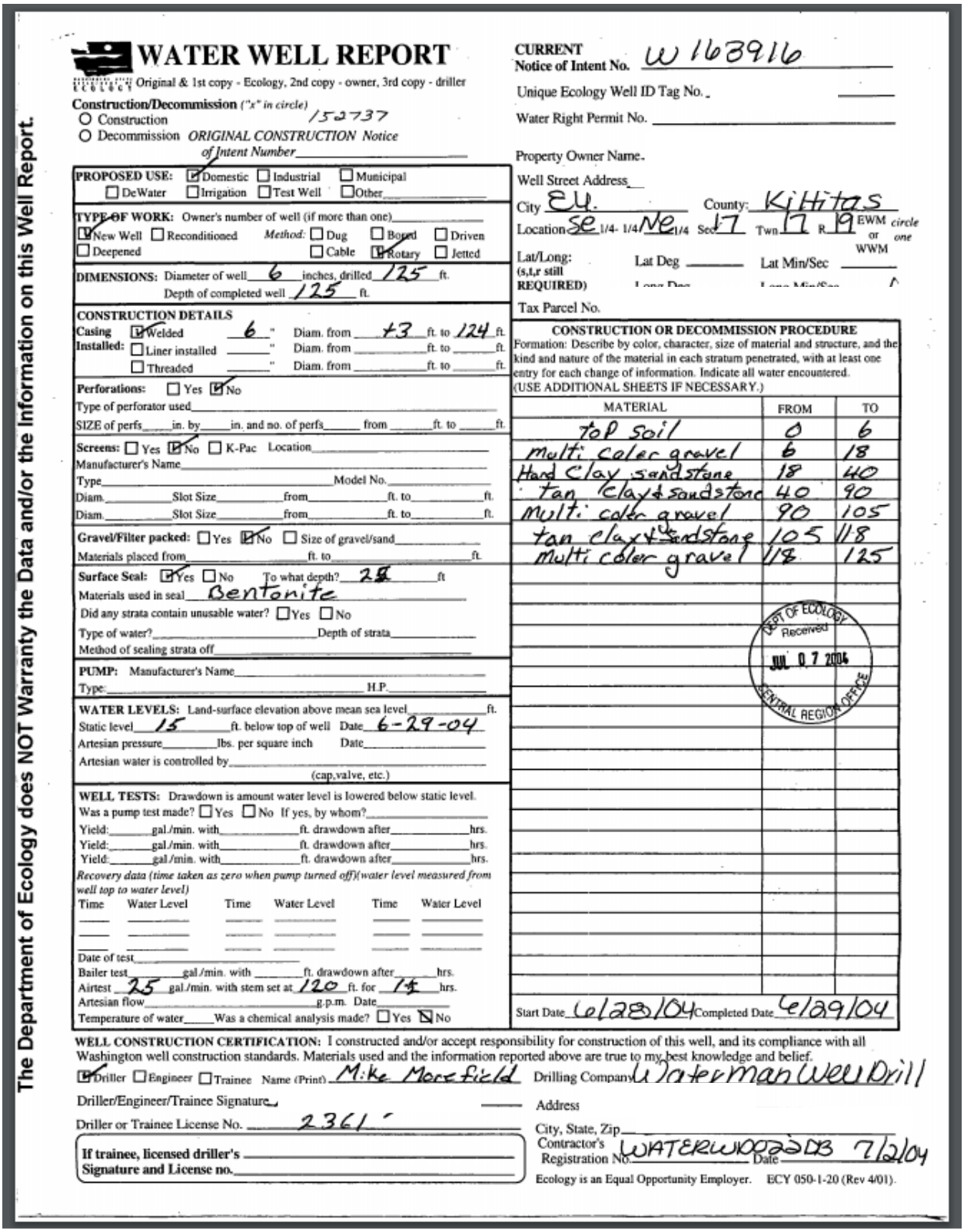
Start Date 10/9/08 Completed Date 10/14/08

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) JUSTIN WILLIAMSLEY Drilling Company HYDRO SYSTEMS DRILLING INC
Driller/Engineer/Trainee Signature _____ Address _____
Driller or trainee License No. 2428 City, State, Zip _____
If TRAINEE, Driller's Licensed No. 2428 Contractor's Registration No. HYDRASD759CK Date 10/14/08
Driller's Signature _____
Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) The Department of Ecology does NOT warranty the Data and/or information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)
○ Construction 152737
○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT Notice of Intent No. W 163916

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name.

Well Street Address

City EU. County: Kittitas

Location SE 1/4- 1/4 NE 1/4 Sec 17 Twn 17 R 19 EWM or WWM *circle one*

Lat/Long: (s,t,r still REQUIRED) Lat Deg Lat Min/Sec

Tax Parcel No.

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)
☑ New Well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 125 ft.
Depth of completed well 125 ft.

CONSTRUCTION DETAILS
Casing Installed: ☑ Welded 6" Diam. from +3 ft. to 124 ft.
☐ Liner installed " Diam. from ft. to ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ☐ Yes ☑ No
Type of perforator used
SIZE of perfs in. by in. and no. of perfs from ft. to ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: ☑ Yes ☐ No To what depth? 25 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

PUMP: Manufacturer's Name
Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 15 ft. below top of well Date 6-29-04
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (cap,valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 25 gal./min. with stem set at 120 ft. for 1½ hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
top soil	0	6
multi color gravel	6	18
Hard Clay sandstone	18	40
tan clay & sandstone	40	90
multi color gravel	90	105
tan clay & sandstone	105	118
multi color gravel	118	125

DEPT OF ECOLOGY Received JUL 07 2004 CENTRAL REGION OFFICE

Start Date 6/28/04 Completed Date 6/29/04

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Mike Morefield Drilling Company Waterman Well Drill

Driller/Engineer/Trainee Signature Address

Driller or Trainee License No. 2361 City, State, Zip

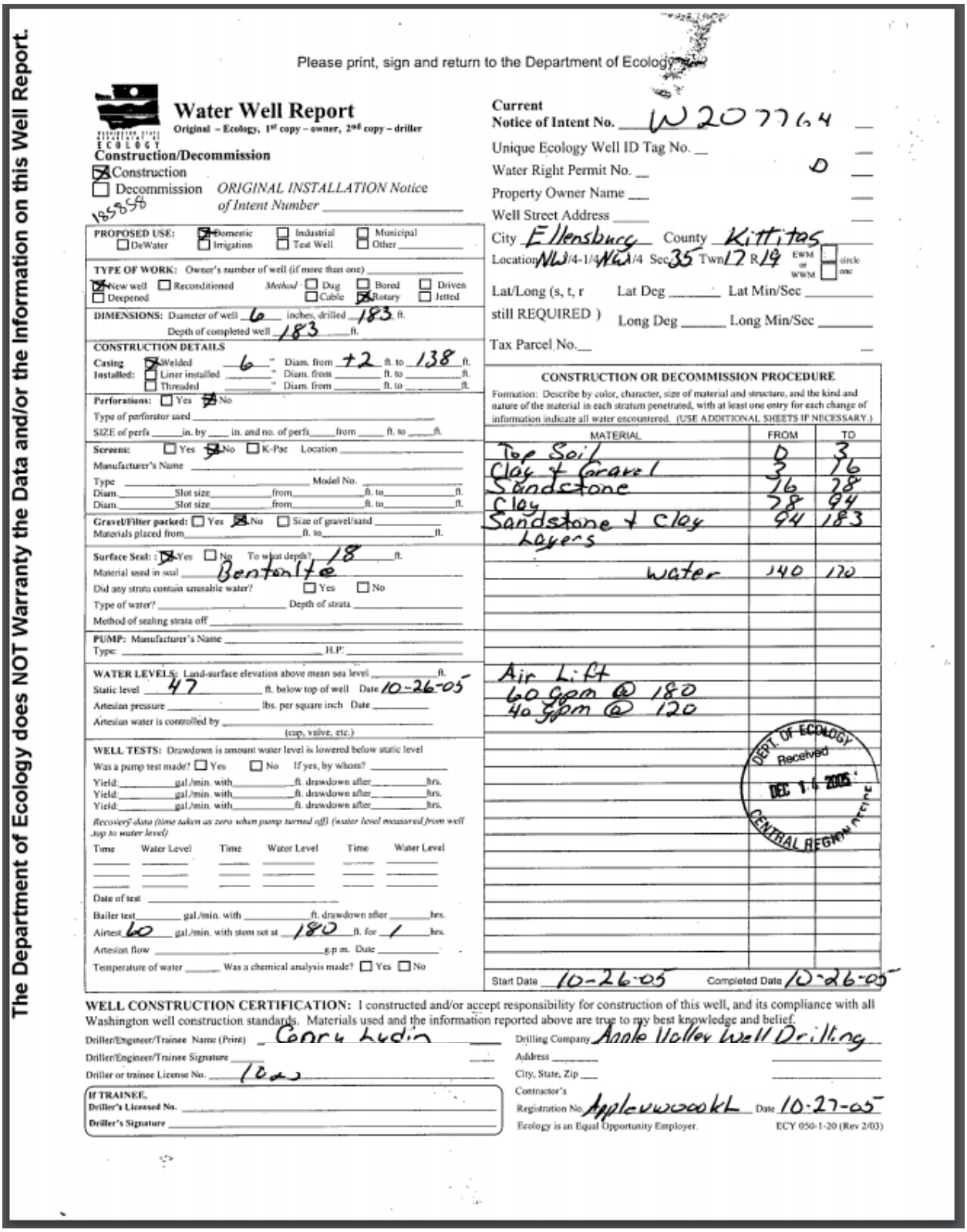
If trainee, licensed driller's Signature and License no.

Contractor's Registration No. WATERWD022DB Date 7/2/04

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01).

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

ECOLOGY

Construction/Decommission

☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* 18858

Current Notice of Intent No. W207764

Unique Ecology Well ID Tag No. __

Water Right Permit No. __ D

Property Owner Name ___

Well Street Address ___

City Ellensburg County Kittitas

Location NW 1/4-1/4 NW 1/4 Sec 35 Twn 17 R 19 EWM or WWM (circle one)

Lat/Long (s, t, r still REQUIRED) Lat Deg ___ Lat Min/Sec ___ Long Deg ___ Long Min/Sec ___

Tax Parcel No. __

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one) ___
☒ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 183 ft.
Depth of completed well 183 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6" Diam. from +2 ft. to 138 ft.
☐ Liner installed ___" Diam. from ___ ft. to ___ ft.
☐ Threaded ___" Diam. from ___ ft. to ___ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used ___
SIZE of perfs ___ in. by ___ in. and no. of perfs ___ from ___ ft. to ___ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ___
Manufacturer's Name ___
Type ___ Model No. ___
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ___
Materials placed from ___ ft. to ___ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? ___ Depth of strata ___
Method of sealing strata off ___

PUMP: Manufacturer's Name ___
Type: ___ H.P. ___

WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level 47 ft. below top of well Date 10-26-05
Artesian pressure ___ lbs. per square inch Date ___
Artesian water is controlled by ___ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? ___
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ___
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest 60 gal./min. with stem set at 180 ft. for 1 hrs.
Artesian flow ___ g.p.m. Date ___
Temperature of water ___ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	3
Clay & Gravel	3	16
Sandstone	16	28
Clay	28	94
Sandstone & clay layers	94	183
water	140	170
Air Lift 60 gpm @ 180 40 gpm @ 120		

DEPT. OF ECOLOGY Received DEC 16 2005 CENTRAL REGION OFFICE

Start Date 10-26-05 Completed Date 10-26-05

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

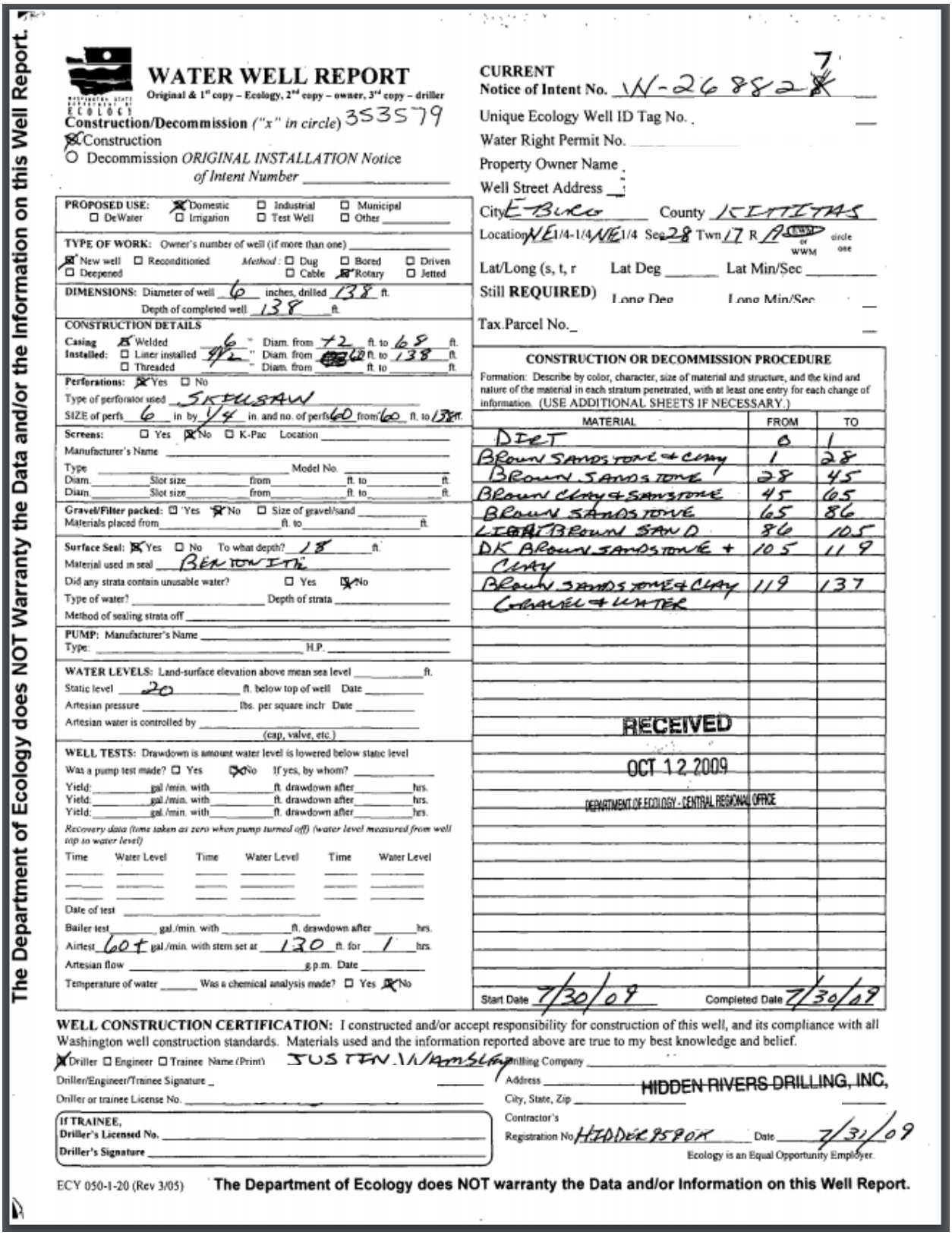
Driller/Engineer/Trainee Name (Print) Corey Ludin
Drilling Company Apple Valley Well Drilling
Driller/Engineer/Trainee Signature ___
Address ___
Driller or trainee License No. 1023
City, State, Zip ___

IF TRAINEE,
Driller's Licensed No. ___
Driller's Signature ___

Contractor's Registration No. Applevw000kL Date 10-27-05

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission ("x" in circle) 353579

☒ Construction

○ Decommission ORIGINAL INSTALLATION Notice of Intent Number _____

CURRENT Notice of Intent No. W-26882 7

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____

Well Street Address _____

City E-BURG County KITTITAS

Location NE 1/4-1/4 NE 1/4 Sec 28 Twn 17 R A (WWM) or E (circle one)

Lat/Long (s, t, r Still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☒ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 138 ft. Depth of completed well 138 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam. from +2 ft. to 68 ft. ☐ Liner installed 4½" Diam. from 60 ft. to 138 ft. ☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No

Type of perforator used SKILSAW

SIZE of perfs 6 in by 1/4 in. and no. of perfs 60 from 60 ft. to 138 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level 20 ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 60+ gal./min. with stem set at 120 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
DIRT	0	1
BROWN SANDSTONE & CLAY	1	28
BROWN SANDSTONE	28	45
BROWN CLAY & SANDSTONE	45	65
BROWN SANDSTONE	65	86
LIGHT BROWN SAND	86	105
DK BROWN SANDSTONE + CLAY	105	119
BROWN SANDSTONE & CLAY GRAVEL & WATER	119	137

RECEIVED

OCT 12 2009

DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 7/30/09 Completed Date 7/30/09

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) JUSTIN WILLIAMSLEE Drilling Company HIDDEN RIVERS DRILLING, INC.

Driller/Engineer/Trainee Signature _____ Address _____

Driller or trainee License No. _____ City, State, Zip _____

IF TRAINEE, Driller's Licensed No. _____ Driller's Signature _____

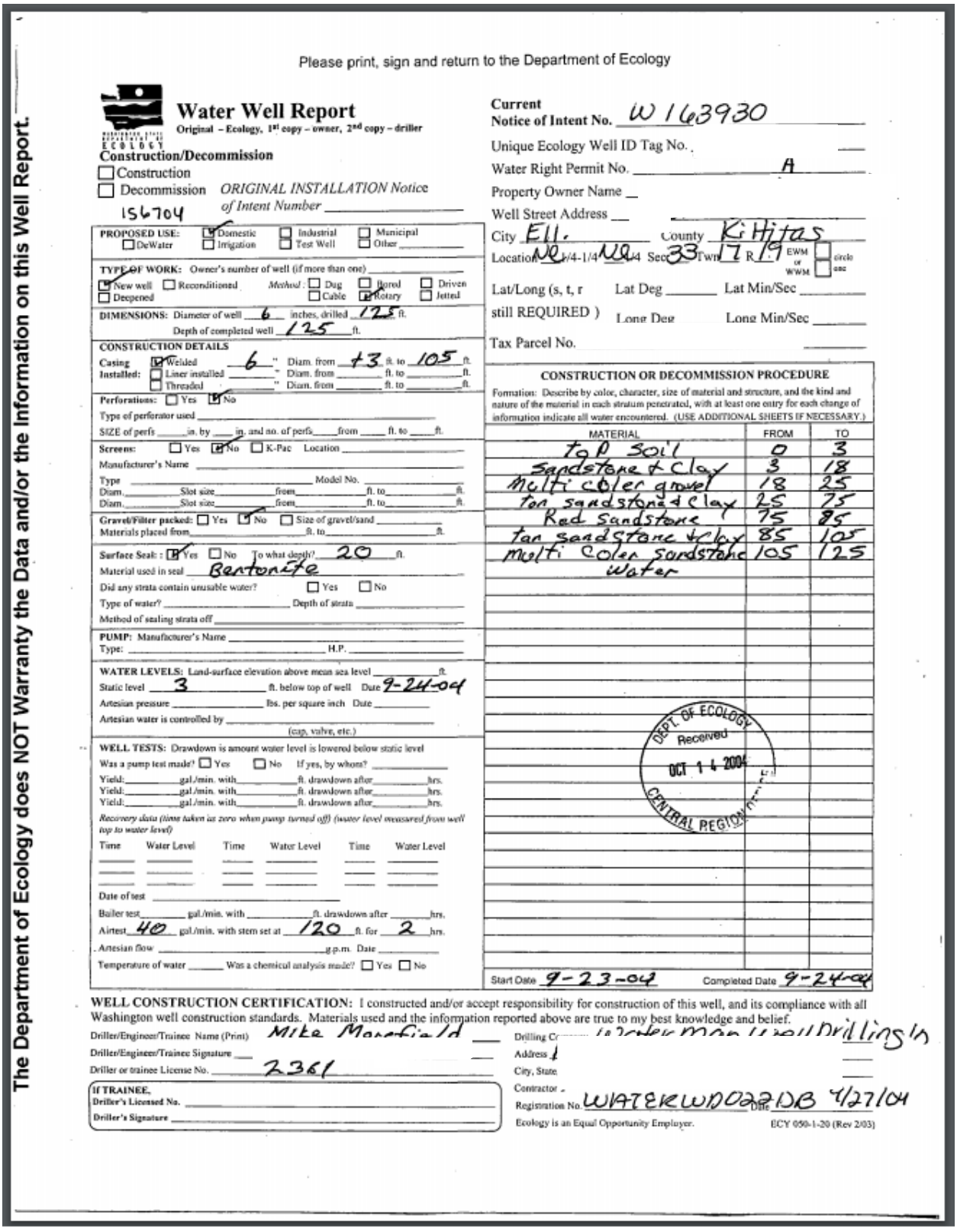
Contractor's Registration No HIDDERR858OX Date 7/31/09

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Construction/Decommission

☐ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* 156704

Current Notice of Intent No. W 163930

Unique Ecology Well ID Tag No. ___

Water Right Permit No. A

Property Owner Name ___

Well Street Address ___

City Ell. County Kittitas

Location NE 1/4-1/4 NW 1/4 Sec 33 Twn 17 R 19 EWM or WWM ☐ circle one

Lat/Long (s, t, r still REQUIRED) Lat Deg ___ Lat Min/Sec ___ Long Deg ___ Long Min/Sec ___

Tax Parcel No. ___

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ___

TYPE OF WORK: Owner's number of well (if more than one) ___
☑ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 125 ft. Depth of completed well 125 ft.

CONSTRUCTION DETAILS
Casing Installed: ☑ Welded 6" Diam. from +3 ft. to 105 ft. ☐ Liner installed ___" Diam. from ___ ft. to ___ ft. ☐ Threaded ___" Diam. from ___ ft. to ___ ft.

Perforations: ☐ Yes ☑ No
Type of perforator used ___
SIZE of perfs ___ in. by ___ in. and no. of perfs ___ from ___ ft. to ___ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location ___
Manufacturer's Name ___
Type ___ Model No. ___
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand ___
Materials placed from ___ ft. to ___ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? ___ Depth of strata ___
Method of sealing strata off ___

PUMP: Manufacturer's Name ___
Type: ___ H.P. ___

WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level 3 ft. below top of well Date 9-24-04
Artesian pressure ___ lbs. per square inch Date ___
Artesian water is controlled by ___ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? ___
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ___
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest 40 gal./min. with stem set at 120 ft. for 2 hrs.
Artesian flow ___ g.p.m. Date ___
Temperature of water ___ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
top soil	0	3
Sandstone & clay	3	18
Multi color gravel	18	25
tan sandstone & clay	25	75
Red Sandstone	75	85
tan sandstone & clay	85	105
Multi Color Sandstone	105	125
water		

DEPT. OF ECOLOGY Received OCT 14 2004 CENTRAL REGION

Start Date 9-23-04 Completed Date 9-24-04

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller/Engineer/Trainee Name (Print) Mike Mansfield
Driller/Engineer/Trainee Signature ___
Driller or trainee License No. 2361

Drilling Co. Waterman Well Drilling Inc
Address ___
City, State ___
Contractor ___
Registration No. WATERWD022DB Date 9/27/04

IF TRAINEE,
Driller's Licensed No. ___
Driller's Signature ___

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 2/03)

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W136423
UNIQUE WELL I D # _____
Water Right Permit No _____

101640

(1) OWNER Name _____ Address _____

(2) LOCATION OF WELL County KITTATAS - SW 1/4 SW 1/4 Sec 28 T 17 N,R 19 W.M

(2a) STREET ADDRESS OF WELL (or nearest address)

TAX PARCEL NO

N

(3) PROPOSED USE
[X] Domestic [ ] Industrial [ ] Municipal
[ ] Irrigation [ ] Test Well [ ] Other
[ ] DeWater

(4) TYPE OF WORK Owner's number of well (If more than one) _____
[X] New Well Method
[ ] Deepened [ ] Dug [ ] Bored
[ ] Reconditioned [ ] Cable [ ] Driven
[ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS Diameter of well 6 inches
Drilled 138 feet Depth of completed well 138 ft

(6) CONSTRUCTION DETAILS.
Casing installed.
[X] Welded 6 " Diam from +2 ft to 116 ft.
[ ] Liner installed _____ " Diam from _____ ft to _____ ft.
[ ] Threaded _____ " Diam from _____ ft to _____ ft.

Perforations: [ ] Yes [X] No
Type of perforator used _____
SIZE of perforations _____ in by _____ in
_____ perforations from _____ ft to _____ ft
_____ perforations from _____ ft to _____ ft
_____ perforations from _____ ft to _____ ft

Screens [ ] Yes [X] No [ ] K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No _____
Diam _____ Slot size _____ from _____ ft to _____ ft
Diam _____ Slot size _____ from _____ ft to _____ ft

Gravel/Filter packed [ ] Yes [X] No [ ] Size of gravel/sand _____
Material placed from _____ ft to _____ ft

Surface seal: [X] Yes [ ] No To what depth? 25 ft
Material used in seal BENTINITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP Manufacturer's Name _____
Type _____ H P _____

(8) WATER LEVELS. Land-surface elevation above mean sea level _____ ft
Static level 45 ft below top of well Date 4/20/2001
Artesian pressure _____ lbs per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom? _____
Yield _____ gal./min with _____ ft drawdown after _____ hrs
Yield _____ gal./min with _____ ft drawdown after _____ hrs
Yield _____ gal /min with _____ ft drawdown after _____ hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal /min with _____ ft drawdown after _____ hrs
Airtest 80 gal./min with stem set at 120 ft for 1 hrs
Artesian flow _____ g p m Date _____
Temperature of water _____ Was a chemical analysis made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation Describe by color character, size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
SOIL	0	3
CLAY	3	15
SAND AND GRAVEL	15	19
SANDSTONE AND CLAY	19	98
SAND	98	103
SANDSTONE AND CLAY	103	114
SANDSTONE AND SAND	114	133
SANDSTONE AND SHALE CLAY	133	138
80 GPM @ 120		
22 GPM @ 60		

DEPT OF ECOLOGY Received JUN 1 7 2001 CENTRAL REGION OFFICE

Work Started 4/20/2001 , 19 Completed 4/20/2001 , 19

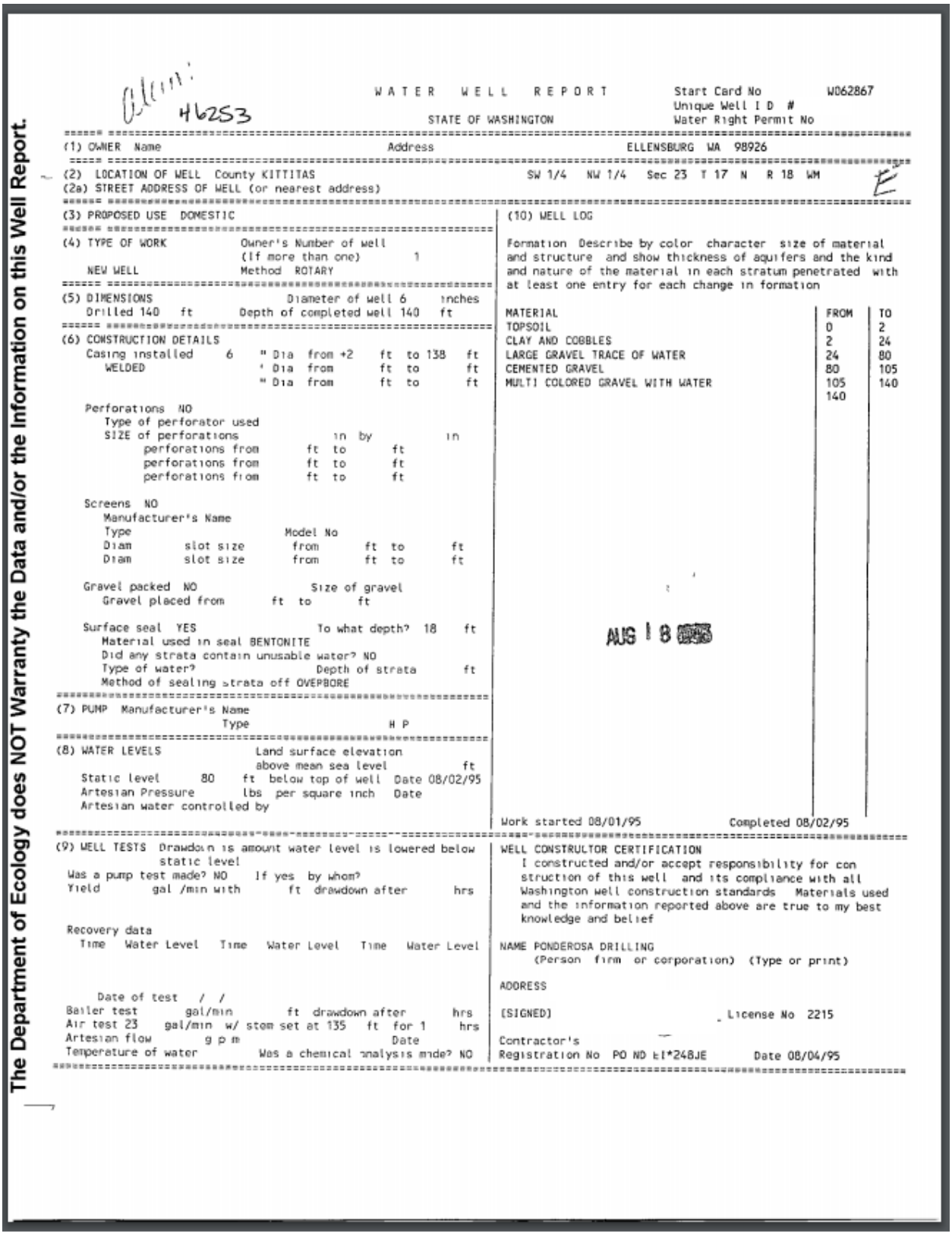
WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Type or Print Name TOM MCGUIRE (Licensed Driller/Engineer) License No 0357
Trainee Name _____ License No _____
Driling Company RICK POULIN WELL DRILLING
(Signed _____ License No 0357
Address _____
Contractor's Registration No RICKPWD042J2 Date 5/15/01 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6800 The TDD number is (360) 407-6006

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

46253

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No W062867
Unique Well I D #
Water Right Permit No

(1) OWNER Name Address ELLENSBURG WA 98926

(2) LOCATION OF WELL County KITTITAS SW 1/4 NW 1/4 Sec 23 T 17 N R 18 WM
(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE DOMESTIC

(4) TYPE OF WORK Owner's Number of well (If more than one) 1
NEW WELL Method ROTARY

(5) DIMENSIONS Diameter of well 6 inches
Drilled 140 ft Depth of completed well 140 ft

(6) CONSTRUCTION DETAILS
Casing installed 6 " Dia from +2 ft to 138 ft
WELDED ' Dia from ft to ft
" Dia from ft to ft

Perforations NO
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft
perforations from ft to ft
perforations from ft to ft

Screens NO
Manufacturer's Name
Type Model No
Diam slot size from ft to ft
Diam slot size from ft to ft

Gravel packed NO Size of gravel
Gravel placed from ft to ft

Surface seal YES To what depth? 18 ft
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft
Method of sealing strata off OVERBORE

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 80 ft below top of well Date 08/02/95
Artesian Pressure lbs per square inch Date
Artesian water controlled by

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? NO If yes by whom?
Yield gal /min with ft drawdown after hrs

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min ft drawdown after hrs
Air test 23 gal/min w/ stem set at 135 ft for 1 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

Formation Describe by color character size of material and structure and show thickness of aquifers and the kind and nature of the material in each stratum penetrated with at least one entry for each change in formation

MATERIAL	FROM	TO
TOPSOIL	0	2
CLAY AND COBBLES	2	24
LARGE GRAVEL TRACE OF WATER	24	80
CEMENTED GRAVEL	80	105
MULTI COLORED GRAVEL WITH WATER	105	140
	140	

AUG 18

Work started 08/01/95 Completed 08/02/95

WELL CONSTRUCTOR CERTIFICATION
I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

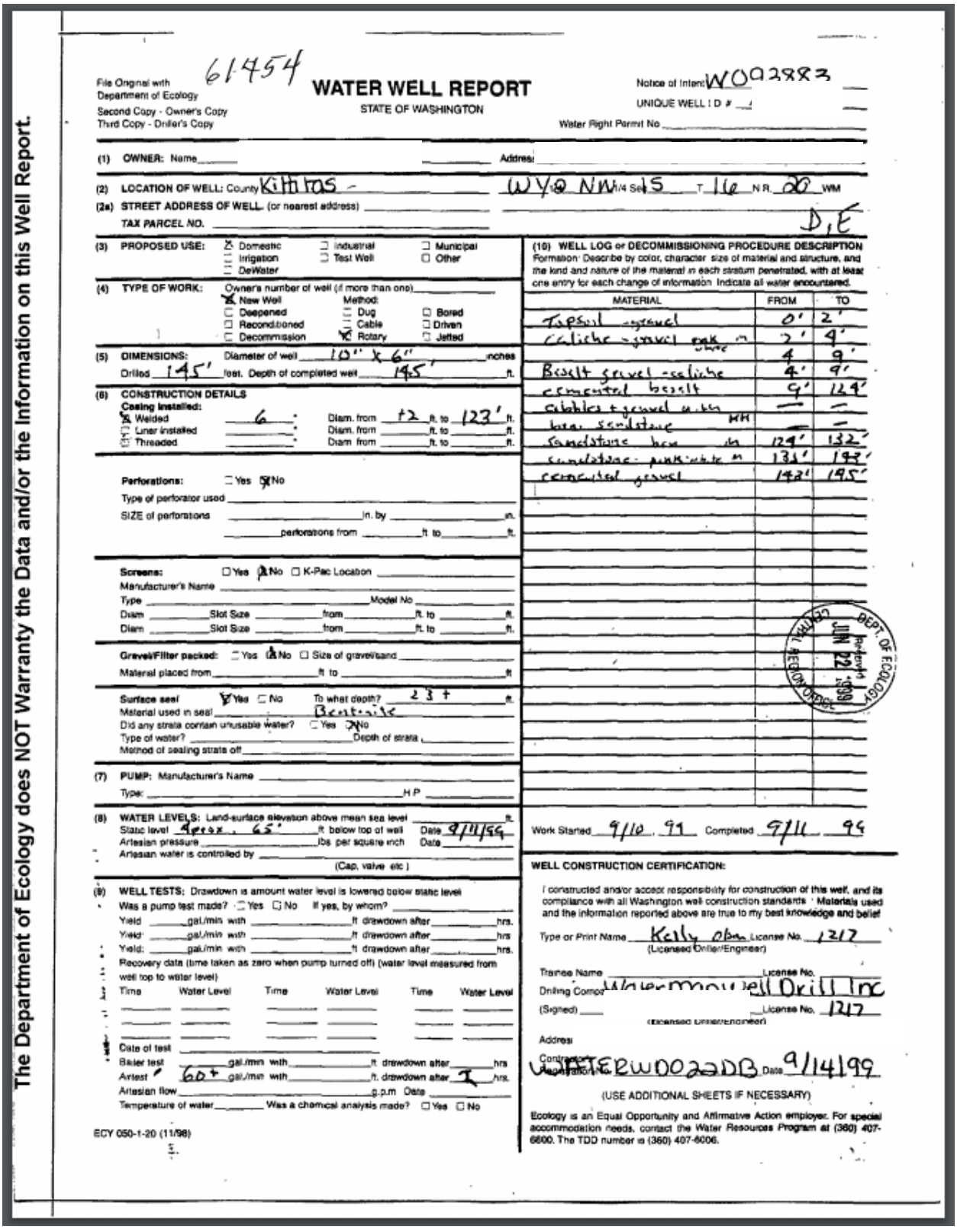
NAME PONDEROSA DRILLING
(Person firm or corporation) (Type or print)

ADDRESS

[SIGNED] License No 2215

Contractor's
Registration No PO ND EI*248JE Date 08/04/95

Note: Personally Identifying Info redacted due to privacy concerns.



61454

WATER WELL REPORT

STATE OF WASHINGTON

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

Notice of Intent WQ02883
UNIQUE WELL I D #
Water Right Permit No.

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Kittitas - WYO NM 1/4 Sec 15 T 16 N R. 20 WM

(2a) STREET ADDRESS OF WELL (or nearest address) _____

TAX PARCEL NO. _____ D,E

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well 10" X 6" inches
Drilled 145' feet. Depth of completed well 145' ft.

(6) CONSTRUCTION DETAILS
Casing installed:
☒ Welded 6" Diam. from +2 ft. to 123' ft.
☐ Liner installed " Diam. from ft. to ft.
☐ Threaded " Diam from ft. to ft.

Perforations: ☐ Yes ☒ No
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No _____
Diam _____ Slot Size _____ from _____ ft. to _____ ft.
Diam _____ Slot Size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____
Material placed from _____ ft to _____ ft

Surface seal ☒ Yes ☐ No To what depth? 23 + ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level Approx. 65' ft. below top of well Date 9/14/99
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____
Yield _____ gal./min with _____ ft drawdown after _____ hrs.
Yield _____ gal./min with _____ ft drawdown after _____ hrs.
Yield: _____ gal./min with _____ ft drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min with _____ ft. drawdown after _____ hrs.
Artest 60+ gal./min with _____ ft. drawdown after 1 hrs.
Artesian flow _____ g.p.m Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

ECY 050-1-20 (11/98)

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Topsoil - gravel	0'	2'
caliche - gravel and sand	2'	4'
	4	9'
Basalt gravel - caliche	4'	9'
cemented basalt	9'	129'
cobbles + gravel with hard sandstone HH	—	—
sandstone hard	129'	132'
sandstone - pink-white	132'	193'
cemented gravel	193'	195'

RECEIVED JUN 22 1999 DEPT. OF ECOLOGY CENTRAL REGION OFFICE

Work Started 9/10 99 Completed 9/11 99

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Kelly Cbm License No. 1217
(Licensed Driller/Engineer)

Trainee Name _____ License No. _____
Drilling Comp Watermaster Well Drill Inc
(Signed) _____ License No. 1217
(Licensed Driller/Engineer)

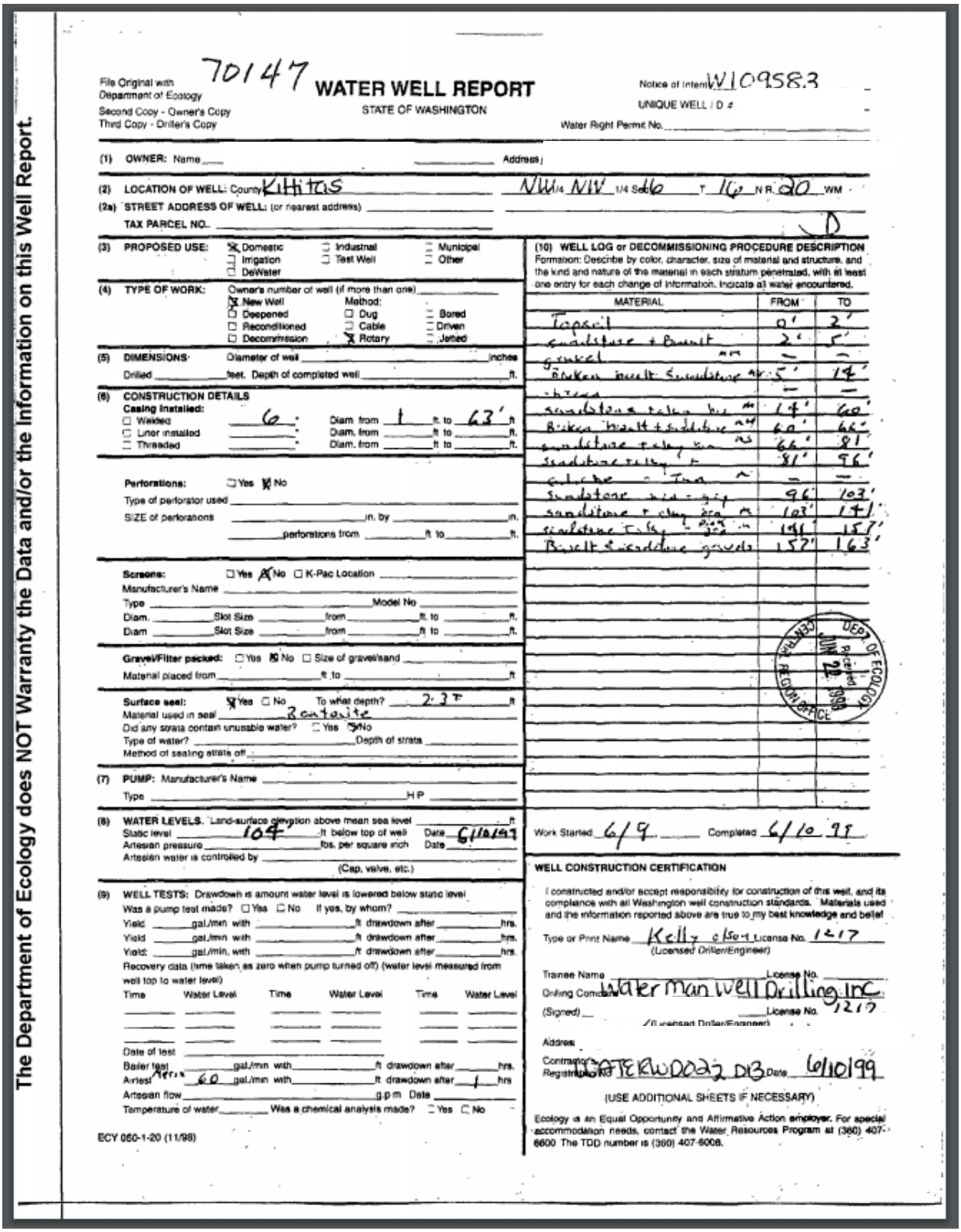
Address _____
Contractor's Registration No. WATERWD022DB Date 9/14/99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



70147

WATER WELL REPORT

STATE OF WASHINGTON

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

Notice of Intent W109583
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Kittitas NW1/4 NW 1/4 Sec 16 T 16 N R 20 WM

(2a) STREET ADDRESS OF WELL: (or nearest address) [redacted]

TAX PARCEL NO.

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well inches
Drilled feet. Depth of completed well ft.

(6) CONSTRUCTION DETAILS
Casing installed: ☐ Welded 6" Diam. from +1 ft. to 63' ft
☐ Liner installed " Diam. from ft. to ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location
Manufacturer's Name
Type Model No
Diam. Slot Size from ft. to ft.
Diam Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand
Material placed from ft. to ft.

Surface seal: ☒ Yes ☐ No To what depth? 21 ft
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft
Static level 104 ft. below top of well Date 6/10/99
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield gal./min with ft drawdown after hrs.
Yield gal./min with ft drawdown after hrs.
Yield: gal./min. with ft drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min with ft drawdown after hrs.
Airtest 60 gal./min with ft drawdown after 1 hrs
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Topsoil	0'	2'
sandstone + basalt	2'	5'
gravel	—	—
Broken basalt sandstone	5'	14'
clay	—	—
sandstone + clay	14'	60'
Broken basalt + sandstone	60'	66'
sandstone + clay	66'	81'
sandstone + clay	81'	96'
caliche - lava	—	—
sandstone + clay	96'	103'
sandstone + clay	103'	141'
sandstone + clay - hard	141'	157'
Basalt & sandstone gravels	157'	163'

DEPT. OF ECOLOGY CENTRAL REGION OFFICE Received JUN 22 1999

Work Started 6/9 Completed 6/10 99

WELL CONSTRUCTION CERTIFICATION
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Kelly Olsen License No. 1217
(Licensed Driller/Engineer)

Trainee Name License No.
Drilling Company Water Man Well Drilling Inc
(Signed) License No. 1217
(Licensed Driller/Engineer)

Address
Contractor's Registration No. WATERWD022 DB Date 6/10/99

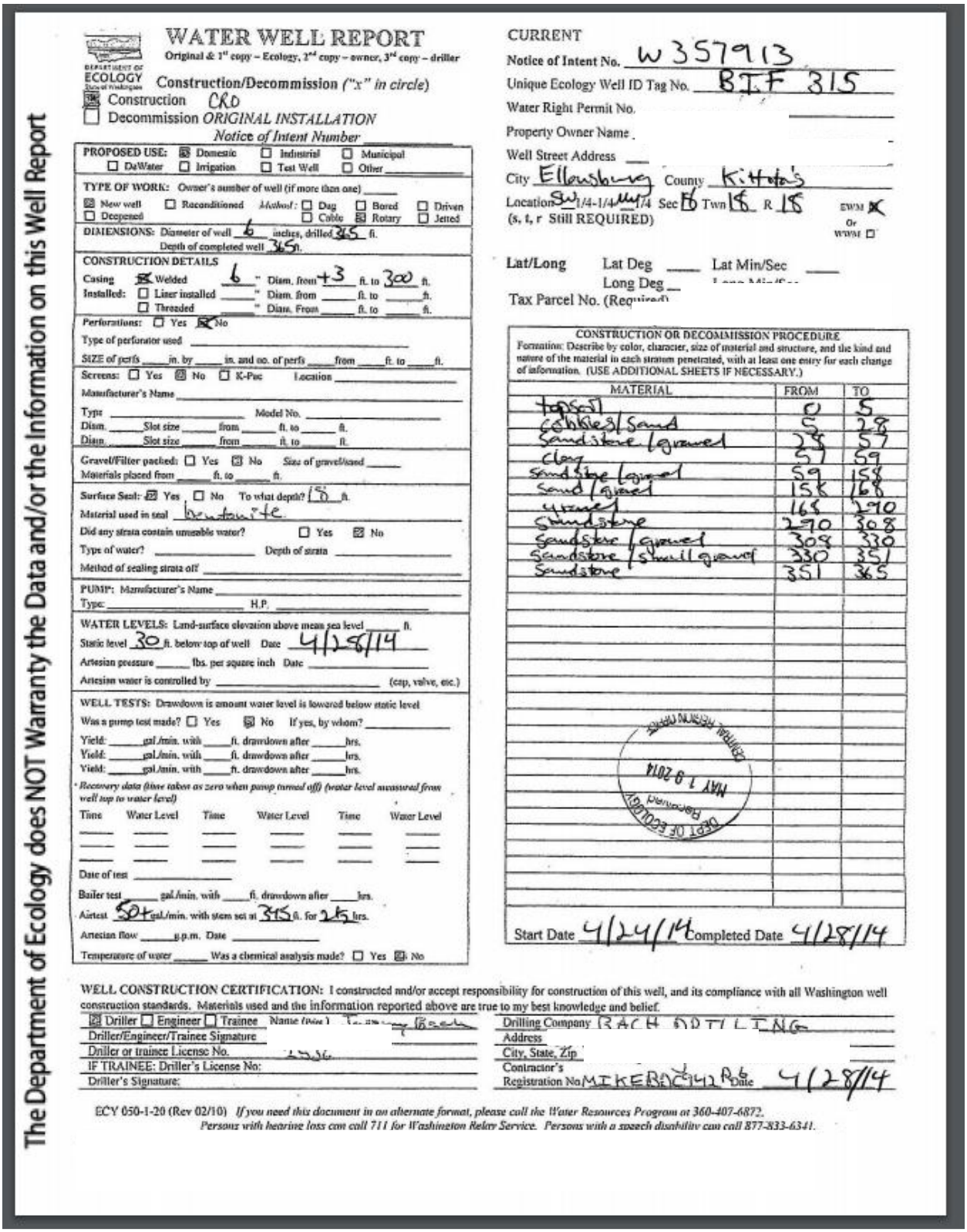
(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 060-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY

Construction/Decommission ("x" in circle)

Construction CRD

Decommission ORIGINAL INSTALLATION

Notice of Intent Number

PROPOSED USE: Domestic; Industrial; Municipal; DeWater; Irrigation; Test Well; Other

TYPE OF WORK: Owner's number of well (if more than one)

New well; Reconditioned; Method: Dug; Bored; Driven; Deepened; Cable; Rotary; Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 365 ft.
Depth of completed well 365 ft.

CONSTRUCTION DETAILS

Casing: Welded 6" Diam. from +3 ft. to 300 ft.

Installed: Liner installed " Diam. from ft. to ft.
Threaded " Diam. From ft. to ft.

Perforations: Yes No

Type of perforator used

SIZE of perfs in. by in. and no. of perfs from ft. to ft.

Screens: Yes No K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: Yes No Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: Yes No To what depth? 50 ft.

Material used in seal bentonite

Did any strata contain unusable water? Yes No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 30 ft. below top of well Date 4/28/14

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

* Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min. with ft. drawdown after hrs.

Airtest 50 gal./min. with stem set at 345 ft. for 25 hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? Yes No

CURRENT

Notice of Intent No. W357913

Unique Ecology Well ID Tag No. BIF 315

Water Right Permit No.

Property Owner Name

Well Street Address

City Ellensburg County Kittitas

Location SW 1/4-1/4 NW 1/4 Sec 16 Twn 18 R 18 EWM X
(s, t, r Still REQUIRED) Or WWM

Lat/Long Lat Deg Lat Min/Sec
Long Deg

Tax Parcel No. (Required)

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
topsoil	0	5
cobbles/sand	5	28
sandstone/gravel	28	57
clay	57	59
sandstone/gravel	59	158
sand/gravel	158	168
gravel	168	290
sandstone	290	308
sandstone/gravel	308	330
sandstone/small gravel	330	351
sandstone	351	365

Start Date 4/24/14 Completed Date 4/28/14

DEPT OF ECOLOGY Received MAY 19 2014 CENTRAL REGION OFFICE

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (type) [redacted]

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2536

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company RACH DRILLING

Address

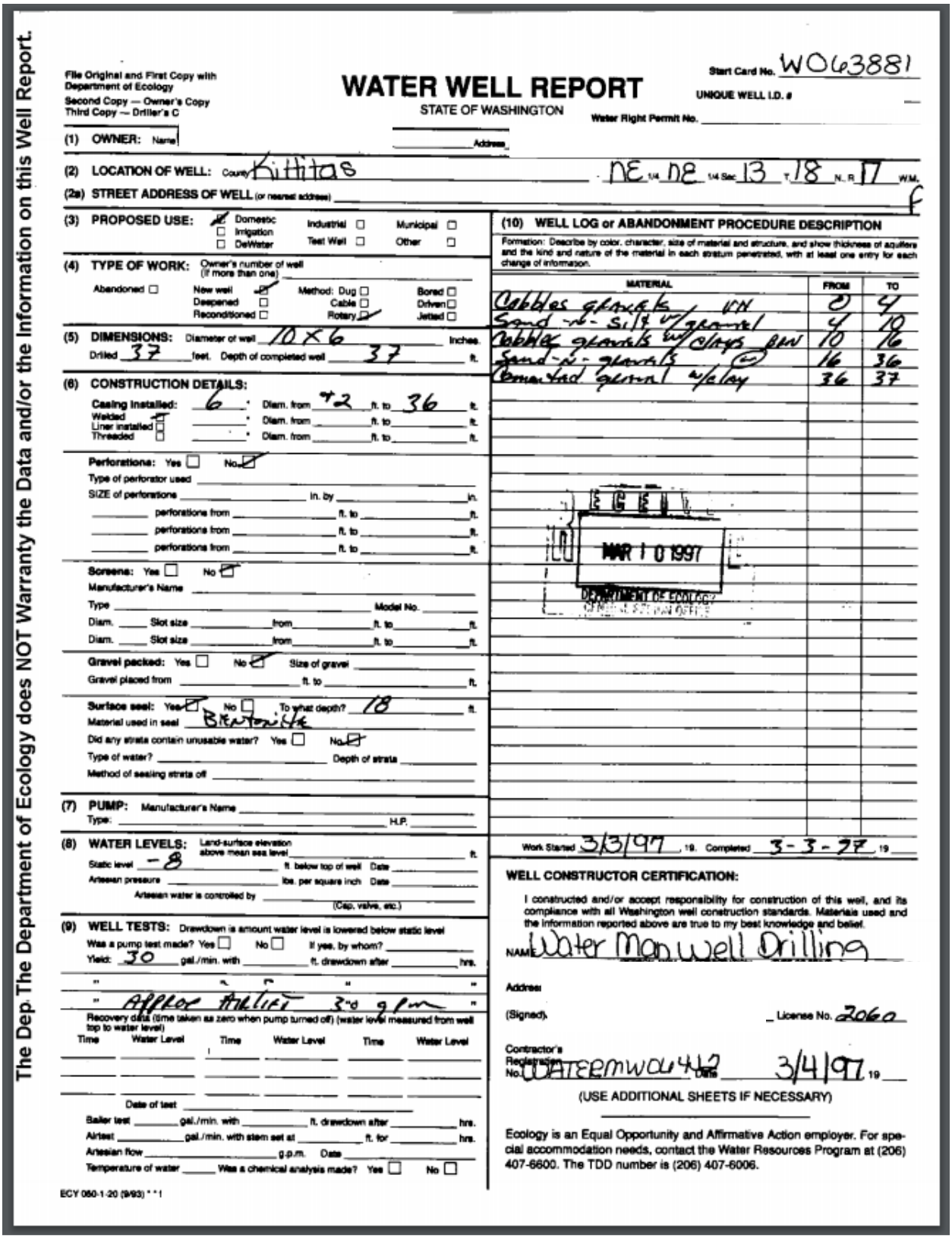
City, State, Zip

Contractor's Registration No MIKERR*142R6 Date 4/28/14

ECY 050-1-20 (Rev 02/10) If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's C

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. WO63881
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Kittitas NE 1/4 NE 1/4 Sec 13 T 18 N. R 17 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 X 6 inches. Drilled 37 feet. Depth of completed well 37 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 36 ft.
Welded ☒ Liner installed ☐ Threaded ☐
_____" Diam. from _____ ft. to _____ ft.
_____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level -8 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? _____
Yield: 30 gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" Airlift 3"0 gpm "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Cobbles gravels w/ FM	0	4
Sand-n-silt w/gravel	4	10
Cobbles gravels w/clays BRN	10	16
Sand-n-gravels (c)	16	36
Cemented gravel w/clay	36	37

RECEIVED
MAR 10 1997
DEPARTMENT OF ECOLOGY

Work Started 3/3/97 19. Completed 3-3-97 19

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Water Man Well Drilling
Address
(Signed) _____ License No. 2060
Contractor's Registration No. WATERMWD442 Date 3/4/97 19

(USE ADDITIONAL SHEETS IF NECESSARY)

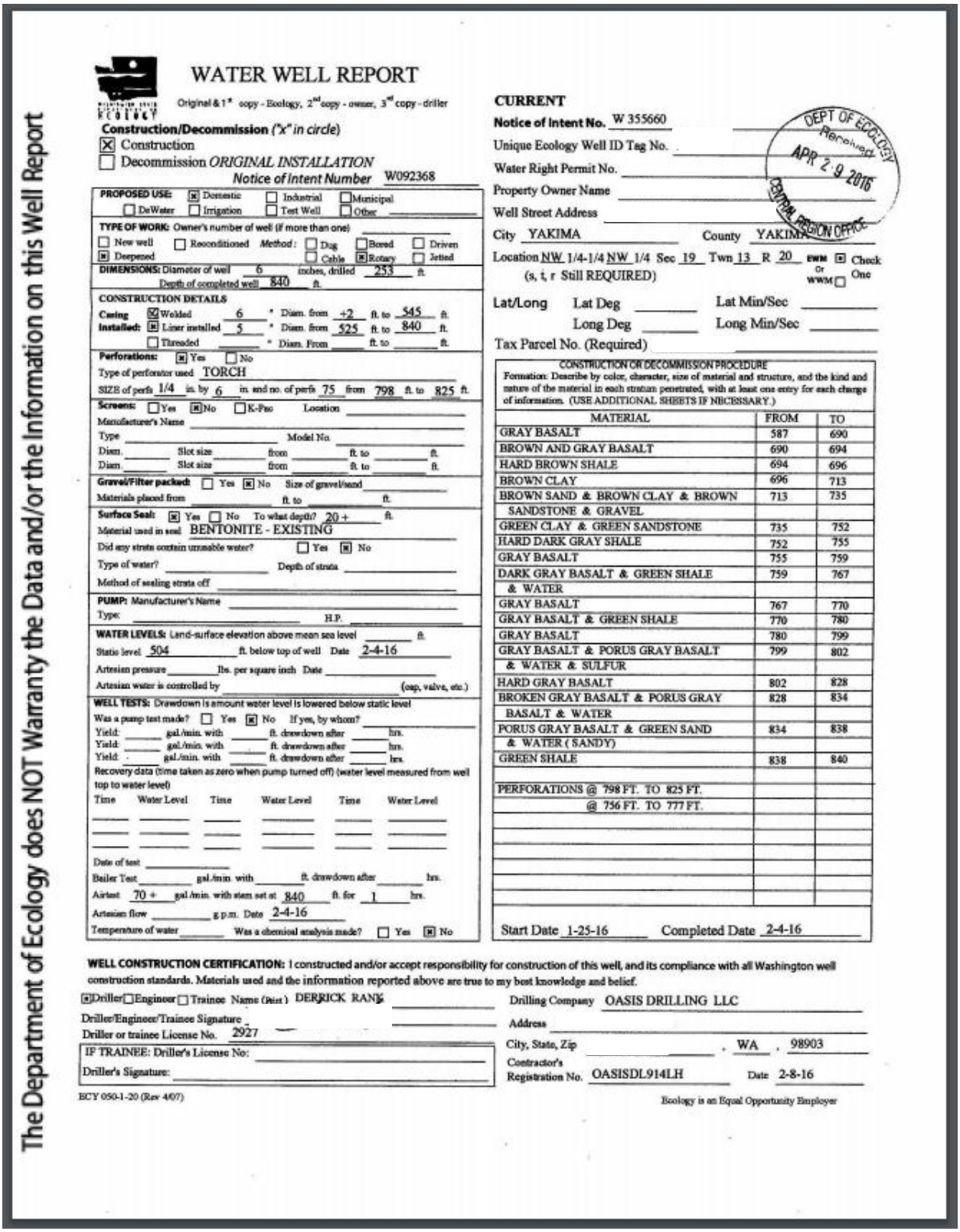
Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * I

Note: Personally Identifying Info redacted due to privacy concerns.

APPENDIX E- MOXEE VALLEY WELL LOGS

Well Name	General Description	Unique Well ID/Report ID
North of Agriculture		
Cla18	At S base of Yakima Ridge Anticline, above influence of irrigation	ACT574
Cla23	At S base of Yakima Ridge Anticline, above influence of irrigation	AGL796
Cla15	At S base of Yakima Ridge Anticline, above influence of irrigation	BCF027
North Valley		
Ter70	N end of transect, below irrigation canal, amidst agriculture	BAF889
Bit50	N end of transect, just above (N) of irrigation canal	BAF928
Bit71	N end of transect, just above (N) of irrigation canal	ABL581
Bit81	N end of transect, just above (N) of irrigation canal	133375
Bit80	N end of transect, just above (N) of irrigation canal	125651
Loc40	N end of transect, below irrigation canal, amidst agriculture	BIF734
Ter59	N end of transect, just above (N) of irrigation canal	126129
Bit09	N end of transect, just above (N) of irrigation canal	AKL903
Middle Valley		
Bea23	~0.5mi S of East Valley High School	952392
Cay22	In middle valley, ~1.5mi E of Yakima R.	BIN443
Mie9	Middle of Moxee Valley, on a local high point, amidst agriculture	ACX982
Duf86	Middle of Moxee Valley, amidst agriculture	AGM800
Bel65	Middle of valley, E of Moxee	AHT031
Bir22	In middle of the valley, ~1 mile E of Yakima R.	ACX879
East Valley		
Des38	SE end of Moxee Valley, amidst agriculture	AHT021
WA-24	SE end of Moxee Valley, on a local high point, amidst agriculture	ALC988
Hof35	S end of Moxee Valley, on a local high point, amidst agriculture	130589
Hof34	S end of Moxee Valley, on a local high point, amidst agriculture	131432
Hof25	S end of Moxee Valley, on a local high point, amidst agriculture	ABX809
Pos12	NE end of Moxee Valley, amidst agriculture	ALE016
South Valley		
Gam02	S end of transect, amidst agriculture	ACL563
Gam76	S end of transect, amidst agriculture	
Gam5	S end of transect, amidst agriculture	130920
Bea85	Middle of transect, directly south of Moxee	ALF463
Bea68	S end of transect, amidst agriculture	APT908
Konnowac Pass		
Kon14	S end of transect, above agriculture on the west side of Konnowac pass	BIN994



WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number W092368

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)

☐ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☒ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 253 ft. Depth of completed well 840 ft.

CONSTRUCTION DETAILS

Casing ☒ Welded 6 " Diam. from +2 ft. to 545 ft.

Installed: ☒ Liner installed 5 " Diam. from 525 ft. to 840 ft.

☐ Threaded " Diam. From ft. to ft.

Perforations: ☒ Yes ☐ No

Type of perforator used TORCH

SIZE of perfs 1/4 in. by 6 in. and no. of perfs 75 from 798 ft. to 825 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand

Materials placed from ft. to ft.

Surface Seal: ☒ Yes ☐ No To what depth? 20 + ft.

Material used in seal BENTONITE - EXISTING

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 504 ft. below top of well Date 2-4-16

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer Test gal./min. with ft. drawdown after hrs.

Airtest 70 + gal./min. with stem set at 840 ft. for 1 hrs.

Artesian flow g.p.m. Date 2-4-16

Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. W 355660

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name

Well Street Address

City YAKIMA County YAKIMA

Location NW 1/4-1/4 NW 1/4 Sec 19 Twn 13 R 20 EWM ☒ Check One WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg Lat Min/Sec

Long Deg Long Min/Sec

Tax Parcel No. (Required)

DEPT OF ECOLOGY Received APR 29 2016 CENTRAL REGION OFFICE

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
GRAY BASALT	587	690
BROWN AND GRAY BASALT	690	694
HARD BROWN SHALE	694	696
BROWN CLAY	696	713
BROWN SAND & BROWN CLAY & BROWN SANDSTONE & GRAVEL	713	735
GREEN CLAY & GREEN SANDSTONE	735	752
HARD DARK GRAY SHALE	752	755
GRAY BASALT	755	759
DARK GRAY BASALT & GREEN SHALE & WATER	759	767
GRAY BASALT	767	770
GRAY BASALT & GREEN SHALE	770	780
GRAY BASALT	780	799
GRAY BASALT & PORUS GRAY BASALT & WATER & SULFUR	799	802
HARD GRAY BASALT	802	828
BROKEN GRAY BASALT & PORUS GRAY BASALT & WATER	828	834
PORUS GRAY BASALT & GREEN SAND & WATER (SANDY)	834	838
GREEN SHALE	838	840
PERFORATIONS @ 798 FT. TO 825 FT. @ 756 FT. TO 777 FT.		

Start Date 1-25-16 Completed Date 2-4-16

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) DERRICK RANEY

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2927

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company OASIS DRILLING LLC

Address

City, State, Zip , WA , 98903

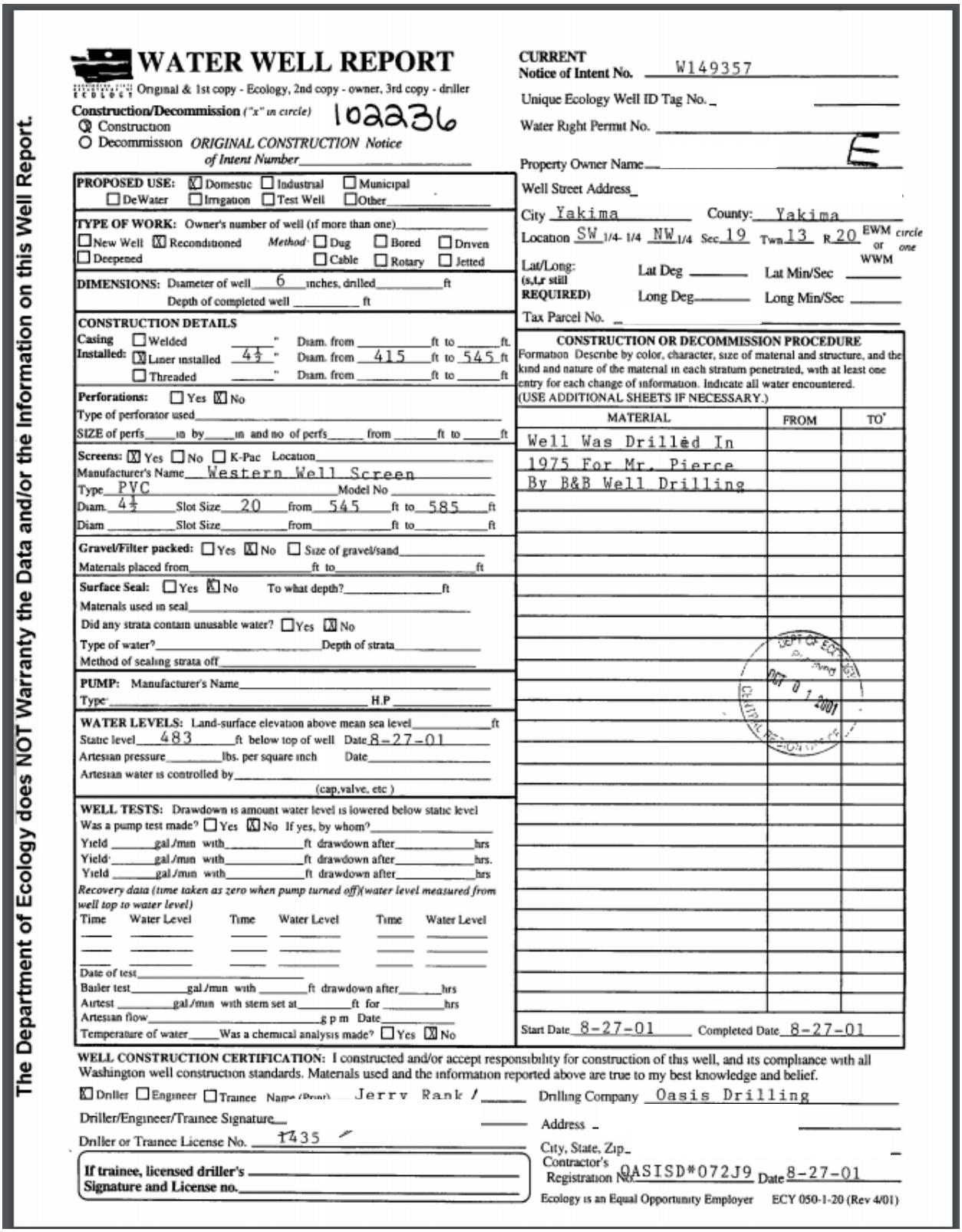
Contractor's Registration No. OASISDL914LH Date 2-8-16

ECY 050-1-20 (Rev 4/07)

Ecology is an Equal Opportunity Employer

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle) 102236

(X) Construction

( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*

CURRENT Notice of Intent No. W149357

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name E

Well Street Address

City Yakima County: Yakima

Location SW 1/4- 1/4 NW 1/4 Sec 19 Twn 13 R 20 EWM or WWM *circle one*

Lat/Long: (s,t,r still REQUIRED) Lat Deg Lat Min/Sec Long Deg Long Min/Sec

Tax Parcel No.

PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK: Owner's number of well (if more than one)

[ ] New Well [X] Reconditioned Method: [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [ ] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled ft. Depth of completed well ft.

CONSTRUCTION DETAILS

Casing Installed: [ ] Welded " Diam. from ft to ft. [X] Liner installed 4½ " Diam. from 415 ft to 545 ft. [ ] Threaded " Diam. from ft to ft.

Perforations: [ ] Yes [X] No

Type of perforator used

SIZE of perfs in by in and no of perfs from ft to ft

Screens: [X] Yes [ ] No [ ] K-Pac Location

Manufacturer's Name Western Well Screen

Type PVC Model No

Diam. 4½ Slot Size 20 from 545 ft to 585 ft

Diam Slot Size from ft to ft

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand

Materials placed from ft to ft

Surface Seal: [ ] Yes [X] No To what depth? ft

Materials used in seal

Did any strata contain unusable water? [ ] Yes [X] No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type H.P

WATER LEVELS: Land-surface elevation above mean sea level ft

Static level 483 ft below top of well Date 8-27-01

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap,valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? [ ] Yes [X] No If yes, by whom?

Yield gal./min with ft drawdown after hrs

Yield gal./min with ft drawdown after hrs.

Yield gal./min with ft drawdown after hrs

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min with ft drawdown after hrs

Airtest gal./min with stem set at ft for hrs

Artesian flow g p m Date

Temperature of water Was a chemical analysis made? [ ] Yes [X] No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Well Was Drilled In		
1975 For Mr. Pierce		
By B&B Well Drilling		

DEPT OF ECOLOGY OCT 0 1 2001 CENTRAL REGIONAL OFFICE

Start Date 8-27-01 Completed Date 8-27-01

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) Jerry Rank /

Driller/Engineer/Trainee Signature

Driller or Trainee License No. 1435

Drilling Company Oasis Drilling

Address

City, State, Zip

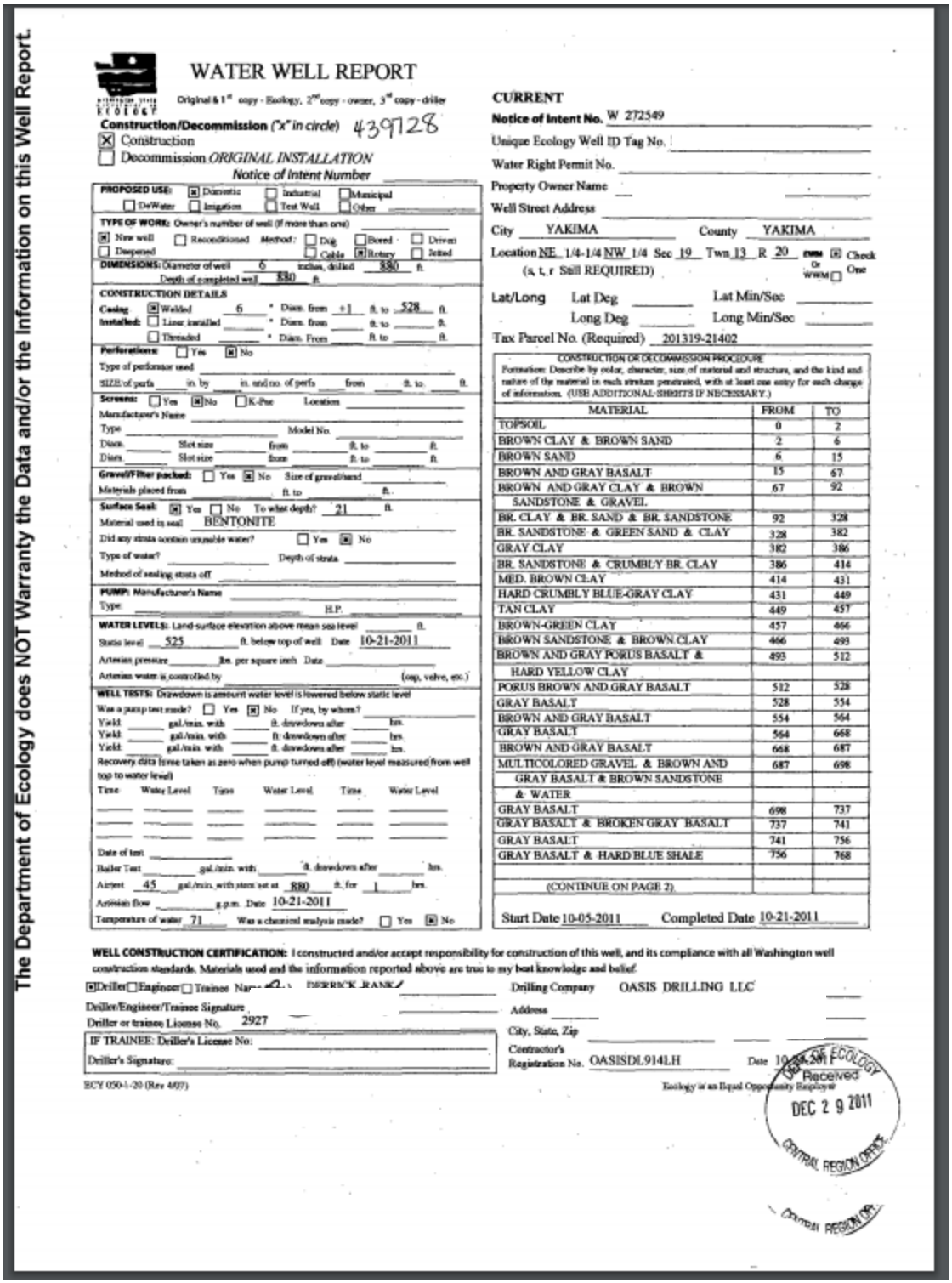
Contractor's Registration No. OASISD*072J9 Date 8-27-01

If trainee, licensed driller's Signature and License no.

Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle) 439728

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)

☒ New well ☐ Reconditioned Method: ☐ Dug ☐ Bored ☐ Driven ☐ Dispersed ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 880 ft.

Depth of completed well 880 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6 " Diam. from +1 ft. to 528 ft.

☐ Liner installed " Diam. from ft. to ft.

☐ Threaded " Diam. From ft. to ft.

Perforations: ☐ Yes ☒ No

Type of perforator used

SIZE of perfs in. by in. and no. of perfs from ft. to ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand

Materials placed from ft. to ft.

Surface Seal: ☒ Yes ☐ No To what depth? 21 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 525 ft. below top of well Date 10-21-2011

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer Test gal./min. with ft. drawdown after hrs.

Airjet 45 gal./min. with stem set at 880 ft. for 1 hrs.

Artesian flow g.p.m. Date 10-21-2011

Temperature of water 71 Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

Notice of Intent No. W 272549

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name

Well Street Address

City YAKIMA County YAKIMA

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 13 R 20 ☒ E ☐ W ☒ Check One

(s, t, r Still REQUIRED) Or WWM ☐

Lat/Long Lat Deg Lat Min/Sec

Long Deg Long Min/Sec

Tax Parcel No. (Required) 201319-21402

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
TOPSOIL	0	2
BROWN CLAY & BROWN SAND	2	6
BROWN SAND	6	15
BROWN AND GRAY BASALT	15	67
BROWN AND GRAY CLAY & BROWN SANDSTONE & GRAVEL	67	92
BR. CLAY & BR. SAND & BR. SANDSTONE	92	328
BR. SANDSTONE & GREEN SAND & CLAY	328	382
GRAY CLAY	382	386
BR. SANDSTONE & CRUMBLY BR. CLAY	386	414
MED. BROWN CLAY	414	431
HARD CRUMBLY BLUE-GRAY CLAY	431	449
TAN CLAY	449	457
BROWN-GREEN CLAY	457	466
BROWN SANDSTONE & BROWN CLAY	466	493
BROWN AND GRAY POROUS BASALT & HARD YELLOW CLAY	493	512
POROUS BROWN AND GRAY BASALT	512	528
GRAY BASALT	528	554
BROWN AND GRAY BASALT	554	564
GRAY BASALT	564	668
BROWN AND GRAY BASALT	668	687
MULTICOLORED GRAVEL & BROWN AND GRAY BASALT & BROWN SANDSTONE & WATER	687	698
GRAY BASALT	698	737
GRAY BASALT & BROKEN GRAY BASALT	737	741
GRAY BASALT	741	756
GRAY BASALT & HARD BLUE SHALE	756	768
(CONTINUE ON PAGE 2)		

Start Date 10-05-2011 Completed Date 10-21-2011

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name DERRICK RANK

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2927

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company OASIS DRILLING LLC

Address

City, State, Zip

Contractor's Registration No. OASISDL914LH Date 10-28-2011

ECY 050-1-20 (Rev 4/07)

Ecology is an Equal Opportunity Employer

DEPT OF ECOLOGY Received DEC 29 2011 CENTRAL REGION OFFICE

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle) 439728

[x] Construction

[ ] Decommission ORIGINAL INSTALLATION *Notice of Intent Number*

CURRENT

Notice of Intent No. W 272549

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name

Well Street Address

City YAKIMA County YAKIMA

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 13 R 20 EWM [x] Check One or WWM [ ]

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ___ Lat Min/Sec ___ Long Deg ___ Long Min/Sec ___

Tax Parcel No. (Required)

PROPOSED USE: [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK: Owner's number of well (if more than one)

[x] New well [ ] Reconditioned *Method:* [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 880 ft. Depth of completed well 880 ft.

CONSTRUCTION DETAILS

Casing Installed: [x] Welded 6 " Diam. from +1 ft. to 528 ft.; [ ] Liner installed " Diam. from ft. to ft.; [ ] Threaded " Diam. From ft. to ft.

Perforations: [ ] Yes [x] No

Type of perforator used

SIZE of perfs in. by in. and no. of perfs from ft. to ft.

Screens: [ ] Yes [x] No [ ] K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [x] No Size of gravel/sand

Materials placed from ft. to ft.

Surface Seal: [x] Yes [ ] No To what depth? 21 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? [ ] Yes [x] No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 525 ft. below top of well Date 10-21-2011

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? [ ] Yes [x] No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer Test gal./min. with ft. drawdown after hrs.

Airtest 45 gal./min. with stem set at 880 ft. for 1 hrs.

Artesian flow g.p.m. Date 10-21-2011

Temperature of water 71 Was a chemical analysis made? [ ] Yes [x] No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
GRAY BASALT & HARD BLUE SHALE & MED. GREEN SHALE	768	855
BROKEN GRAY BASALT & HARD BLUE & GREEN SHALE & WATER & LITTLE SULFUR	855	857
GRAY BASALT & HARD BLUE & GREEN SHALE	857	880
(CONTINUED FROM PAGE 1)		

Start Date 10-05-2011 Completed Date 10-21-2011

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print) DERRICK RAJK

Driller/Engineer/Trainee Signature

Driller or trainee License No.

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company OASIS DRILLING LLC

Address

City, State, Zip

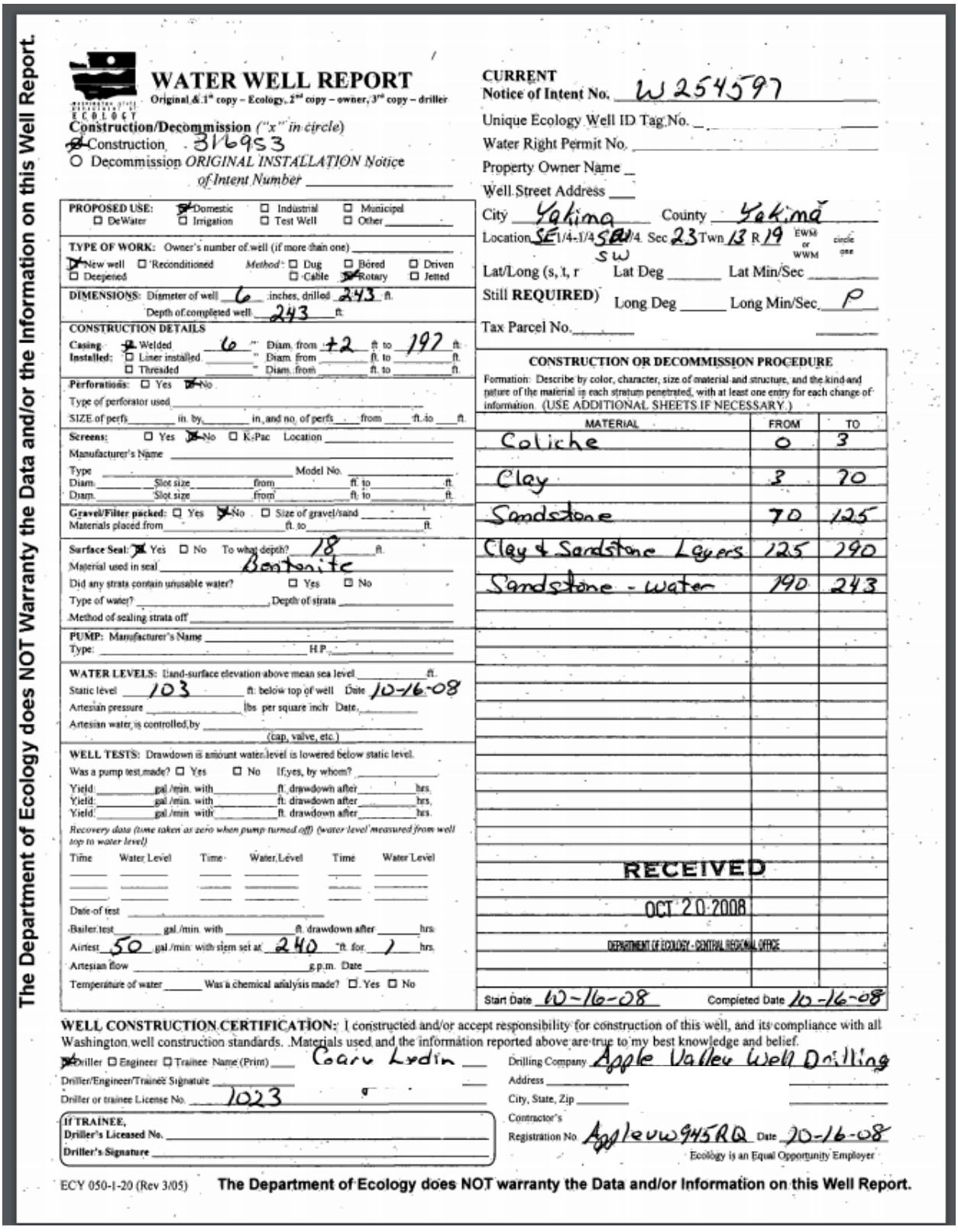
Contractor's Registration No. OASISDL914LH Date

ECY 050-1-20 (Rev.4/07)

Ecology is an Equal Opportunity Employer

DEPT OF ECOLOGY Received DEC 2 9 2011 CENTRAL REGION OFFICE

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission ("x" in circle)

- [x] Construction - 316953
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. W254597

Unique Ecology Well ID Tag No. _____
Water Right Permit No. _____
Property Owner Name _____
Well Street Address _____
City Yakima County Yakima
Location SE 1/4-1/4 SW 1/4 Sec 23 Twn 13 R 19 EWM or WWM (circle one)
Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec P
Tax Parcel No. _____

PROPOSED USE: [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
[x] New well [ ] Reconditioned [ ] Deepened — Method: [ ] Dug [ ] Bored [ ] Driven [ ] Cable [x] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 243 ft. Depth of completed well 243 ft.

CONSTRUCTION DETAILS
Casing Installed: [x] Welded 6" Diam. from +2 ft. to 197 ft. [ ] Liner installed _____" Diam. from _____ ft. to _____ ft. [ ] Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: [ ] Yes [x] No
Type of perforator used _____
SIZE of perfs _____ in. by _____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: [ ] Yes [x] No [ ] K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: [ ] Yes [x] No [ ] Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: [x] Yes [ ] No To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [ ] No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 103 ft. below top of well Date 10-16-08
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? [ ] Yes [ ] No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 50 gal./min. with stem set at 240 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? [ ] Yes [ ] No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Coliche	0	3
Clay	3	70
Sandstone	70	125
Clay & Sandstone Layers	125	190
Sandstone - water	190	243

RECEIVED
OCT 20 2008
DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 10-16-08 Completed Date 10-16-08

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Coary Lydin
Driller/Engineer/Trainee Signature _____
Driller or trainee License No. 1023
Drilling Company Apple Valley Well Drilling
Address _____
City, State, Zip _____
Contractor's Registration No. Applevw945RQ Date 10-16-08

IF TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle) 372107

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number

PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK: Owner's number of well (if more than one)

[X] New well [ ] Reconditioned Method: [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [X] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 445 ft.
Depth of completed well 442 ft.

CONSTRUCTION DETAILS

Casing Installed: [X] Welded 6 " Diam. from +1 ft. to 427 ft.
[ ] Liner installed " Diam. from ft. to ft.
[ ] Threaded " Diam. From ft. to ft.

Perforations: [ ] Yes [X] No
Type of perforator used
SIZE of perfs in. by in. and no. of perfs from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No Size of gravel/sand
Materials placed from ft. to ft.

Surface Seal: [X] Yes [ ] No To what depth? 23 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

PUMP: Manufacturer's Name
Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 214 ft. below top of well Date 01-12-2010
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer Test gal./min. with ft. drawdown after hrs.
Airtest 70 gal./min. with stem set at 435 ft. for 1 hrs
Artesian flow g.p.m. Date 01-12-2010
Temperature of water 64 Was a chemical analysis made? [ ] Yes [X] No

CURRENT

Notice of Intent No. W 250171
Unique Ecology Well ID Tag No.
Water Right Permit No.
Property Owner Name
Well Street Address
City YAKIMA County YAKIMA
Location NE 1/4-1/4 SE 1/4 Sec 23 Twn 13 R 19 EWM [X] Check Or WWM [ ] One
(s, t, r Still REQUIRED)
Lat/Long Lat Deg Lat Min/Sec
Long Deg Long Min/Sec
Tax Parcel No. (Required)

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation. Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
TOPSOIL	0	8
GRAVEL & BR. CLAY	8	32
GRAVEL & BR. CLAY & MED. BR. SANDSTONE	32	117
BR. CLAY & BR. SAND	117	239
BR. CLAY & BR. SAND & SM. GRAVEL & WATER	239	276
SOFT COARSE GRAY SANDSTONE & GRAY SAND & GRAY CLAY & SM. GRAVEL	276	337
BR. SANDSTONE & BR. CLAY & BR. SAND & SM. GRAVEL & WATER	337	362
GRAY SAND & MULTICOLORED GRAVEL & WATER	362	378
BR. CLAY & BR. SAND	378	393
GRAY SAND & GRAVEL & WATER	393	395
BR. CLAY & BR. SAND	395	403
GRAY CLAY & SM. GRAVEL	403	420
CRUMBLY BR. CLAY	420	425
BR. SANDSTONE & BR. CLAY & WATER	425	441
WHITE SANDSTONE & GRAVEL	441	445

RECEIVED
APR 28 2010
DEPARTMENT OF ECOLOGY - CENTRAL REGIONAL OFFICE

Start Date 01-05-2010 Completed Date 01-12-2010

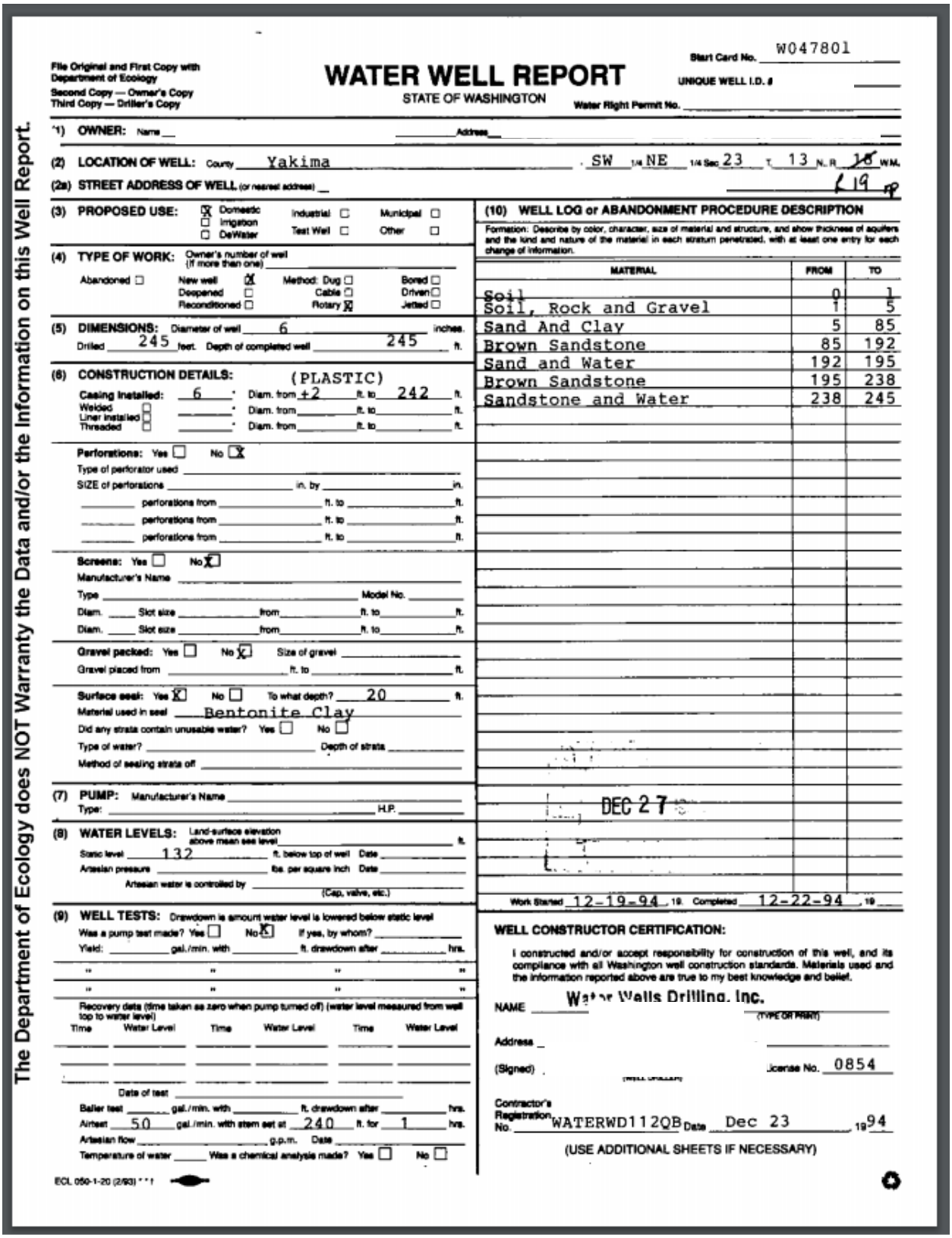
WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) JERRY RANK
Driller/Engineer/Trainee Signature
Driller or trainee License No. 1432
Drilling Company OASIS DRILLING LLC
Address
City, State, Zip
Contractor's Registration No. OASISDL914LH Date 01-12-2010

IF TRAINEE: Driller's License No:
Driller's Signature:

ECY 050-1-20 (Rev 4/07) Ecology is an Equal Opportunity Employer

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W047801
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Yakima SW 1/4 NE 1/4 Sec 23 T. 13 N. R. 19 WM.

(2a) STREET ADDRESS OF WELL (or nearest address) [redacted] 619 rp

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 245 feet. Depth of completed well 245 ft.

(6) CONSTRUCTION DETAILS: (PLASTIC)
Casing Installed: 6" Diam. from +2 ft. to 242 ft.
Welded [ ] Liner installed [ ] Threaded [ ] " Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal Bentonite Clay
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 132 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 50 gal./min. with stem set at 240 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Soil	0	1
Soil, Rock and Gravel	1	5
Sand And Clay	5	85
Brown Sandstone	85	192
Sand and Water	192	195
Brown Sandstone	195	238
Sandstone and Water	238	245

DEC 27

Work Started 12-19-94 19 Completed 12-22-94 19

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

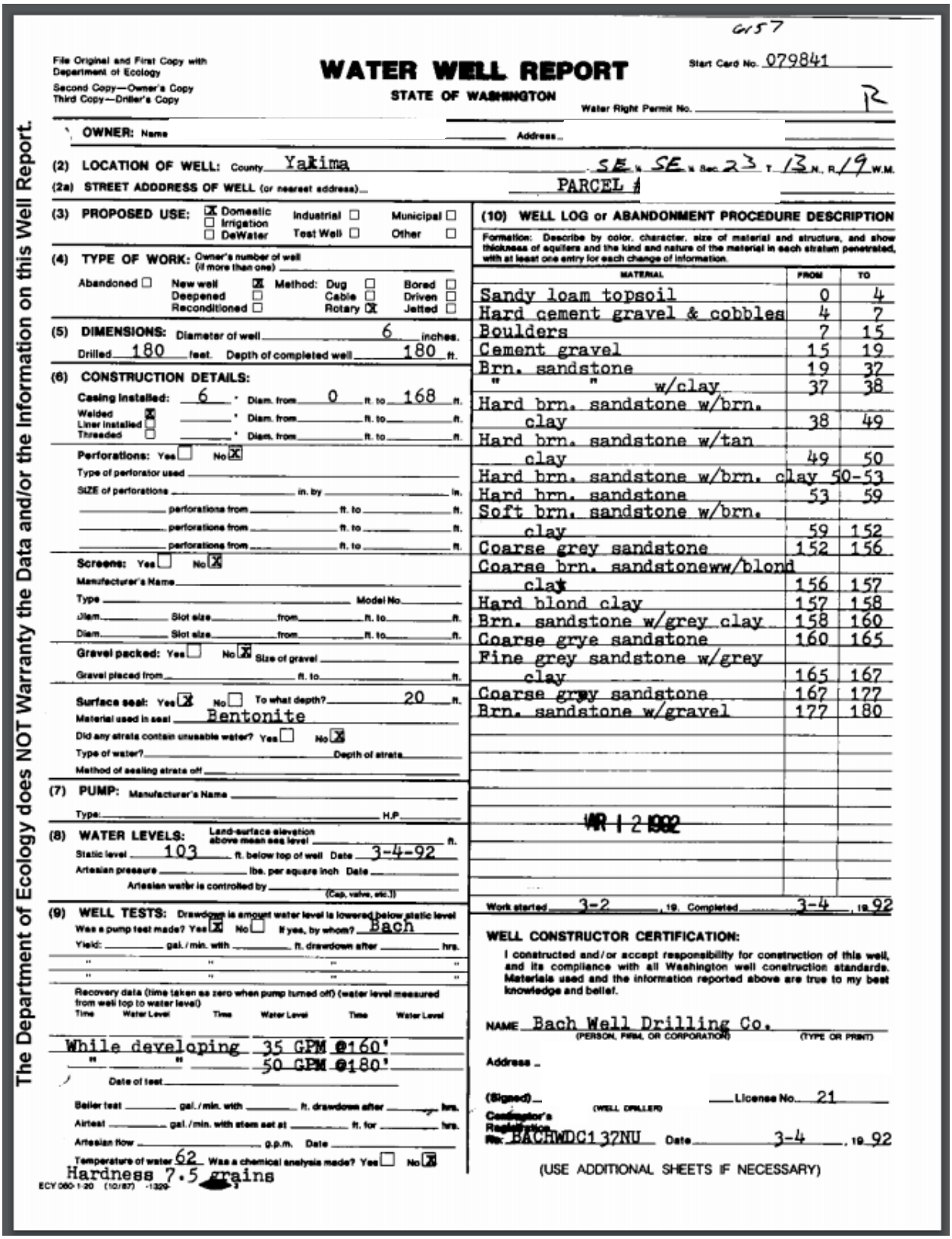
NAME Water Wells Drilling, Inc. (TYPE OR PRINT)
Address [redacted]
(Signed) [redacted] License No. 0854
Contractor's Registration No. WATERWD112QB Date Dec 23 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



G157

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 079841

Water Right Permit No. R

OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Yakima SE ¼ SE ¼ Sec 23 T. 13 N. R. 19 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) PARCEL #

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 180 feet. Depth of completed well 180 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 168 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 103 ft. below top of well Date 3-4-92
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Bach
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

While developing 35 GPM @160'
" " 50 GPM @180'

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water 62 Was a chemical analysis made? Yes ☐ No ☒
Hardness 7.5 grains

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sandy loam topsoil	0	4
Hard cement gravel & cobbles	4	7
Boulders	7	15
Cement gravel	15	19
Brn. sandstone	19	37
" " w/clay	37	38
Hard brn. sandstone w/brn. clay	38	49
Hard brn. sandstone w/tan clay	49	50
Hard brn. sandstone w/brn. clay	50	53
Hard brn. sandstone	53	59
Soft brn. sandstone w/brn. clay	59	152
Coarse grey sandstone	152	156
Coarse brn. sandstoneww/blond clay	156	157
Hard blond clay	157	158
Brn. sandstone w/grey clay	158	160
Coarse grye sandstone	160	165
Fine grey sandstone w/grey clay	165	167
Coarse grey sandstone	167	177
Brn. sandstone w/gravel	177	180

MAR 1 2 1992

Work started 3-2 19. Completed 3-4 19 92

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Bach Well Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address _____

(Signed) _____ (WELL DRILLER) License No. 21

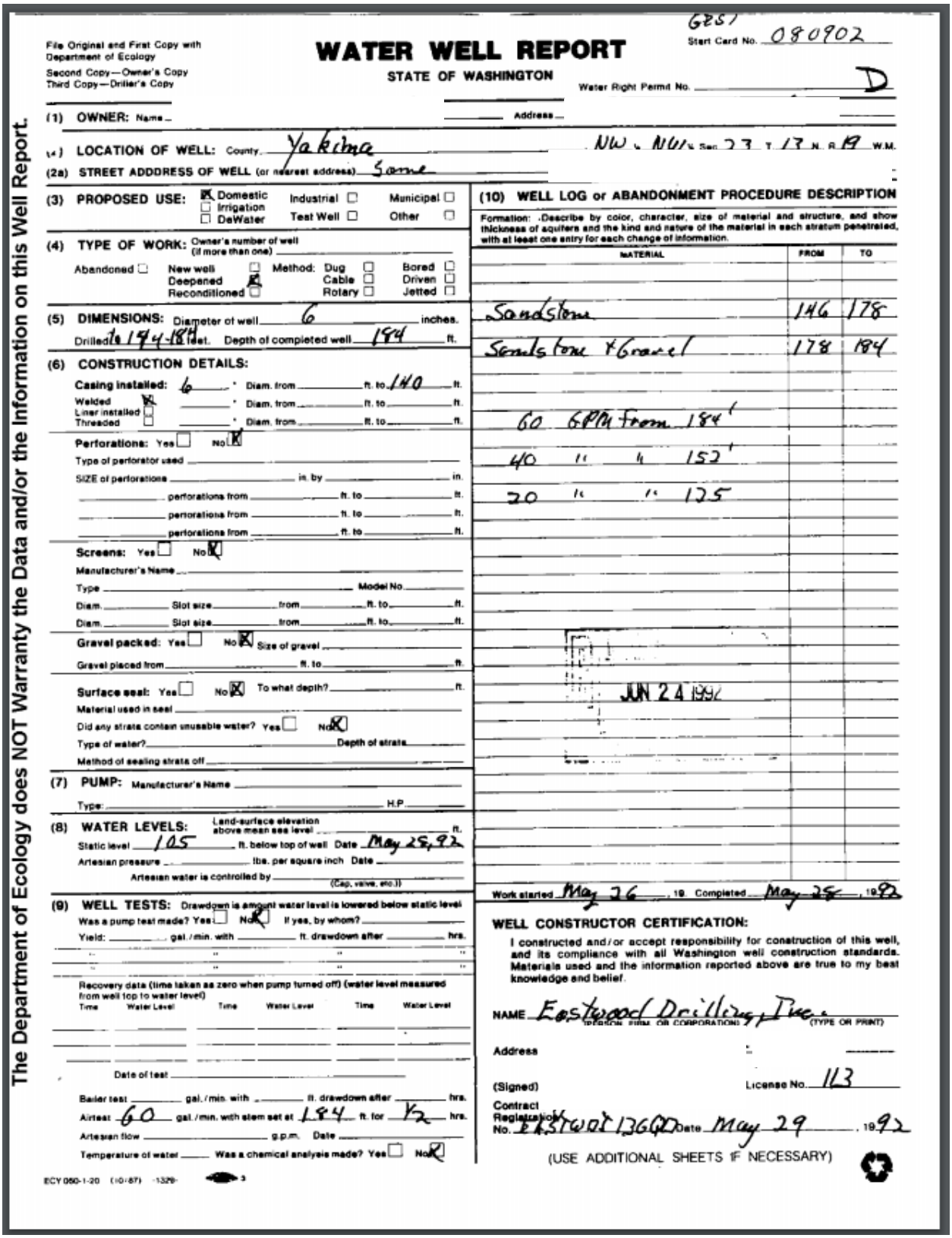
Contractor's Registration No. BACHWDC137NU Date 3-4 19 92

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20 (10/87) -1320-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



GRS
Start Card No. 080902

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Water Right Permit No. D

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Yakima NW ¼ NW ¼ Sec 23 T 13 N. R 19 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Same

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled to 194-184 feet. Depth of completed well 184 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from _____ ft. to 140 ft.
Welded ☒ _____ " Diam. from _____ ft. to _____ ft.
Liner installed ☐
Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☐ No ☒ To what depth? _____ ft.
Material used in seal _____
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 105 ft. below top of well Date May 25, 92
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 60 gal./min. with stem set at 184 ft. for ½ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sandstone	146	178
Sandstone & Gravel	178	184
60 GPM From 184'		
40 " " 152'		
20 " " 125		

JUN 24 1992

Work started May 26, 19 Completed May 25, 1992

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

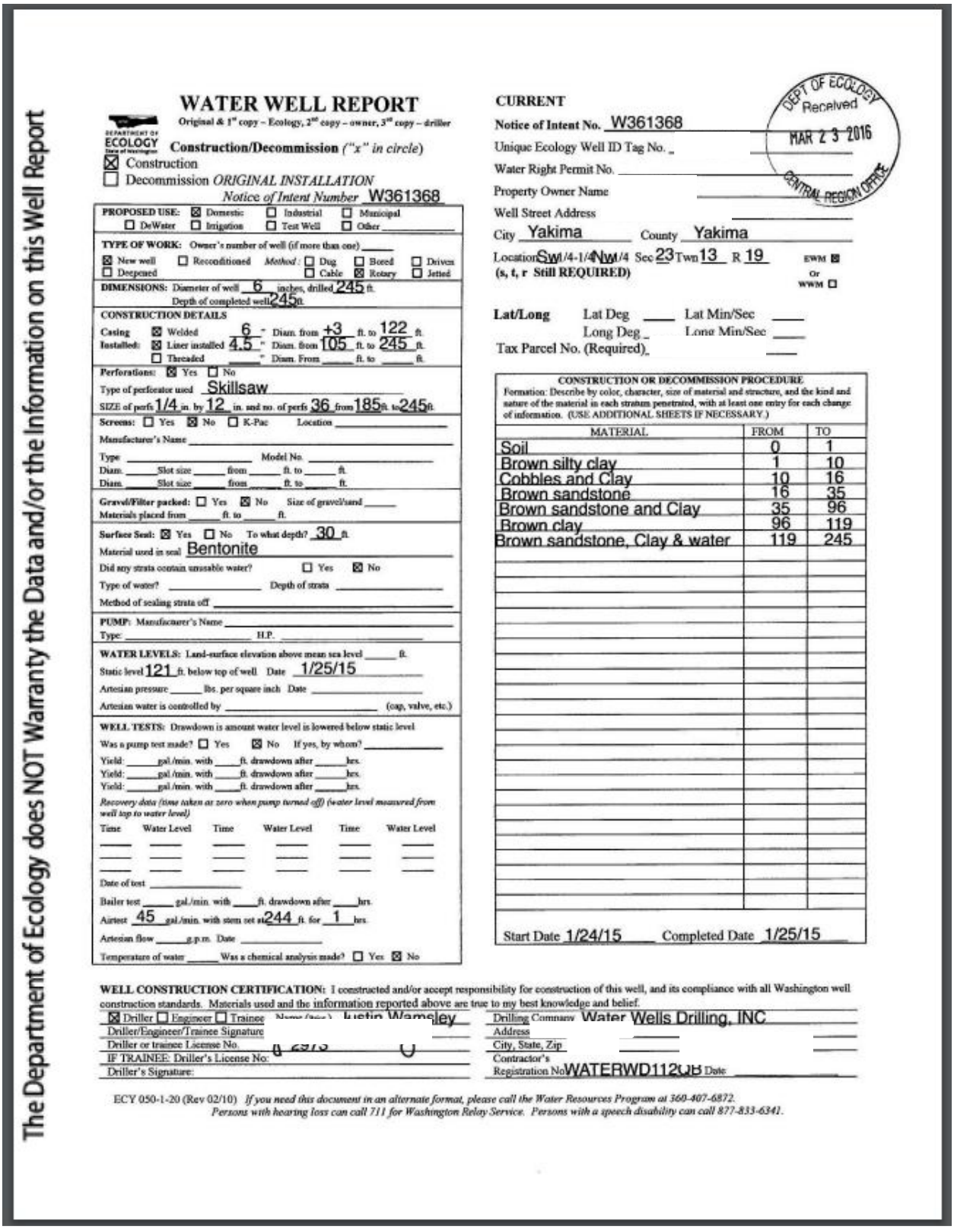
NAME Eastwood Drilling, Inc. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address _____
(Signed) _____ License No. 113
Contract Registration No. EASTWOD136QD Date May 29, 1992

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number W361368

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

TYPE OF WORK: Owner's number of well (if more than one)

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 245 ft. Depth of completed well 245 ft.

CONSTRUCTION DETAILS

Casing ☒ Welded 6 " Diam. from +3 ft. to 122 ft.

Installed: ☒ Liner installed 4.5 " Diam. from 105 ft. to 245 ft.

☐ Threaded " Diam. From ft. to ft.

Perforations: ☒ Yes ☐ No

Type of perforator used Skillsaw

SIZE of perfs 1/4 in. by 12 in. and no. of perfs 36 from 185 ft. to 245 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand

Materials placed from ft. to ft.

Surface Seal: ☒ Yes ☐ No To what depth? 30 ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: H.P.

WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 121 ft. below top of well Date 1/25/15

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min. with ft. drawdown after hrs.

Airtest 45 gal./min. with stem set at 244 ft. for 1 hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

CURRENT

DEPT OF ECOLOGY Received MAR 2 3 2016 CENTRAL REGION OFFICE

Notice of Intent No. W361368

Unique Ecology Well ID Tag No.

Water Right Permit No.

Property Owner Name

Well Street Address

City Yakima County Yakima

Location SW 1/4-1/4 NW 1/4 Sec 23 Twn 13 R 19 EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg Lat Min/Sec

Long Deg. Long Min/Sec

Tax Parcel No. (Required)

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Soil	0	1
Brown silty clay	1	10
Cobbles and Clay	10	16
Brown sandstone	16	35
Brown sandstone and Clay	35	96
Brown clay	96	119
Brown sandstone, Clay & water	119	245

Start Date 1/24/15 Completed Date 1/25/15

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (type) Justin Wamsley

Driller/Engineer/Trainee Signature

Driller or trainee License No.

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company Water Wells Drilling, INC

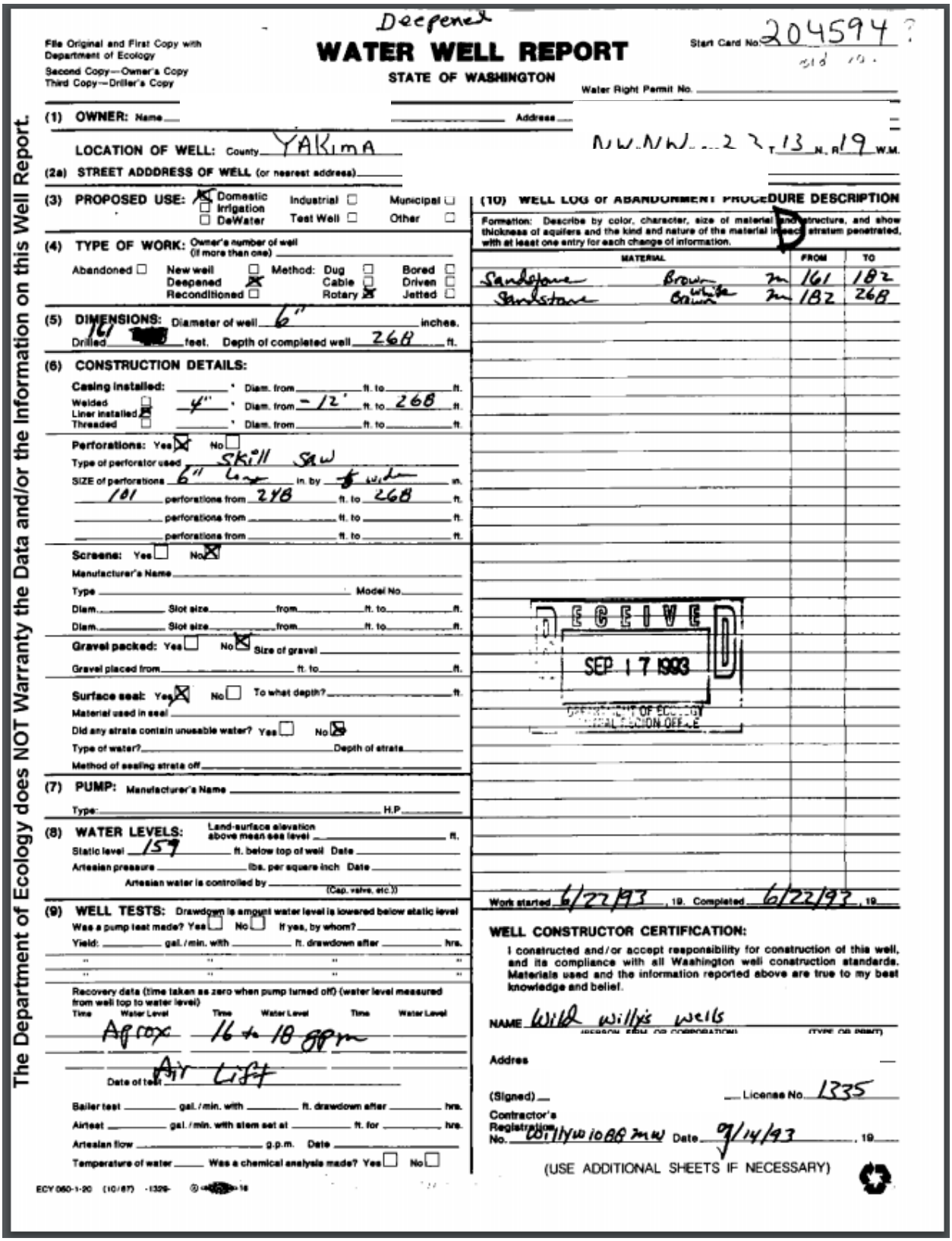
Address

City, State, Zip

Contractor's Registration No WATERWD112UB Date

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Note: Personally Identifying Info redacted due to privacy concerns.



Deepened

WATER WELL REPORT

STATE OF WASHINGTON

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

Start Card No. 204594

Water Right Permit No.

(1) OWNER: Name ____ Address ____

LOCATION OF WELL: County YAKIMA NW NW 22 T 13 N. R 19 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) ____

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) ____

Abandoned [ ] New well [ ] Method: Dug [ ] Bored [ ] Deepened [X] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6" inches. Drilled 161 feet. Depth of completed well 268 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ____ " Diam. from ____ ft. to ____ ft.
Welded [ ] 4" " Diam. from -12' ft. to 268 ft.
Liner installed [X]
Threaded [ ] ____ " Diam. from ____ ft. to ____ ft.

Perforations: Yes [X] No [ ]
Type of perforator used Skill Saw
SIZE of perforations 6" Long in. by 1/8 wide in.
101 perforations from 248 ft. to 268 ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes [X] No [ ] To what depth? ____ ft.
Material used in seal ____
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 159 ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.))

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
	Approx	16 to 18 gpm			

Date of test Air Lift

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG OF ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL		FROM	TO
Sandstone	Brown	161	182
Sandstone	White Grain	182	268

RECEIVED
SEP 17 1993
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 6/22/93, 19. Completed 6/22/93, 19.

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Wild Willy's Wells (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address ____

(Signed) ____ License No. 1335

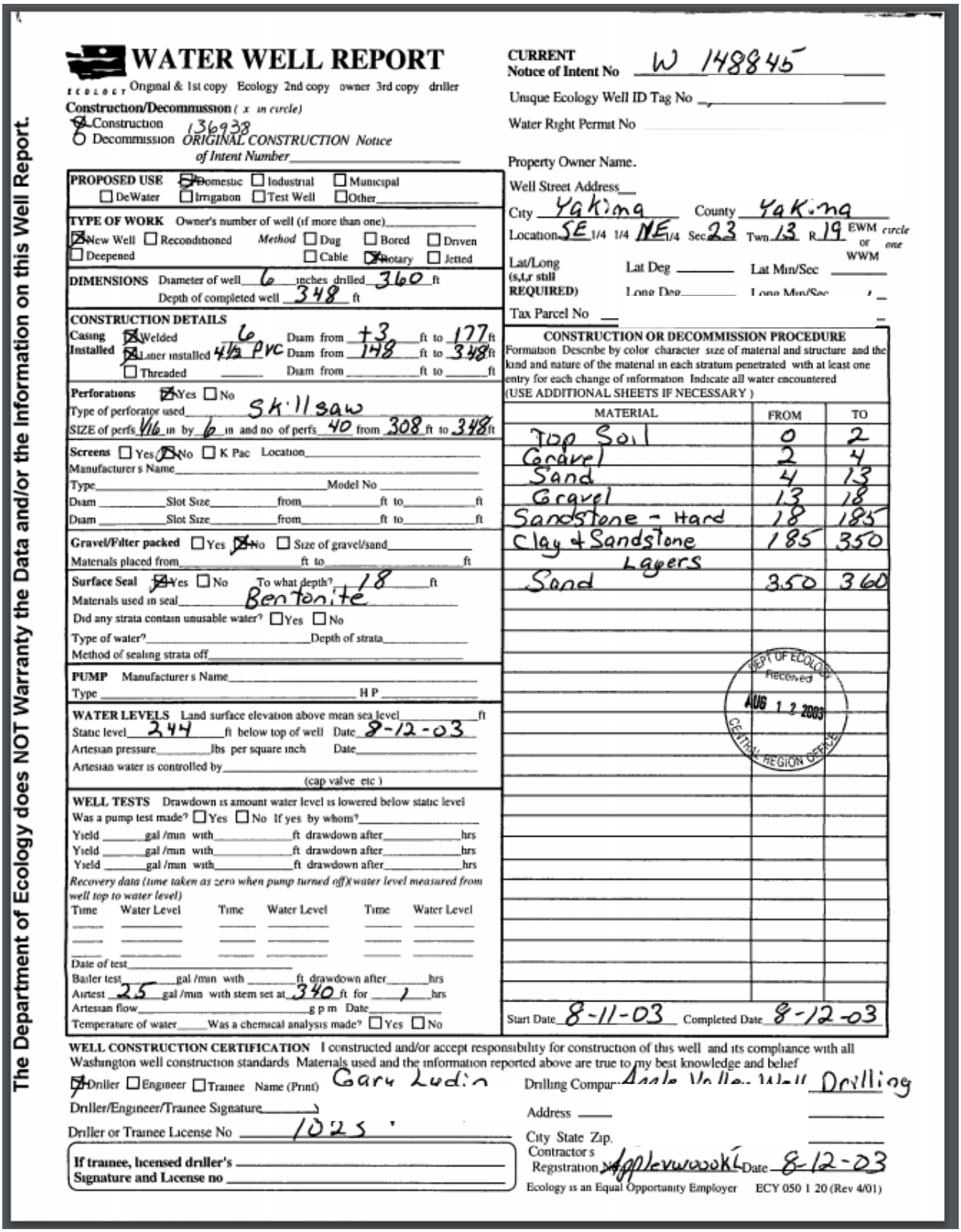
Contractor's Registration No. WILLYWI 10BB JM Date 9/14/93, 19.

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- (X) Construction 136938
- ( ) Decommission ORIGINAL CONSTRUCTION Notice of Intent Number

CURRENT Notice of Intent No W 148845

Unique Ecology Well ID Tag No

Water Right Permit No

Property Owner Name.

Well Street Address

City Yakima County Yakima

Location SE 1/4 1/4 NE 1/4 Sec 23 Twn 13 R 19 EWM or WWM (circle one)

Lat/Long (s,t,r still REQUIRED) Lat Deg Lat Min/Sec Long Deg Long Min/Sec

Tax Parcel No

PROPOSED USE (X) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other

TYPE OF WORK Owner's number of well (if more than one)
(X) New Well ( ) Reconstructioned Method ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (X) Rotary ( ) Jetted

DIMENSIONS Diameter of well 6 inches drilled 360 ft
Depth of completed well 348 ft

CONSTRUCTION DETAILS
Casing (X) Welded 6 Diam from +3 ft to 177 ft
Installed (X) Liner installed 4½ PVC Diam from 148 ft to 348 ft
( ) Threaded Diam from ft to ft

Perforations (X) Yes ( ) No
Type of perforator used Skilsaw
SIZE of perfs 1/16 in by 6 in and no of perfs 40 from 308 ft to 348 ft

Screens ( ) Yes (X) No ( ) K Pac Location
Manufacturer's Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed ( ) Yes (X) No ( ) Size of gravel/sand
Materials placed from ft to ft

Surface Seal (X) Yes ( ) No To what depth? 18 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ( ) Yes ( ) No
Type of water? Depth of strata
Method of sealing strata off

PUMP Manufacturer's Name
Type H P

WATER LEVELS Land surface elevation above mean sea level ft
Static level 244 ft below top of well Date 8-12-03
Artesian pressure lbs per square inch Date
Artesian water is controlled by (cap valve etc)

WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ( ) Yes ( ) No If yes by whom?
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Yield gal /min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 2.5 gal /min with stem set at 340 ft for 1 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? ( ) Yes ( ) No

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation Describe by color character size of material and structure and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
Top Soil	0	2
Gravel	2	4
Sand	4	13
Gravel	13	18
Sandstone - Hard	18	185
Clay & Sandstone Layers	185	350
Sand	350	360

DEPT OF ECOLOGY Received AUG 12 2003 CENTRAL REGION OFFICE

Start Date 8-11-03 Completed Date 8-12-03

WELL CONSTRUCTION CERTIFICATION I constructed and/or accept responsibility for construction of this well and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

(X) Driller ( ) Engineer ( ) Trainee Name (Print) Gary Ludin

Driller/Engineer/Trainee Signature

Driller or Trainee License No 1025

Drilling Company Eagle Valley Well Drilling

Address

City State Zip

Contractor's Registration No Applewood Date 8-12-03

If trainee, licensed driller's Signature and License no

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

4371

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 033795

M

Water Right Permit No. _____

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Yakima Parcel # _____ Sec 36 T 13 N. R 19 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) _____

Abandoned ☐ New well ☒ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐
Deepened ☐ Reconditioned ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 140 feet. Depth of completed well 140 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 100 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 16 ft. below top of well Date 12-17-90
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Bach
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
	35 GPM @140'		25 GPM @100'		
	30 GPM @120'		20 GPM @ 80'		

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water 60 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO	
Clay Loam	0	12	
Cemented Gravel	12	30	
Brn. sandy clay	30	39	
Cemented gravel w/brn. sandy clay	39	50	
Med. brn. sandstone	50	58	
Cemented gravel w/brn. sandy clay	58	70	
Cemented gravel w/green sandy clay	70	77	
Green sandy clay	77	81	
Hard green sandstone	81	110	wb
Med. green sandstone	110	135	wb
Green sandstone w/green sandy clay	135	140	

RECEIVED JAN 1991 DEPARTMENT OF ECOLOGY CENTRAL REGION OFFICE

Work started 12-12 19 Completed 12-17 1990

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Bach Well Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address _____

(Signed) _____ License No. 1436

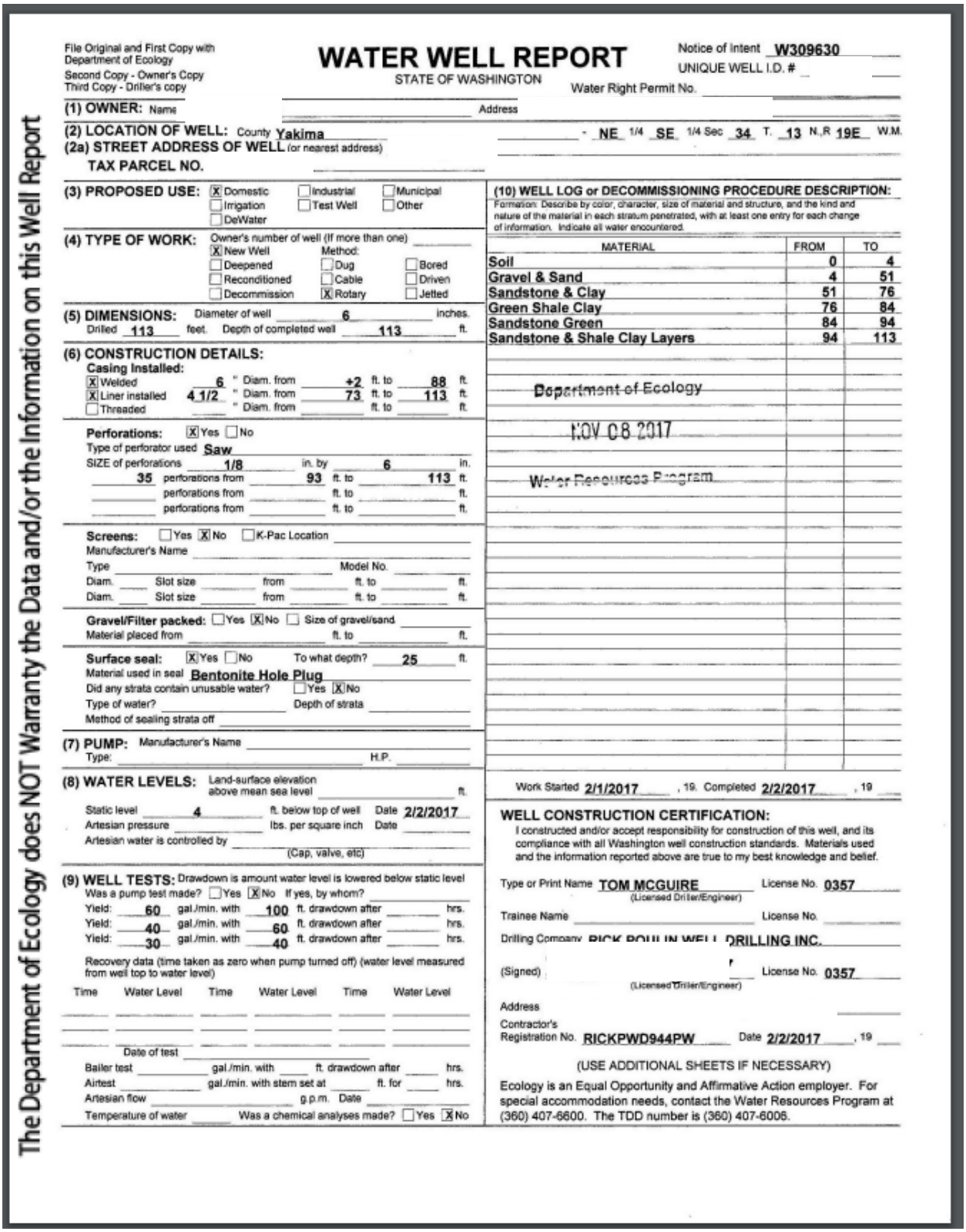
Contractor Registration No. BACHWDC137NU Date 1-17 19 91

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W309630
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Yakima - NE 1/4 SE 1/4 Sec 34 T. 13 N.,R 19E W.M.
(2a) STREET ADDRESS OF WELL (for nearest address) [redacted]
TAX PARCEL NO. [redacted]

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) [redacted]
[X] New Well Method: [ ] Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [ ] Jetted [ ] Decommission

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 113 feet. Depth of completed well 113 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +2 ft. to 88 ft.
[X] Liner installed 4 1/2 " Diam. from 73 ft. to 113 ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [X] Yes [ ] No
Type of perforator used Saw
SIZE of perforations 1/8 in. by 6 in.
35 perforations from 93 ft. to 113 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 25 ft.
Material used in seal Bentonite Hole Plug
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 4 ft. below top of well Date 2/2/2017
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: 60 gal./min. with 100 ft. drawdown after hrs.
Yield: 40 gal./min. with 60 ft. drawdown after hrs.
Yield: 30 gal./min. with 40 ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Soil	0	4
Gravel & Sand	4	51
Sandstone & Clay	51	76
Green Shale Clay	76	84
Sandstone Green	84	94
Sandstone & Shale Clay Layers	94	113

Department of Ecology
NOV 08 2017
Water Resources Program

Work Started 2/1/2017 , 19. Completed 2/2/2017 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

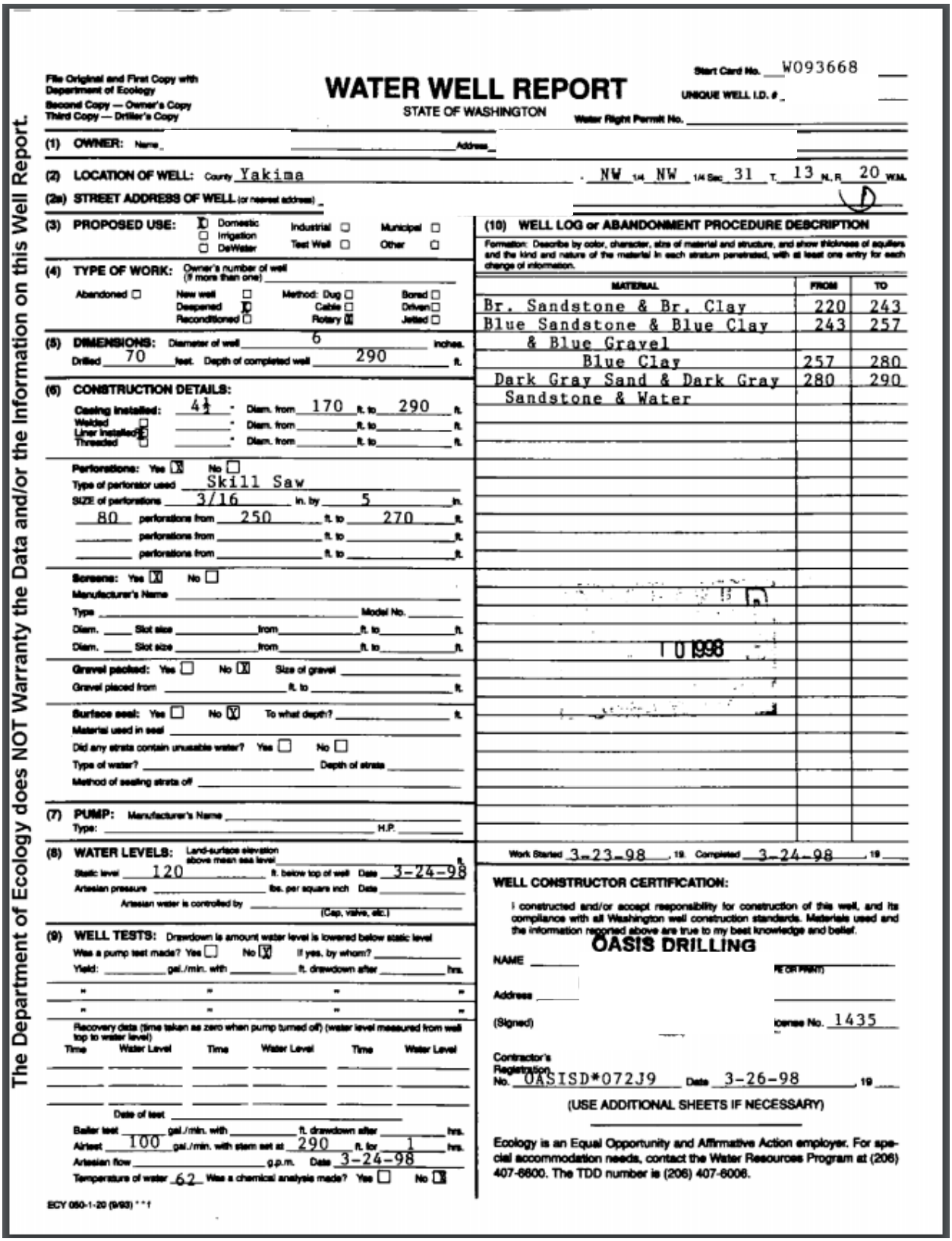
Type or Print Name TOM MCGUIRE License No. 0357
(Licensed Driller/Engineer)
Trainee Name License No.
Drilling Company RICK POULIN WELL DRILLING INC.
(Signed) License No. 0357
(Licensed Driller/Engineer)
Address
Contractor's Registration No. RICKPWD944PW Date 2/2/2017 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W093668
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County Yakima - NW 1/4 NW 1/4 Sec 31 T. 13 N. R. 20 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 70 feet. Depth of completed well 290 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 4½ " Diam. from 170 ft. to 290 ft.
Welded ☐
Liner installed ☒
Threaded ☐ " Diam. from ____ ft. to ____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Skill Saw
SIZE of perforations 3/16 in. by 5 in.
80 perforations from 250 ft. to 270 ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☒ No ☐
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☐ No ☒ To what depth? _____ ft.
Material used in seal _____
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 120 ft. below top of well Date 3-24-98
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest 100 gal./min. with stem set at 290 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date 3-24-98
Temperature of water 62 Was a chemical analysis made? Yes ☐ No ☒

ECY 050-1-20 (9/93) * * f

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Br. Sandstone & Br. Clay	220	243
Blue Sandstone & Blue Clay	243	257
& Blue Gravel		
Blue Clay	257	280
Dark Gray Sand & Dark Gray	280	290
Sandstone & Water		

10 1998

Work Started 3-23-98, 19 Completed 3-24-98, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

OASIS DRILLING
NAME _____ (TYPE OR PRINT)
Address _____
(Signed) _____ License No. 1435

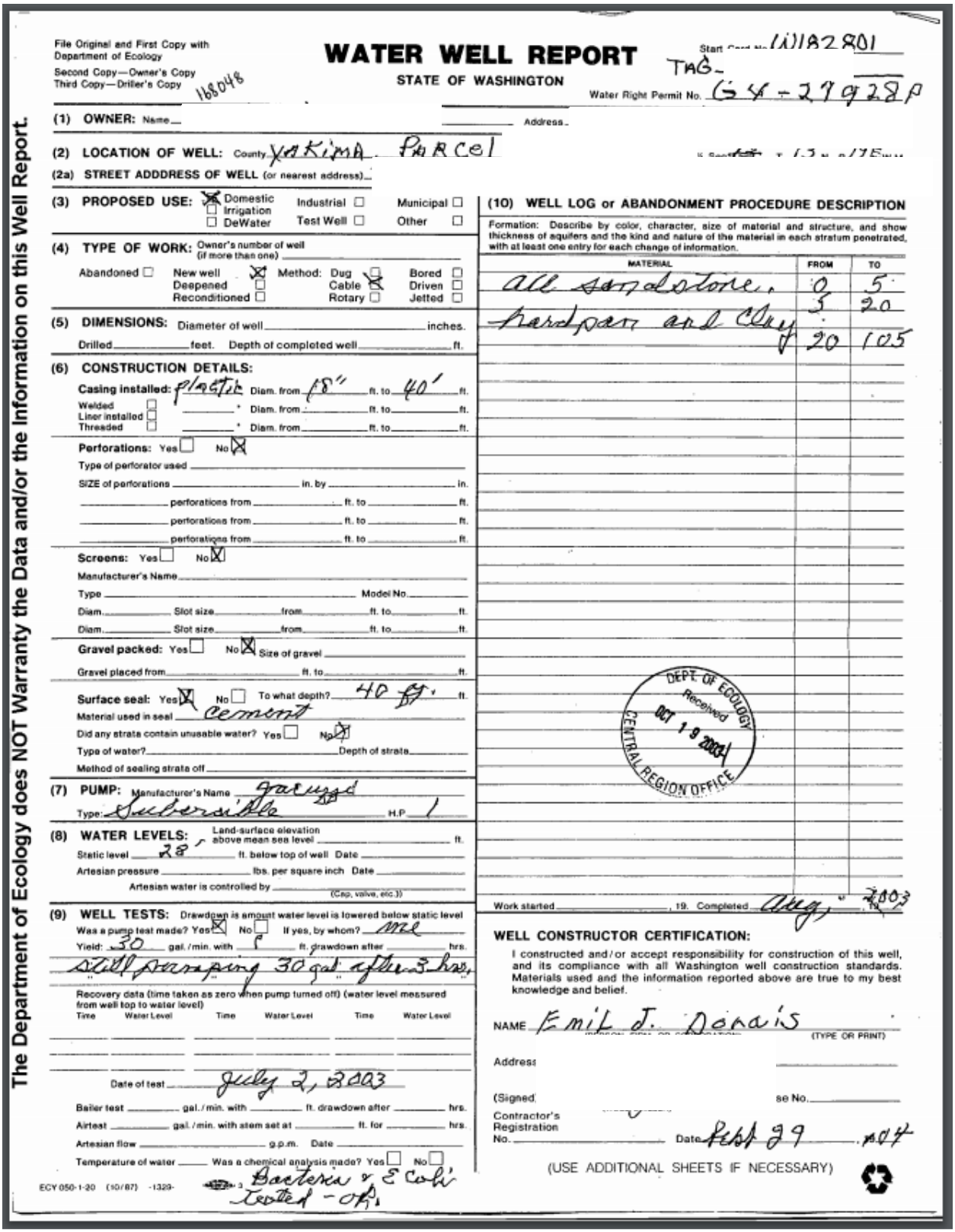
Contractor's Registration No. OASISD*072J9 Date 3-26-98, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy
168048

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 1)182801
TAG-
Water Right Permit No. G4-29928P

(1) OWNER: Name ____ Address ____

(2) LOCATION OF WELL: County YAKIMA PARCEL

(2a) STREET ADDDRESS OF WELL (or nearest address) ____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) ____
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☒ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well ____ inches. Drilled ____ feet. Depth of completed well ____ ft.

(6) CONSTRUCTION DETAILS:
Casing installed: plastic Diam. from 18" ft. to 40' ft.
Welded ☐ Liner installed ☐ Threaded ☐ ____" Diam. from ____ ft. to ____ ft.
Perforations: Yes ☐ No ☒
Type of perforator used ____
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
Screens: Yes ☐ No ☒
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Gravel packed: Yes ☐ No ☒ Size of gravel ____
Gravel placed from ____ ft. to ____ ft.
Surface seal: Yes ☒ No ☐ To what depth? 40 ft. ft.
Material used in seal cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name Jacuzzi
Type: Submersible H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 28 ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? me
Yield: 30 gal./min. with 5 ft. drawdown after ____ hrs.
still pumping 30 gal. after 3 hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test July 2, 2003
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
all sandstone.	0	5
hardpan and clay	5	20
	20	105

DEPT. OF ECOLOGY Received OCT 1-9 2004 CENTRAL REGION OFFICE

Work started ____ 19. Completed Aug. 2003

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

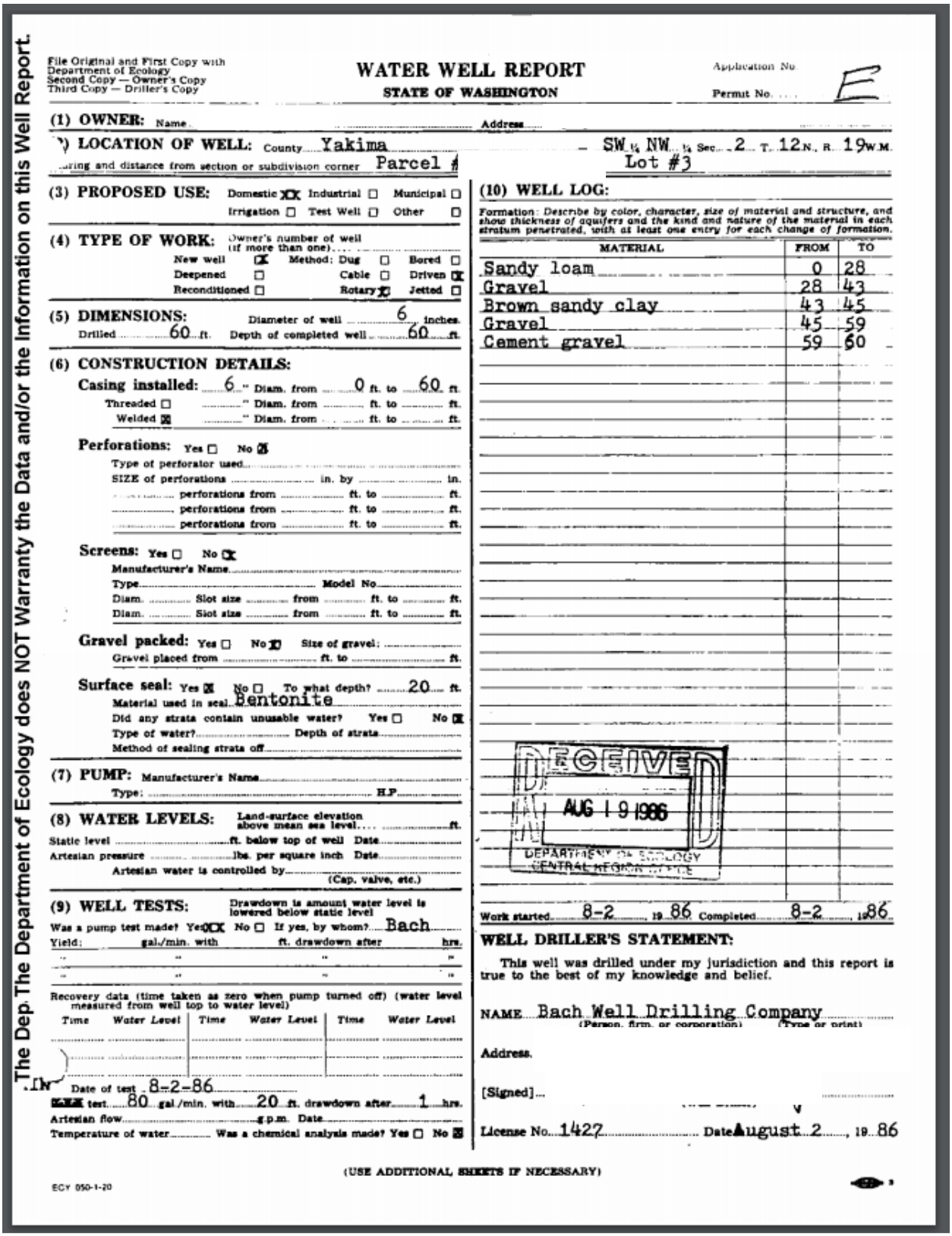
NAME Emil J. Donais (TYPE OR PRINT)
Address ____
(Signed) ____ se No. ____
Contractor's Registration No. ____ Date Sept 29 2004

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-
Bacteria & E Coli Tested - OK.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.
Permit No. E

(1) OWNER: Name ... Address ...

(2) LOCATION OF WELL: County Yakima — SW ¼ NW ¼ Sec. 2 T. 12 N., R. 19 W.M.
Bearing and distance from section or subdivision corner Parcel # Lot #3

(3) PROPOSED USE: Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well (if more than one) ...
New well [X] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [X]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 60 ft. Depth of completed well 60 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 60 ft.
Threaded [ ] " Diam. from ... ft. to ... ft.
Welded [X] " Diam. from ... ft. to ... ft.

Perforations: Yes [ ] No [X]
Type of perforator used ...
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes [ ] No [X] Size of gravel: ...
Gravel placed from ... ft. to ... ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? ... Depth of strata ...
Method of sealing strata off ...

(7) PUMP: Manufacturer's Name ...
Type: ... H.P. ...

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level ... ft. below top of well Date ...
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [X] No [ ] If yes, by whom? Bach
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 8-2-86
Bailer test 80 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water ... Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy loam	0	28
Gravel	28	43
Brown sandy clay	43	45
Gravel	45	59
Cement gravel	59	60

RECEIVED
AUG 19 1986
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 8-2 19 86 Completed 8-2 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Bach Well Drilling Company
(Person, firm, or corporation) (Type or print)
Address ...
[Signed] ...
License No. 1427 Date August 2 19 86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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Third Copy — Driller's Copy

61518

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W093965

UNIQUE WELL I.D. #

Water Right Permit No.

(1) OWNER: Name _____ Address _____

(2) LOCATION OF WELL: County YAKIMA NE 1/4 NE 1/4 Sec 4 T 12 N, R 19 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) _____

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) _____
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 80 feet. Depth of completed well 80 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +1 ft. to 77 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes ☒ No ☐ To what depth? _____ ft.
Material used in seal _____
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level _____ ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
SOIL	0	2
SOIL, ROCK	2	10
SAND, GRAVEL, ROCK, BL CLAY, WATER	10	80

RECEIVED
JUL 20 1998
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work Started _____, 19 Completed _____, 19 _____

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME _____ (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address _____

(Signed) _____ (WELL CONTRACTOR) License No. _____

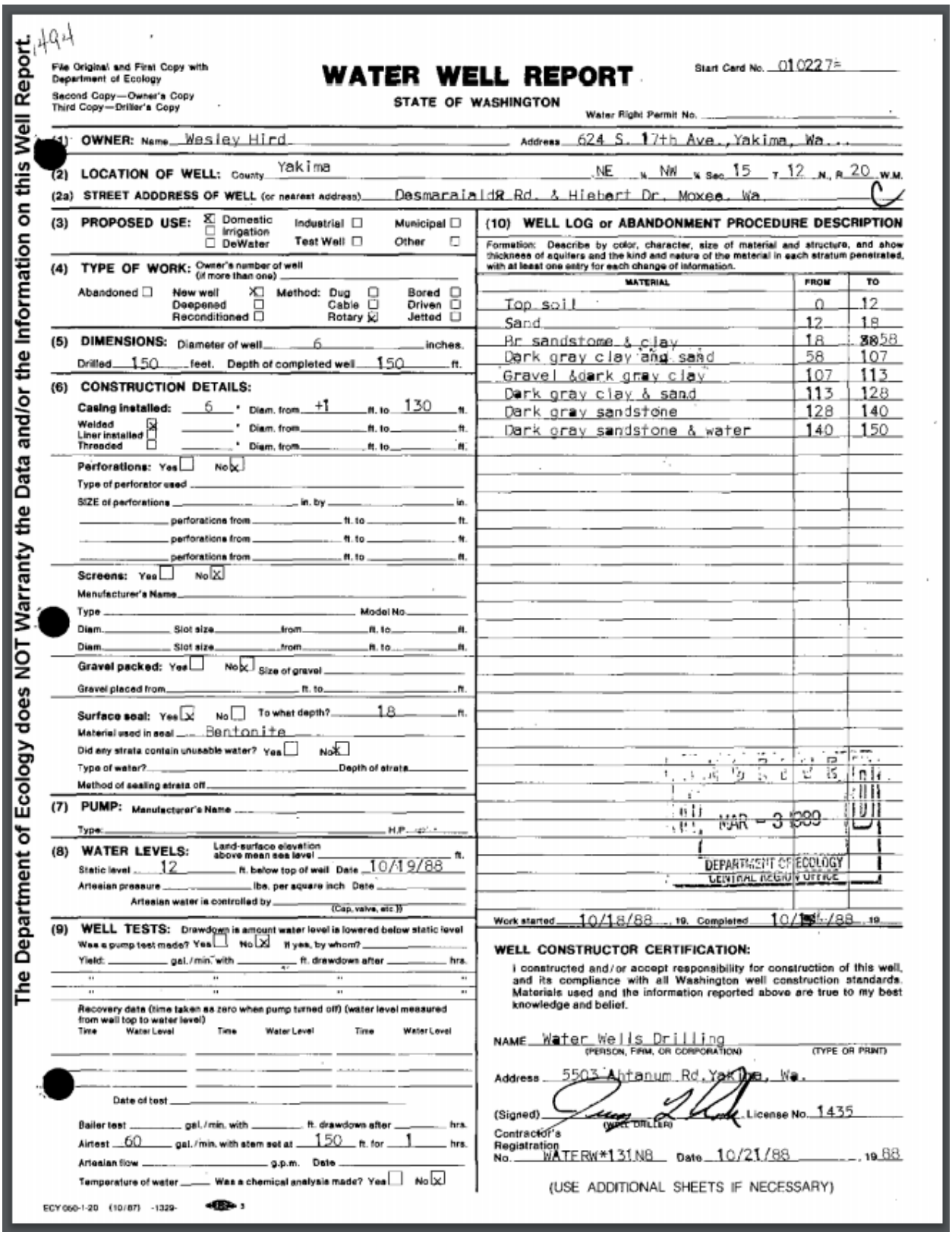
Contractor's Registration No. _____ Date 29 June 19 98

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

Note: Pe



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

1494

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 010227

Water Right Permit No.

(1) OWNER: Name Wesley Hird Address 624 S. 17th Ave., Yakima, Wa.

(2) LOCATION OF WELL: County Yakima NE ¼ NW ¼ Sec. 15 T. 12 N., R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Desmaraid Rd. & Hiebert Dr. Moxee, Wa.

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 150 feet. Depth of completed well 150 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +1 ft. to 130 ft.
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 12 ft. below top of well Date 10/19/88
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min. with ft. drawdown after hrs.
Airtest 60 gal./min. with stem set at 150 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top soil	0	12
Sand	12	18
Br sandstone & clay	18	58
Dark gray clay and sand	58	107
Gravel & dark gray clay	107	113
Dark gray clay & sand	113	128
Dark gray sandstone	128	140
Dark gray sandstone & water	140	150

RECEIVED MAR – 3 1989
DEPARTMENT OF ECOLOGY CENTRAL REGION OFFICE

Work started 10/18/88 19. Completed 10/19/88 19.

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Water Wells Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 5503 Ahtanum Rd, Yakima, Wa.

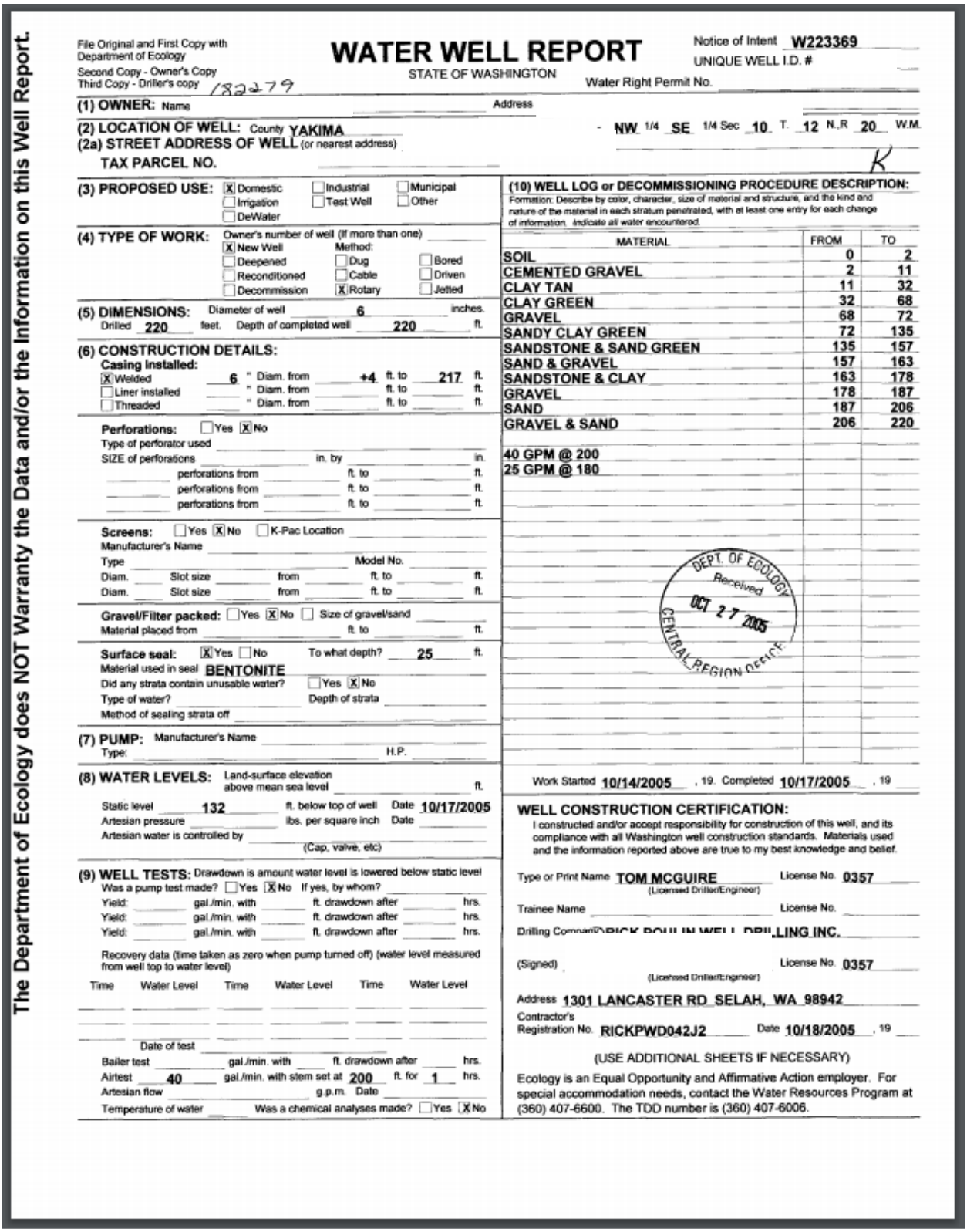
(Signed) (WELL DRILLER) License No. 1435

Contractor's Registration No. WATERW*131N8 Date 10/21/88 19 88

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20 (10/87) -1329-

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy 182279

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W223369
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County YAKIMA - NW 1/4 SE 1/4 Sec 10 T. 12 N.,R 20 W.M.
(2a) STREET ADDRESS OF WELL (or nearest address) [redacted]
TAX PARCEL NO. [redacted]

K

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
[X] New Well Method: [ ] Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [X] Rotary [ ] Jetted [ ] Decommission

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 220 feet. Depth of completed well 220 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +4 ft. to 217 ft.
[ ] Liner installed " Diam. from ft. to ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [ ] Yes [X] No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 25 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 132 ft. below top of well Date 10/17/2005
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 40 gal./min. with stem set at 200 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL	0	2
CEMENTED GRAVEL	2	11
CLAY TAN	11	32
CLAY GREEN	32	68
GRAVEL	68	72
SANDY CLAY GREEN	72	135
SANDSTONE & SAND GREEN	135	157
SAND & GRAVEL	157	163
SANDSTONE & CLAY	163	178
GRAVEL	178	187
SAND	187	206
GRAVEL & SAND	206	220
40 GPM @ 200		
25 GPM @ 180		

DEPT. OF ECOLOGY Received OCT 27 2005 CENTRAL REGION OFFICE

Work Started 10/14/2005 , 19. Completed 10/17/2005 , 19

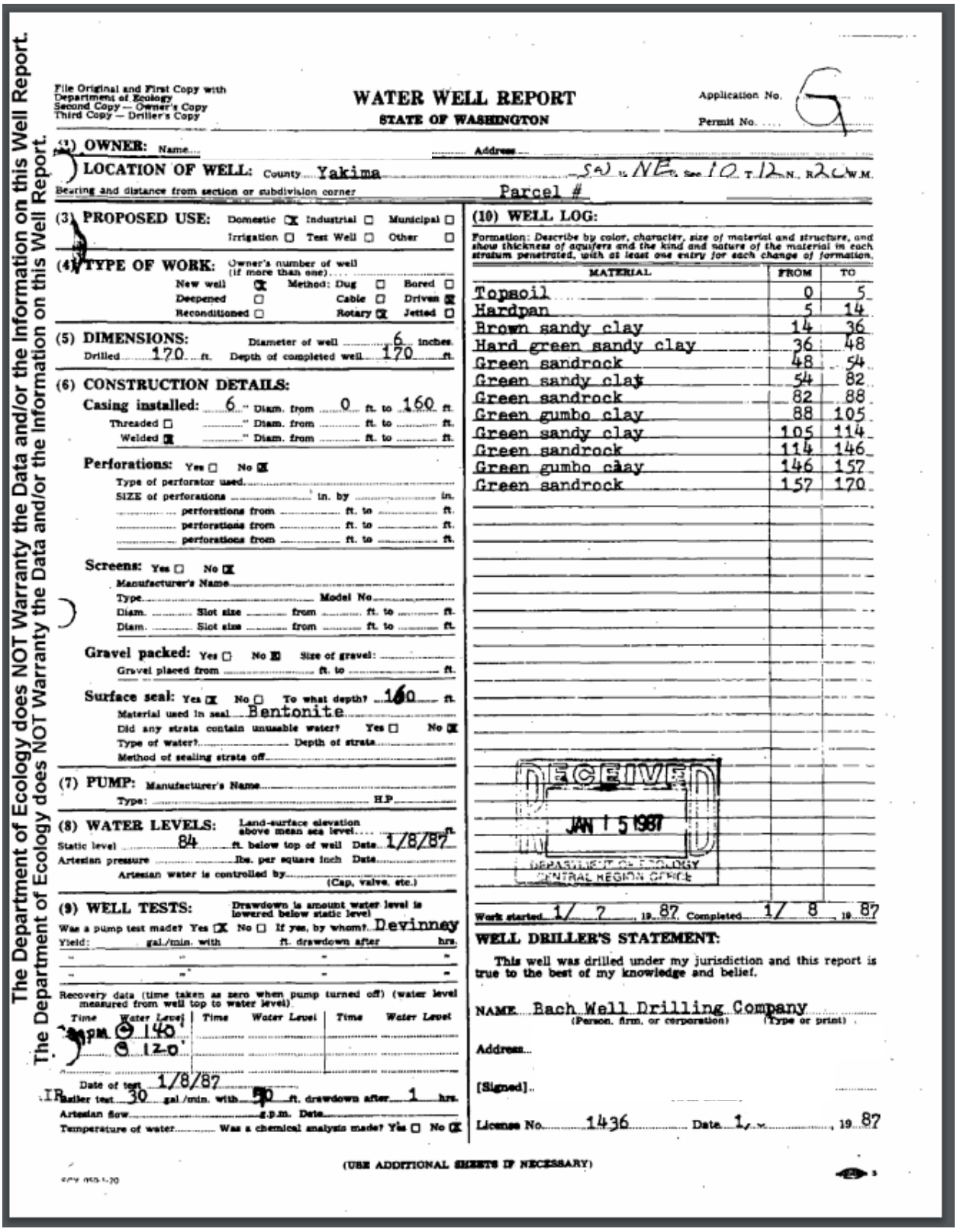
WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name TOM MCGUIRE (Licensed Driller/Engineer) License No. 0357
Trainee Name License No.
Drilling Company RICK POULIN WELL DRILLING INC.
(Signed) (Licensed Driller/Engineer) License No. 0357
Address 1301 LANCASTER RD SELAH, WA 98942
Contractor's Registration No. RICKPWD042J2 Date 10/18/2005 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. [redacted]
Permit No. [redacted]

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Yakima SW ¼ NE ¼ Sec 10 T 12 N. R 20 W.M.
Bearing and distance from section or subdivision corner Parcel # [redacted]

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) [redacted]
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☒
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 170 ft. Depth of completed well 170 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 160 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 160 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level
Static level 84 ft. below top of well Date 1/8/87
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Devinney
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
3 PM	140				
	120				

Date of test 1/8/87
Bailer test 30 gal./min. with 50 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Topsoil	0	5
Hardpan	5	14
Brown sandy clay	14	36
Hard green sandy clay	36	48
Green sandrock	48	54
Green sandy clay	54	82
Green sandrock	82	88
Green gumbo clay	88	105
Green sandy clay	105	114
Green sandrock	114	146
Green gumbo clay	146	157
Green sandrock	157	170

RECEIVED
JAN 15 1987
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 1/ 7 19 87 Completed 1/ 8 19 87

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Bach Well Drilling Company
(Person, firm, or corporation) (Type or print)

Address [redacted]

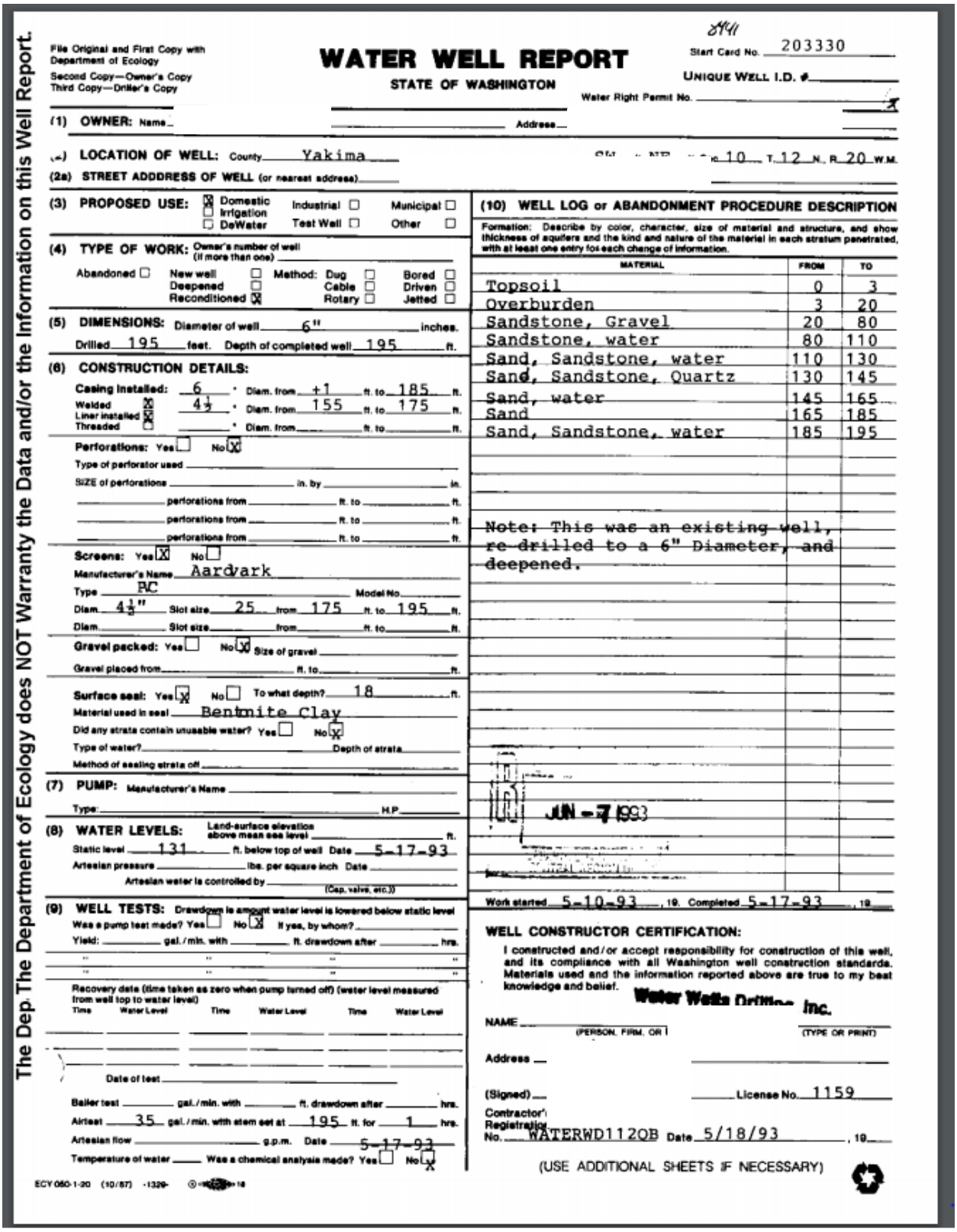
[Signed] [redacted]

License No. 1436 Date 1/ 14 19 87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Note: Personally Identifying Info redacted due to privacy concerns.



The Dep. The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

8941

Start Card No. 203330

UNIQUE WELL I.D. #

Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County Yakima SW NE Sec. 10 T. 12 N. R. 20 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)

Abandoned ☐ New well ☐ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☒ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches. Drilled 195 feet. Depth of completed well 195 ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6 " Diam. from +1 ft. to 185 ft.
Welded ☒ 4½ " Diam. from 155 ft. to 175 ft.
Liner installed ☒
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Aardvark
Type PC Model No.
Diam. 4½" Slot size 25 from 175 ft. to 195 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentmite Clay
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 131 ft. below top of well Date 5-17-93
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 35 gal./min. with stem set at 195 ft. for 1 hrs.
Artesian flow g.p.m. Date 5-17-93
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	3
Overburden	3	20
Sandstone, Gravel	20	80
Sandstone, water	80	110
Sand, Sandstone, water	110	130
Sand, Sandstone, Quartz	130	145
Sand, water	145	165
Sand	165	185
Sand, Sandstone, water	185	195

Note: This was an existing well, re drilled to a 6" Diameter, and deepened.

JUN -7 1993

Work started 5-10-93 19. Completed 5-17-93 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Water Wells Driller Inc.

NAME (PERSON, FIRM, OR CORP.) (TYPE OR PRINT)

Address

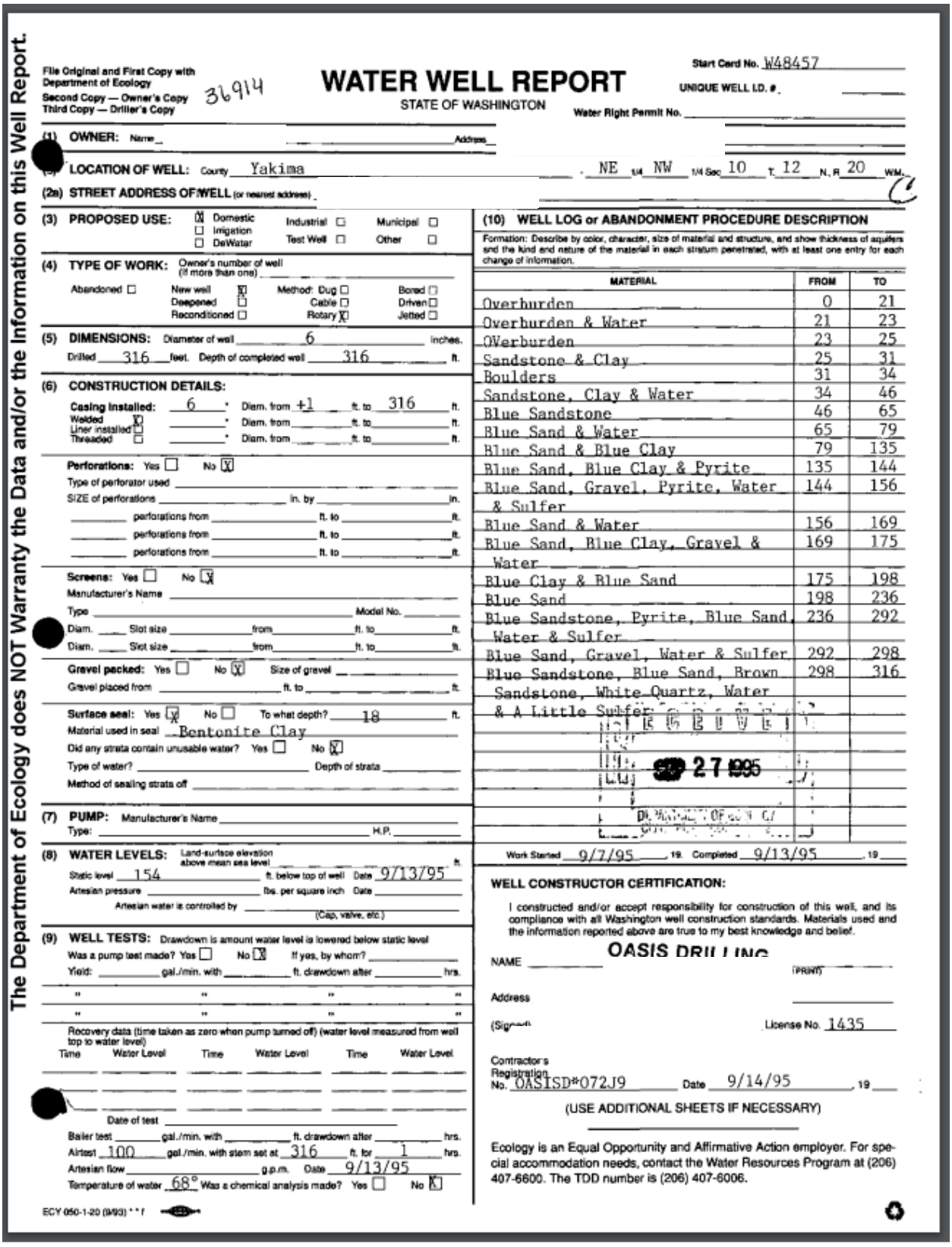
(Signed) License No. 1159

Contractor's Registration No. WATERWD112QB Date 5/18/93 19

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

36914

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W48457

UNIQUE WELL I.D. #

Water Right Permit No.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Yakima NE 1/4 NW 1/4 Sec 10 T. 12 N. R. 20 WM.

(2a) STREET ADDRESS OF WELL (or nearest address) [redacted]

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) [redacted]
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 316 feet. Depth of completed well 316 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +1 ft. to 316 ft. Welded [X]
Liner installed [ ] " Diam. from ft. to ft.
Threaded [ ] " Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal Bentonite Clay
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 154 ft. below top of well Date 9/13/95
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 100 gal./min. with stem set at 316 ft. for 1 hrs.
Artesian flow g.p.m. Date 9/13/95
Temperature of water 68° Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Overburden	0	21
Overburden & Water	21	23
OVerburden	23	25
Sandstone & Clay	25	31
Boulders	31	34
Sandstone, Clay & Water	34	46
Blue Sandstone	46	65
Blue Sand & Water	65	79
Blue Sand & Blue Clay	79	135
Blue Sand, Blue Clay & Pyrite	135	144
Blue Sand, Gravel, Pyrite, Water & Sulfer	144	156
Blue Sand & Water	156	169
Blue Sand, Blue Clay, Gravel & Water	169	175
Blue Clay & Blue Sand	175	198
Blue Sand	198	236
Blue Sandstone, Pyrite, Blue Sand, Water & Sulfer	236	292
Blue Sand, Gravel, Water & Sulfer	292	298
Blue Sandstone, Blue Sand, Brown Sandstone, White Quartz, Water & A Little Sulfer	298	316

RECEIVED
SEP 27 1995
DEPARTMENT OF ECOLOGY

Work Started 9/7/95 19 Completed 9/13/95 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME OASIS DRILLING (PRINT)

Address [redacted]

(Signature) License No. 1435

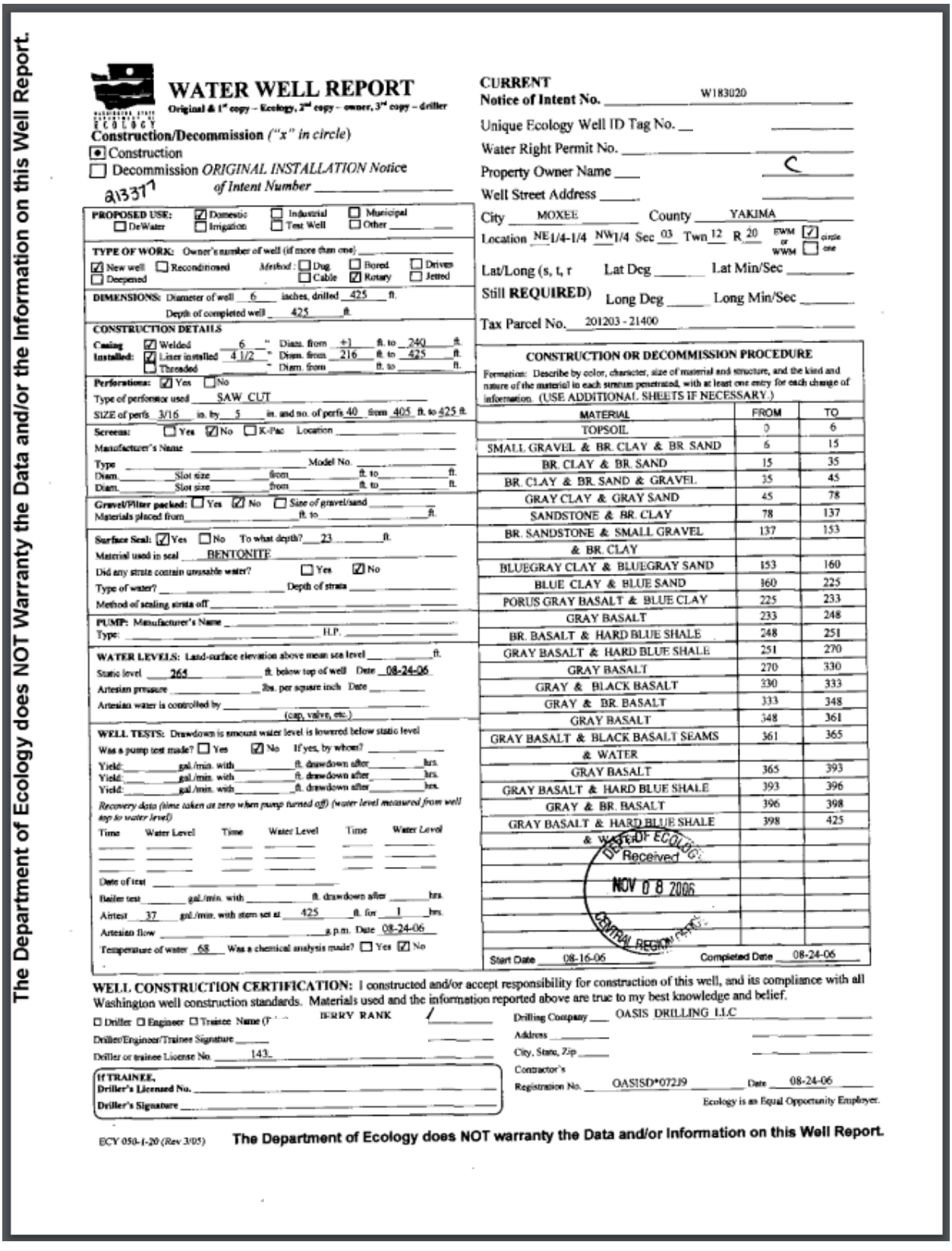
Contractor's Registration No. OASISD*072J9 Date 9/14/95 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

(•) Construction

( ) Decommission *ORIGINAL INSTALLATION Notice of Intent Number* a13377

CURRENT Notice of Intent No. W183020

Unique Ecology Well ID Tag No. _____

Water Right Permit No. _____

Property Owner Name _____ C

Well Street Address _____

City MOXEE County YAKIMA

Location NE 1/4-1/4 NW 1/4 Sec 03 Twn 12 R 20 EWM [✓] or WWM [ ] circle one

Lat/Long (s, t, r Still **REQUIRED**) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 201203 - 21400

PROPOSED USE: [✓] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other

TYPE OF WORK: Owner's number of well (if more than one) _____

[✓] New well [ ] Reconditioned [ ] Deepened — Method: [ ] Dug [ ] Bored [ ] Driven [ ] Cable [✓] Rotary [ ] Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 425 ft. Depth of completed well 425 ft.

CONSTRUCTION DETAILS

Casing Installed: [✓] Welded 6 " Diam. from +1 ft. to 240 ft. [✓] Liner installed 4 1/2 " Diam. from 216 ft. to 425 ft. [ ] Threaded " Diam. from ft. to ft.

Perforations: [✓] Yes [ ] No

Type of perforator used SAW CUT

SIZE of perfs 3/16 in. by 5 in. and no. of perfs 40 from 405 ft. to 425 ft.

Screens: [ ] Yes [✓] No [ ] K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: [ ] Yes [✓] No [ ] Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: [✓] Yes [ ] No To what depth? 23 ft.

Material used in seal BENTONITE

Did any strata contain unusable water? [ ] Yes [✓] No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level 265 ft. below top of well Date 08-24-06

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? [ ] Yes [✓] No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____

Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest 37 gal./min. with stem set at 425 ft. for 1 hrs.

Artesian flow _____ g.p.m. Date 08-24-06

Temperature of water 68 Was a chemical analysis made? [ ] Yes [✓] No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
TOPSOIL	0	6
SMALL GRAVEL & BR. CLAY & BR. SAND	6	15
BR. CLAY & BR. SAND	15	35
BR. CLAY & BR. SAND & GRAVEL	35	45
GRAY CLAY & GRAY SAND	45	78
SANDSTONE & BR. CLAY	78	137
BR. SANDSTONE & SMALL GRAVEL & BR. CLAY	137	153
BLUEGRAY CLAY & BLUEGRAY SAND	153	160
BLUE CLAY & BLUE SAND	160	225
POROUS GRAY BASALT & BLUE CLAY	225	233
GRAY BASALT	233	248
BR. BASALT & HARD BLUE SHALE	248	251
GRAY BASALT & HARD BLUE SHALE	251	270
GRAY BASALT	270	330
GRAY & BLACK BASALT	330	333
GRAY & BR. BASALT	333	348
GRAY BASALT	348	361
GRAY BASALT & BLACK BASALT SEAMS & WATER	361	365
GRAY BASALT	365	393
GRAY BASALT & HARD BLUE SHALE	393	396
GRAY & BR. BASALT	396	398
GRAY BASALT & HARD BLUE SHALE & WATER	398	425

DEPT OF ECOLOGY Received NOV 08 2006 CENTRAL REGION OFFICE

Start Date 08-16-06 Completed Date 08-24-06

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[ ] Driller [ ] Engineer [ ] Trainee Name (P) BERRY RANK

Driller/Engineer/Trainee Signature _____

Driller or trainee License No. 143

Drilling Company OASIS DRILLING LLC

Address _____

City, State, Zip _____

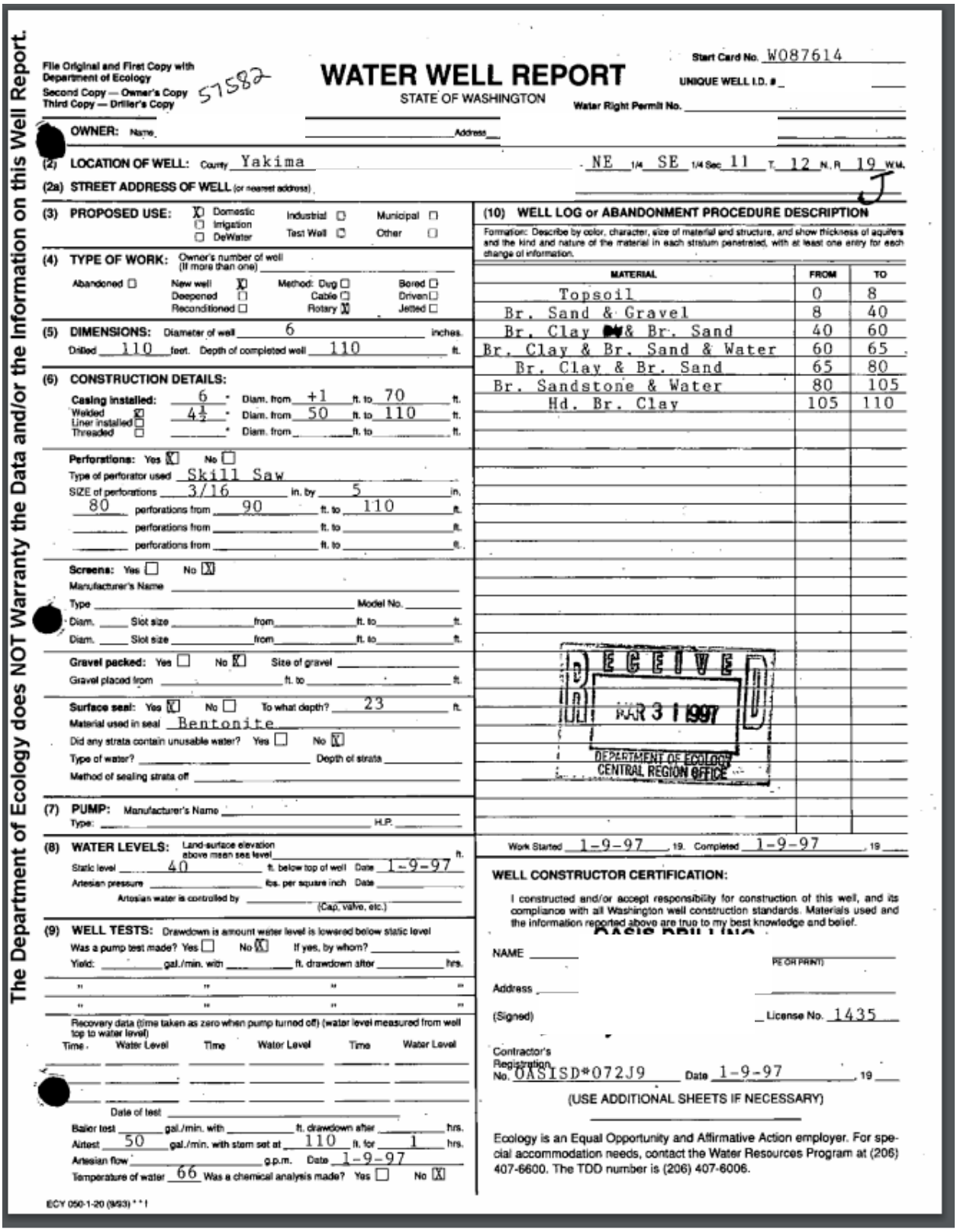
Contractor's Registration No. OASISD*072J9 Date 08-24-06

IF TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy
57582

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W087614
UNIQUE WELL I.D. #
Water Right Permit No.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

(1) OWNER: Name [redacted] Address [redacted]

(2) LOCATION OF WELL: County Yakima NE 1/4 SE 1/4 Sec 11 T. 12 N. R. 19 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) J

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 110 feet. Depth of completed well 110 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +1 ft. to 70 ft.
Welded ☒ 4½" Diam. from 50 ft. to 110 ft.
Liner installed ☐ Threaded ☐ ____" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Skill Saw
SIZE of perforations 3/16 in. by 5 in.
80 perforations from 90 ft. to 110 ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 23 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 40 ft. below top of well Date 1-9-97
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time | Water Level | Time | Water Level | Time | Water Level
Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 50 gal./min. with stem set at 110 ft. for 1 hrs.
Artesian flow g.p.m. Date 1-9-97
Temperature of water 66 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	8
Br. Sand & Gravel	8	40
Br. Clay & Br. Sand	40	60
Br. Clay & Br. Sand & Water	60	65
Br. Clay & Br. Sand	65	80
Br. Sandstone & Water	80	105
Hd. Br. Clay	105	110

RECEIVED
MAR 31 1997
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work Started 1-9-97 19. Completed 1-9-97 19

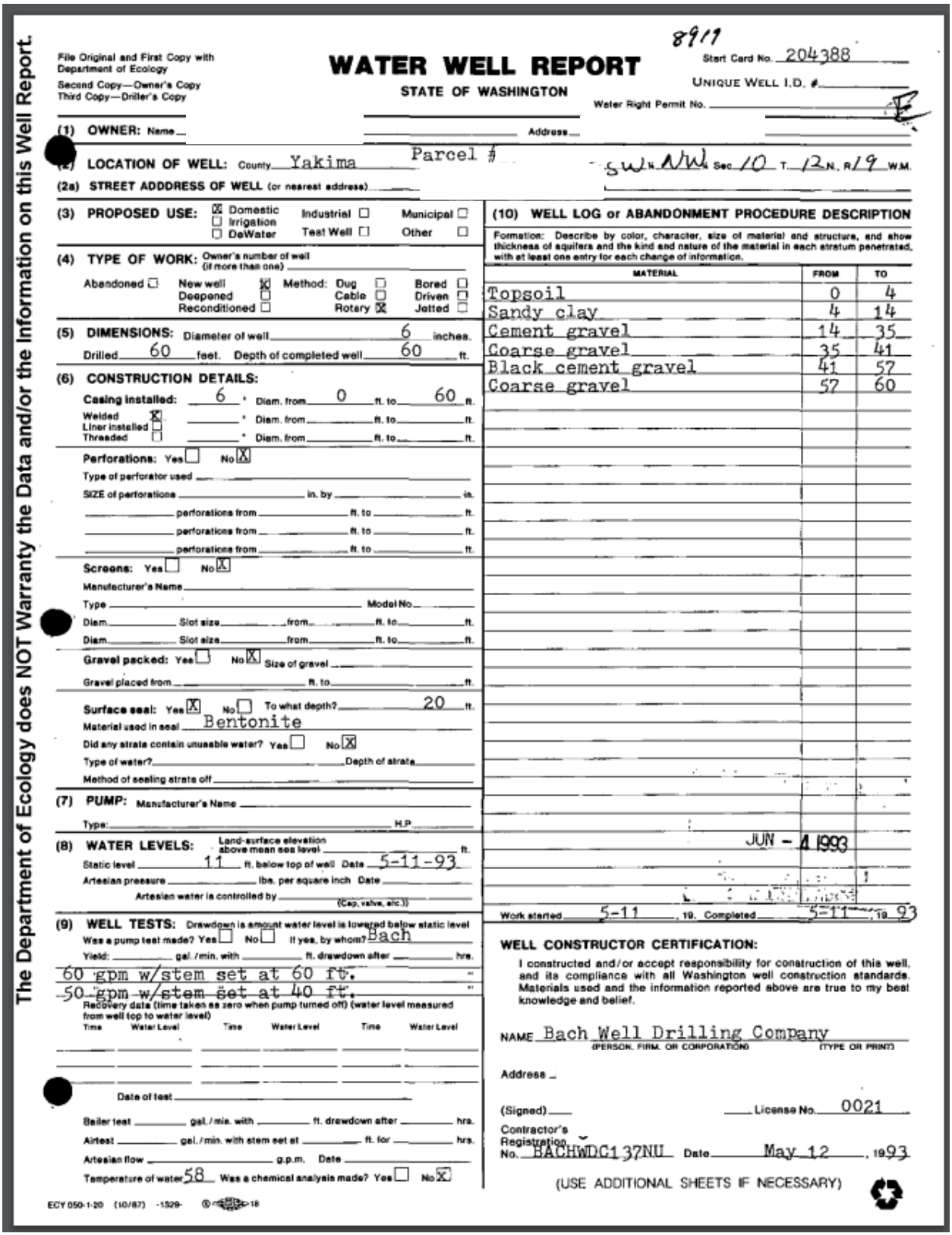
WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.
OASIS DRILLING
NAME (PLEASE PRINT)
Address
(Signed) License No. 1435
Contractor's Registration No. OASISD*072J9 Date 1-9-97 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93) * * I

Note: Personally Identifying Info redacted due to privacy concerns.



8911

WATER WELL REPORT

STATE OF WASHINGTON

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

Start Card No. 204388
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County Yakima Parcel # SW¼ NW¼ Sec. 10 T. 12 N. R. 19 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 60 feet. Depth of completed well 60 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 60 ft.
Welded ☒ Liner installed ☐ Threaded ☐ " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 11 ft. below top of well Date 5-11-93
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? Bach
Yield: gal./min. with ft. drawdown after hrs.
60 gpm w/stem set at 60 ft.
50 gpm w/stem set at 40 ft.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water 58 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Topsoil	0	4
Sandy clay	4	14
Cement gravel	14	35
Coarse gravel	35	41
Black cement gravel	41	57
Coarse gravel	57	60

JUN - 4 1993

Work started 5-11 19 Completed 5-11 19 93

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

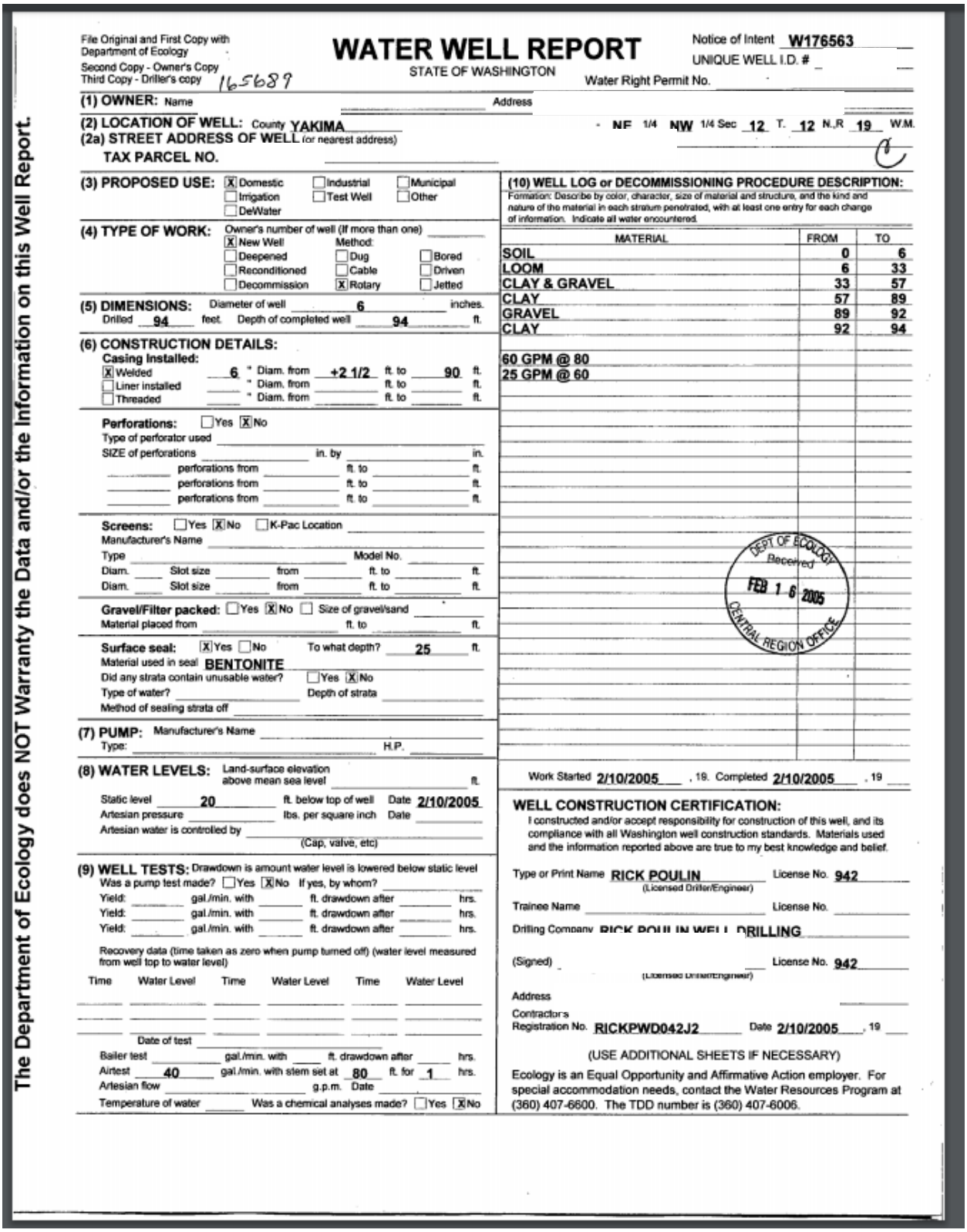
NAME Bach Well Drilling Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address
(Signed) License No. 0021
Contractor's Registration No. BACHWDC137NU Date May 12 19 93

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy 165689

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W176563
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County YAKIMA - NE 1/4 NW 1/4 Sec 12 T. 12 N.,R 19 W.M.
(2a) STREET ADDRESS OF WELL (or nearest address)
TAX PARCEL NO.

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
[X] New Well Method: [ ] Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [ ] Jetted [ ] Decommission

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 94 feet. Depth of completed well 94 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +2 1/2 ft. to 90 ft.
[ ] Liner installed " Diam. from ft. to ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [ ] Yes [X] No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 25 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date 2/10/2005
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 40 gal./min. with stem set at 80 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL	0	6
LOOM	6	33
CLAY & GRAVEL	33	57
CLAY	57	89
GRAVEL	89	92
CLAY	92	94
60 GPM @ 80		
25 GPM @ 60		

DEPT OF ECOLOGY Received FEB 16 2005 CENTRAL REGION OFFICE

Work Started 2/10/2005 , 19. Completed 2/10/2005 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

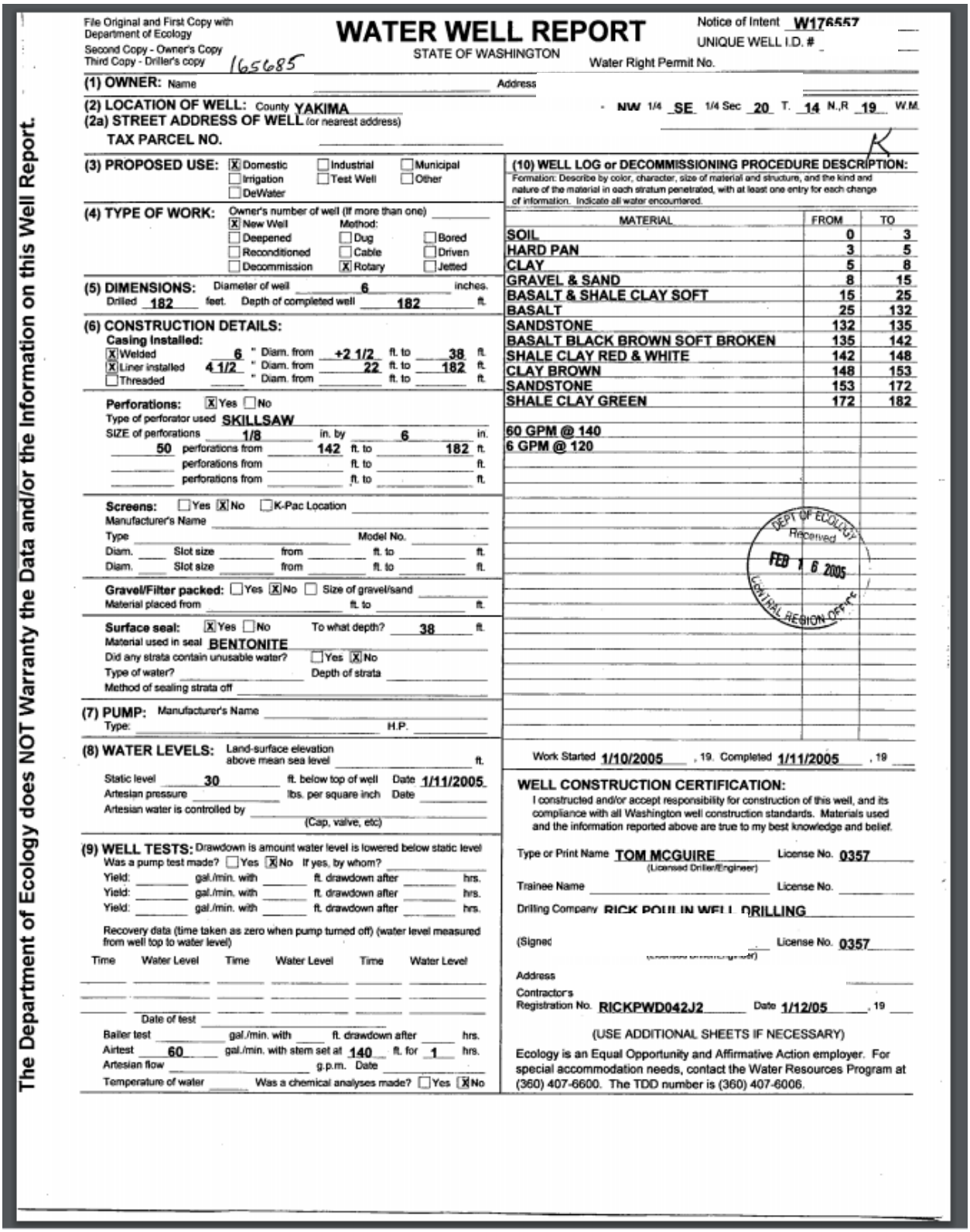
Type or Print Name RICK POULIN (Licensed Driller/Engineer) License No. 942
Trainee Name License No.
Drilling Company RICK POULIN WELL DRILLING
(Signed) (Licensed Driller/Engineer) License No. 942
Address
Contractors Registration No. RICKPWD042J2 Date 2/10/2005 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy 165685

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W176557
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County YAKIMA NW 1/4 SE 1/4 Sec 20 T. 14 N.,R 19 W.M.
(2a) STREET ADDRESS OF WELL (or nearest address)
TAX PARCEL NO.

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
[X] New Well Method: [ ] Deepened [ ] Dug [ ] Bored [ ] Reconditioned [ ] Cable [ ] Driven [ ] Decommission [X] Rotary [ ] Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 182 feet. Depth of completed well 182 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +2 1/2 ft. to 38 ft.
[X] Liner installed 4 1/2 " Diam. from 22 ft. to 182 ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [X] Yes [ ] No
Type of perforator used SKILLSAW
SIZE of perforations 1/8 in. by 6 in.
50 perforations from 142 ft. to 182 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 38 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 30 ft. below top of well Date 1/11/2005
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 60 gal./min. with stem set at 140 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL	0	3
HARD PAN	3	5
CLAY	5	8
GRAVEL & SAND	8	15
BASALT & SHALE CLAY SOFT	15	25
BASALT	25	132
SANDSTONE	132	135
BASALT BLACK BROWN SOFT BROKEN	135	142
SHALE CLAY RED & WHITE	142	148
CLAY BROWN	148	153
SANDSTONE	153	172
SHALE CLAY GREEN	172	182
60 GPM @ 140		
6 GPM @ 120		

DEPT OF ECOLOGY Received FEB 16 2005 CENTRAL REGION OFFICE

Work Started 1/10/2005 , 19. Completed 1/11/2005 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

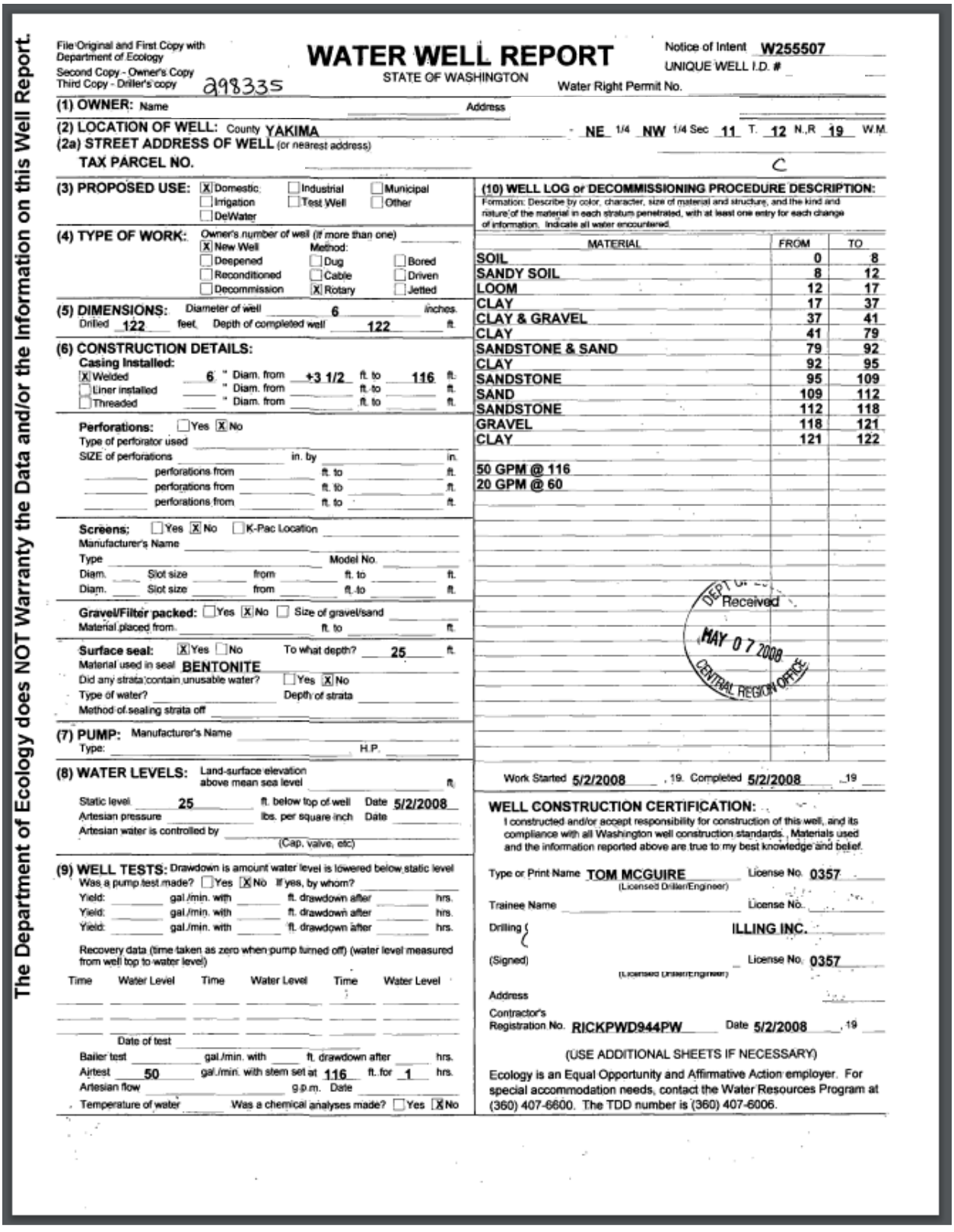
Type or Print Name TOM MCGUIRE License No. 0357
(Licensed Driller/Engineer)
Trainee Name License No.
Drilling Company RICK POULIN WELL DRILLING
(Signed License No. 0357
Address
Contractor's Registration No. RICKPWD042J2 Date 1/12/05 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Note: Personally Identifying Info redacted due to privacy concerns.



The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy 298335

WATER WELL REPORT
STATE OF WASHINGTON

Notice of Intent W255507
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Address

(2) LOCATION OF WELL: County YAKIMA NE 1/4 NW 1/4 Sec 11 T. 12 N.,R 19 W.M.
(2a) STREET ADDRESS OF WELL (or nearest address)
TAX PARCEL NO. C

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
[X] New Well Method: [ ] Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [X] Jetted [ ] Decommission

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 122 feet. Depth of completed well 122 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +3 1/2 ft. to 116 ft.
[ ] Liner installed " Diam. from ft. to ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [ ] Yes [X] No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 25 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 25 ft. below top of well Date 5/2/2008
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 50 gal./min. with stem set at 116 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL	0	8
SANDY SOIL	8	12
LOOM	12	17
CLAY	17	37
CLAY & GRAVEL	37	41
CLAY	41	79
SANDSTONE & SAND	79	92
CLAY	92	95
SANDSTONE	95	109
SAND	109	112
SANDSTONE	112	118
GRAVEL	118	121
CLAY	121	122
50 GPM @ 116		
20 GPM @ 60		

DEPT OF ECOLOGY Received MAY 07 2008 CENTRAL REGION OFFICE

Work Started 5/2/2008 , 19. Completed 5/2/2008 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name TOM MCGUIRE License No. 0357
(Licensed Driller/Engineer)
Trainee Name License No.
Drilling ILLING INC.
(Signed) License No. 0357
(Licensed Driller/Engineer)
Address
Contractor's Registration No. RICKPWD944PW Date 5/2/2008 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

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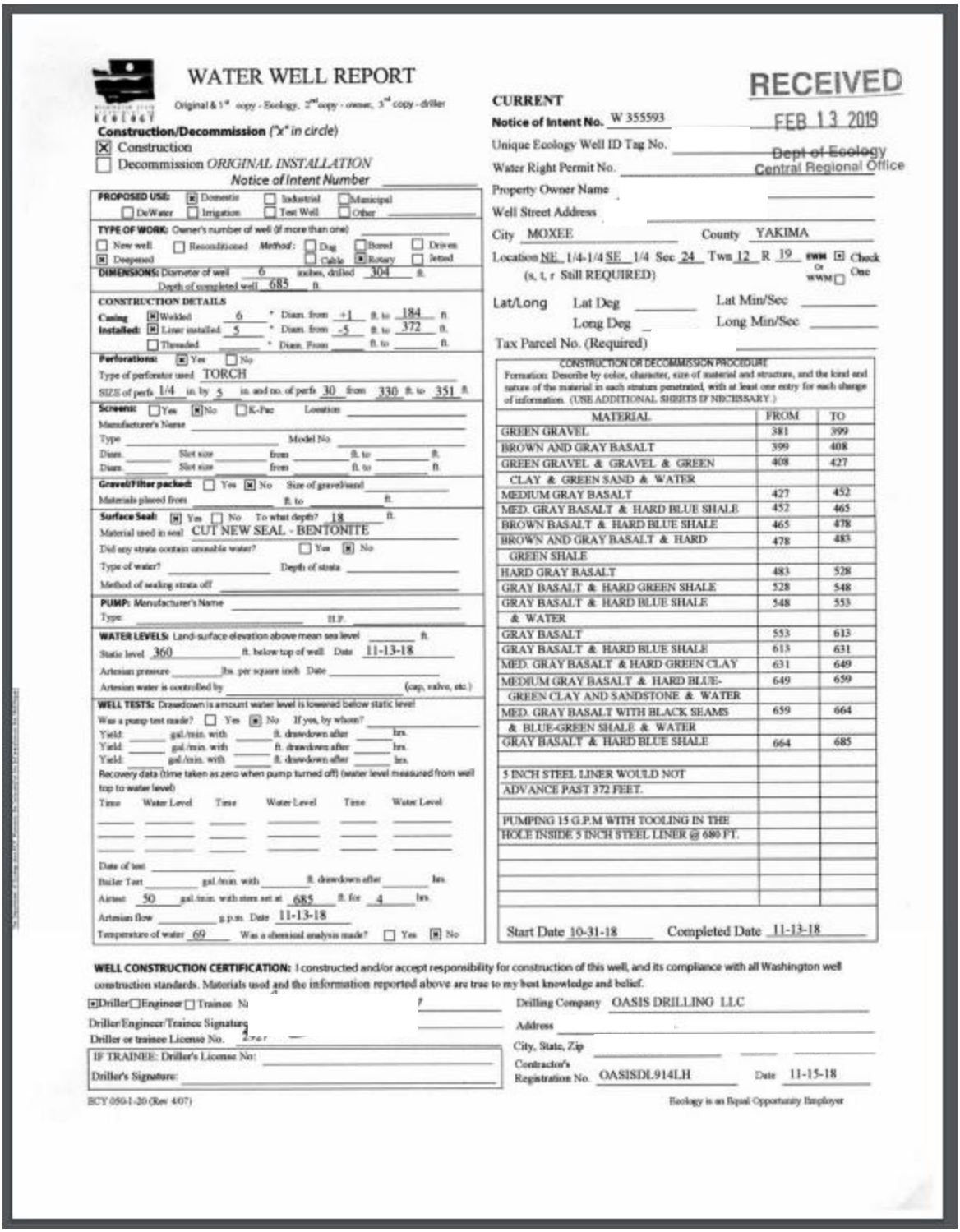
Note: Personally Identifying Info redacted due to privacy concerns.



WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

RECEIVED
FEB 13 2019
Dept of Ecology
Central Regional Office

Construction/Decommission ("x" in circle)
☒ Construction
☐ Decommission *ORRIGINAL INSTALLATION*
Notice of Intent Number _____

PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
☐ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☒ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 304 ft.
Depth of completed well 685 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6 " Diam. from +1 ft. to 184 ft.
☒ Liner installed 5 " Diam. from -5 ft. to 372 ft.
☐ Threaded _____ " Diam. From _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used TORCH
SIZE of perfs 1/4 in. by 5 in. and no. of perfs 30 from 330 ft. to 351 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.
Material used to seal CUT NEW SEAL - BENTONITE
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 360 ft. below top of well Date 11-13-18
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer Test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 50 gal./min. with stem set at 685 ft. for 4 hrs.
Artesian flow _____ g.p.m. Date 11-13-18
Temperature of water 69 Was a chemical analysis made? ☐ Yes ☒ No

CURRENT
Notice of Intent No. W 355593
Unique Ecology Well ID Tag No. _____
Water Right Permit No. _____
Property Owner Name _____
Well Street Address _____
City MOXEE County YAKIMA
Location NE 1/4-1/4 SE 1/4 Sec 24 Twn 12 R 19 ☒ EWM ☐ WWM Check One
(s, t, r Still REQUIRED)
Lat/Long Lat Deg _____ Lat Min/Sec _____
Long Deg _____ Long Min/Sec _____
Tax Parcel No. (Required) _____

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
GREEN GRAVEL	381	399
BROWN AND GRAY BASALT	399	408
GREEN GRAVEL & GRAVEL & GREEN CLAY & GREEN SAND & WATER	408	427
MEDIUM GRAY BASALT	427	452
MED. GRAY BASALT & HARD BLUE SHALE	452	465
BROWN BASALT & HARD BLUE SHALE	465	478
BROWN AND GRAY BASALT & HARD GREEN SHALE	478	483
HARD GRAY BASALT	483	528
GRAY BASALT & HARD GREEN SHALE	528	548
GRAY BASALT & HARD BLUE SHALE & WATER	548	553
GRAY BASALT	553	613
GRAY BASALT & HARD BLUE SHALE	613	631
MED. GRAY BASALT & HARD GREEN CLAY	631	649
MEDIUM GRAY BASALT & HARD BLUE-GREEN CLAY AND SANDSTONE & WATER	649	659
MED. GRAY BASALT WITH BLACK SEAMS & BLUE-GREEN SHALE & WATER	659	664
GRAY BASALT & HARD BLUE SHALE	664	685
5 INCH STEEL LINER WOULD NOT ADVANCE PAST 372 FEET.		
PUMPING 15 G.P.M WITH TOOLING IN THE HOLE INSIDE 5 INCH STEEL LINER @ 680 FT.		

Start Date 10-31-18 Completed Date 11-13-18

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee N _____
Driller/Engineer/Trainee Signature _____
Driller or trainee License No. 2767
IF TRAINEE: Driller's License No: _____
Driller's Signature: _____

Drilling Company OASIS DRILLING LLC
Address _____
City, State, Zip _____
Contractor's Registration No. OASISDL914LH Date 11-15-18

ECY 050-1-20 (Rev 4/07) Ecology is an Equal Opportunity Employer

Note: Personally Identifying Info redacted due to privacy concerns.